10B11PH111 Physics-I

Course Goal

At the end of the course, the students will have sufficient scientific understanding of different phenomena associated with optics, atomic physics, thermal physics and relativistic mechanics.

Course Objectives

1. To enable the students to get better understanding about physical optics and its applications in engineering.
2. To familiarize students about modern physics and its applications in engineering.
3. To enable the students to get better understanding about thermal physics and its applications in engineering.
4. To familiarize students with relativistic mechanics.
5. At the conclusion of the course, the ability of students should have enhanced to think logically about the problems of science and technology and obtain their solutions.

Course Outcomes:

Students will have the knowledge of the basic concepts of optics and lasers, special theory of relativity, thermal physics and atomic physics.

Course Evaluation:

Test - I	15
Test - II	25
Test - III	35
Teacher Assessment	25
Total Marks	**100**

Detailed Syllabi

Lecture-wise Breakup

Subject Code	10B11PH111	**Semester**	1
Subject Name	Physics-I		
Credits	4	**Contact Hours**	4

Module No.	**Subtitle of the Module**	**Topics**	**No. of Lectures**
1.	Interference	Introduction, Young's double slit experiment, Phase difference and Path Difference, Coherence, Analytical treatment of interference, Methods of interference (division of wave front & division of amplitude) Applications of interference in the field of engineering,	**8**

		Scientific applications of interference.	
2.	Diffraction	Introduction, Difference between interference and diffraction, Fresnel and Fraunhoffer class of diffraction, Diffraction grating, Applications of diffraction grating, Resolving and dispersive power of an optical instrument.	**6**
3.	Polarization	Introduction, Difference between unpolarized and polarized light, Means of production of polarized light, Optical activity, specific rotation, Lorentz half shade and biquartz polarimeter.	**4**
4.	Atomic Physics	Introduction, Quantum numbers, spin and orbital angular momentum, Atoms in magnetic field, Zeeman effect, Atoms in electric field, Stark effect.	**4**
5.	Quantum Physics	Wave particle duality, uncertainty principle and its applications, wave function, Schrodinger equation and its solutions, Particle in a box, Harmonic Oscillator	**6**
6.	Lasers	Principle and working of laser, Different types of lasers (Three level and four level lasers).	**2**
7.	Thermal Physics	Introduction, Zeroth law of Thermodynamics. First law of thermodynamics, Specific heat relation, Work done during an isothermal and adiabatic process. Second law of thermodynamics, concept of entropy, entropy for an ideal gas, Third law of thermodynamics, Principle of increase of entropy or degradation of energy, Reversible and irreversible processes. Carnot cycle and Carnot engine, Refrigerator, Clausius-Cleyperon equation, Thermodynamic Potentials, Maxwell's equations.	**8**
8.	Relativistic Mechanics	Inertial & non-inertial frames, Michelson- Morley experiment, Einstein's postulates. Lorentz transformation, equations. Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity Mass energy equivalence.	**4**
		Total number of Lectures	**42**

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	N. Subrahmanayam, Brij Lal and M.N. Avadhanulu, A Text Book of Optics, S. Chand (2012)
2.	Ajoy Ghatak, Optics, Tata McGraw Hill, 5th addition, (2012)
3.	Brij Lal, N Subrahmanyam and P.S. Hemne, Heat Thermodynamics and Statistical Physics, S. Chand, 3rd edition (2012).

4.	Arthur Beiser, Concepts of Modern Physics, McGraw Hill, 6th edition (1994).
5.	F.A. Jenkins and H.E. White, Fundamentals of Optics, McGraw-Hill (1981).
6.	R. Eisberg and R. Resnick, Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles, John Wiley & Sons, 2nd edition (1985).

10B11PH211 Physics-II

Course Goal

At the end of the course, the students will have sufficient scientific understanding of different phenomena associated with electrodynamics, statistical physics, solid state physics and optical fibre Communication.

