Sr. No.	Course Outcome (CO) statement	Marks % weightage
CO-1	The student will gain knowledge of basic theoretical and mathematical concept of electronic materials.	22
CO-2	The student will demonstrate understanding of basic principles, properties and applications associated with semiconducting materials	27
CO-3	The student will demonstrate understanding of basic theory and properties associated with optoelectronic materials.	17
CO-4	The student will gain knowledge of the different measurements techniques to characterize various semiconducting, electrical and optoelectrical materials and devices.	17
CO-5	The student will demonstrate understanding of basic theory, properties and applications of Superconductivity.	17

Tutorial – 1

Que No.		Total Marks	CO
1	Mention the postulates of Classical free electron theory proposed by Lorentz and Drude.	5	1
2	Define: (*i*) Current density (*ii*) Relaxation time (*iii*) Collision time	3	1
3	Explain drift velocity (v_d) of an electron inside a conductor in presence of external electric field (E).	2	1
4	What are intrinsic and extrinsic semiconductors?.	2	2
5	State points of difference between intrinsic and extrinsic semiconductors	3	2
6	Explain intrinsic and extrinsic (N & P type) semiconductors with the help of energy band diagram.	5	2
7	Define superconductivity.	2	5
8	List the properties of superconductor and explain each of them.	3	5
9	What is Meissener's effect? For superconductor show that, $\chi m = -1$.	5	5

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Tutorial – 2

Que No.		Total Marks	CO
1	Derive expression for thermal conductivity (k) using classical free electron theory based on Drude & Lorentz model.	5	1
2	State Wiedemann – Franz law, using it derive expression and also calculate value of Lorenz number (L).	5	1
3	Give Einstein's relation between mobility and diffusion constant for semiconductor.	3	2
4	What are called Schottky and Ohmic metal – semiconductor junction?	2	2
5	Discuss in detail Schottky junction.	5	2
6	What is London penetration depth? Write its expression and introduce each term in it.	2	5
7	Write note on BCS theory.	3	5
8	What is Josephson effect? Explain AC & DC Josephson effects?	5	5

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CO-5	The student will demonstrate understanding of basic theory, properties and applications of Superconductivity.	17

Tutorial – 3

Que No.		Total Marks	CO
1	Discuss Fermi – Dirac distribution function.	5	1
2	Define density of states and derive its expression.	5	1
3	Discuss in detail Ohmic junction.	5	2
4	Explain any one optoelectronics device in detail. (LED, Photodiode etc,...)	5	2
5	Numerical	2	5
6	Numerical	3	5
7	Numerical	2	5
8	Numerical	3	5