1. Name of the Department: Physics						
2.Course Name	**Physics**			**L**	**T**	**P**
3.Course Code	**PY101**			3	1	0
4.Type of Course (use tick mark)		Core (√)	**Foundation Course ()**		**Departmental Elective ()**	
5.Pre-requisite (if any)	10+2 with Physics and Mathematics	**6.Frequency (use tick marks)**	Even (√)	Odd (√)	Either Sem ()	Every Sem ()

7.Total Number of Lectures, Tutorials, Practicals

Lectures = 30	Tutorials = 10	Practical = Nil

8. COURSE OBJECTIVES: The purpose of this undergraduate course is to impart basic knowledge of fundamental concept of physics which is necessary for a strong engineering knowledge base.

9. COURSE OUTCOMES (CO):
After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	ATTRIBUTES
CO1	To analyze the connection between daily life observations and science. To realize that apparently different ideas of Optics such as Interference and Diffraction have interrelationship between them. To realize the simplicity of ideas involved in explaining complex phenomenon.
CO2	To grow in ideas of different aspect of light and develop connection between daily life applications and science To analyze the process of development of a new theory while dealing with Polarization. To correlate that the conceptualization of an idea is far ahead than its practical realization while dealing with LASER. To grow in realization of totally different manifestation of light. To find the most recent applications of light in terms of communication and storage of data. To realize that how the design of complex systems is based on the simple ideas. To realize that the conceptualization of an idea is far ahead than its practical realization while dealing with Optical Fibers.
CO3	To grow in developing connection between philosophy and science. To find that seemingly different ideas such as Optics and Mechanics have interrelationship between them. To understand the process of development of a new theory and its application in life. To realize the requirement of power of imagination.
CO4	To grow in developing the connection between philosophy and science To find that seemingly different ideas such as Compton Effect and Quantum Theory have interrelationship between them. To understand and analyze the process of development of a new theory and how the development of one idea leads to the development of a apparently different idea. To realize and appreciate the efforts made by the individuals to give a new understanding of science that led to the modern day applications.
CO5	To grow in developing connection between daily life utility and material science. To realize that apparently different materials with respect to Electric and Magnetic properties have inter relationship between them. To evaluate that how totally different manifestation of Modern Science leads to new technology. To do the evaluation that how an idea is far ahead than its practical realization while dealing with Nano Technology and Super Conductivity.

10.Unit wise detailed content

Unit-1	Number of lectures = 08	Title of the unit: Wave Optics

Methods of formation of coherent sources, Fresnel's Biprism, displacement of fringes, thin film interference, Newton's ring. Fraunhoffer's diffraction at single slit, grating, Rayleigh's criterion of resolution, resolving power of grating.

Unit-2	Number of lectures = 08	Title of the unit Optical Activity and Modern Optics

Production of plane polarized light by reflection and Double refraction, Nicol prism, Optical activity, polarimeter(Laurent's and Biquartz). Principle of fiber optics, numerical aperture, attenuation, dispersion in optical fibers, material dispersion, waveguidedispersion, intermodal and intramodal dispersion, Pulse dispersion in step index fiber. Main components of laser, Einstein's coefficients, He-Ne laser, Nd-YAG laser and their applications.

Unit-3	Number of lectures = 08	Title of the unit: Properties of Matter and Relativistic Mechanics

Viscosity, Poiseulli's equation, Michelson-Morley experiment and its implications, Galilean transformation equationsLorentz transformation equations and their consequences, energy mass relation, relativistic kinetic energy.

Unit-4	Number of lectures = 08	Title of the unit: Quantum Physics

Compton effect, basic postulates of quantum mechanics, Wave function and its physical admissibility, orthogonality of wave functions, normalization of wave functions, Heisenberg's uncertainty principle (no derivation) and its applications (non-existence of electron in nucleus, Bohr's radius), Schrodinger's equation and its application to free particle, particle in one dimensional box

Unit-5	Number of lectures = 08	Title of the unit: Physics of Materials

Magnetic Properties: Magnetization, Origin of magnetic moment, dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.
Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