Course Objectives

1. To offer a broad aspect of those areas of Physics which are specifically required as an essential background to engineering students for their studies in higher semesters.
2. To enable the students to get better understanding about solid state physics and its applications in engineering.
3. To familiarize students about electromagnetism and its applications in engineering.
4. To enable the students to get better understanding about statistical physics and its applications in engineering.
5. To familiarize students with optical fibers communication.
6. At the conclusion of the course, the ability of students should have enhanced to think logically about the problems of science and technology and obtain their solutions.

Course Outcomes:

After studying this course the students would gain enough knowledge to understand/ solve basic electrodynamics, statistical physics and solid state physics problems which is not possible by classical understanding.

Course Evaluation:

Test - I	15
Test - II	25
Test - III	35
Teacher Assessment	25
Total Marks	**100**

Detailed Syllabi

Lecture-wise Breakup

Subject Code	10B11PH211	**Semester**	1
Subject Name	Physics-II		
Credits	4	**Contact Hours**	4

Module No.	**Subtitle of the Module**	**Topics**	**No. of Lectures**
1.	Solid State Physics	Basic ideas of bonding, ionic bonding, covalent bonding (hybridization), metallic bonding, dispersion bonds, dipole bonds, hydrogen bonds, Lattice points and space	**16**

		lattice, basis and crystal structure, unit cell and primitive cell, seven crystal systems and fourteen Bravais space lattice, coordination number, nearest neighbour distance, atomic radius, atomic packing factor in crystal structure, calculation of lattice constant, lattice planes and Miller indices, separation between lattice planes. X-ray diffraction, Bragg's law of X-ray diffraction, Bragg's x-ray spectrometer, powder crystal method, rotating crystal method. Electronic conduction in metals, classical free electron theory, quantum theory of free electrons, band theory of solids, distinction between metals, semiconductors and insulators, intrinsic and extrinsic semiconductors, carrier concentration in thermal equilibrium in intrinsic semiconductor, Fermi level and energy band diagram in intrinsic semiconductor, energy band diagram and Fermi level in extrinsic semiconductors, effect of temperature on extrinsic semiconductor, electrical conductivity of intrinsic semiconductor and extrinsic semiconductor, Hall effect, allied parameters and its applications.	
2.	Electromagnetism	Basic knowledge of fields, gradient, divergence and curl, Coulomb's law and related numerical, electric flux, Gauss's law for the charge inside and outside the Gaussian surface, applications of Gauss law: spherical and cylindrical symmetries, electric field due to charged conductor, force per unit area on the surface of the charged conductor, treatment of electrostatic problems by solution of Laplace and Poisson's equations. Biot Savart law, Ampere's law, Maxwell's equations in free space and dielectric media, energy in electromagnetic waves (Poynting vector and Poynting theorem), plane electromagnetic waves in free space, transverse nature, wave impedance and energy flow, energy density and energy flux (Poynting vector) in an electromagnetic field, radiation pressure.	**12**
3.	Statistical Physics & Applications	Introduction, macrostates, microstates, thermodynamic probability, distribution of n-particles in k-cells, phase space, minimum volume, classical and quantum statistics: common approach to three statistics, Maxwell-Boltzmann (ideal gas), Bose-Einstein (photon gas), Fermi-Dirac distributions (electron gas), Compton effect.	**10**
4.	Optical Fibers Communication	Light propagation in fibers, Step index and Graded Index fibers, Numerical Aperture and Attenuation, Single and Multimode fibers and their propagation	**4**

		characteristics, Fiber losses and optical fiber applications.	
		Total number of Lectures	**42**

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	Charles Kittel, Introduction to Solid State Physics. John Wiley & Sons, 8th edition 2005.
2.	S. O. Pillai, Solid State Physics, New age international publishers, 7th edition (2016).
3.	David J Griffiths, Introduction to Electrodynamics, Eastern Economy Editions, PHI, 4th edition (2012).
4.	Brij Lal, N Subrahmanyam and P.S. Hemne, Heat Thermodynamics and Statistical Physics, S. Chand, 3rd edition (2012).
5.	Gerd Keiser, Optical Fiber Communication, Tata McGraw-Hill Education Pvt. Ltd., 5th edition (2013).

