PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

CONDENSEDMATTERPHYSICS-I(Special)

Offered to : M.Sc.(PHYSICS)	Course Code : 22PH3D3
Course Type : Domain specific elective (DSE)	Course : CONDENSEDMATTERPHYSICS-I(Special)
Year of Introduction : 2004	Year of offering : 2022
Year of Revision : 2022	Percentage of Revision : Nil
Semester : III	Credits : 4
Hours Taught: 60 hrs. per Semester	Max.Time : 3 Hours

Course Description: Condensed Matter Physics -I is the field of physics that deals with the macroscopic and microscopic physical properties of matter, especially the solid and liquid phases which arise from electromagnetic forces between atoms. More generally, the subject deals with "condensed" phases of matter: systems of many constituents with strong interactions between them.

CourseObjectives:

1. Tounderstandthelatticedefectsindifferentcrystals
2. Tounderstandthethermalandopticalpropertiesofcrystalsduetolatticedefects.
3. Tolearntheconceptsofluminescenceand phosphorescence
4. ToUnderstandtheSpecificheat ofsolidsindifferentcrystals
5. ToUnderstandthemagneticpropertiesanddifferenttheoriesofmagnetism

CourseOutcomes: Atthe endofthiscourse, studentsshould beable to:

CO1: Remember the concepts of crystal structures and their properties
CO2: Understand the importance of crystal defects
CO3: Analyze the process involved in the Luminescence.
CO4: Understand the importance of specific heat of solids.
CO5: Analyze the theories involved in different magnetic domains.

CO-POMATRIX								
	CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
22PH3D3	**CO1**	H					L	M
	CO2	H					L	M
	CO3			H			L	M
	CO4	H					L	M
	CO5			H			L	M

Syllabus		
Unit	**LearningUnits**	**Lecture Hours**
I	**CrystalDefects** The structure of metals, lattice defects and configurational entropy – The number ofvacanciesandinterstitialasfunctionoftemperature,theformationoflatticedefectsin metals, interstitial diffusion in metals, chemical diffusion in metals-Kirkendallleffect, Edge and screw dislocation, Estimates of dislocations densities, The Frank - Readmechanismof dislocationmultiplication.(CO1)	12
II	**OpticalProperties** Optical and thermal electronic excitation in ionic crystals. The ultraviolet spectrum ofthe alkali halides; excitons, Illustration of electron-hole interaction in single ions,Qualitative discussion of the influence of lattice defects on the electronic levels, Nonstoichiometric crystals containing excess metal. The transformation of F centers intoF'-centers and vice- versa, Photoconductivity in crystals containing excess metal,Color centers resulting from excess halogen, Color centers produced by irradiationwithX-rays. (CO2)	12
III	**Luminescence** Introduction,KindsofLuminescence,Excitationandemission,EfficiencyofPhosphor, Decay mechanisms, Thermo luminescence and glow, Thallium-activatedalkalihalides, thesulfide phosphors, Electroluminescence.(Co3)	12
IV	**LatticeVibrationsandThermalProperties** Elastic waves in one dimensional array of identical atoms. Vibrational modes of adiatomic linear lattice and dispersion relations. Acoustic and optical modes. Infraredabsorption in ionic crystals. Phonons and verification of dispersion relation in crystallattices.Latticeheatcapacity– EinsteinandDebyetheories.Latticethermalconductivity-Phononmeanfreepath.OriginofthermalexpansionandGruneisenrelation.(CO4)	12
V	**MagneticPropertiesof Solids** QuantumtheoryofParamagnetism,CrystalFieldSplitting,QuenchingoftheorbitalAngular MomentumFerromagnetism Curie point andtheExchange integral,SaturationMagnetizationatAbsoluteZero,Magnons,Bloch'sT$^{3/2}$law. FerromagneticDomains.Ferrimagnetism.Thestructureofferrites,Thesaturationmagnetization,Elements ofNeel's theory. (CO5)	12

ReferenceBooks:

1. A.J.DEKKER,SolidStatePhysics,Macmillan,2002
2. CHARLESKITTEL,IntroductiontoSolidStatePhysics,JohnWiley&Sons,2007
3. GUPTAand KUMAR,Solid StatePhysics,K. Nath&Co.,2000
4. S.O. PILLAI,SolidStatePhysicsNewAgeInternational, 2006
5. M.A.Wahab,Solid StatePhysics,Narosa, 2019,3rd edition