COs	Attributes	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	To analyze the connection between daily life observations and science. To realize that apparently different ideas of Optics such as Interference and Diffraction have interrelationship between them. To realize the simplicity of ideas involved in explaining complex phenomenon.	1	3	2	1	3	3	1	3	2	2	1	3
CO2	To grow in ideas of different aspect of light and develop connection between daily life applications and science To analyze the process of development of a new theory while dealing with Polarization. To correlate that the conceptualization of an idea is far ahead than its practical realization while dealing with LASER. To grow in realization of totally different manifestation of light. To realize that how the design of complex systems is based on the simple ideas. To realize that the conceptualization of an idea is far ahead than its practical realization while dealing with Optical Fibers.	3	3	2	1	3	3	1	2	2	3	2	3
CO3	To grow in developing connection between philosophy and science. To find that seemingly different ideas such as Optics and Mechanics have interrelationship between them. To understand the process of development of a new theory and its application in day to day life. To realize the requirement of power of imagination.	3	3	3	3	1	3	1	3	2	2	1	3
CO4	To grow in developing the connection between philosophy and science To find that seemingly different ideas such as Compton Effect and Quantum Theory have interrelationship between them. To understand and analyze the process of development of a new theory and how the development of one idea leads to the development of a apparently different idea. To realize and appreciate the efforts made by the individuals to give a new understanding of science that led to the modern-day applications.	3	3	3	2	2	3	1	2	2	1	1	3
CO5	To grow in developing connection between daily life utility and material science. To realize that apparently different materials with respect to Electric and Magnetic properties have inter relationship between them. To evaluate that how totally different manifestation of Modern Science leads to new technology. To do the evaluation that how an idea is far ahead than its practical realization while dealing with Nano Technology and Super Conductivity.	3	3	3	3	3	3	3	2	2	2	3	3

3: Strong contribution, 2: Average contribution, 1: Low contribution

12.Brief description of self learning/E-learning component

1. https://nptel.ac.in/courses/115/101/115101011/
2. https://nptel.ac.in/courses/115/107/115107095/
3. https://nptel.ac.in/courses/113/106/113106093/
4. https://nptel.ac.in/courses/115/101/115101107/

13. Books recommended:

1. Fundamentals of Optics by Jenkins and White
2. Optical Fiber Communication by Gerd Keiser
3. Concepts of Modern Physics by Arthur Beiser
4. Introduction to Special Theory of Relativity by Robert Resnick
5. Quantum Physics by Eisberg
6. Introduction to Nanotechnology by Poole Owens, Wiley India
7. Solid State Physics by S.O. Pillai, New Age Publications

1. Name of the Department: Physics					
2.Course Name	**Physics for Bioengineering**		**L**	**T**	**P**
3.Course Code	**PY102**		3	1	0
4.Type of Course (use tick mark)		Core (√)	Foundation Course ()		Departmental Elective ()
5.Pre-requisite (if any)	10+2 with Physics and Mathematics/Biology	**6.Frequency (use tick marks)**	Even (√)	Odd ( )	Either Sem ()	Every Sem ()

(note: row 5 spans: Pre-requisite, value, Frequency label, Even, Odd, Either Sem, Every Sem)

7.Total Number of Lectures, Tutorials, Practicals

Lectures = 30	Tutorials = 10	Practical = Nil

8. COURSE OBJECTIVES: The purpose of this undergraduate course is to impart basic knowledge of fundamental concept of physics which is necessary for a strong engineering knowledge base.

9. COURSE OUTCOMES (CO):
After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	ATTRIBUTES
CO1	To analyze the connection between daily life observations and science. To realize that apparently different ideas of Optics such as Interference and Diffraction have interrelationship between them. To realize the simplicity of ideas involved in explaining complex phenomenon.
CO2	To grow in ideas of different aspect of light and develop connection between daily life applications and science To analyze the process of development of a new theory while dealing with Polarization. To correlate that the conceptualization of an idea is far ahead than its practical realization while dealing with LASER.
CO3	To grow in developing connection between philosophy and science. To realize the interconnection of seemingly different ideas such as Instrumentation and Elementary Molecular Spectroscopy. Torealize the importance of Raman effect and its application in bioengineering.
CO4	To grow in developing connection between daily life utility and material science. To understand and analyze the process of development of a new theory and how the development of one idea leads to the development of an apparently different idea. Torealize and appreciate the efforts made by the individuals to give a new understanding of science that led to the modern-day applications.
CO5	To grow in developing connection between daily life utility and Quantum Physics. To get introduced to nanotechnology and its applications, Nanostructure formation techniques etc. To evaluate that how totally different manifestation of Modern Science leads to new technology. To do the evaluation that how an idea is far ahead than its practical realization while dealing with Nano Technology.

