INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM

INTRODUCTION OF NEW COURSE

Course Title	**Photovoltaic Science and Engineering**	Course No *(to be assigned by Academic Cell)*	**INT5XXX**			
Specialization	Interdisciplinary	Structure (LTPC)	3	0	0	3
To be offered for	UG / PG / Ph.D.	Status	Core ☐		Elective ▬	
Faculty Proposing the course	Dr. Vivek Kumar	Type	New ▬		Modification ☐	
Date of DAC	05/09/2018	Members Present	All Faculty Members of the Dept.			
Pre-requisite	None	Submitted for approval	**38th Senate**			
Learning Objectives	Students will learn how solar cells convert light into electricity, solar cell design principle and performance evaluation, different PV technologies and PV systems.					
Learning Outcomes	Students will able to: • Describe the physical working principles of photovoltaic conversion in solar cells. • Analyze the performance of solar cells and modules. • Design a complete photovoltaic system for any particular application.					
Contents of the course *(With approximate break up of hours)*	**Introduction to Solar Energy:** Solar energy and Photovoltaics (PV), Status and prospects of solar energy, Solar radiation at the Earth's surface. (2 Hrs.) **Device Physics of Semiconductor Solar Cells:** Semiconductors, p-n and p-i-n Junctions, Homo and hetero-junctions, Band bending, Depletion capacitance, Charge carrier and current densities, electrical transport, Photo carrier generation and recombination, Metal semiconductor contacts, Surface and interface states. (9 Hrs.) **Principle of Cell Design and Cell Performance:** Cell type, Optical design, Design and fabrication of metal contacts, I-V-T and C-V-f characteristics in dark and light, Effect of parasitic resistance, Conversion efficiency and spectral response, Surface and bulk recombination losses, Shockley-Queisser limit. (9 Hrs.) **Commercial PV Technologies: Crystalline silicon and III-V solar cells (**Single, tandem and multi/ hetero-junction solar cells). ***Thin Film Solar cells:*** Amorphous silicon, cadmium telluride and copper indium gallium di-selenide based solar cells. (9 Hrs.) **Emerging Technologies:** Organic PV, Organic/inorganic hybrid systems, Nanostructured materials based solar cells. (5 Hrs.) **PV Systems:** PV Modules, Maximum power point tracking (MPPT), Inverters, Storage, Stand alone PV systems, Grid-connected PV systems, Economics of PV systems. (6 Hrs.)					
TextBooks	1. Stephen J. Fonash, Solar Cell Device Physics (2nd edition), Academic Press (2010). 2. Chetan Singh Solanki., Solar Photovoltaic: "Fundamentals, Technologies and Application", PHI Learning Pvt., Ltd. (2009).					
Reference Books	1. L.D. Partain, L.M. Fraas, "Solar Cells and Their Applications", Wiley (2010). 2. P. Wurfel, Physics of solar cells, Wiley (2013). 3. A. Luque and S. Hegedus, Handbook of Photovoltaic Science & Engineering, Wiley (2003).					