

25UEET414	ILLUMINATION TECHNOLOGY	Category	L	T	P	R	Credit	Year of Introduction
		PEC	3	0	0	0	3	2025

Preamble: This course introduces modern illumination engineering principles and lighting system design for residential, commercial, and industrial applications. It covers light sources, photometric measurements, indoor and outdoor lighting design, and energy-efficient lighting technologies. The course enables students to design and evaluate lighting systems using modern tools and industrial standards.

Prerequisite: IEE104 Introduction to Electrical & Electronics Engineering

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Explain illumination principles, photometric quantities, and modern light sources.	K2 Understand
CO2	Apply photometric laws and measurement techniques in lighting systems.	K3 Apply
CO3	Apply standard methods and tools to design the indoor and industrial lighting systems.	K3 Apply
CO4	Apply outdoor, energy-efficient, and smart lighting concepts in industrial applications.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	1	-	-	-	1	2	1
CO2	3	3	2	1	-	-	1	-	-	-	1	2	2
CO3	3	3	3	1	3	-	2	-	-	-	1	3	3
CO4	3	2	3	-	-	1	3	-	-	-	1	3	3
Avg	3	2.5	2.25	1	3	1	1.75	-	-	-	1	2.5	2.25

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*	-	-	*	*
CO2	*	*	*	*	*	-	-	*	*
CO3	*	*	*	*	*	*	-	*	*
CO4	*	*	*	*	*	-	*	*	*

Wks Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	*

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 Hours

Continuous Internal Evaluation Pattern:

Attendance	: 5 marks
Continuous Assessment Test	: 20 marks
Continuous Assessment Assignment	: 15 marks

SYLLABUS

Module 1(12 Hours)

Nature of light, electromagnetic spectrum, and vision. Types of illumination: natural and artificial lighting. Photometric quantities: luminous flux, intensity, illumination, luminance, and efficiency. Quality of lighting, glare, shadow, reflection, colour rendering, and stroboscopic effect.

Electric light sources: incandescent, halogen, fluorescent, mercury vapour, sodium vapour, metal halide, and LED lamps. Modern trends in lighting: solid-state lighting, smart lighting, and industrial lighting applications. Types of luminaires and lighting systems: direct, indirect, semi-direct, and semi-indirect lighting.

Module 2 (10 Hours)

Photometric definitions and units: lumen, candle power, illumination, luminance, and lamp efficiency. Laws of illumination: inverse square law and cosine law.

Illumination from point, linear, and surface sources. Polar curves and light distribution characteristics. Measurement of light using lux meter, integrating sphere, and goniophotometer.

Module 3 (10 H Hours)

Lighting design concepts: utilisation factor, maintenance factor, uniformity ratio, and reflection factor. Illumination requirements for residential, commercial, and industrial facilities.

Selection of lamps and luminaires for industrial environments. Illumination calculation using lumen method. Layout design and mounting considerations. Indian standards and recommended illumination levels for industrial buildings, workshops, and offices.

Introduction to lighting design software tools such as DIALux and Relux.

Module 4 (10 Hours)

Street lighting systems: types, arrangements, and design considerations. Flood lighting for industrial areas, yards, and sports facilities. Tunnel and area lighting.

Energy-efficient lighting systems and energy conservation techniques. Smart lighting systems using sensors such as motion sensors, occupancy sensors, and photo sensors. Introduction to lighting control systems and industrial lighting automation.

Textbooks

1. Jain, V. K. (2014). *Fundamentals of illumination engineering* (2nd ed.). S. Chand & Company Ltd.
2. Gupta, J. B. (2015). *Utilization of electric power and electric traction* (10th ed.). S. Chand & Company Ltd.
3. Partab, H. (2013). *Art and science of utilization of electrical energy* (3rd ed.). Dhanpat Rai & Sons.

Reference Books

1. Illuminating Engineering Society. (2011). *IES lighting handbook* (10th ed.). Illuminating Engineering Society of North America.
2. Philips Lighting BV. (2016). *Philips lighting manual* (6th ed.). Philips International.
3. General Electric Company. (2013). *GE lighting handbook*. General Electric.
4. Barnes, J. R. (2012). *Lighting design and installation handbook*. McGraw-Hill Education.
5. Phillips, D. (2000). *Lighting modern buildings*. Architectural Press (Elsevier).