10.Unit wise detailed content

Unit-1	Number of lectures = 08	Title of the unit: Wave Optics

Ramsden and Huygens eyepieces, coherent sources, Fresnel's biprism, thin film interference, Newton's ring, Fraunhoffer's diffraction at single slit, Fraunhoffer's diffraction at N-Slits (grating), Rayleigh's criterion of resolution, resolving power of microscope

Unit-2	Number of lectures = 08	Title of the unit: Polarization and Lasers

Types of Polarised light, Double refraction, Nicol prism, Optical activity, polarimeter (Laurent's and Biquartz). Characteristics of laser beam, Main components of laser, optical gain, Einstein's coefficients, He-Ne laser, Nd-YAG laser.

Unit-3	Number of lectures = 08	Title of the unit: Instrumentation and Elementary Molecular Spectroscopy

Electron microscope: Principle and its working, Region of electromagnetic spectrum, Diatomic molecule as a rigid rotator and its spectrum, Non-rigid rotator, Vibrational spectra of diatomic molecule (simple harmonic oscillator and anharmonic oscillator, Qualitative discussions only), Raman Scattering (Quantum and classical theory of Raman effect)

Unit-4	Number of lectures = 08	Title of the unit: Crystal Physics

Introduction to crystal structure (Lattice, basis, unit cell, lattice parameters) Seven crystal systems and fourteen Bravais lattices, Coordination number, nearest neighbor distance, atomic radius and atomic packing fraction for SC, BCC and FCC, Simple crystal structures of NaCl and diamond cubic, Miller indices, Origin of X-rays (Continuous and characteristic), Bragg's law, Moseley's law.

Unit-5	Number of lectures = 08	Title of the unit: Quantum Physics and Nanotechnology

Wave function and its physical admissibility, orthogonality of wavefunctions, normalization of wave functions, Schrodinger wave equation, Particle in a 1-D box, Identical particles, symmetric and anti symmetric wave functions.
Introduction to nanotechnology and its applications, Nanostructure formation techniques (CVD, sputtering).

COs	Attributes	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	To analyze the connection between daily life observations and science. To realize that apparently different ideas of Optics such as Interference and Diffraction have interrelationship between them. To realize the simplicity of ideas involved in explaining complex phenomenon.	3	2	2	1	3	3	1	3	2	2	1	3
CO2	To grow in ideas of different aspect of light and develop connection between daily life applications and science To analyze the process of development of a new theory while dealing with Polarization. To correlate that the conceptualization of an idea is far ahead than its practical realization while dealing with LASER.	2	3	2	1	3	3	1	2	2	3	2	3
CO3	To grow in developing the connection between daily life and Molecular Spectroscopy. To realize the interconnection of seemingly different ideas such as Instrumentation and Elementary Molecular Spectroscopy. Torealize the importance of Raman effect and its application in bioengineering.	3	1	3	3	1	1	2	3	1	2	1	2
CO4	To grow in developing connection between daily life utility and material science. To understand and analyze the process of development of a new theory and how the development of one idea leads to the development of an apparently different idea. To realize and appreciate the efforts made by the individuals to give a new understanding of science that led to the modern-day applications. To analyze the importance of Miller indices, X-rays, Bragg's law and Moseley's law.	2	3	3	2	2	3	1	1	2	1	1	3
CO5	To grow in developing connection between daily life utility and Quantum Physics. To get introduced to nanotechnology and its applications, Nanostructure formation techniques etc. To evaluate that how totally different manifestation of Modern Science leads to new technology. To do the evaluation that how an idea is far ahead than its practical realization while dealing with Nano Technology.	3	3	1	3	3	2	3	2	1	2	3	2

3: Strong contribution, 2: Average contribution, 1: Low contribution

12.Brief description of self learning/E-learning component

1. https://nptel.ac.in/courses/115/101/115101011/
2. https://nptel.ac.in/courses/115/107/115107095/
3. https://nptel.ac.in/courses/113/106/113106093/
4. https://nptel.ac.in/courses/115/101/115101107/

13. Books recommended:

1. Fundamentals of Molecular Spectroscopy by C.N. Banwell, TMH Pub.
2. Molecular Structures and Spectroscopy by G. Herzberg.
3. Introduction to Solid State Physics by Charles Kittel. John Willey Pub.

