PSGR
Krishnammal College for Women
Affiliated to Bharathiar University \ Autonomous \ College of Excellence \ Accredited with A++ Grade \ Ranked 9th in NIRF

# DEPARTMENT OF PHYSICS

# CHOICE BASED CREDIT SYSTEM (CBCS)
# LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

## BACHELOR OF SCIENCE - PHYSICS
## 2023-2026 BATCH

PSGR Krishnammal College for Women

Affiliated to Bharathiar University \ Autonomous \ College of Excellence \ Accredited with A++ Grade \ Ranked 9th in NIRF

# BACHELOR OF SCIENCE IN PHYSICS
## CHOICE BASED CREDIT SYSTEM (CBCS) &
## LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)
## SCHEME & SYLLABUS OF EXAMINATION
## 2023-2026 BATCH

| Sem | Part | Course Code | Title of the Course | Course Type | Instruction Hours/week | Contact Hours | Tutorial Hours | Duration of Examination | Examination Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CA | ESE | Total | |
| I | I | TAM2301 / HIN2301/ FRE2301 | Language T/H/F Paper I | L | 6 | 88 | 2 | 3 | 25 | 75 | 100 | 3 |
| | II | ENG2301 | English Paper I | L | 6 | 88 | 2 | 3 | 25 | 75 | 100 | 3 |
| | III | PS23C01 | Core Physics Paper I: Mechanics, Properties of Matter and Sound | CC | 6 | 88 | 2 | 3 | 25 | 75 | 100 | 5 |
| | | PS23CP1 | Core Physics Practical I | CC | 3 | | | - | - | - | - | - |
| | | CE23A03/ TH23A01 | Allied Chemistry Paper–I (offered to B.Sc Physics)/ Mathematical Statistics- I | GE | 4 | 58 | 2 | 3 | 25 | 75 | 100 | 4 |
| | | CE23AP2 | Allied Chemistry Practicals (offered to B.Sc Physics) | GE | 3 | | | - | - | - | - | - |
| | IV | NME23B1/ NME23A1/ NME23ES | Basic Tamil I/ Advanced Tamil I/ Introduction to Entrepreneurship | AEC | 2 | 30 | - | 3 | 100 | - | 100 | 2 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **II** | I | TAM2302 / HIN2302/ FRE2302 | Language T/H/F Paper II | L | 6 | 88 | 2 | 3 | 25 | 75 | 100 | 3 |
| | II | ENG2302 | English Paper II | L | 5 | 73 | 2 | 3 | 25 | 75 | 100 | 3 |
| | III | PS23C02 | Core Physics Paper II Heat and Thermodynamics | CC | 6 | 86 | 4 | 3 | 25 | 75 | 100 | 5 |
| | | PS23CP1 | Core Physics Practicals – I | CC | 3 | 45 | - | 3 | 25 | 75 | 100 | 4 |
| | | CE23A04/ TH23A02 | Allied Chemistry Paper –II (offered to B.Sc Physics)/ Mathematical Statistics –II | GE | 5/6 | 73/88 | 2 | 3 | 20* | 55* | 75 | 4/5 |
| | | CE23AP2 | Allied Chemistry Practicals (offered to B.Sc Physics) | GE | 3 | 45 | - | 3 | 15# | 35# | 50 | 2 |
| | IV | NME23B2/ NME23A2 | Basic Tamil II/ Advanced Tamil II (outside class hours) | AEC | 2 | - | - | - | 100 | - | 100 | Grade |
