# DKM COLLEGE FOR WOMEN DEPARTMENT OF PHYSICS

## **Allied Physics II**

Theory		Credit
k Hr/Semester		
60	2	6
	Theory   k Hr/Semester   60	TheoryPracticalkHr/Semester602

#### **COURSE OBJECTIVES:**

- To understand the basic knowledge with the contents of, Fundamentals of Materials Science
- To know about the basis of nanomaterials and its characterization and applications, and also to know about the principles used in the characterization techniques used to study the nanomaterials.
- To understand and describe the principles behind various superconducting applications

## **COURSE OUTCOMES:**

On the successful completion of this course students will be able

СО	CO Statement	Knowledge
Number		Level(K1-
		K4)
CO1	To develop critical thinking on the nature of materials like	K3
	conductors, semiconductors and dielectrics	
CO2	To analyze different types of crystal structures and its behaviour	K4
CO3	To understand the principle behind nanomaterial and its	K2
	applications in various fields.	
CO4	To extend the application oriented knowledge on communication	K3
	technology.	
CO5	To understand the basis of superconductivity and to apply them in	K2
	our day today life	

Knowledge level: K1-Remember, K2-Understanding Level, K3-Apply, K4 -Analysis.

Cos	PO1	PO2	PO3	PO4	PO5
CO1	S	М	S	S	S
CO2	S	S	S	S	М
CO3	М	М	S	М	S
CO4	М	S	S	М	М
CO5	S	S	S	S	S

# MAPPING WITH PROGRAMME OUTCOMES

#### **UNIT I: PROPERTIES OF MATERIALS**

Solids-Classification of Solids - Energy band theory - Electrical and thermal properties: Conductors, Semiconductors & Dielectrics. -Electrical Conductivity of Solids

Intrinsic & Extrinsic semiconductors - n-type and p-type semiconductors-Carrier Concentration for intrinsic Semiconductor-reason for using copper instead of aluminium conductors in electrical installation work-Hall Effect - Working Principle -Hall Sensor-Magnetic field measurement.

Dielectric Materials: Introduction – Polarizability - Types of Polarizability - Properties and Applications of Dielectric Materials.

#### **UNITII: SUPER CONDUCTIVITY**

Superconductivity and its occurrence- Type I and II super conductors -properties- Meissner effect- Isotope effect- Postulates of BCS theory- Low temperature and High temperature conductivity. SQUIDS- Principle, Construction and Working -Maglev-Magnetic levitation.

#### **UNIT III: LASERS AND FIBER OPTICS**

Lasers: Principle- Spontaneous and Stimulated Emission - Population Inversion -Optical Pumping.

Types – Types of laser - Principle, Construction, and Working of He-Ne laser - CO<sub>2</sub> laser – Medical applications of Lasers.

Fiber optics: Principle: Total internal reflection- Acceptance angle -Numerical aperture-Classification of fibres based on refractive index and modes: Step index single mode fibre & Graded index Multi mode -Step index multi mode fibre-graded index multimode fiber-Comparison . Fiber optic communication system- block diagram- merits and demerits of fiber Optic communication system.

#### **UNIT-IV: CRYSTALLOGRAPHY**

Crystallography- Crystalline and amorphous solids-lattice-Unit cell - Primitive cell - Lattice planes- lattice parameters- -classification of crystal system - reciprocal lattice (concept only)-- Miller indices- Bravais lattice-Simple-Cubic-BCC-FCC-Derivation of Bragg's lawstructure determination using Powder XRD technique-crystal imperfections: point, line, surface and volume defects.

#### UNITV:INTRODUCTION TO NANOSCIENCE (12hrs)

NanoScience- Introduction to Nanomaterials - Optical ,Mechanical and Electrical Properties of Nanomaterials -surface area to volume ratio - Synthesis methods: bottom up & top-down method - solgel technique & Ball milling method.

Classification of Nanomaterials: Introduction to Quantum dot- Carbon nanotube (CNT): types and applications -Graphene-thin film-thin film in PV technology for energy conversion - photocatalyst- anti-microbial agents.

#### **ALLIED PHYSICS II**

#### (12hrs)

# (12hrs)

# (12hrs)

# (12hrs)

# **TEACHING METHODOLOGY:**

- Class Room Teaching
- Assignments
- Discussions
- Home Test
- PPT Presentations
- Demo using Models

# **TEXT BOOKS:**

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF
				PUBLICATIO
				Ν
1.	Arumugam M	Materials Science.	Anuradha publishers	2010
2.	Pillai S.O.	Solid State Physics.	New Age	2009
			International (P)	
			Ltd., publishers,	
3.	K. Ravichandran,	Introduction to Thin	Research India	2013
	K. Swaminathan,	Films,	Publications,	
	B. Sakthivel,			
5.	K. Ravichandran,	Introduction to	Jazym Publications,	2015
	K. Swaminathan,	Characterization of		
	B. Sakthivel, C.	Nanomaterials and		
	Ravidhas,	Thin Films		
6.	Er. Rakesh Rathi	Nanotechnology	S.chand Publication	2009
7.	Prof.Dr.G.	Allied Physics Part-II	padmapriya	2007
	Ravichandran		Publications,	
			Puducherry, First	
			Edition	
8.	B.B. Laud	Lasers and Non-	New Age	2011
		Linear optics,	International, New	
			Delhi	
9.	Dr.A.Chandrasekar	<b>Engineering Physics</b>	Scitech publishers	2019

#### **REFERENCE BOOKS:**

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Palanisamy	Materials Science.	SCITECH	2011
	P.K.		Publishers,	
2.	Senthilkumar G.	Engineering Physics II.	VRB Publishers,	2011
3.	Mani P.	Engineering Physics II.	Dhanam	2011
			Publications	
4.	Marikani A.	Engineering Physics	PHI Learning Pvt.,	2009
			India,	
5.	S.	Nanotechnology	TBH Edition	2010
	Shanmugam,.			
6.	K.Thyagarajan	Introduction to Fiber	Cambridge,	1999
	and Ajay Ghtak	optics	University Press	
7.	John M. Senior,	Optical fiber	PHI, 2 <sup>nd</sup> edition.	2014
		communications:		
		Principles and practice		

## WEB SOURCES:

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1. <u>https://www.electrochem.org/semiconductors-shaping-society</u>

2. https://www.scribd.com/doc/26247685/Practical-Applications-of-Electrical-Conductors

3. http://hyperphysics.phy-astr.gsu.edu/hbase/Solids/Squid.html