END SEMESTER EXAMINATION – MODEL QUESTION PAPER (STC 2025 SCHEME)

Course Code	25UEET414
Course Name	ILLUMINATION TECHNOLOGY
Max. Marks: 60	Duration: 2.5 Hours

Part A <i>(Answer all questions. Each question carries 3 marks)</i>				
Qn No.	Question	Marks	CO	BL
1	Explain the nature of light and its dual characteristics.	3	1	L2
2	Compare natural lighting and artificial lighting with suitable examples.	3	1	L2
3	A point source having an intensity of 400 cd is placed 6 m above a working plane. Determine the illumination directly below the source.	3	2	L3
4	A room is illuminated by a lamp of intensity 250 cd at a point located 3 m away and inclined at 45°. Determine the illumination using the cosine law.	3	2	L3
5	A lighting installation has a utilisation factor of 0.6 and maintenance factor of 0.8. Compute the combined correction factor.	3	3	L3
6	A workshop uses a luminaire with a maintenance factor of 0.75 and utilisation factor of 0.65. Determine the effective lumen output for a lamp producing 6000 lm.	3	3	L3
7	A motion sensor switches OFF the lighting after 8 minutes of inactivity. Find the total energy saved if a 120 W lamp remains OFF for 5 hours.	3	4	L3
8	An occupancy sensor reduces the operating duration of a 150 W lamp from 10 hours to 6 hours. Compute the daily energy saved.	3	4	L3
Part B <i>(Answer any one full question from each Module. Each carry 9 marks)</i>				
Module I				
Qn No.	Question	Marks	CO	BL
9.a.	Explain the characteristics of good illumination and the factors influencing lighting quality.	5	1	L2
9.b.	Compare direct, semi-direct, indirect, and diffused lighting systems.	4	1	L2
OR				
10.a	Classify the various defects in lighting systems.	5	1	L2
10.b	Compare the characteristics of different luminaires used in	4	1	L2

	lighting installations.			
Module II				
Qn No.	Question	Marks	CO	BL
11.a	A lamp produces 2400 lm and is supplied with 30 W. Determine: a) Luminous efficacy. b) Efficiency if maximum efficacy is 683 lm/W. c) Flux produced for 50 W input.	5	1	L3
11.b	Two lamps having intensities of 300 cd and 500 cd are placed 4 m above a working plane. Find the total illumination at a point directly below the lamps.	4	1	L3
OR				
12.	A lighting installation uses two lamps: Lamp A = 400 cd and Lamp B = 600 cd. Both are mounted 5 m above a working plane. Find the total illumination at a point midway between them.	5	2	L3
12.b	A lux meter records 150 lux at 2 m and 38 lux at another location. Determine: a) The distance of the second location. b) Verify the inverse square law.	4	2	L3
Module III				
Qn No.	Question	Marks	CO	BL
13.	A room has the following illumination values, Maximum illumination = 600 lux and Minimum illumination = 420 lux. Determine the following: a) Uniformity ratio. b) Suitability for office lighting.	9	3	L3
OR				
14.	An industrial shed requires 250 lux over an area of 400 m ² . Available lamps - Metal halide lamp: 12000 lm and LED lamp: 15000 lm. Compute the number of lamps required for both cases using UF = 0.6 and MF = 0.75	9	3	L3
Module IV				
Qn No.	Question	Marks	CO	BL

15.	A tunnel lighting system uses 50 luminaires, each rated at 120 W. The lighting operates for 12 hours per day. Find: a) Daily energy consumption. b) Monthly energy consumption. c) Energy cost at ₹8 per kWh.	9	4	L3
OR				
16.	An automated lighting system uses Motion sensor delay = 10 minutes, Lamp rating = 100 W and Inactive duration = 4 hours/day. Compute: a) Daily energy saved. b) Monthly energy saved. c) Annual energy savings.	9	4	L3
