

**Subject Code: 01GS0101**

**Subject Name: Physics**

**B.Tech. Year - I**

**Objective:** Students are expected to learn basics of physics which will help them to apply physical concepts in various engineering branches whichever is applicable for them. The course is divided into ten modules. The course also discusses various aspects of physics which are used in many commercial, as well as industrial applications. Keeping wide view of applications of Non Destructive Testing, a special unit of the same is introduced.

**Credits Earned:** 4 Credits

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

- To Interpret the mechanics of various types of sound waves -what they look like, how they are produced, interact with other sound waves and materials.
- To Describe the basic physical principles and applications of ultrasonic sound.
- To Discuss construction, principle of optical fiber communication. Analyze the structure and properties of lasers to their performance and intended applications .
- To Utilize the concept of superconductivity, magnetic and advanced engineering materials and their behaviors under various system conditions.
- To Explain the need of NDT and its methodologies. Illustrate the properties and mechanisms of nano physics
- To demonstrate in the laboratory the ability to collect, analyze data and to prepare coherent reports of his or her findings

**Pre-requisite of course:** NA.

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA	CSE	Viva (V)	Term work (TW)	
3	0	2	4	50	30	20	25	25	150

**Contents:**

<b>Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Acoustics:</b> Introduction of musical sound and noise, Audible sound, Characteristics of audible sound, Loudness and Weber-Fechner law, Introduction of sound absorption co-efficient, Sabine's formula for reverberation (Without Derivations), Factors affecting the acoustics of building and their remedies, Sound absorbing materials, Sound Insulation, Noise Pollution, Noise Control in machineries.	5
2	<b>Ultrasonics:</b> Ultrasonic sound, Piezo-electric effect and Piezo-electric generator, Magnetostriction effect and Magnetostriction generator, Measurement of ultrasonic sound by Debye-Sear method, Applications of ultrasound in various disciplines.	4
3	<b>Non Destructive Testing:</b> <i>Visual inspection:</i> Scope and advantages of NDT, comparison of NDT with DT, Classification of NDT, equipments used for visual inspection, magnifying glass and mirror, microscope, borescope, endoscope, video imagescope. <i>Eddy current testing:</i> principle, advantages and disadvantages, factors affecting eddy current response, limitations and types of probes. <i>Liquid penetrant testing:</i> introduction, principle, equipments, procedures, limitations. <i>Radiographic testing:</i> X-ray and gamma ray radiography, principle, equipments and methodology, radiographic exposure factors, image quality, limitations and radiation hazards.	5
4	<b>Optical Fiber:</b> Introduction of Optical Fiber, Structure and advantages of Optical Fiber, Total Internal Reflection, Derivation of Numerical Aperture and Acceptance angle, Modes of Propagation, Classification of Optical Fiber, Fiber loss, Fiber optic communication system, Applications of optical fiber.	4

5	<b>LASER:</b> Properties of LASER, Spontaneous and stimulated emission, LASER with basic idea about Population Inversion, Pumping mechanism, Optical Resonators, Nd:YAG LASER, principle, construction and working, Applications of LASER in various disciplines, Principle of holography and its applications.	4
6	<b>Superconductivity:</b> General Properties of superconductors, Types of Superconductors, High Temperature superconductors, Applications: Magnets, Josephson effect, SQUID, Maglev, other	4
7	<b>Magnetic Materials:</b> 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.	5
8	<b>Nano-Physics:</b> Introduction of Nano scale, Surface to volume ratio, Synthesis of Nano materials: Top-down; Ball milling, lithography, erosion, Bottom-up; PVD, CVD, PECVD, and sol-gel methods, Structure and types of Carbon Nano tube, Synthesis of CNT; Electrical arc method, CVD, Laser ablation, Properties and applications of CNT, Properties and applications of Nano materials.	5
9	<b>Advanced Engineering Materials:</b> Metallic glass: Introduction, Synthesis; splat cooling and Melt spinning methods, Properties and Applications Shape Memory Alloy: Introduction, Properties and Applications Energy materials: Hydrogen fuel cell	4
<b>Total Hours</b>		<b>40</b>

**References:**

1. V. Rajendran, Engineering Physics, McGraw Hill Education (India) Pvt. Ltd.
2. K. Rajagopal, Engineering Physics, Prentice Hall of India Pvt. Ltd.
3. J. Prasad, C. G. K. Nair, “Non-Destructive Testing and Evaluation of Materials”, Tata McGraw Hill Education Private Limited.

**Suggested Theory distribution:**

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

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

**Suggested List of Experiments:**

1. To verify I-V characteristics of PN diode
2. To verify I-V characteristics of Zener diode
3. To verify I-V characteristics of Light Emitting diode
4. To determine efficiency of solar cell
5. Study of solar cell in series and parallel combinations
6. To determine Numerical Aperture of Optical Fiber
7. To determine propagation and bending losses of Optical Fiber
8. To determine velocity of ultrasonic sound in water by ultrasonic interferometer
9. To determine energy band gap of semiconductor by four probe method
10. To determine energy band gap of semiconductor by resistivity-temperature method
11. To determine carrier concentration of a given semiconductor by Hall effect

12. To determine divergence of LASER beam

**Instructional Method:**

- a. 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, may also use any of tools such as demonstration, role play, etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

**Supplementary Resources:**

1. <http://nptel.ac.in/courses>
2. <http://nptel.ac.in/downloads>
3. <http://vlab.amrita.edu/index.php>