VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF PHYSICS
PHYSICS OE TRACKS (B.E-III Semester)
Semiconductor Physics and Device Applications
ESSENTIALS OF SEMICONDUCTOR PHYSICS

L : T : P	Credits	CIE		SEE		Course Code
		Marks	Exam Duration	Marks	Exam Duration	
02 :0 :0	2	30	90 min	60	3hours	U23OE320PH
CIE	Assignments (02)		Quizzes (02)	Internal Exams(01)		Total CIE Marks
Ave. Marks	5		5	30		40

UNIT I: Basics of Quantum Mechanics (8 Hrs)
Existence of matter waves, Wave function and its significance, Schrodinger time dependent and independent wave equations, Wave equation of a free particle, Origin of band gap, Energy bands in solids, Postulates of quantum mechanics, Quantum mechanical operators and expectation values, Potential well , Quantum tunnelling.

UNIT II: Semiconductors: Energy Band and Charge Carriers (6 Hrs)
Types of semiconductors (doping, bandgap, composition), Fermi-Dirac statistics- Density of states of semiconductor, Fermi level in semiconductors, Law of mass action, Charge compensation and charge neutrality, Hall probes and its applications.

UNIT-III:Growth of Semiconductors (6 Hrs)
Introduction, Bulk crystal growth, Epitaxial crystal growth, Evaporation and sputtering, defects in crystal, Band gap engineering, GaAs crystal growth.

UNIT IV: Carrier Transport in Semiconductors (6 Hrs)
Carrier generation, Carrier life time, Carrier scattering and mobility, Low-field and high-field transport, introduction to diffusion, Drift-diffusion current and total current density, Einstein relation , Direct and indirect recombination and trapping, Current continuity equation, Carrier injection, ambipolar transport, Diffusion length.

References:

1.P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
2. Donald Neamen, Semiconductors Physics and Devices, Tata Mc Graw Hill, 2003
3. Tyagi, Introduction to Semiconductor Materials and Devices, Wiley Publications, 2002.
4. Semiconductor Devices, Basic Principles Jasprit Singh, Wiley Publications, 2001
5. Electronic Devices and Circuits- Millman and Halkias-Tata Mc Graw Hill, 1983.
6. Solid State Electronic Devices - Ben G Streetman-Prentice Hall, New Delhi, 1995.

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4/4/23

26/6/23