1.	Name of the Department: Physics					
2.	Course Name	**INTRODUCTRY PHYSICS**		**L**	**T**	**P**
3.	Course Code	**PY103**		3	1	0

4.	Type of Course (use tick mark)		Core (√)	Foundation Course ()		Departmental Elective ()	
5.	Pre-requisite (if any)	10+2 with Physics	**6. Frequency (use tick marks)**	Even ()	Odd (√)	Either Sem ()	Every Sem ()

7. **Total Number of Lectures, Tutorials, Practicals**

Lectures = 30	Tutorials = 10	Practical = Nil

8. COURSE OBJECTIVES: The purpose of this undergraduate course is to impart basic and key knowledge of mechanics, wave motion, relativity, and modern optics. The main goal of the course is to introduce students to introductory physics and its applications and for them to learn the fundamentals of this important topic.

9. COURSE OUTCOMES (CO):
After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	ATTRIBUTES
CO1	Students will be able to articulate and describe the Inertial and non-inertial reference frames, Newton's laws of motion, conservation principles and motion of a particle in central force field.
CO2	Students will gain an understanding of fundamental ideas of special theory of relativity such as length contraction and time dilation and mass –energy invariance.
CO3	Students will gain basic knowledge of physical characteristics of simple harmonic motion (SHM) and obtaining solution of the oscillator using differential equations. Students will understand the basics of physics of hearing, heartbeat.
CO4	Use the principles of wave motion and superposition to explain the physics of polarization, interference, and diffraction.
CO5	Students will gain an understanding of membrane system, membrane physics and thermodynamics of transport process.

10. Unit wise detailed content

Unit-1	Number of lectures = 08	Title of the unit: Mechanics

Galilean invariance and Newton's Laws of motion. Dynamics of a system of particles, Conservation of momentum and energy, work energy theorem. Conservation of angular momentum, torque, Motion of a particle in central force field. Kepler's Laws, Satellite in circular orbit and applications (Synchronous satellite, GPS, Artificial gravity, apparent weightlessness), Physiological effects of acceleration and angular motion.

Unit-2	Number of lectures =08	Title of the unit: Theory of Relativity

Constancy of speed of light, postulate of Special theory of relativity, length contraction, time dilation, relativistic velocity addition, Mass-energy momentum relations Electricity: Simple circuit, Ohm's Law. Semiconductors and amplifiers

Unit-3	Number of lectures = 08	Title of the unit: Waves and Oscillations

Simple harmonic motion, damped and driven harmonic oscillator, coupled oscillator, energy relation and energy transfer, normal modes, Wave equation, Travelling waves, superposition principle, pulses, Doppler effect, effects of vibrations in humans, physics of hearing,heartbeat

Unit-4	Number of lectures = 08	Title of the unit: Modern optics

Two slit Interference, Diffraction, Resolving power, Resolution of the eye, Laser characteristics, Principle, Population inversion, Application of laser in medical science, Polarization of EM wave, Malus Law, Polarizing materials, Polarizer, Analyzer

Unit-5	Number of lectures = 08	Title of the unit: Membrane Systems and Membrane Physics

Micelle and Bilayer formation, structure and function. Physicochemical characterization and analysis of micelles and bilayers. Membrane equlibria and Transport. Thermodynamics of transport process. Ficks', law, Nernst Planck Equations, Diffusion, Osmosis, Donnan effect, permeabilily coefficient Resting potentials, Measurement membrane conductance.

11. CO-PO mapping

COs	Attributes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Students will be able to articulate and describe the Inertial and non-inertial reference frames, Newton's laws of motion, conservation principles and motion of a particle in central force field.	3	2	3	1	3	2	1
CO2	Students will gain an understanding of fundamental ideas of special theory of relativity such as length contraction and time dilation and mass –energy invariance.	3	3	3	1	1	1	1
CO3	Students will gain basic knowledge of physical characteristics of simple harmonic motion (SHM) and obtaining solution of the oscillator using differential equations. Students will understand the basics of physics of hearing, heartbeat.	3	2	3	1	1	1	1
CO4	Use the principles of wave motion and superposition to explain the physics of polarisation, interference and diffraction.	3	2	3	1	2	1	1
CO5	Students will gain an understanding of membrane system, membrane physics and thermodynamics of transport process.	3	2	3	1	2	2	1

<div align="center">3: Strong contribution, 2: Average contribution, 1: Low contribution</div>

12. Brief description of self learning / E-learning component

1. NPTEL :: Physics - NOC:Physics of Biological Systems
2. NPTEL :: Basic courses-Sem 1 and 2 - Engineering Physics I

13. Books recommended:

1. E. M. Purcell, Ed: "Berkeley Physics Course, Vol. 1, Mechanics" (McGraw- Hill).

2. R. P. Feymman, R. B. Lighton and M Sands; The Feymman Lectures in Physics, Vol. 1 (BI Publications, Bombay, Delhi, Calcutta, Madras).