10B11PH212 Bio-Physical Techniques

Course Goal

This course aimed to learn concepts for strong foundation of biophysical methods and their application in the field of biotechnology. Students will gain a greater understanding of the underlying theory of these methods and their practical applications in the laboratories.

Course Objectives

- Exposure to various instruments used in Biophysics.
- To be able to use important biophysical methods to decipher problems relevant to biology.
- Better understanding of the structure-function activity of biomolecules.

Course Outcomes:

Students after going through this course will have

- knowledge about different degrees of freedom of biological molecules with varying energy of the electromagnetic spectrum
- basic underlying techniques of the analytical instruments, their principle and working.
- information about different spectroscopies (microwave, Raman, FTIR, Electronic, ESR,NMR etc).

Course Evaluation:

Test - I	15
Test - II	25
Test - III	35
Teacher Assessment	25
Total Marks	**100**

Detailed Syllabi

Lecture-wise Breakup

Subject Code	10B11PH212	**Semester**	4
Subject Name	Bio-Physical Techniques		
Credits	4	**Contact Hours**	4

Module No.	**Subtitle of the Module**	**Topics**	**No. of Lectures**
1.	Molecular spectroscopy	Introduction to molecular spectroscopy, Quantization of energy, Elements of Quantum Mechanics, Schrödinger	**10**

		wave equation. Harmonic Oscillator, Regions of the electromagnetic spectrum, Representation of spectra, Basic elements of practical spectroscopy, the width and intensity of spectral lines.	
2.	Microwave spectroscopy	Introduction to Microwave spectroscopy, Rotation of molecules, Concept of moment of inertia (M.I), M.I of different types of molecules. Rotational spectra of rigid diatomic molecule (derivation of energy by applying Schrödinger wave equation, Selection rules for transition), Isotopic effect on rotational spectra. Non rigid rotator (effect on rotational spectra due to centrifugal force), derivation of energy, distortion constant, Selection rules. Rotation of poly-atomic linear molecules, derivation of M.I of linear triatomic molecule. Rotational spectra of Symmetric top molecule, Asymmetric top molecules, Instruments and techniques of microwave spectroscopy, chemical analysis.	**11**
3.	Infrared spectroscopy basics	Introduction to infrared spectroscopy, Vibration of single molecule, vibration of diatomic molecule. Simple harmonic oscillator (derivation of energy, selection rule), An harmonic oscillator (derivation of energy, selection rule). Vibration rotation spectra of diatomic molecule, Born-Oppenheimer approximation. Transition states and selection rule of rotational vibration spectra of diatomic molecule, Break Down of the Born-Oppenheimer approximations: The interaction of Rotations and vibrations.	**11**
4.	Infrared spectroscopy interpretation and applications	Vibrations of polyatomic molecules, Fundamental Vibrations and their Symmetry, Overtones and Combination Frequencies, parallel and perpendicular vibrations, Vibration of symmetric top molecules, Techniques and instrumentation of Infrared spectroscopy, Applications of Infrared spectroscopy.	**10**
		Total number of Lectures	**42**

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	C. N. Banwell, Fundamentals of Molecular Spectroscopy. McGraw-Hill, (1194)

2.	Sune Svanberg, Atomic and Molecular Spectroscopy: Basic Aspects and Practical pplications, Springer Science & Business Media (2012).
3.	G. Aruldhas, Molecular structure and spectroscopy, PHI Learning Pvt. Ltd. (2007)
4.	Charles H. Townes, A. L. Schawlow, Microwave Spectroscopy, Dover Publications Inc.(1975)
5.	Walter Gordy, Microwave Spectroscopy, Springer Berlin Heidelberg (1957)
6.	Barbara H. Stuart , Infrared Spectroscopy: Fundamentals and Applications, Wiley (2004)
7.	Brian C. Smith, Fundamentals of Fourier Transform Infrared Spectroscopy, Second Edition, CRC Press (2011)

10B11PH611 Materials Science

Course Goal

At the completion of this course, the student should have the basic understanding of different materials and their properties. Students would be able to properly select suitable material for different engineering application and thus design better products.

