Course Title	**Solar Cells and Photovoltaic Systems**
Course Code	**EE5333**
No. of Credit Hrs (Lecture + Tutorial + Lab)	**3 (2+0+1)**
No. of Contact Hrs (Lecture + Tutorial + Lab)	**4 (2+0+2)**
Level-Year	**9/10-5**
Prerequisite (if any)	**EE4403**

1) Course Objectives:

Through this course, the students will gain awareness about the relevance of PV systems as an alternative energy source. The course is designed to provide the basic skills and knowledge related to the modelling, analysis, design and application of photovoltaic systems.

2) Expected Learning Outcomes:

By the end of this course the student will be able to:

1. Describe the parameters governing the construction and deployment of photovoltaic systems. PLO1 [1]
2. Demonstrate and explain the semiconductor physics principles related to solar cells and photovoltaic generation. PLO1 [1]
3. Analyze and evaluate the modeling, design, and application aspects of photovoltaic systems. PLO2 [2]
4. Investigate the technical issues and challenges involved in harnessing electricity from solar cells. PLO3 [6]
5. Communicate experimental findings and project outcomes through structured reports. PLO8 [3]
6. Recognize and practice professional responsibility by following safety procedures during photovoltaic system experiments. PLO6 [4]

3) Course Contents:

1. Introduction - Solar cell physics, conversion of solar energy into electricity, photovoltaic effect, equivalent circuit of the solar cell, arrangements of arrays according to the voltage, module & its connections.
2. Construction - crystalline silicon and III-V solar cells: single, tandem and multijunction solar cells, thin film solar cells: amorphous silicon, cadmium telluride and copper indium gallium diselenide based solar cells, organic photovoltaic devices.
3. Dark and illumination characteristics, figures of merit of solar cell, efficiency limits, variation of efficiency with band-gap and temperature, efficiency measurements.
4. Stand-alone & grid-connected photovoltaic systems.

4) Lab experiments:

1. Testing Photovoltaic Cells- Construct a simple photovoltaic (PV) system, using a PV cell(s) and a DC ammeter
2. How the amount and wavelength of light affect the generation of electricity
3. How PV systems are connected to produce different voltages and currents
4. Measuring open-circuit voltage & short-circuit current of solar cells
5. Determination of I-V& P-V Characteristics of a Series and Parallel combination of PV Panels / Modules
6. Power Flow calculation of Stand-Alone PV System of DC Load with Battery

5) Teaching Methods:

- Lectures and Discussion
- Videos

- Self-learning
- Laboratory demonstrations

6) Mode of Evaluation: Course Assessment Methods

- Quizzes , Assignment, Homeworks, Reports, Presentations etc.
- Lab Work
- Mid Exam
- Final Exam

Evaluation

No	Assessment Activities *	Percentage
1.	Assignments/Quizzes/HomeWorks/Mini-Projects/Presentations/Reports+Quizzes	15%
2.	Mid Exam	25%
3.	Lab/Tutorial (Lab Exam)	10%
4.	Lab/Tutorial (Lab Reports)	10%
5.	Final Exam	40%

7) Textbook(s):

- Stuart R. Wenham et. al., Applied Photovoltaics, Taylor and Francis, Third edition, 2012.
- R. A. Messenger, Photovoltaic Systems Engineering, CRC Press, fourth edition, 2017.