CMRCET/H&S/PHY/BOS/2022/1

Date: 15.10.2022

DEPARTMENT OF PHYSICS

BOARD OF STUDIES AS PER UGC NORMS

S.No	Position	Composition	Name	Signature
1	Chairman	Associate Professor	Dr. M. CHANDRA SHEKHAR REDDY Head of the Department	
2	Member	Expert Nominated by Vice-Chancellor/University	Dr. KATRAPALLY VIJAYA KUMAR Professor & Principal, JNTUH UCE, Rajanna Sircilla, Agraharam.	
3	Member	Expert from Industry/ R&D	Dr. SRINIVAS KUCHIPUDI DRDO, Advance System Laboratory, Kanchanabagh, Hyderbad	
4	Member	External Expert nominated by the Academic Council (1)	Dr. TIRUMALA SREEKANTH Professor, JNTUH University College of Engineering, Jagtial	
5	Member	External Expert nominated by the Academic Council (2)	Dr. SREENATH REDDY MARRI Associate Professor, Univerity College of Science, Osmania University, Hyderabad.	
6	Member	Senior Faculty of the Department	Dr. D. NEELIMA PATNAIK Associate Professor	
7	Member	Senior Faculty of the Department	Dr. G. PRATHIBHA Associate Professor	
8	Member	Senior Faculty of the Department	Dr. P. MADHUKAR Assistant Professor	
9	Member	Senior Faculty of the Department	Mr. K. JAYA PRAKASH REDDY Assistant Professor	

HEAD OF THE DEPARTMENT

Minutes of Board of Studies Meeting of Department of Physics held on 15.10.2022 at 02:00PM :

1. The College BoS proposed two separate courses, namely **Engineering Physics** for CIV & MEC and **Applied Physics** for EEE, ECE, CSE, INF, CSD, CSC, CSM & AIM. But BoS committee suggested a common course for all the Engineering Branches with the title **Applied Physics.**

2. With the suggestions of the BoS committee, the topics related to **Energy Materials** are included in **Applied Physics** syllabus due to it's emerging applications in various fields.

3. With the suggestions of students during stakeholder' feedback and BoS Members during the meeting, the topics related to **Nanotechnology** are introduced in the **Applied Physics** syllabus.

4. With the suggestions of the alumni during the stakeholder' feedback, the pre requisites to understand the classifications of semiconductors such as **Classical free electron theory of metals, quantum free theory of metals & Band theory of metals** are included in the **Applied Physics** syllabus.

5. With the suggestions of College BoS members, the topics such as magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics are included in the **Applied Physics** syllabus

6. To bridge the gap between the theory and the laboratory courses, the BoS committee included the following new experiments in the Applied Physics Lab (A400501)

   a) V-I characteristics of a p-n junction diode and Zener diode
   b) a) V-I and L-I characteristics of light emitting diode (LED) b)V-I Characteristics of solar cell
   c) Determination of the resistivity of semiconductor by two probe method.
   d) Study B-H curve of a magnetic material.
   e) Determination of dielectric constant of a given material
   f) a) Determination of the beam divergence of the given LASER beam
   g) Understanding the method of least squares – torsional pendulum as an example.

The Syllabus for the courses **Applied Physics** (A400007) & Applied Physics lab (A400501) is approved

(1) (2) (3) K. Sai (4) T. Sankar (5)

(6) (7) (8) (9)

(A400007) APPLIED PHYSICS

(Common to all branches)

L	T	P	C
3	1	0	4

UNIT – I

QUANTUM MECHANICS:

Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect – de Broglie hypothesis- Davisson and Germer experiment – Heisenberg uncertainty principle – Physical significance of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

ELECTRIC PROPERTIES OF SOLIDS:

Free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

UNIT – II

SEMICONDUCTORS AND DEVICES:

Intrinsic and extrinsic semiconductors, Variation of Fermi level with temperature – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode –LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT – III

LASERS:

Laser beam characteristics-three quantum processes-Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser , CO_2 laser - semiconductor laser-applications of laser.

FIBER OPTICS:

Introduction to optical fiber - advantages of optical fibers - total internal reflection- construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers- losses in optical fiber - optical fiber for communication system - applications.

UNIT - IV

DIELECTRIC MATERIALS:

Dielectric Materials: Basic definitions- types of polarizations (qualitative) –Local field – Clausius Mossotti Equation piezoelectric, pyroelectric and ferroelectric materials – applications.

MAGNETIC MATERIALS:

Introduction to Magnetic materials - Hysteresis-soft and hard magnetic materials- magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics.

UNIT - V

ENERGY MATERIALS:

Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

NANOTECHNOLOGY:

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapour deposition (PVD) - chemical vapour deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterial.

TEXT BOOKS

1. Engineering Physics (3rd edition), PK Palanisamy, SciTech Publications, 2015.
2. Essentials of Nan science& Nanotechnology(1stedition), Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 2021.

REFERENCES

1. Fundamentals of Physics.(6th edition), Halliday, R.Resnick and J.Walker,John Wiley and Sons, 2001.
2. Quantum Physics,(2nd edition), H.C. Verma, TBS Publication, 2012
3. Introduction to Solid State Physics, (7th edition), Charles Kittel, Wiley Eastern, 2019.
4. Physics of Semiconductor devices (4th edition), Simon.MSze and Kwok K . Ng, Wiley Student Edition,2006.
5. Applied Physics (2nd Edition) Dr M Chandra Shekhar Reddy, Skytech Publications, 2022.

COURSE OUTCOMES

On completion of the course students will be able to

1. Understand the concepts of Quantummechanics and visualize the differences between the solids by their classification.
2. Identify and analyze the importance of semiconductors and semiconductor devices in Science and Engineering Applications.
3. Appreciate the features and applications of Lasers and Optical fibers.
4. Applying the fundamental properties of dielectric and magnetic materials in different engineering fields.
5. Evaluate various aspects of Energy Materials and Nano-materials and their applications in diverse fields.

(A400501)APPLIED PHYSICS LAB

L	T	P	C
0	0	3	1.5

(Any 8 experiments are to be performed)

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. a) V-I and L-I characteristics of light emitting diode (LED) b)V-I Characteristics of solar cell
6. Determination of Energy gap of a semiconductor.
7. Determination of the resistivity of semiconductor by two probe method.
8. Study B-H curve of a magnetic material.
9. Determination of dielectric constant of a given material
10. a) Determination of the beam divergence of the given LASER beam b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
11. Understanding the method of least squares – torsional pendulum as an example.
12. Diffraction grating: Determination of wavelength of a source (LASER).

LABORATORY MANUAL:

1. Applied Physics Lab (2nd Edition) Dr M Chandra Shekhar Reddy, Dr Neelima Patnaik, Jaya Prakash Reddy Kasu, Skytech Publications, 2022.
2. "A Text book of Practical Physics" (2nd Edition) - S. Balasubramanian, M.N. Srinivasan S Chand Publishers, 2017.

COURSE OUTCOMES

On completion of the course students will be able to

1. Appreciate quantum physics in optoelectronics.
2. Determine the Planck's constant using Photo electric effect
3. Determine energy gap of a semiconductor diode and magnetic fields.
4. Identify the material whether it is n-type or p-type by Hall experiment.
5. Evaluate the basic properties of lasers and optical fibers.