Course Objectives

1. To enable the students to get better understanding about materials and their applications in engineering.
2. To familiarize students for making proper selection of materials for different applications.
3. To enable the students to use the knowledge about materials for their projects and ultimately apply the materials knowledge in their respective professional career.
4. At the conclusion of the course, the student should have a far greater capacity to read and understand technical articles such as those seen in the IEEE Transactions on Electron Devices, IEEE Transactions on Nanotechnology, Computer-aided design, Computational Materials Science *etc*.

Course Outcomes:

At the end of this course students will be able to understand the microscopic and macroscopic behavior of various materials. Students will be able to select material as per specific application in engineering field.

Course Evaluation:

Test - I	15
Test - II	25
Test - III	35
Teacher Assessment	25
Total Marks	**100**

Detailed Syllabi

Lecture-wise Breakup

Subject Code	10B11PH611		**Semester**	6
Subject Name	Materials Science			
Credits	4		**Contact Hours**	4
Module No.	**Subtitle of the Module**	**Topics**		**No. of Lectures**
1.	Dielectric Materials	Polarization mechanism & Dielectric Constant, Behavior of polarization under impulse and frequency switching, Dielectric loss, Spontaneous polarization, Piezoelectric		**10**

		effect; Applications of Dielectric Materials.	
2.	Polymers	Various types of Polymers and their applications; Mechanical behavior of Polymers, synthesis of polymers. Conducting polymers	**4**
3.	Optical Fiber	Light propagation in fibers and Graded Index fibers, Numerical Aperture and Attenuation, Single and Multimode.	**3**
4.	Display Devices	Fluorescent Materials, LCD	**2**
5.	Magnetic Materials	Concept of magnetism, Classification, dia-, para-, ferro-, antiferro- and ferri-magnetic materials, Their properties and Applications; Hysteresis; Applications.	**9**
6.	Superconducting Materials	Meissner effect, Critical field, type-I and type-II superconductors; Field penetration and London equation; High temperature Superconductors and their Applications.	**4**
7.	Ceramics	Structure, Types, Properties and Applications of Ceramics; Mechanical behavior and Processing of Ceramics	**3**
8.	New Engineering Materials	Metallic Glasses, Shape Memory Alloys, Memory Effect, Nano-materials- significance of nanoscale, 0-Dimensional, 1- Dimensional, 2- Dimensional, 3-Dimensional nanostructures, Applications.	**7**
		Total number of Lectures	**42**

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)

1.	Charles Kittel, Introduction to Solid State Physics. John Wiley & Sons, 8th edition 2005.
2.	S. O. Pillai, Solid State Physics, New age international publishers, 7th edition (2016).
3.	William D. Callister and David G. Rethwisch, Materials science and engineering: an introduction, John Wiley & Sons, 8th edition (2010).
4.	S.L. Kakani and Amit Kakani, Material Science (Science and Engineering of Materials), New age international publishers, 3rd edition (2016).
5.	M. A. Wahab, Solid State Physics: Structure and Properties of Materials, Narosa, 3rd edition, (2015).
6.	http://web.stanford.edu/~richlin1/sma/sma.html
7.	http://www.nanowerk.com/nanotechnology/introduction/introduction_to_nanotechnology_1a.p

	hp
8.	http://www.advancedsciencenews.com/best-of-advanced-optical-materials/

10B14PH841 Wireless Networks

Course Goal

At the end of course, students will know all aspects of wireless network systems, their working, design and layout. Students will themselves be able to design the network and know all requirements of the same.

Course Objectives

1. To enable the students to get better understanding about wireless network system and their applications in communications.
2. To familiarize students for making proper selection of spectrum for different applications.
3. To enable the students to use the knowledge about wireless network for their projects and ultimately apply in their respective professional career.
4. At the completion of this course, students would be able to properly select suitable network for desired communication application and thus design better products.

Course Outcomes:

At the end of the course students will be able to learn about the basics of antennas, their properties, different wireless systems, security and privacy over wireless networks.

