

**JAWAHARLAL NEHRUTECHNOLOGICALUNIVERSITY: KAKINADA****KAKINADA–533003, Andhra Pradesh, India****R-16 Syllabus for ECE JNTUK**

<b>I Year-I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>APPLIED PHYSICS (R161104)</b>					

**Prerequisite Course:** Basic Concept of Physics**Description and Objectives:**

- 1) Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization involving required to design instruments with higher resolution.
- 2) Teach Concepts of coherent sources, its realization and utility optical instrumentation.
- 3) Study the concepts regarding the bulk response of materials to the EM fields and their analytically study in the back-drop of basic quantum mechanics.
- 4) Understand the physics of Semiconductors and their working mechanism for their utility in sensors.

**Course Outcomes:**

Upon completion of the course, the student will be able to achieve the following outcomes.

<b>COs</b>	<b>Course Outcomes</b>	<b>POs</b>
1	Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization involving required to design instruments with higher resolution.	3
2	Teach Concepts of coherent sources, its realization and utility optical instrumentation.	2
3	Understand the utilization of optical sources in present technology.	2
4	Study the concepts regarding the bulk response of materials to the EM fields and their analytically study in the back-drop of basic quantum mechanics.	3
5	Apply the knowledge of quantum views for understanding the formation of energy bands in solids and their classification.	2
6	Understand the physics of Semiconductors and their working mechanism for their utility in sensors.	3

**UNIT-I: INTERFERENCE:**

Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton’s rings – construction and basic principle of Interferometers.

**UNIT-II: DIFFRACTION:**

Fraunhofer diffraction at single slit - Cases of double slit, N-slits &amp; Circular Aperture (Qualitative treatment only)- Grating equation - Resolving power of a grating, Telescope and Microscopes.

**UNIT-III: POLARIZATION & LASERS:**Types of Polarization – Methods of production - Nicol Prism -Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter).  
Characteristics–Stimulated emission –Einstein’s Transition Probabilities-Pumping schemes - Ruby laser – Helium Neon laser.



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### **UNIT-IV: ELECTROMAGNETIC FIELDS:**

Scalar and Vector Fields – Electric Potential-Gradient, Divergence of fields – Gauss and Stokes theorems- Propagation of EM waves through dielectric medium.

### **UNIT-V: QUANTUM MECHANICS & FREE ELECTRON THEORY:**

Introduction - Matter waves – Schrödinger Time Independent and Time Dependent wave equations – Particle in a box.

Defects of Classical free electron theory –Quantum Free electron theory - concept of Fermi Energy.

### **UNIT-VI: BAND THEORY OF SOLIDS & SEMICONDUCTOR PHYSICS:**

Bloch's theorem (qualitative) – Kronig – Penney model – energy bands in crystalline solids – classification of crystalline solids– effective mass of electron & concept of hole.

Conduction–Density of carriers in Intrinsic and Extrinsic semiconductors–Drift & Diffusion – relevance of Einstein's equation- Hall effect in semiconductors

### **TEXT BOOKS:**

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshira sagar, S.Chand & Company Ltd., (2014)
2. 'Solid State Physics' by A.J.Dekker, Mc Millan Publishers (2011)
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

### **REFERENCE BOOKS:**

1. Applied Physics by P.K.Palanisamy, Scitech publications (2014)
2. Lasers and Non-Linear optics by B.B.Laud, New Age International Publishers (2008).
3. Engineering Physics by M. Arumugam, Anuradha Publication (2014)