COURSE CODE: **1153EE111**	COURSE TITLE: **LED LIGHTING**	L	T	P	C
		3	**0**	**0**	**3**

COURSE CATEGORY:

Allied Elective

PREAMBLE :

This course forms the basis for understanding the types and fabrication of LEDs also it aims to discuss about the significance of driver circuits used in LED lighting system. The control strategies used in lighting of LED based systems are discussed so as to provide knowledge in design and analysis of LED based system. Lastly, the course also provides basic hands on exposure on assembly techniques for developing LED based products

PREREQUISITE COURSES:

Power Electronics & Drive

COURSE EDUCATIONAL OBJECTIVES:

The objectives of the course are to make the students,

- State the need for Illumination
- List standard voltage levels.
- Power electronics as applied to LED technology
- Define the aspects of design of lighting systems
- Maintain the lighting systems
- Fault rectification of lighting systems

COURSE OUTCOMES :

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Explain the fundamental elements, laws and quantities of illumination and optical design	K2
CO2	Explain about LED lighting, types of lightings	K2
CO3	Discuss and design the types and working of power electronic circuits used in LED technology	K3
CO4	Develop the Lighting control strategies, building lighting control systems and applications	K3
CO5	Design and fabricate PCB for LED lighting system, repair, maintenance of LED systems	K3

CORRELATION OF COs AND POs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		H					M				
CO2		M				M						
CO3	H		M					M		M		
CO4					M							
CO5												

COURSE CONTENT:

UNIT I	LIGHT AND ILLUMINATION	9

Basics about Light: Electromagnetic Spectrum, Visible Spectrum, Wavelength, Characterisations, Classification of Radiometry & Photometry - Natural & Artificial Light Sources - Characteristics about Light - Light and Vision - Evolution of Lighting Technologies - Merits and Demerits of the technologies - Instruments used for Measurement of Light Quantities.

UNIT II	LED TECHNOLOGY	9

Physics of a LED - Electrical characteristics - Optical characteristics - Data Sheet interpretation - Types of LED's - Experimental Procedures for determination of the Characteristics - White LED Parameters - Solid State Luminaire - Solid State Luminaire Standards - Performance Measurements

UNIT III	POWER ELECTRONICS FOR LED LIGHTING	9

LED Driver Requirements and Regional Standards – Topology Overview - Linear, Buck, Boost, Buck-Boost, Sepic & Fly-back) - Driving options - Discrete based drivers, Linear drivers, Switching drivers - AC-DC Drivers, Importance of Power Factor Correction (PFC), Single Stage vs 2-Stage Design, TRIAC Dimmable AC-DC Drivers - PWM IC

UNIT IV	LIGHT POWER & CONTROL	9

Lighting control strategies, techniques & equipment, sensors and timers, switches versus dimming control algorithm, harmonics, EI from lighting equipment – its measurement & suppression techniques. Impact of lighting control, protocols for lighting control; Lighting control by computer, simple multi-channel & large multi-channel control, stage & entertainment lighting control, architectural & building lighting control systems; Centralised vs. distributed system; Status monitoring, fault monitoring, electrical load monitoring, lamp life monitoring system, applications

UNIT V	LED MANUFACTURING TECHNOLOGY	9

Design Fundamentals of LED Lamps - Testing Of LED Lamps – SMD PCB Assembly technology – Screen printing, Pick & place Machines programming & practice, Reflow soldering, Hand Soldering, SMD REWORK & Repair, Dispensing, Coating, protection Optional

ADVANCED: LED Packaging process- Diebonding, Wire bonding, Encapsulation etc.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Optoelectronic Devices and Circuits, Theory and Applications, Amar K.Ganguly, Narosa Publishing House
2. Power Electronics, Dr.P.S.Bimbhra, Khanna Publishers.

REFERENCE BOOKS:

1. LIGHT-EMITTING DIODES E. FRED SCHUBERT , Cambridge University Press The Edinburgh Building, Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore.
2. Light Design, Anil Valia, Published by Mili Jain