Course Evaluation:

Test - I	15
Test - II	25
Test - III	35
Teacher Assessment	25
Total Marks	**100**

Detailed Syllabi

Lecture-wise Breakup

Subject Code	10B14PH841		**Semester**	8
Subject Name	Wireless Networks			
Credits	3		**Contact Hours**	3
Module No.	**Subtitle of the Module**	**Topics**		**No. of Lectures**
1.	**Basics of**	Attenuation, fading, Multipath Propagation – Delay spread, ISI, Coherence BW, Doppler Spread,		**10**

	wireless Systems	Propagation models. Frequency reuse – Cellular systems, Co-channel interference, Adjacent channel interference, Cellular Capacity, Evolution of mobile wireless communication systems	
2.	**Wireless Technologies**	Cellular wireless,Wireless local area networks, Mesh networks, Satellites, Multi-hop wireless, Wireless local loop, Antennas: Dipole,Folded Dipole, Monopole,ARRAYS: Yagi-Uda (parasitic arrays),Phased Arrays,Loop, Ground Plane, Helical, Discone, Turnstile,Microstrip Patch, Dish	**8**
3.	**Wireless networks and Advanced Trends in Wireless Communications**	WiFi, 802.11, 802.11a and 802.11 b Wireless LANs, frame structure, modes of operation, data rates, power management, handoff strategies, Medium access control etc. Bluetooth networks: Piconet, scatternet, frame structure, data rates, synchronous and asynchronous services, power saving etc. Heterogeneous networking: Always Best Connected (ABC), Vertical handoffs, QoS mechanisms, Cross layer design, Pico-cells and Femto-cells, PAN's, Introduction to Ad-hoc networks - Wireless Sensor networks – Design principles and challenges (energy constraint)	**12**
4.	**Multi access Mechanism, Measurements, Security, Privacy and Protocols**	Spread Spectrum – Multiple Access & Interference Mitigation, OFDM - inter symbol interference, FFT/IFFT, PAPR, cyclic prefix, OFDM transmitter and receiver, Introduction to MIMO systems – Capacity gain (multiplexing), Diversity gain, Diversity-Capacity Trade-offs, Adaptive Modulation and Coding, Introduction to Space-Time Coding.	**12**
		Total number of Lectures	**42**

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	John Ross, The Book of Wireless, No Starch Press, 2nd edition (2008).
2.	Vijay K. Garg, Wireless Communications and Networking, Morgan Pub., 1st edition (2007).
3.	Roberto Ramirez-Iniguez, S. M. Idrus, Z. Sun, Optical Wireless Communications: IR for Wireless Connectivity, CRC press (2008).
4.	Praphul Chandra, D. M. Dobkin, A. Bensky, R. Olexa, D. A. Lide, F. Dowla, Wireless Networking, Elsevier (2008)

10B17PH171 Physics Lab-I

Course Goal

At the end of the lab course, the students will have the test of all knowledge through experiments. Students will gain sufficient scientific understanding of different phenomena associated with the respective theory paper Physics -I.

Course Objectives

1. **The Art of Experimentation:** The introductory laboratory engages each student in significant experiences with experimental processes, including some experience in investigation.
2. **Experimental and Analytical Skills:** The laboratory help the student develop a broad array of basic skills and tools of experimental physics and data analysis.
3. **Conceptual Learning:** The laboratory help students master basic physics concepts.
4. **Understanding the Basis of Knowledge in Physics:** The laboratory help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments.
5. **Developing Collaborative Learning Skills:** The laboratory helps students to develop collaborative learning skills that are vital to success in many lifelong endeavors.

Course Outcomes:

The student after doing this laboratory course will have

- insight of core Physics-I theory course
- ability to correlate their theoretical knowledge with experiment directly.
- working knowledge and principle of various instruments
- the aptitude to design new experiment.