3. J. C. Upadhyay: 'Mechanics (Himalaya Publishing House)

4. D.S. Mathur "Mechanics" (S. Chand).
5. P. K. Srivastava: "Mechanics" (New Age International).
6. Rodney Cotterill; Biophysics: An Introduction, John Wiley & Sons (year)
7. D.S. Mathur, Mechanics, S. Chand & Company Ltd. 2000
8. N. K. Bajaj, The Physics of Waves and Oscillations, Tata McGraw Hill 1988

1.	Name of the Department: Physics					

2.	Course Name	Physics Lab	**L**	**T**	**P**
3.	Course Code	PY104	0	0	6

4.	Type of Course (use tick mark)		Core (√)	Foundation Course ( )	Departmental Elective ( )
5.	Pre-requisite (if any)	10+2 with Physics	6. Frequency (use tick marks)	Even (√) Odd (√)	Either Sem ( ) Every Sem ( )

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 10

8. COURSE OBJECTIVES: The purpose of this undergraduate course is to impart practical knowledge of the concepts through different experiments related to its theoretical course.

9. COURSE OUTCOMES (CO):
After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	ATTRIBUTES
CO1	To demonstrate how interference takes place by division of amplitude and by division of wavefront.
CO2	To demonstrate the practical applications of polarization phenomenon in finding the specific rotation, refractive index and Brewster's angle.
CO3	To demonstrate the practical application of Fraunhoffer diffraction in wavelength and focal length calculation.
CO4	To demonstrate the magnetic and heating effect of current in finding the magnetic field and Stefan's constant.
CO5	To demonstrate how to calculate the energy band gap of a semiconductor material and viscosity of a liquid

10. Syllabus

Exp-01	To determine the wave length of monochromatic light by Newton's ring.
Exp-02	To determine the wave length of monochromatic light with the help of Fresnel's Biprism.
Exp-03	To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
Exp-04	To determine the specific rotation of cane sugar solution using Half Shade polarimeter.
Exp-05	To determine the wavelength of spectral lines using plane transmission grating.
Exp-06	To determine the Brewster's angle and refractive index of material with the help of a laser source.
Exp-07	To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil.
Exp-08	To verify Stefan's law by electrical method.
Exp-09	To determine the energy band gap of a given semiconductor material.
Exp-10	To determine the coefficient of viscosity of a liquid.

11. CO-PO mapping

COs	Attributes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	To demonstrate how interference takes place by division of amplitude and by division of wavefront.	3	3	2	1	3	1	3
CO2	To demonstrate the practical applications of polarization phenomenon in finding the specific rotation, refractive index and Brewster's angle.	2	2	2	2	2	3	2
CO3	To demonstrate the practical application of Fraunhoffer diffraction in wavelength and focal length calculation.	3	3	1	3	3	1	3
CO4	To demonstrate the magnetic and heating effect of current in finding the magnetic field and Stefan's constant.	2	2	2	3	1	2	2
CO5	To demonstrate how to calculate the energy band gap of a semiconductor material and viscosity of a liquid	2	1	1	1	2	2	2

3: Strong contribution, 2: Average contribution, 1: Low contribution

12. Brief description of self learning / E-learning component

1. https://youtu.be/fWhgguWc8rk
2. https://youtu.be/Bf0Tg-fNWjQ
3. https://youtu.be/dDp_Insp_p0
4. https://youtu.be/N0lxwqANsd4
5. https://youtu.be/G8Rqd2HNhuk
6. https://youtu.be/7Mq4isproEE
7. https://youtu.be/G8Rqd2HNhuk
8. https://youtu.be/NtfbmAw62Hw

13. Books recommended:

1. Practical Physics. by R. K. Shukla, New Age International Private Limited; Third edition.
2. B.Sc. Practical Physics by Harnam Singh and Hemne, S. Chand.
3. B. Sc. Practical Physics by CL Arora, S Chand and Company
4. Practical Physics by Kumar P.R.S., Prentice Hall India Learning Private Limited
5. Engineering Physics Practical by S.K. Gupta, Krishna Prakashan