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

Paper **-3:ADVANCESINMATERIALSSCIENCE**

Offered to : M.Sc.(PHYSICS)	Course Code : 22PH4D2
Course Type : Domain specific elective (DSE)	Course : Advances in materials science
Year of Introduction : 2022	Year of offering : 2023
Year of Revision : 2022	Percentage of Revision : Nil
Semester : IV	Credits : 4
Hours Taught : 60 hrs. per Semester	Max.Time : 3 Hours

DescriptionandPurpose:

The Course Advances in Materials Science is focussed to equip the students with knowledgeand understanding of the key structural properties of different classes of materials. Students will gainskills in characterization of materials.

Course Objectives:

1. To understand the properties of different materials.
2. To understand the formation and applications of glass materials.
3. To understand the importance of bio materials.
4. To understand the importance of nano materials.
5. To provide the detailed information of carbon nano tubes.

Course Outcomes: At the end of this course, students should be able to:
CO1: Understand the basic concept of properties of materials
CO2: Understand the preparation of glass materials and their applications.
CO3: Analyse the process of preparation and applications of glass materials.
CO4: Apply the concepts of synthesis of nano materials.
CO5: Understand the concepts of applications of carbon nano tubes.

CO-POMATRIX								
	CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
22PH4D2	**CO1**	H					L	M
	CO2	H	M				L	M
	CO3		H				L	M
	CO4		H				L	M

	CO5	H	M				L	M

Syllabus		
Unit	**LearningUnits**	**Lecture Hours**
I	**ClassificationofMaterials** Introduction, structure of materials, bonding in solids, Types of materials, Metals, Ceramics (and glasses)polymers, composites, semiconductors. Metals and alloys: Phase diagrams of single component, binaryandternarysystems,diffusion,nucleationandgrowth-MechanicalProperties.MetallicGlasses.Preparation, structureandpropertieslikeelectrical,magnetic,thermalandmechanical applications.	12
II	**Glasses** Theglasstransition-Glassformation,Typesofglasses.Theoriesofglasstransition-Factorsthatdeterminetheglasstransitiontemperature-Glassformingsystemsandeaseofglassformation-Preparationofglassmaterials-ApplicationsofGlasses:Electronicapplications,electrochemicalapplications, opticalapplications andMagneticapplications.	12
III	**Biomaterials-Implantmaterials**: Introduction to biomaterials for biomedical applications, Chemical structure and property of biomaterials,Preparation.Stainlesssteelsanditsalloys,TiandTibasedalloys,Ceramicimplantmaterials;Hydroxyapatiteglassceramics,CarbonImplantmaterials,PolymericImplantmaterials,Softtissuereplacement implants: Sutures, Surgical tapes and adhesives, heart valve implants, artificial organs, HardTissuereplacementImplants.	12
IV	**NanoStructuredMaterials**: OriginofNanomaterials–Zero,OneandTwodimensionalNanomaterialsQuantumconfinement,Density of states, physical and chemical properties, Synthesis of Nanomaterials - Bottom-up and Top-downapproaches,Chemicalmethods:Sol-GelProcess–SprayPyrolysis–SolvothermalSynthesis–Chemical Vapor	12

	Deposition(CVD), Physical methods: Ball Milling – Inert Gas Condensation Technique–Thermalevaporation–PulsedLaserDeposition(PLD)–Sputtering.	
V	**Carbonbasednanomaterials:** Carbonbasedmoleculesandcarbonbond-C60:Discovery,SynthesisandstructureofC60-SuperconductivityinC60-Carbonnanotubes:Fabrication–Structure–Electricalproperties–Vibrationalproperties–Mechanicalproperties–Applications(fuelcells,chemicalsensors,catalysts).	12

TextandReferenceBooks:

1. InorganicSolids,D.M.ADAMS (JohnWiley&Sons).
2. PhysicsofAmorphousMaterials,S.R.ELLIOTT (Longman).
3. Phase Transformations in Metals and Alloys, D.A. PORTER AND K.E. EASTERLING (CRCPress).
4. Biomaterials:AnIntroduction,JOONPARKandR.S.LAKES (Springer).
5. Biomaterials:PrinciplesandApplications, J.B.PARK(CRCPress).
6. Nanocrystallinematerials, H.GLEITER(Reviewarticlefrom“ProgressinMaterialsScience,Volume33,Issue4,1989,Pages223-315”).
7. W. D.Callister, "MaterialsScienceandEngineering:AnIntroduction",JohnWiley&Sons, 2007.
8. CharlesPPooleJr.,andFrankJ.Owens,IntroductiontoNanotechnology, JohnWileySons,Inc.,2003