Course Evaluation:

Day to day work 60%: Break-up of Day to day work will be as follows: (i) Attendance 15% (ii) Quantity & Quality of Experiments including Performed, Learning laboratory Skills and handling Laboratory Equipment, Instruments, Gadgets, Components, Materials and Software etc. 30% (iii) Laboratory record 15%.	60
Mid Term Test (Viva + performance)	20
End Term Test (Viva + Performance)	20
Total marks	**100**

List of Experiments

Lab-wise Breakup

Subject Code	10B17PH171	**Semester**	1
Subject Name	Physics Lab - I		
Credits	1	**Contact Hours**	2

Module No.	**Subtitle of the Module**	**Topics**	**No. of Lab Hours**
1.	Interference	To determine the wavelength of sodium light by measuring the diameters of Newton's Rings	**4**
2.	Interference	To find the wavelength of sodium light using Fresnel's biprism.	**4**
3.	Diffraction	To measure the wavelengths of certain lines in the spectrum of the mercury lamp using plane transmission grating.	**4**
4.	Dispersion	To determine the dispersive power of the material of prism with the help of a spectrometer.	**4**
5.	Magnetism	To determine the magnetic susceptibility of a given paramagnetic liquid using Quinck's method.	**4**
6.	Polarization	To find the specific rotation of sugar solution by using a half shade polarimeter.	**4**
7.	Polarization	To find the specific rotation of sugar solution by using a biquartz polarimeter.	**4**
		Total number of Lab Hours	**28**

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	S. P. Singh, Advanced Practical Physics,Pragati Prakashan, Vol. 1 (2013).
2.	C. L. Arora, Practical Physics, S. Chand Company Limited, 20th edition (2004).
3.	N. Subrahmanayam, Brij Lal and M.N. Avadhanulu, A Text Book of Optics, S. Chand (2012)
4.	Ajoy Ghatak, Optics, Tata McGraw Hill, 5th addition, (2012)
5.	F.A. Jenkins and H.E. White, Fundamentals of Optics, McGraw-Hill (1981).

10B17PH271 Physics Lab-II

Course Goal

At the end of the lab course, the students will have the test of all knowledge through experiments. Students will gain sufficient scientific understanding of different phenomena associated with the respective theory paper Physics-II.

Course Objectives

1. **The Art of Experimentation:** The introductory laboratory engages each student in significant experiences with experimental processes, including some experience in investigation.
2. **Experimental and Analytical Skills:** The laboratory help the student develop a broad array of basic skills and tools of experimental physics and data analysis.
3. **Conceptual Learning:** The laboratory helps student's to understand basic physics concepts.
4. **Understanding the Basis of Knowledge in Physics:** The laboratory help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments.
5. **Developing Collaborative Learning Skills:** The laboratory helps students to develop collaborative learning skills that are vital to success in many lifelong endeavors.

Course Outcomes:

The student after doing this laboratory course will have

- insight of core Physics-II theory course
- ability to correlate their theoretical knowledge with experiment directly.
- working knowledge and principle of various instruments
- the aptitude to design new experiment.

Course Evaluation:

Day to day work 60%: Break-up of Day to day work will be as follows: (i) Attendance 15% (ii) Quantity & Quality of Experiments including Performed, Learning laboratory Skills and handling Laboratory Equipment, Instruments, Gadgets, Components, Materials and Software etc. 30% (iii) Laboratory record 15%.	60
Mid Term Test 20% (Viva + performance)	20
End Term Test 20% (Viva + Performance)	20
Total marks	**100**

List of Experiments
Lab-wise Breakup

Subject Code	**10B17PH271**	**Semester**	2	
Subject Name	**Physics Lab - II**			
Credits	1	**Contact Hours**	2	
Module No.	**Subtitle of the Module**	**Topics**		**No. of lab Hours**
1.	Optical Fiber	To determine the numerical aperture, losses, attenuation coefficient E-O and O-E convertor characteristics of an optical fibre using LED as a light source.		**4**
2.	Solid state Physics	To measure resistivity of semiconductor and band gap of the semiconductor using four probe method.		**4**
3.	Solid state Physics	To study Hall effect in semiconductor and determination of its allied parameters.		**4**
4.	Electromagnetism	To calculate the e/m ratio for an electron using Thomson method/Bar magnet method		**4**
5.	Solid state Physics	To study magnetostriction in magnetic materials using He-Ne laser.		**4**
6.	Solid state Physics	To study the coercivity, saturation magnetization, retentivity of given materials.		**4**
7.	Solid state Physics	Experimental Determination of Planck's constant using Light Emitting Diodes (LEDs) and Photoelectric Effect.		**4**
		Total number of Lab hours		**28**