| | | 23PEPS1 | Professional English for Physical Sciences | AEC | 2 | 25 | 5 | - | 100 | - | 100 | 2 |
| | | NM23GAW | GENERAL AWARENESS | | - | - | - | - | - | - | 100 | - |
| **III** | I | TAM2303 / HIN2303/ FRE2303 | **Language III –** Tamil Paper III/ Hindi Paper III/ French Paper III | L | 6 | 88 | 2 | 3 | 25 | 75 | 100 | 3 |
| | II | ENG2303 | English Paper III | E | 5 | 73 | 2 | 3 | 25 | 75 | 100 | 3 |
| | III | PS23C03 | Electricity and Magnetism | CC | 4 | 58 | 2 | 3 | 25 | 75 | 100 | 4 |
| | | PS23CP2 | Physics Practical – II | CC | 3 | | - | - | - | - | - | - |
| | | TH23A12 | **Allied – I** Mathematics for Physics- I | GE | 7 | 103 | 2 | 3 | 25 | 75 | 100 | 5 |
| | | PL23A01 PL23AP1 | Allied Botany Paper- I Allied Botany Practical | GE | 5 2 | 73 30 | 2 - | 3 - | 20 - | 55 - | 75€ - | 4 - |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AS23A01<br>AS23AP1 | Allied Zoology Paper I<br>Allied Zoology Practical | GE | 5<br>2 | 73<br>30 | 2<br>- | 3<br>- | 20<br>- | 55<br>- | 75€<br>- | 4<br>- |
| | | PS23SCE 1/CS23SBGP | Skill Based Subject I: Coursera- IoT and Embedded Systems / GEN - AI | SEC | 3 | 45/44 | -/1 | - | 100 | - | 100 | 3 |
| | IV | NM23DTG | Design Thinking | AEC | 2 | 30 | - | - | 100 | - | 100 | 2 |
| | | NM22UHR | Universal Human Values and Human Rights # | AECC | - | - | - | - | 100 | - | 100 | Gr. |
| **I-V** | VI | 16BONL1<br>16BONL2 | Online Course 1<br>Online Course 2 | ACC | - | - | - | - | - | - | - | - |
| **I-IV** | VI | COMISSER | Community Service | | 30 | | | | | | | |
| **IV** | **I** | TAM2304/ HIN2304/ FRE2304 | Tamil Paper – IV/ Hindi Paper – IV/ French Paper IV | L | 5 | 73 | 2 | 3 | 25 | 75 | 100 | 3 |
| | **II** | ENG2304 | English Paper - IV | E | 6 | 88 | 2 | 3 | 25 | 75 | 100 | 3 |
| | III | PS23C04 | Fundamentals of Digital Electronics | CC | 4 | 58 | 2 | 3 | 25 | 75 | 100 | 4 |
| | | PS23CP2 | Physics Practicals – II | CC | 3 | 45 | - | 3 | 25 | 75 | 100 | 4 |
| | | TH23A31 / PL23A02/ AS23A02 | Mathematics II/<br>Fundamentals of Botany II /<br>General Principles in Zoology | GE | 7<br>4<br>4 | 103<br>58<br>58 | 2<br>2<br>2 | 3<br>3<br>3 | 25<br>20*<br>20* | 75<br>55*<br>55* | 100<br>75<br>75 | 5<br>4<br>4 |
| | | PL23AP1<br>AS23AP1 | Botany Practical /<br>Zoology Practical | GE | 3 | 45 | - | 3 | 15# | 35# | 50 | 2 |
| **III/ IV** | III | PS23SCE 1/ CS23SBGP | IoT and Embedded Systems / GEN - AI | SEC | 3 | 45 | - | - | 100 | - | 100 | 3 |
