SARASWATI MAHILA MAHAVIDHYALAYA, PALWAL

LESSON-PLAN

Class: M.Sc Physics **Semester: IVth**

Subject: Physics of Nano- Materials **Session: 2021-2022**

1.	UNIT-1 Free electron theory (qualitative idea)
2.	FET and its features
3.	Idea of band structure, Metals, insulators and semiconductors
4.	Idea of band structure, Metals, insulators and semiconductors
5.	Concept of effective Mass
6.	Density of States in Bands 1D
7.	Density of States in Bands 2D
8.	Density of States in Bands 3D
9.	Variation of Density of States with Energy
10.	Variation of Density of States with Energy
11.	Variation of Density of States and Band Gap with Size of Crystal
12.	Variation of Density of States and Band Gap with Size of Crystal
13.	Electronic Structure From Bulk to Quantum Dot
14.	Excitions in Direct and Indirect Band Gap Semiconductors
15.	Excitions in Direct and Indirect Band Gap Semiconductors
16.	Electronic States in Direct Semiconductor Nano-crystals
17.	Electronic States in Indirect Semiconductor Nano-crystals

18.	Revision Of UNIT-1
19.	Revision Of UNIT-1
20.	UNIT-2 Physics of Reduced Dimensional Systems and Devices introduction
21.	Quantum Confinement
22.	Electron confinement in One, Two and Three Dimensional
23.	Electron confinement in One, Two and Three Dimensional
24.	Infinitely Deep Square Well Potentials
25.	Various Low Dimensional Systems: Quantum Well Structure
26.	Idea of Quantum Well Structure
27.	Electron Wave Function and Energy in Quantum Well Structure (Infinite Well Approximation).
28.	Density of States of Quantum Well
29.	Optical Absorption in Quantum Well
30.	Quantum wires: Electron Wave Function and Energy
31.	Density of States of Quantum wire
32.	Quantum Dots: Electron Wave Function and Energy
33.	Density of States of Quantum dot
34.	Idea of Hetero-junction LED
35.	Quantum Well Laser
36.	Quantum Dot Laser

37.	Coulomb Blockade
38.	Single Electron Transistor
39.	Revision Of UNIT-2
40.	Revision Of UNIT-2
41.	CLASS TEST OF Unit 1&2
42.	Unit-3 Synthesis/Fabrication of Nanomaterials/Nanostructures
43.	Bottom up and Top down Approaches for Synthesis of Nano Materials
44.	Synthesis of Zero-Dimensional Nanostructures (Nanoparticles): Sol-Gel Process
45.	Sol-Gel Process
46.	Synthesis inside Micelles
47.	Micro-Emulsions
48.	Growth Termination
49.	Growth Termination
50.	Epitaxial Core-Shell Nanoparticles
51.	Ball Milling
52.	One-Dimensional Nanostructures (Nanowires, Nanorods Nanotubes): Vapor (or solution)-liquid-solid (VLS or SLS) growth and Size Control
53.	VLS Technique
54.	Electrochemical deposition Technique
55.	Electrochemical deposition Technique
56.	Lithography Technique

57.	Lithography Technique
58.	Two-Dimensional Nanostructures (Thin Films & Quantum Wells): Molecular Beam Epitaxy (MBE)
59.	MBE Technique
60.	MOCVD Technique
61.	MOCVD Technique
62.	Cluster Beam Evaporation Technique
63.	Cluster Beam Evaporation Technique
64.	Ion Beam Deposition Technique
65.	Ion Beam Deposition Technique
66.	Chemical Bath Deposition Technique
67.	Chemical Bath Deposition Technique
68.	Revision Of UNIT-3
69.	Revision Of UNIT-3
70.	UNIT-4 Characterization of Nanomaterials/Nanostructures: XRD
71.	Effect of Particle Size and Strain on Width of XRD Peaks of Nanomaterials
72.	Determination of Crystallite/Particle Size and Strain in Nanomaterials Using Debye Scherrer's Formula
73.	Williamson–Hall's Plot
74.	Transmission Electron Microscopy: Basic principle, Brief Idea of Set up,

75.	Sample Preparation & Imaging Modes (Dark & Bright Field) in TEM
76.	Selected Area Electron Diffraction
77.	Photoluminescence (PL) Spectroscopy: Basic Principle and idea of Instrumentation
78.	Shift in PL Peaks with Particle Size, Determination of Alloy Composition in Thin Films of Compound Semiconductors
79.	Estimation For Width of Quantum Wells
80.	Raman Spectroscopy: Basic Principle and idea of Instrumentation
81.	Variations in Raman spectra of Nanomaterials with Particle Size
82.	Study of Raman Spectra of Carbon Nanotubes and Graphene.
83.	Study of Raman Spectra of Carbon Nanotubes and Graphene.
84.	Revision Of UNIT-4
85.	Revision Of UNIT-4