Master of Science in Physics
M.Sc. (Physics) Semester II

Course Code	**PS02EPHY52**	Title of the Course	**Solid State Electronics Devices & Solar Cells**
Total Credits of the Course	**04**	Hours per Week	**04**

Course Objectives:	This course on Solid State Electronics Devices & Solar Cells is one of the elective courses of physics intended at the MSc level. Its basic objective is 1. To provide basic training on the working principles of solid state electronics devices and solar cells. 2. Aims to provide the details of the design aspects of various solid state electronics devices, their characteristics and applications. 3. Aims to provide details related to the working of Photo Voltaic devices, their merits and demerits. Methods to improve the efficiency of solar cells.

Course Content		
Unit	Description	Weightage* (%)
1	Contact between materials and pn Junctions, Contact between two materials Metals Semiconductors contacts, I/V characteristics, thermoelectric effects, The pn Junction – equilibrium conditions, zero bias, forward bias and reverse bias, The effect of temperature on diode characteristics, diode equivalent circuits, properties of the depletion layer, abrupt junction, junction potential, width of depletion layer and depletion layer capacitance, reverse breakdown mechanism.	**25%**
2	Graded junctions, practical pn junction, Bipolar junction Transistor -emitter efficiency and base transport factor, d.c. characteristics of a transistor, C-B characteristic, distribution of excess charge in base, variation of current gain with collector current, common emitter characteristics, transistor breakdown voltages, The Ebers-Moll model, charge control of a transistor, measurement of _B and _C.	**25%**
3	The hybrid _ equivalent circuit of BJT and equivalent circuit of FET, light absorption in semiconductors, working principle LDR, photo-diode, photo-transistor and LED, liquid crystal display devices. IC operational amplifiers, frequency compensation, op-Amp switching application, op-Amp inverter, precision rectifier, peak clipper, Schmitt trigger, UTP, LTP and adjustment, comparator, monostable, astable multivibrator.	**25%**

4	Introduction to the photovoltaic systems, merits and limitations of solar PV systems, prospects of solar PV systems-principle of a photovoltaic cell, V-I characteristics of a solar cell- Inter connections of solar cells, efficiency of solar cell and its spectral response, -Configuration of a solar PV systems, PV cell technology, Structures of solar cells-M-S solar cells, MIS solar cells, solid – liquid junction solar cells, comparison of p-n junction, Schottky junction, M-S, MI-S solar cells.	**25%**

Teaching-Learning Methodology	Off line , Online mode of direct teaching learning, Tutorials, class assignments

Evaluation Pattern		
Sr.No.	Details of the Evaluation	Weightage
1	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
	Acquire o the working principles of solid state electronics devices. o the knowledge of various parameters that decides the performance of the device. o better understanding of the photo voltaic systems. o the basic structure of solar cells and methods to improve the efficiency of solar cells.

Suggested References:	
Sr.No.	References
1	Electronic Devices and Components, by J. Seymore, Longmann Scientific & Technical (1988)
2	Integrated Electronics, by K. R. Botkar, Khanna Publishers (1987)
3	Integrated Electronics: Analog and Digital Circuits Systems, by Millman and Halkias Tata McGraw -Hill Publishing Company Ltd.(2004)
4	Solid State Pulse Circuits, by David A. Bell, Prentice Hall of India Pvt. Ltd. (1988)
5	Energy Technology (Non conventional, Renewable and conventional), by S. Rao and Dr. P. B.Parrulkar, Khanna Publishers (1994)

On-line resources to be used if available as reference material

On-line Resources
engineering.buffalo.edu www.britannica.com www.ncbi.nlm.nih.gov www.ntnu.edu

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