| **IV** | IV | NM23EII | Entrepreneurship and Innovation (IgniteX) | AECC | 2 | 30 | - | - | 100 | - | 100 | 2 |
| | IV | NM23EVS | Environmental Studies | AECC | SS | - | - | - | 100 | - | 100 | Gr. |
| | V | COCOACT | Co-curricular Activities | GC | - | | | - | 100 | - | 100 | 1 |
| **I-V** | VI | 16BONL1<br>16BONL2 | Online Course 1<br>Online Course 2 | ACC | - | - | - | - | - | - | - | - |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **I-IV** | VI | COM15SER | Community Services 30 hours | GC | - | - | - | - | - | - | - | - |
| **V** | III | PS23C05 | Electronics | CC | 6 | 88 | 2 | 3 | 25 | 75 | 100 | 5 |
| | | PS23C06 | Solid State Physics | CC | 6 | 88 | 2 | 3 | 25 | 75 | 100 | 5 |
| | | PS23E01/ PS23E02/ PS23E03/ | Mathematical Physics/ Materials Science – I/ Bio medical Instrumentation-I | DSE | 4 | 58 | 2 | 3 | 25 | 75 | 100 | 5 |
| | | PS23CP3 | Physics Practical III | CC | 6 | 90 | | 3 | 25 | 75 | 100 | 4 |
| | | PS23SB01 | Programming in C | SEC | 3 | 41 | 4 | - | 100 | - | 100 | 3 |
| | | PS16AC1/ PS16AC2 | Energy Physics- I/ Experimental techniques and data Analysis - I | ACC | SS | | | 3 | 25 | 75 | 100 | 5$ |
| | | PS23PROJ | Project and Viva Voce | DSE | 3 | 45 | | | 25 | 75 | 100 | 5 |
| | IV | NM21CS1 | Cyber Security I | AECC | 2 | 30 | - | - | 100 | - | 100 | Gr |
| | VI | PS23COM | Comprehensive Examination | GC | - | - | - | | 100 | - | 100 | Gr |
| | IV | PS23INST | Field Work / Institutional Training | DSE | - | - | - | - | 100 | - | 100 | 2 |
| | VI | COM15SER | Community Services 30 Hours | GC | - | - | - | - | - | - | - | - |
| | VI | 16BONL1 16BONL2 | Online Course Online Course | ACC | - | - | - | - | - | - | - | - |
| **VI** | III | PS23C07 | Optics and Spectroscopy | CC | 5 | 73 | 2 | 3 | 25 | 75 | 100 | 5 |
| | III | PS23C08 | Quantum Mechanics | CC | 5 | 73 | 2 | 3 | 25 | 75 | 100 | 5 |
| | III | PS23C09 | Atomic and Nuclear Physics | CC | 5 | 73 | 2 | 3 | 25 | 75 | 100 | 4 |
| | III | PS23E04 PS23E05 PS23E06 | Microprocessor/ Materials Science – II/ Bio medical Instrumentation -II | DSE | 6 | 88 | 2 | 3 | 25 | 75 | 100 | 5 |
| | | PS16AC3/ PS16AC4 | Energy Physics- II/ Experimental techniques and data Analysis - II | ACC | - | - | - | 3 | 25 | 75 | 100 | 5$ |
| | III | PS23CP4 | Physics Practicals- IV | CC | 6 | 90 | - | 3 | 25 | 75 | 100 | 4 |
| | III | PS21SB02 | Non Conventional Energy Resources | SEC | 3 | 43 | 2 | - | 100 | - | 100 | 3 |
| I-V | VI | 16BONL1 16BONL2 | Online Course Online Course | ACC | - | - | - | - | - | - | - | - |

