

COURSE TITLE	ENGINEERING PHYSICS
COURSE CODE	01GS1101
COURSE CREDITS	4

Objective:

- 1 The graduates will be able to solve non-traditional problems that potentially draw on knowledge in multiple areas of physics.
- 2 Understand basic physics of semicond applications.
- 3 Acquire knowledge of magnetic materials.
- 4 Obtain knowledge of mechanism of various lasers and apply it for optical fibre communication
- 5 Prepare different basic logic gate circuits and check its application in various engg. fields
- 6 apply various numerical analysis methods to solve scientific problems/develop mathematical models.
- 7 The graduates will be able to solve non on knowledge in multiple areas of physics

Course Outcomes: After completion of this course, student will be able to:

- 1 Understand basic physics of semiconductors and use it in various engineering applications.
- 2 Acquire knowledge of magnetic materials.
- 3 Obtain knowledge of mechanism of various lasers and apply it for optical fibre communication.
- 4 Prepare different basic logic gate circuits and check its application in various engineering fields.
- 5 Apply various numerical analysis methods to solve scientific problems/develop mathematical models.

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Electronic Materials Introduction, Free electron theory, Types of electronic materials, metals, semiconductors, insulators Density of states and energy band diagrams, Kronig-Penny model, Energy bands in solids, E-K diagram, Direct and indirect bandgaps, Occupation probability, Fermi level, Effective mass	10

Contents : Unit	Topics	Contact Hours
2	Semiconductor Physics Intrinsic and extrinsic semiconductors, Carrier generation and recombination, Carrier transport: diffusion and drift, P-N Junction, Metal-semiconductor junction (Ohmic and Schottky), Optical loss and gain, Photovoltaic effect, Solar cell.	7
3	Magnetic Materials Definitions : Magnetic induction, Auxiliary Magnetic field, Magnetic dipole, Dipole moment, Magnetization, Magnetic parameters, Bohr magnetron, Classification of Magnetic Materials based on magnetic moment, Soft and Hard Magnetic Materials,, Anti-ferromagnetic materials, Ferrites,, Magnetic recording and readout, Magnetic storage devices.	8
4	Lasers and Fibre Optics Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser,, Population inversion, Pumping, Types of Lasers: Ruby laser, He-Ne laser, Applications of laser., Fibre Optics: Introduction, , Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture,, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres	11
5	Digital electronics Introduction – Logic levels, Basic logic gates: OR, AND , NOT gates, Universal logic gates:NAND and NOR gates, Symbolic representation,, Boolean expression and Truth table for all above logic gates, Integrated circuits– Levels of integration, SSI, MSI, LSI and VLSI-Advantages of ICs	10
6	Numerical Methods Representations of numbers: Roundoff error, truncation error,, significant error, error in numerical computations, Solution of transcendental and algebraic equations, Bisection, secant, Regula Falsi, fixed-point, Newton-Raphson, Graffe's methods	8
Total Hours		54

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment To determine of Resistivity and band Gap of Semiconductor by Four probe method at different temperature, To measure Numerical aperture of a given optical fiber using optical fiber kit, To observe various types of losses occurs in optical fibre using fibre kit., To determine the wavelength of laser light with a diffraction grating, To construct basic gates using PN junction diode, To find out the Fill Factor of a given solar cell., To study the variation of Hall Voltage with probe current at constant magnetic field., To study the variation of Hall Voltage with magnetic field at constant probe current., To obtain hysteresis curve (B.H Curve) for a given ferromagnetic material (Thinrods) on a DSO using solenoid and then to determine the related magnetic constant from it., To Measure the voltage and current of the parallel combinations, To verify Boolean Algebra and Demorgan's Theorem, To determine the volume magnetic susceptibility of Manganese sulphate solution at different	24
2	Experiment-1 To Verify the truth table of the Half adder & Full Subtractor., To Determine the Wavelength of Laser Light with a Diffraction Grating., To find out fill factor of given a Solar cell., To study the V-I Characteristics of a Light emitting diode (LED)., To draw the V-I characteristic of Zener diode and to determine Zener breakdown voltage., To verify truth table of logic gates using PN junction diode., To determine the Numerical aperture and acceptance angle of the given optical fibre., To determine the Width of the slit by diffraction., To verify inverse square law using Inverse square law kit., To draw V-I characteristics of PN Junction diode and to determine knee or cut in voltage., To determine of Resistivity and band Gap of Semiconductor by Four Probe method at different temperatures. (V. Lab)	22
Total Hours		46

Textbook :

- 1 Engineering Physics, Dattu R Joshi, McGraw hill Publications, 2017
- 2 Principles of Lasers, O. Svelto, Springer New York, 1989

References:

- 1 Optics, Optics, Ajoy Ghatak, McGraw-Hill Education, 2010
- 2 Fundamentals of Physics, Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker , Asian Books Pvt. Limited, 1994

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
20.00	20.00	35.00	10.00	10.00	5.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, also use any of tools such as demonstration, role play, Quiz, brainstorming, case studies etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in classroom.
- 4 Students will use supplementary resources such as online videos

Supplementary Resources:

- 1 <https://www.wolframalpha.com/examples/mathematics/applied-mathematics/numerical-analysis/>
- 2 <https://nptel.ac.in/courses/115/107/115107095/>
- 3 https://nptel.ac.in/content/storage2/courses/112108150/pdf/Web_Pages/WEBP_M16.pdf
- 4 <https://nptel.ac.in/courses/115/102/115102025/>