Department of Physics

Board of Studies – First meeting on 20-10-2022 at 02:00 pm

AGENDA

Item-1: Welcoming the distinguished Members of the Board of Studies for the BoS meeting by the Head of the Department.

Item-2: Brief about R22 regulations.

Item-3: Discussion on Course Structure and Syllabus of B.Tech., I-Year

Item-4: Review/Approval of the detailed syllabi of Quantum Mechanics, Semiconductors, Dielectrics, Nanotechnology, Lasers and Fiber optics

Item-5: Review/Approval of the Applied physics Lab syllabus

1. **Item-6:** Any other suggestions to the department.

Item-7: Any other points with permission of the chair

19/10/22

Md. Naseeruddin

Chairman of BoS and HoD of H&S Dept.

Department of Physics
Board of Studies Members

S.No	Name	Designation	Position
1	Mr. Md.Naseeruddin	HoD, H&S Department	Chairman
2	**Dr. Suresh Sripada**	**Asst. Prof. of Physics, JNTUH, UCEJ**	**University Nominee**
3	**Dr. Md. Shareefuddin**	**Professor, UCS ,Osmania University, HYD**	**Subject Expert-1**
4	**Dr. M. Sreenath Reddy**	**Associate. Prof., UCS, Osmania University, HYD**	**Subject Expert-2**
5	Dr. S. Sudhakar Reddy	Professor, SIET	Specialized Faculty-1
6	Dr. G. Suman	Asst. Prof, SIET	Specialized Faculty-2
8	Mrs. B. Himabindu	Assoc. Prof, SIET	Faculty
9	Mr. Y. Kiran Kumar	Asst. Prof, SIET	Faculty
10	Mr. S. Satish Goud	Assoc. Prof, SIET	Faculty

Dr. S. Sai Satyanaryana Reddy
B.E.,M.E.,Ph.D.
PRINCIPAL
SREYAS INSTITUTE OF ENGG., AND TECH.,
#9-39, Beside Indu Aranya, Bandlaguda,
Nagole, Thattiannaram, Hyd-68.

Suggestions/Remedies/Any other points

Minutes of the Meeting Points:

I. Applied Physics Theory

Unit – I Quantum physics and solids

a. The topics wave – particle duality and de–Broglie hypothesis need to be discussed in brief before the Davisson and Germer experiment.
b. Instead of Born's interpretation of wave function discuss the physical significance of wave function.
c. It is also decided to skip the Symmetry in solids.

Unit – II Semiconductors and devices

No changes

Unit – III Dielectric, Magnetic and energy materials

a. By discussing about the basic definition, the application of LCD and crystal oscillators is to be explained in brief.
b. The topics of magnetostriction, magneto resistance and multiferroics are to be followed in order.

Unit – IV Nanotechnology

No changes

Unit – V Lasers and Fiber optics

a. It is advised that keeping in view of the students the argon ion laser can be skipped

II. Applied Physics lab

a. Regarding the applied physics lab syllabus it is decided by the committee to perform all the twelve experiments which are there in the JNTUH syllabus. Keeping in view of frequent failure of function generators it is decided to change LCR circuit can be replaced with CR circuit experiment.
b. It is advised by the committee to procure equipment of all the twelve experiments listed in the syllabus with a minimum of eight sets each and maintain in good condition.

List of enclosures:

1) R22 Regulations
2) Course Structure
3) Syllabus

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Board of Studies Members
Meeting attended on 20-10-2022

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B.Tech. COURSE STRUCTURE, I YEAR SYLLABUS (R22 Regulations)

Applicable from AY 2022-23 Batch

I Year I Semester

S. No.	Course Code	Course	L	T	P	Credits
1.		Matrices and Calculus	3	1	0	4
2.		Engineering Chemistry	3	1	0	4
3.		Programming for Problem Solving	3	0	0	3
4.		Basic Electrical Engineering	2	0	0	2
5.		Computer Aided Engineering Graphics	1	0	4	3
6.		Elements of Computer Science & Engineering	0	0	2	1
7.		Engineering Chemistry Laboratory	0	0	2	1
8.		Programming for Problem Solving Laboratory	0	0	2	1
9.		Basic Electrical Engineering Laboratory	0	0	2	1
		Total	**12**	**2**	**12**	**20**

I Year II Semester

S. No.	Course Code	Course	L	T	P	Credits
1.		Ordinary Differential Equations and Vector Calculus	3	1	0	4
2.		Applied Physics	3	1	0	4
3.		Engineering Workshop	0	1	3	2.5
4.		English for Skill Enhancement	2	0	0	2
5.		Electronic Devices and Circuits	2	0	0	2
6.		Applied Physics Laboratory	0	0	3	1.5
7.		Python Programming Laboratory	0	1	2	2
8.		English Language and Communication Skills Laboratory	0	0	2	1
9.		IT Workshop	0	0	2	1
		Total	**10**	**4**	**12**	**20**

ORIGINAL

APPLIED PHYSICS

B.Tech. I Year II Sem.

L	T	P	C
3	1	0	4

Pre-requisites: 10 + 2 Physics

Course Objectives: The objectives of this course for the student are to:

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibres.

Course Outcomes: At the end of the course the student will be able to:

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT - I: QUANTUM PHYSICS AND SOLIDS

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 - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Symmetry in 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 – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

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

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

UNIT - IV: NANOTECHNOLOGY

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

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UNIT - V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations-lasing action - pumping methods- ruby laser, He-Ne laser , CO_2 laser, Argon ion Laser, Nd:YAG 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.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4thEdition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
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R22 B.Tech.

REVISED

APPLIED PHYSICS

B.Tech. I Year I Sem.

L T P C
3 1 0 4

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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.

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UNIT - V: LASER AND FIBER OPTICS

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

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INSTITUTE OF ENGINEERING AND TECHNOLOGY
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(Approved by AICTE, New Delhi | Affiliated to JNTUH, Hyderabad | Accredited by NAAC "A" Grade & NBA, Hyderabad | PIN: 500068)

APPLIED PHYSICS LABORATORY

B.Tech. I Year II Sem.

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of this course for the student to

1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

Course Outcomes: The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carried out data analysis.

LIST OF EXPERIMENTS:

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. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)
   b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a) Determination of the beam divergence of the given LASER beam
    b) Determination of Acceptahce Angle and Numerical Apertureof an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

Note: *Any 8 experiments are to be performed.*

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3. Gain the knowledge of applications of dielectric constant.
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5. Carried out data analysis.

LIST OF EXPERIMENTS:

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2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits OR Time constant of RC Circuit.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)
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