22PYB02 - ADVANCED MATERIALS AND NANO TECHNOLOGY
(Common to CIVIL, CHEM & AGRI)

	L	T	P	C
	3	0	0	3

PRE - REQUISITE: Nil

Course Objectives:	• To gain adequate information about the properties of matter and nano materials. • To expose the concepts of Photonics, fiber optics and Advanced new engineering materials.

Course Outcomes The student will be able to		Cognitive Level	Weightage of COs in End Semester Examination
CO1	Correlate the stress and strain ratio to apply the elasticity for spring materials.	An	20%
CO2	Discriminate the thermal conductivity of the medium to employing in instrument applications.	An	20%
CO3	Articulate the role of nanotechnology in environmental sustainability for the field of agriculture.	Ap	20%
CO4	Operate the optical fibers in sensor devices.	Ap	20%
CO5	Appraise the classification of composites in the applications of aerospace components, automotive parts, and sports equipment.	Ev	20%

UNIT I -PROPERTIES OF MATTER	(9)

Elasticity – Hooke's law Stress-strain diagram and its uses – factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple – torsion pendulum: theory and experiment - bending of beams – bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment – I-shaped girders - stress due to bending in beams.

UNIT II -THERMAL PHYSICS	(9)

Mode of heat transfer-thermal conductivity-Newton 's law of cooling –thermal conduction through compound media (bodies in series and parallel) – Thermal conductivity of a good conductor – Forbe's method - Thermal conductivity of bad conductor – Lee's disc – Hazards– Cyclone and flood hazards – Fire hazards and fire protection, fire – proofing of materials, fire safety regulations and firefighting equipment. Prevention and safety measures.

UNIT III -SYNTHESIS AND PROPERTIES OF NANOSTRUCTURES	(9)

Introduction to Nanoscience – Types of nanostructure and properties of Nanomaterials – Synthesis and preparation of Nanomaterials – Nanosensors – Biosensors – Nanoscience and Environment.

UNIT IV -PHOTONICS AND FIBER OPTICS	(9)

Photonics: Population of energy levels – Einstein's A and B coefficients derivation – Resonant cavity – Types of lasers – solid state laser (Neodymium) – gas laser (CO_2) Applications of lasers in science – Engineering – Medicine.

Fibre optics: Principle, numerical aperture and acceptance angle - Types of optical fibres (Material, refractive index and mode) -Losses in optical fibre - Fibre optic communication Fibre optic sensors (pressure and displacement).

UNIT V -ADVANCED NEW ENGINEERING MATERIALS	(9)

Ceramics - Types and applications - Composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics - Metallic glasses: types, glass forming ability of alloys, melt spinning process, applications - Shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy and application - Bio material - applications.

TOTAL(L:45) = 45 PERIODS

TEXT BOOKS:
2. Dattuprasad, Ramanlal Joshi, "Engineering Physics" Tata McGraw hill education, 2019.
3. V.Rajendran, — Engineering Physics, Tata McGraw-Hill. New Delhi.2017.
4. Marikani, "Materials Science", PHI Learning Private Limited, Eastern Economy Edition, 2018.

REFERENCES:
1. Subrahmanyam N, Brijlal, "A Text Book of Optics" S.Chand& Co. Ltd, New Delhi, 2017.
2. Kongbamchandramanisingh, "Basic Physics", PHI, 2018.
3. M.N.Avathanalu, P.G.Kshirsagar "A text book of engineering physics" S.Chand&company Ltd, 2017.

WEB LINKS:
1. https://bayanbox.ir/view/7764531208313247331/Kleppner-D.-Kolenkow-R.J.-Introduction-to-Mechanics-2014.pdf.
2. https://physicaeducator.files.wordpress.com/2017/11/electricity_and_magnetism-by-purcell-3ed-ed.pdf.
3. https://rajeshvcet.home.blog/regulation-2021/ph3151-engineering-physics-study-materials/
4. https://zenodo.org/record/243407#.ZEgPZXZBzlU
5. https://farside.ph.utexas.edu/teaching/qmech/qmech.pdf.
6. https://web.pdx.edu/~pmoeck/phy381/workbook%20nanoscience.pdf.

Mapping of COs with POs / PSOs															
COs	**POs**													**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	
1	3	2													
2	3	2													
3	3						2								
4	3		2												
5	3					2	2					2			
CO (WA)	**3**	**2**	**2**			**2**	**2**					**2**			

M.