

PHYSICS FOR ENGINEERS

(Common to branches CSE/AI&ML/DS)

SEMESTER: I

YEAR: B. Tech I Year

Course Code	23PHY101	L	T	P	S/O	C
Course Title	APPLIED PHYSICS	3	0	2	0	4
Pre-requisites	12 th standard Physics					
Co-requisites	Basic mathematics course with vector calculus					

Lecture Plan

UNIT I:

8 lecture hours

Vector Analysis: Gradient of a scalar field, Divergence and Curl of a vector field, Vector integration: Line, Surface and volume integrals (Qualitative), Statement of Gauss' and Stoke's theorems.

Electromagnetic Theory: Ampere's law and displacement current, Maxwell's equations in integral and differential forms, electromagnetic wave propagation in free space and conducting media, Poynting theorem.

UNIT II:

10 lecture hours

Wave Optics: Introduction, Interference, Young's double slit experiment, Newton's rings, Michelson interferometer, Diffraction of light, Rayleigh's resolution criteria, Angular Dispersion, Dispersive power, and resolving power.

Lasers and Fiber Optics: Introduction to Lasers, Induced absorption, Spontaneous emission and Stimulated emission, Einstein's A and B coefficients; Population Inversion, Ruby Laser, He-Ne laser, semiconductor laser and their applications, Principle of Optical Fiber and its usage in communication.

UNIT III:

10 lecture hours

Quantum Physics: Black Body radiation, Stefan's Law and Planck's Radiation Law (Statements), de-Broglie hypothesis, Heisenberg uncertainty principle, Schrodinger time-dependent and independent wave equations, Physical significance of a wave function, Particle in a one-dimensional infinite potential box.

Quantum Computing: Introduction to Quantum Computing, Superposition, Entanglement, Interference and Coherence/de-coherence, Representation of a qubit-Bloch sphere (Qualitative), Pure and mixed states, Polarization, von Neumann Entropy, Quantum logic gates: Hadamard Gate, Pauli Gates, C - NOT Gate and Toffoli gates, The Stern–Gerlach experiment.

UNIT IV:

8 lecture hours

Semiconductors and Devices: Intrinsic and extrinsic semiconductors, Direct and indirect bandgap semiconductors, carrier concentration and conductivity in intrinsic semiconductors, Hall Effect and its applications, V-I characteristics of P-N junction diode. Semiconductor materials of interest for optoelectronic devices (LED, Photo diode, Solar cell).

Text Books:

1. Malik H.K, Singh A.K. (2011), "Engineering Physics", TMH, New Delhi. ISBN: 9780070671539
2. Nielson and Chuang, "Quantum Computation and Quantum Information", Cambridge University Press (2013).

Reference Book (s):

1. Laser Fundamentals, William T. Silfvast, 2nd edn, Cambridge University press, New York (2004).
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand Publications.
3. David J Griffith, "Introduction to electrodynamics", 4th Edition (2020), Cambridge University Press.
4. Concepts of Modern Physics, Arthur Beiser, Tata McGraw-Hill, New Delhi (2010).
5. Semiconductor Devices, Physics and Technology, S. Sze , M. Kwei Lee, 3 edn, Wiley (2015).
6. A. K. Ghatak, Optics, Tata McGraw Hill, 2007.

Web References:<https://www.edx.org/course/subject/physics>

2. <https://ocw.mit.edu/search/?q=physics&t=Physics>

E-Text Books:

1. <https://www.scribd.com/document/70908178/Semiconductor-Devices-Basic-Principles-Jaspri-Sing>
2. <https://www.pdfdrive.com/laser-fundamentals-e18754996.html>
3. <https://www.pdfdrive.com/an-introduction-to-fiber-optics-e176261072.html>

MOOCs Course:

- i. <https://nptel.ac.in/courses/115/102/115102025/>
(Fundamental concepts of semiconductors)
- ii. <https://nptel.ac.in/courses/104/104/104104085/>
(LASER: Fundamentals and Applications)
- iii. <https://archive.nptel.ac.in/courses/115/101/115101107>
(Introduction to Quantum Physics)
- iv. <https://nptel.ac.in/courses/115/101/115101092/>
(Quantum Information and Computing)

Evaluation Scheme:

Component	Marks	Remarks
Internal I	30	Closed Book
i. Assignment-I	5	
ii. Quiz-I/Seminar-I	5	
iii. Test-I	20	
Internal II	30	Closed Book
i. Assignment-II	5	
ii. Quiz-II/Seminar-II	5	
iii. Test II	20	
Comprehensive	40	Closed Book

Applied Physics Lab (B Tech. 2022)

Course code	22PHY101P
Pre-requisites/Exposure	12 th level Physics
Co-requisites	12 th level Mathematics

Text Books

1. Practical Physics by C. L. Arora, S. Chand Publications, ISBN: 9788121909099
2. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal
ISBN: 978-8122500844

Reference Books

1. Engineering Practical Physics B Mallick S Panigrahi, Publisher: Cengage Learning, ISBN: 9788131525203.
2. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House, ISBN: 978-0423738902
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers

Modes of Evaluation: Progressive and End Semester Practical tests/ Viva**Evaluation Scheme:**

Assessment 1	Assessment 2	Assessment 3
Write up	Conduct of experiment	Viva-voce

Course Content:

Sl. No.	List of Experiments
1	Newton's Rings: Radius of Curvature of Plano - Convex Lens
2	Wavelength of laser Using Diffraction Grating
3	Lee's Method – Determination of coefficient of thermal conductivity of a bad conductor
4	To verify the relation between thermo-EMF of a thermocouple and temperature difference between two hot junctions using the Seebeck Effect.
5	Magnetic Field Experiment: - Stewart & Gees Apparatus
6	Measurement of e/m by Thomson's Bar Magnet
7	Energy Band Gap of a Semiconductor
8	Hall Effect Characteristics
9	Solar Cell Characteristics
10	Study the photoelectric effect and determine the stopping potential from the photocurrent versus the applied potential graph
11	Stefan's law of radiation and to determine Stefan's constant using an electrical method
12	Determination of Moment of Inertia of a Flywheel