FOUR YEAR UNDERGRADUATE PROGRAMME (FYUGP) IN PHYSICS
DETAILED SYLLABUS OF 2ND SEMESTER

Course Code:SEC237
Title of the Course: Solar Energy Basics and System Design
Nature of the Course: Skill Enhancement Course (SEC)
End Semester: 80 Marks(60T+20P)
In Semester: 20 Marks
Total Credits: 03

COURSE OBJECTIVES:

1. To provide basic knowledge on solar energy with special emphasis on Solar Photovoltaic Systems.
2. To provide knowledge on various schemes undertaken by government for skill based green jobs as a career option.
3. To encourage entrepreneurship.

UNITS	CONTENTS	L	T	P	Total Hours
1 (Marks 10)	**Classification of Energy Sources** Classification of energy sources, conventional (coal, oil and gas) and renewable sources (solar, biomass, wind, hydro, geothermal, tidal, OTEC); Sun as the source of energy.	4	-	-	4
2 (Marks 20)	**Basics of Electricity and Electronics** Electric charge and current, Ohm's law, Series and parallel connection of resistance; Atomic structure revisited, semiconductors; Intrinsic and extrinsic semiconductors, energy levels, electrical conductivity, Fermi level, P-N junction diode, forward and reverse biasing of P-N junctions, measuring instruments, DC power, AC power, energy, earthing.	8	-	4	12
3 (Marks 35)	**Basics of Solar cell** Photovoltaic effect, Solar cell and its function, solar technologies, solar cell parameters, efficiency of solar cell, new generation of solar cell materials, solar PV module, rating of solar PV module, PV module parameters, measuring module parameters, efficiency of PV module, connection of PV module in series and parallel, estimation and measurement of PV module power, selection of PV module. Types of solar PV system, design methodology for SPV system.	14	-	8	22
4 (Marks 15)	**Maintenance of SPV Systems** Tools required for maintenance, preventive maintenance of SPV systems, Factors effecting the SPV system performance, Financial Models and Career Opportunities, Different financial models associated with PV systems and emerging trends, various government schemes on skilled based green jobs as a career option	6	-	-	6
		32	-	12	44

where, L: Lectures T: Tutorials P: Practical

Modes of In-semester assessment: (20 Marks)

- One Test =10Marks
- Others (Any one) =10Marks
    - Seminar/Poster presentation
    - Peer teaching and discussion
    - Project report submission

Learner Outcomes:

1. A student will have skill based knowledge about the emerging area of renewable energy systems.
2. A student will have knowledge about the design and maintenance of Solar Photovoltaic Systems.
3. A student will be able to consider solar energy as a means of self employment and source of income.

Reading List:

1. V.K Mehta , Rohit Mehta; Principles Of Electronics, S. Chand
2. Solanki C. S. (2009); Solar Photovoltaics: Fundamentals, Technologies and Applications, Prentice Hall India.
3. Reinders A., Verlinden P., Sark W., Freundlich A., (2017); Photovoltaic Solar Energy: From Fundametal to Applications, Wiley.
4. Bube R.H. (1989); Photovoltaic Materials, Imperial College Press
5. Partain L.D. (ed) (1995); Solar Cells and their Applications, John Wiley
6. Rauschenbach H.S. (1980); Solar Cell Array Design Handbook, Van Nostrand Reinfold.

Solar Energy Basics and Solar Design (Lab):

1. To determine resistance of a conductor using Ohm's Law.
2. To study V-I characteristics of PN junction diode.
3. To study the V-I & power curves of solar cells and find maximum power point & efficiency.
4. To design Photovoltaic Module using SIMULINK/MATLAB software.

Recommended readings:

1. Basic Electronics: A text manual, P. B. Zbar, A. P. Malvino, M. A. Miller, 1994, Mc-Graw Hill.
2. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.
3. Beginning MATLAB and Simulink, Second Edition nOvenber 2022, Sulaymon Eshkabilov, Apress.