

2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: 80B02	Applied Physics (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: 4		3	1	-

Prerequisites: Fundamentals of Physics

Objective:

The main objective of this course is to provide an adequate exposure and develop insight about the basic principles of semiconductor physics along with the possible applications

Module-I

Principles of Quantum Mechanics [9 periods]

Qualitative discussion on black body radiation spectrum problem, Photo electric effect concept and Einstein's explanation; Postulates of Quantum mechanics, Louis de Broglie's concept of matter waves, Davisson and Germer's experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation, Physical Significance and properties of the Wave Function; Energy of a particle in One Dimensional infinite Potential well.

Module –II [9 periods]

Band Theory of Solids

Free electron theory of metals(Qualitatively), Fermi Level, Density of Energy States and Energy Band Diagrams, Bloch theorem for particle in a periodic potential (Qualitatively), Kronig-Penny Model(Qualitatively), E-K Diagram, Origin of Energy Bands in solids, Effective mass of an electron, Distinction between Metals, Semiconductors and Insulators.

Module –III [12 periods]

Semiconductor Physics

Intrinsic and Extrinsic Semiconductors, Expression for carrier concentration in intrinsic and extrinsic semiconductor, Qualitative treatment of Fermi energy level in Intrinsic and extrinsic semiconductors, Direct and indirect band gap semiconductors, Carrier generation and Recombination, Drift and Diffusion, Equation of Continuity.

P-N Junction: Formation & V-I Characteristics, LED: Construction and Working Principle, Solar Cell: Construction & I-V Characteristics.

Module –IV [9 periods]

Lasers and Fiber Optics:

Lasers: Introduction to interaction of radiation with matter, Coherence, Einstein's coefficients, Principle and working of Laser, Population inversion, Pumping, Semiconductor LASER, Applications of laser.

Fiber Optics: Introduction, Optical fiber as a dielectric wave guide, Total Internal Reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibers, Losses associated with optical fibers, Applications optical fibers.

Module –V [9 Periods]

Electromagnetic Theory

Gradient of Scalar field and its Physical Significance; Divergence and Curl of Vector field; Qualitative treatment of Gauss's Law of electrostatics and Gauss law of magnetostatics, Ampere's law and its modification, Faraday's law of electromagnetic induction, Induced E.M.F in a conductor, Lenz's Law, Maxwell equations in differential form, wave equation for free space.

Outcomes:

After completion of the course, student will be able to:

1. Acquire the theoretical information about matter in terms of quantum physics
2. Analyze the formation the bands thereby classification of materials on the basis of transport properties.
3. Understand the fundamentals of semiconductor physics and also the Optoelectronics
4. Be aware of the concepts and applications of LASER and Optical fibers.
5. Apply basic knowledge on electromagnetic principles and using these wave equations for the propagation

Text Books:

1. K Vijaya Kumar, S Chandralingam, “**Modern Engineering Physics**” Volume I & II, S. Chand, 1st Edition, 2017.
2. J.Singh, ”Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill.ink, 1995.

Reference Books:

1. P K Palanisamy, “**Engineering Physics**”, SciTech Publication, 4th Edition, 2014.
2. B K Pandey and S. Chaturvedi, “**Engineering Physics**” Cengage Learning India Revised Edition, 2014.
3. R K Gaur and SL Gupta, “**Engineering Physics**” Dhanpat Rai Publications, Eighth Revised Edition, 2006.
4. D K Bhattacharya, Poonam Tandon, “**Engineering Physics**”, Oxford University Press, 1st Edition, 2015.
5. P. Bhattacharya, “**Semiconductor Optoelectronic Devices**”, Prenticehall of India,1997

e-RESOURCES

1. https://www.researchgate.net/publication/259574083_Lecture_Notes_on_Engineering_Physics
2. https://www.researchgate.net/publication/292607115_Applied_Physics

Journals :

1. <http://www.springer.com/physics/theoretical%2C+mathematical+%26+computational+physics/journal/40094>
2. <http://www.springer.com/physics/journal/340>

NPTEL VIDEOS:

1. <http://nptel.ac.in/courses/113104012/>
2. https://www.youtube.com/watch?v=jnjjWI1s9_s&list=PLzJaFd3A7DZse2tQ2qUFChSiCj7jBidOO
3. <https://www.youtube.com/watch?v=4a0FbQdH3dY>