**Total Marks** – 3800 **Total Credits** - 140

**CC** – Core Courses
**GE** – Generic Elective
**CA** – Continuous Assessment
**ESE** - End Semester Examination

**AECC** – Ability Enhancement Compulsory Course
**ACC –** Additional Credit Course

**GC** – General Course
**SS –** Self Study

**Gr –** Grade
**SEC – Skill Enhancement Course**
**DSE – Discipline Specific Elective**
**L** - Language
*** CA conducted for 25 and converted to 20**
*** ESE conducted for 75 and converted to 55**
**# CA conducted for 25 and converted to 15**
**# ESE conducted for 75 and converted to 35**
$ **Credits applicable to candidates who take up Advanced level Course examination**

| PS23C01 | MECHANICS, PROPERTIES OF MATTER AND SOUND | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | | **88** | 2 | - | 5 |

## Preamble

To give the students fundamental ideas on conservation laws, rotational and vibrational motion of rigid bodies, elasticity, viscosity, surface tension and basics of sound.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Understand and define the laws involved in mechanics , properties of matter and sound | K2 |
| CLO2 | Analyze the behavior of various bodies due to kinematic and dynamic forces acting on the body. | K4 |
| CLO3 | Apply the key evidence of the classical description of the properties of matter | K3 |
| CLO4 | Recall the principles and basic equations and apply them to unseen problems | K4 |
| CLO5 | Acquire problem solving skills on par with industry | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| **CLO1** | M | M | S | S | S | S |
| **CLO2** | S | S | S | S | S | S |
| **CLO3** | S | S | S | S | S | S |
| **CLO4** | S | S | S | L | S | S |
| **CLO5** | S | M | M | M | S | S |

S- Strong; M-Medium; L-Low

## Syllabus

**Unit I** **18 Hrs**

**Impact of elastic bodies and Friction**

Conservation Laws – Collision - Impulse of a force – Fundamental principle of impact - Direct impact of two smooth spheres - loss of K.E due to direct impact of two smooth spheres-Oblique impact of a smooth sphere on a fixed smooth plane – oblique impact of two smooth spheres and loss of K.E due to oblique impact – friction – Laws of friction – angle of friction – cone of friction – Experimental method for determining co-efficient of friction between two surfaces-Equilibrium of a body on a rough inclined plane acted upon by an External force.

**Unit II** **18Hrs**

**Rigid Body Dynamics**

Rigid body – rotational and vibrational motion – Torque – angular momentum – Angular impulse – moment of inertia – radius of gyration – dimensions and units of moment of inertia – Analogous parameters in translational and Rotational motion.

**Simple Harmonic Motion**

Composition of two simple harmonic motions in a straight line – Composition of two simple harmonic motions of equal time periods at right angles – Lissajous Figures – Experimental methods – Uses of Lissajous Figures

**Unit III** **17 hrs**

**Elasticity**

Elasticity – Three types of elastic moduli and relation between them – Poisson's ratio – Bending of beams – Expression for bending moment – Depression of the loaded end of a Cantilever – uniform – non uniform bending – theory – experiment – pin and microscope method – work done in uniform bending – Koenig's method – non-uniform bending – theory – expression for couple per unit twist – determination of rigidity modulus – Static torsion method with scale and telescope – Rigidity modulus by torsion pendulum with mass – I section girders.

**Unit IV** **17 hrs**

**Viscosity and Surface tension**

Viscosity – Poiseuille's formula for the flow of a liquid through a capillary tube – corrections – Poiseuille's method to determine the coefficient of viscosity of liquid – Ostwald's viscometer – variation of viscosity with temperature and pressure – Searle's viscometer (rotating cylinder method). Effect of temperature on brake oils in cars.

**Surface tension** – work done in increasing the area of the surface – work done in blowing a bubble- experimental determination of surface tension – Jaeger's method- Quincke's method – variation of surface tension with temperature – drop weight method- experimental determination of interfacial tension between water and kerosene.

**Unit V** **18 hrs**

**Sound**

Velocity of transverse waves along stretched string – Laws of transverse vibration of strings – Melde's experiment – Siren – Determinations of frequency of a tuning fork by revolving drum method and phonic stroboscopic method – Means of Lissajous method

**Acoustics** – Reverberation – Sabine's reverberation formula – Determination of absorption coefficient. **Ultrasonics** – properties – production – Galton whistle – Magnetostriction oscillator – Piezo-electric oscillator- detection and application.

Importance of Industry 4.0 in Physics.

## Text Books

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | Murugeshan.R | Mechanics and Mathematical Methods | S.Chand& Co Ltd, New Delhi | 2006 | Reprint |
| 2 | Mathur D.S | Mechanics | S. Chand &Co Ltd, New Delh | 2012 | 2nd Edition |
| 3 | R.Murugesan | Properties of Matter | S.Chand and Company Pvt Ltd | 2013 | 11th edition |
| 4 | Saighal.R.L | Textbook of Sound | S.Chand&Co Ltd | 1998 | 2ndEdition |
| 5 | P. Kaliraj, T. Devi | Higher Education for Industry 4.0 and Transformation to Education 5.0 | | | |

## Reference Books

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | Bhargava& Sharma | A Text Book of Mechanics | Ratan Prakashan Mandir | 1990 | 7thEdition |
| 2 | Brijlal Subramanyam | Properties of Matter | S. Chand and Company Pvt Ltd | 1995 | 3rd Edition |
| 3 | Murugesan. R | Properties of matter, Sound and thermal physics | S. Chand & Co Ltd | 2011 | 1st Edition |

## Pedagogy

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, power point presentation, Weblinks, NPTEL Lectures.