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	S. P. Singh, Advanced Practical Physics,Pragati Prakashan, Vol. 1 (2013).
2.	C. L. Arora, Practical Physics, S. Chand Company Limited, 20th edition (2004).
3.	Charles Kittel, Introduction to Solid State Physics. John Wiley & Sons, 8th edition 2005.
4.	S. O. Pillai, Solid State Physics, New age international publishers, 7th edition (2016).
5.	Gerd Keiser, Optical Fiber Communication, Tata McGraw-Hill, 5th edition (2013).

16B11PH112 Basic Engineering and Applied Physics

Course Goal

The purpose of this course is to develop scientific temper and analytical capability through learning physical concepts and their applications in engineering and technology. Comprehension of some basic physical concepts will enable the students to logically solve problems. To give students a basic exposure to Physics that will better prepare them for more rigorous courses that will be taken later on.

Course Objectives

1. To understand the general scientific concepts required for technology.
2. To apply the concepts in solving BT/BI engineering problems.
3. To explain scientifically the new developments in engineering and technology
4. To get familiarized with the concepts, theories, and models behind many technological applications.

Course Outcomes:

Students will have the knowledge of the basic concepts of optics, viscosity and nanomaterials which is required for BT/BI.

Course Evaluation:

Test - I	15
Test - II	25
Test - III	35
Teacher Assessment	25
Total Marks	**100**

Detailed Syllabi

Lecture-wise Breakup

Subject Code	16B11PH112	**Semester**	1
Subject Name	**Basic Engineering Physics**		
Credits	4	**Contact Hours**	4

Module No.	**Subtitle of the Module**	**Topics**	**No. of Lectures**
1.	Nature of light and matter	The electromagnetic spectrum: Sources of light, emission and absorption spectra, Basics of Fluorescence, Brief introduction to spectroscopy, Particle nature of radiation- The Photoelectric effect, Compton Effect. X-rays (continuous and characteristic), X-ray diffraction-	**10**

		Bragg's law. The origin of quantum theory- Planck's hypothesis, the wave nature of matter- wave-particle duality, matter waves (de Broglie hypothesis). Basic postulates of quantum mechanics - the wave function - its physical interpretation, the Schrodinger equation.	
2.	Interference	Coherence and coherent sources, Interference by division of wavefront (Young's double slit experiment, Fresnels' biprism), Interference by division of amplitude (Newton's rings, Michelson's Interferrometer).	**6**
3.	Diffraction	Fresnel and Fraunhoffer types of diffraction, Fraunhofer diffraction: Single slit, double slit, circular aperture and N-slit. Diffraction grating - wavelength determination, resolving power and dispersive power. Resolving power of optical instruments – Rayleigh criterion.	**6**
4.	Polarization	Types of polarization, Brewster's law, Malu's law, e-ray and O-ray, dichroism, Nicol prism, double refraction, quarter-wave and half-wave plates, elliptically and circularly polarized light, optical activity, specific rotation, Laurent half-shade polarimeter.	**6**
5.	Viscosity and centrifugation	Streamline flow, Turbulent motion, Critical velocity, Viscosity, Coefficient of viscosity, Poiseulle's equation, Stoke's method, Ostwald viscometer. Centrifugation.	**6**
6.	Surface tension	Excess pressure inside a liquid drop and soap bubble, Angle of contact, Searl's Torsion balance method, Jaeger's method, Quincke's method, Interfacial surface tension.	**4**
7.	Introduction to Nanotechnology	Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Fabrication: Bottom-up and Top-down, Characterization, Nanobiotechnology.	**4**
		Total number of Lectures	**42**

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	Neeraj Mehta, Applied Physics for Engineers, PHI India Limited (2011).
2.	Brij Lal and Subramanyam, Optics, S. Chand & Company (2012).
3.	R S Burden , Surface Tension and the Spreading of Liquids, Cambridge University Press (2014).
4.	Ajoy Ghatak, Optics, Tata McGraw Hill (2005).
5.	David Griffiths, Introduction to Quantum Mechanics, Prentice Hall (2004).

