

25MEET301	BASICS OF ILLUMINATION SCIENCE AND LIGHTING DESIGN	Category	L	T	P	R	Credit	Year of Introduction
		VAC	4	0	0	0	4	2025

Preamble: This course aims to introduce students to the principles of illumination engineering and lighting design, focusing on practical considerations and design aspects for both indoor and outdoor lighting applications.

Prerequisite: Nil

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

CO	Course Outcomes	Knowledge Level
CO1	Apply the concepts of light, vision, colour, lighting quality, and various lighting systems in indoor and outdoor environments.	K3 Apply
CO2	Explain photometric quantities, laws of illumination, lighting calculation methods, and Indian standard recommendations for illumination levels.	K2 Understand
CO3	Explain different lamp technologies and lighting sources, including their characteristics, evolution, and application in aesthetic and special lighting.	K2 Understand
CO4	Apply illumination design principles to develop simple interior and exterior lighting layouts using standard design parameters and computer-aided tools.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	3	2	1	-	-	-	-	-	-	-	-	2	1
CO2	3	3	2	2	-	-	-	-	-	-	-	2	2
CO3	2	2	2	1	-	-	-	-	-	-	-	2	2
CO4	3	3	3	2	2	-	-	-	-	-	1	2	2
Avg	2.75	2.5	2	1.66	2	-	-	-	-	-	1	2	1.75

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 (14 Hours)

Sources of light - Day light, artificial light sources - energy radiation, visible spectrum of radiation. Quality of lighting- visual comfort, visual performance, safety, shadow, glare, reflection, colour rendering, colour appearance and stroboscopic effect.

Lighting systems- direct, indirect, semi direct, semi-indirect, Lighting schemes-ambient, task, accent lighting. General and localized - Artificial lighting as substitute to natural light. Good Practices in Lighting.

Module 2 (14 Hours)

Measurement of light: Luminous flux, Luminous intensity, Lumen, Illuminance, Luminance, Candle power- M.H.C.P, M.S.C.P - Lamp efficiency. Concept of polar curve - Laws of illumination - Inverse square law and Lambert's Cosine law. Lighting calculations- Point by point method and Average Lumen method. Indian standard recommendation and standard practices for illumination levels in various areas.

Module 3 (14 Hours)

Light sources:Different types of lamps and its evolution - Incandescent lamp - Fluorescent Lamp, Compact Fluorescent Lamp (CFL). Sodium Vapour lamp, Metal halide Lamps, Argon Neon lamps for signboards. Introduction to LED Lighting.

Special Features of Aesthetic Lighting:Monument and statue lighting, Sports lighting, Hospital lighting, Auditorium lighting, Facade Lighting, Retail Lighting.

Module 4 (14 Hours)

Design of Interior Lighting:Interior Lighting Design Standards - Maintenance factor, Uniformity ratio, Direct ratio, Coefficients of utilisation and factors affecting it - Illumination required for various work planes, Space to mounting height ratio (SHR) - DLOR and ULOR

Design of Outdoor Lighting:Street Lighting design- Flood lighting- Beam angle- Selection of lamp and projector.Computer Aided Lighting design:Role of computers in design - Softwares used for lighting design.

Text Books:

1. Pritchard, D. C. (2014). *Lighting* (6th ed.). Routledge.
2. Lindsey, J. L., & Dunning, S. C. (2015). *Applied illumination engineering* (3rd ed.). Fairmont Press.
3. Matthews, J. (1993). *Introduction to the design and analysis of building electrical systems*. Springer.

Reference Books:

- 1.Giridharan, M. K. (2016). *Electrical systems design* (2nd ed.). I K International Publishers.
- 2.Ganslandt, R., & Hofmann, H. (1997). *Handbook of lighting*. ERCO Edition.
- 3.Matthews, J. (1993). *Introduction to the design and analysis of building electrical systems*. Springer.
- 4.CIBSE. (2018). *SLL lighting handbook*. Chartered Institution of Building Services Engineers.
- 5.Cayless, M. A. (1996). *Lamps and lighting*. Routledge.

(STC 2025 SCHEME)

Course Code	25MEET301
Course Name	BASICS OF ILLUMINATION SCIENCE AND LIGHTING DESIGN
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.	Describe the basic concepts of light and explain the visible spectrum of radiation.	3	1	L2
2.	Explain the factors affecting the quality of lighting and the characteristics of good lighting.	3	1	L2
3.	Explain luminous flux, luminous intensity and illuminance.	3	2	L2
4.	Describe the inverse square law and Lambert's cosine law of illumination.	3	2	L2
5.	Explain the construction and characteristics of fluorescent and CFL lamps	3	3	L2
6.	Describe the applications of LED lighting in modern illumination systems.	3	3	L2
7.	Explain the significance of maintenance factor and coefficient of utilisation in lighting design.	3	4	L2
8.	Describe the role of computer-aided tools in lighting design.	3	4	L2
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.	Determine the appropriate light source for different applications by considering the factors affecting lighting quality.	9	1	L3
OR				
10.	Design a suitable lighting scheme for a given indoor or outdoor environment using appropriate lighting systems and good lighting practices.	9	1	L3
Module II				
Qn No.	Question	Marks	CO	BL
11.a.	Explain the concept of polar curves and discuss their importance in illumination engineering.	5	2	L2
11.b.	Describe the point-by-point method and average lumen method used in lighting calculations.	4	2	L2

OR				
12.a.	Explain the factors influencing illumination levels and discuss the Indian standard recommendations for illumination in various areas.	5	2	L2
12.a.	Compare the point-by-point method and average lumen method of lighting calculations.	4	2	L2
Module III				
Qn No.	Question	Marks	CO	BL
13. a.	Explain the construction, working and characteristics of incandescent and fluorescent lamps.	5	3	L2
13. b.	Compare sodium vapour lamps and metal halide lamps based on their characteristics and applications.	4	3	L2
OR				
14. a.	Describe the special lighting requirements of hospitals and auditoriums.	5	3	L2
14. b.	Explain the aesthetic considerations involved in monument and facade lighting.	4	3	L2
Module IV				
Qn No.	Question	Marks	CO	BL
15.a.	Apply the principles of interior lighting design to propose an energy-efficient lighting scheme for a commercial building considering SHR, coefficient of utilisation and maintenance factor.	6	4	L3
15. b.	Apply the concept of SHR to decide whether luminaires spaced 9 m apart can be mounted at a height of 5 m if the recommended SHR is 1.5.	3	4	L3
OR				
16. a.	An office room of dimensions 15 m × 10 m requires an illumination level of 300 lux. The coefficient of utilisation is 0.6 and the maintenance factor is 0.75. Determine the total lumen output required.	6	4	L3
16. b.	Determine the Uniformity Ratio of a lighting installation when the average illuminance is 300 lux and the minimum illuminance is 200 lux.	3	4	L3