## Course Designers

1. Dr.M.Lavanya

| PS23CP1 | CORE PRACTICALS I | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | | - | - | 3hrs/week | - |

**Preamble**

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, Sound, Heat, Optics, Electricity and Magnetism.

**Course Outcomes**

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1. | Apply knowledge of mathematics and physics fundamentals and an instrumentation to arrive solution for various problems. | K2 |
| CLO2. | Understand the usage of basic laws and theories to determine various properties of the materials given. | K2 |
| CLO3. | Understand the application side of the experiments | K2 |
| CLO4. | Use standard methods to calibrate the given low range voltmeter and ammeter and to measure resistance of the given coil and various physical quantities. | K3 |
| CLO5. | Use of basic laws to study the spectral properties and optical properties of the given prism. | K3 |

**Mapping with Programme Outcomes**

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | L | L | L | L |
| CLO2 | S | S | S | S | M | M |
| CLO3 | S | S | S | S | M | M |
| CLO4 | S | S | S | S | M | M |
| CLO5 | S | S | S | S | M | M |

S- Strong; M-Medium; L-Low

## Syllabus

**List of Experiments**

1. Determination of Young's Modulus of the given rectangular beam by Non Uniform bending using Optic lever.
2. Determination of Young's Modulus of the given rectangular beam by Uniform bending using pin and microscope.
3. Determination of Rigidity modulus of the material of the given rod by using Static torsion apparatus.
4. Determination of Rigidity modulus of the material of the suspension wire using Torsion pendulum.
5. Determination of Moment of Inertia of the given disc by torsional oscillations.
6. Determination of frequency of AC mains using Sonometer.
7. Determination of Acceleration due to gravity using Compound pendulum.
8. Determination of thermal conductivity of the given bad conductor using Lee's disc method.
9. Determination of Refractive index of the given solid prism using Spectrometer
10. Determination of Refractive index of a liquid using hollow prism - Spectrometer
11. Determination of wavelength of prominent lines of mercury spectrum using grating by minimum deviation method using Spectrometer
12. Calibration of a low range voltmeter using Potentiometer
13. Calibration of a low range ammeter using Potentiometer
14. Determination of unknown resistance of the given coil of wire using potentiometer.
15. Determination of Moment of a magnet using deflection magnetometer by Tan C method.
16. Determination of $B_H$ by measuring the field along the axis using deflection magnetometer.
17. Determination of Temperature co-efficient of resistance of a Thermistor using Wheatstone's bridge.
18. Determination of Spring Constant of different metals.
19. Determination of frequency of tuning fork using Melde's apparatus.
20. Determination of Planck's constant using different LEDs.

## Pedagogy:

Demonstration and practical sessions

## Course Designers:

1. Dr. P. Meena
2. Dr. G. Praveena

| PS23A01 | ALLIED PHYSICS PAPER- I (For Chemistry) | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | III | 58 | 2 | - | 4 |

## Preamble

This paper introduces the student**s** to the basic concepts of Elasticity, Rotational motion, Heat and thermodynamics, Sound, Optics, Atomic and Nuclear Physics

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Define the fundamental concepts of material properties, heat, sound, optics, atomic and nuclear physics | K1 |
| CLO2 | Demonstrate the practical concepts behind the optics, heat and sound through experimental setup | K2 |
| CLO3 | Apply the fundamental properties and the associated laws to understand physical systems | K2 |
| CLO4 | Analyze the thermo dynamical, optical properties of matter and to find its applications in various fields | K3 |