6.	K. K. Chattopadhyay, Introduction to Nanoscience and Nanotechnology, Prentice Hall India Learning Private Limited (2009).
7.	D. S. Viswanath, T. Ghosh, Dasika H.L. Prasad, Nidamarty V.K. Dutt, Kalipatnapu Y. Rani , Viscosity of Liquids: Theory, Estimation, Experiment, and Data , Springer (2007).

16B17PH172 Basic Engineering and Applied Physics Lab

Course Goal

At the end of the lab course, the students will have the test of all knowledge through experiments. Students will gain sufficient scientific understanding of different phenomena associated with the respective theory paper Basic Engineering Physics.

Course Objectives

1. **The Art of Experimentation:** The introductory laboratory engages each student in significant experiences with experimental processes, including some experience in investigation.
2. **Experimental and Analytical Skills:** The laboratory help the student develop a broad array of basic skills and tools of experimental physics and data analysis.
3. **Conceptual Learning:** The laboratory help student's to understand basic physics concepts.
4. **Understanding the Basis of Knowledge in Physics:** The laboratory help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments.
5. **Developing Collaborative Learning Skills:** The laboratory helps students to develop collaborative learning skills that are vital to success in many lifelong endeavors.

Course Outcomes:

The student after doing this laboratory course will have

- insight of core Basic Engineering Physics theory course
- ability to correlate their theoretical knowledge with experiment directly.
- working knowledge and principle of various instruments
- the aptitude to design new experiment.

Course Evaluation:

Day to day work 60%: Break-up of Day to day work will be as follows: (i) Attendance 15% (ii) Quantity & Quality of Experiments including Performed, Learning laboratory Skills and handling Laboratory Equipment, Instruments, Gadgets, Components, Materials and Software etc. 30% (iii) Laboratory record 15%.	60
Mid Term Test (Viva + performance)	20
End Term Test (Viva + Performance)	20
Total marks	**100**

List of Experiments
Lab-wise Breakup

Subject Code	16B17PH172	**Semester**	1
Subject Name	Basic Engineering Physics Lab		

Credits	1	Contact Hours	2

Module No.	**Subtitle of the Module**	**Topics**	**No. of Labs Hours**
1.	Interference	To find the wavelength of sodium light using Fresnel's biprism.	**4**
2.	Interference	To determine the wavelength of sodium light by measuring the diameters of Newton's rings.	**4**
3.	Diffraction	To measure the wavelengths of certain lines in the spectrum of the mercury lamp using plane transmission grating.	**4**
4.	Polarization	To find the specific rotation of sugar solution by using a polarimeter.	**4**
5.	Dispersion	To calculate the angle of prism and dispersive power of the materials of the prism with the help of spectrometer.	**4**
6.	Absorbance and fluorescence	Studies for absorbance, excitation and emission in liquids in support of Jablonski diagram.	**4**
7.	Viscosity	To determine coefficient of viscosity of water by Poiseuille's Method.	**4**
		Total number of Lectures	**28**

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)

1.	S. P. Singh, Advanced Practical Physics,Pragati Prakashan, Vol. 1 (2013).
2.	C. L. Arora, Practical Physics, S. Chand Company Limited, 20th edition (2004).
3.	N. Subrahmanayam, Brij Lal and M.N. Avadhanulu, A Text Book of Optics, S. Chand (2012)
4.	Ajoy Ghatak, Optics, Tata McGraw Hill, 5th addition, (2012)
5.	F.A. Jenkins and H.E. White, Fundamentals of Optics, McGraw-Hill (1981).
6.	Dabir S. Viswanath, Tushar Ghosh, Dasika H.L. Prasad, Nidamarty V.K. Dutt, Kalipatnapu Y. Rani , Viscosity of Liquids: Theory, Estimation, Experiment, and Data , Springer (2007).