## Mapping with Programme Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | M | L | L |
| CLO2 | S | M | S | M | S | L |
| CLO3 | S | M | S | L | M | S |
| CLO4 | S | M | S | S | S | S |
| CLO5 | S | M | S | M | S | M |

S- Strong; M-Medium; L-Low

## Syllabus

**Unit – I** **11 Hrs**

**Properties of Matter**

Elasticity: Moduli of elasticity – bending moment-expression – Young's modulus by uniform and non-uniform bending – theory and experiment– I–section girders – Torsion pendulum – couple per unit twist – work done in twisting – determination of the rigidity modulus of the material of the wire.

**Unit - II** **12 Hrs**

**Transmission of Heat**

**Conduction process:** Thermal conductivity – Rectilinear field along a bar – Measurement of Thermal conductivity of a bad conductor by Lee's disc method

Convection process: Lapse rate – stability of atmosphere – Green house effect

Radiation process: Solar constant – Pyrheliometer – solar energy and its applications (flat plate collector & solar cooker) – concentration solar collector, Fresnel Lenses method.

**Unit - III** **11 Hrs**

**Thermodynamics, Sound:**

Thermodynamics: Thermodynamic variables – Extensive and Intensive variables – Maxwell's Thermodynamic relation – Thermodynamic potential – Significance – relation of thermodynamics potentials with their variables

**Ultrasonics:** Piezo electric & Magnetostriction method – Principle – Construction – Working and Applications.

**Unit - IV** **12 Hrs**

**Optics:**

Dispersion: Dispersive power-combination of prisms to produce (i) deviation without dispersion (ii) dispersion without deviation – direct vision spectroscope.

Interference: Air wedge – determination of diameter of a wire – Newton's rings-determination of refractive of a liquid

Polarization: Production, detection and analysis of different types of polarized light – quarter and half wave plates

**Unit - V** **12Hrs**

Atomic Physics: Vector atom model – Quantum numbers associated with vector atom model – Pauli's exclusion principle – excitation and ionization potential – experimental determination – **Franck and Hertz method.**

Nuclear Physics: Elementary particles – classification – particles and antiparticles –conservation laws and symmetry – Quark model.

**Books for Study:**

| S. No | Authors | Title of the Book | Publishers | Year of Publication |
|---|---|---|---|---|
| 1 | Brijlal Subramanium | Heat and thermodynamics | S.Chand and Co, 16th Edition. | 2012 |
| 2 | Brijlal Subramanium & Hemne.P.S, | Heat thermodynamics and Statistical Physics | S.Chand and Co, 12th edition | 2011 |
| 3 | Brijlal Subramanium | Optics | S.Chand and Co, 21st Edition | 2012 |
| 4 | Murugeshan R | Allied Physics | S.Chand and Co, 1st Edition | 1998 |

**Books for Reference:**

| S. No | Authors | Title of the Book | Publishers | Year of Publication |
|---|---|---|---|---|
| 1 | Jayaprakash. N | Heat and thermodynamics | S Chand and Co, 16th Edition. | 2012 |

| | | | | |
|---|---|---|---|---|
| 2 | Mathur D.S | Properties of Matter | S Chand and Co, 2nd Edition | 1970 |
| 3 | Murugesan R | Modern Physics | S.Chand and Co , 9th edition | 2013 |

**Pedagogy**

Chalk and talk, PPT, Seminar, Group discussion, Interaction

**Course Designers:**

1. Mrs.S.Sowmya

**References For E-Content:**

1. https://youtu.be/qQhOYbztNIQ
2. https://youtu.be/gcI-bkr7ilg
3. https://youtu.be/7tr4qWPgP40
4. https://youtu.be/N5GAHntU_nQ
5. https://youtu.be/hDP6egLrsdM
6. https://youtu.be/nmsPcTzIkrw
7. https://youtu.be/rAhvvyQBUt0
8. https://youtu.be/TUaTNzZ00oM
9. https://youtu.be/tDB3zP9MEZc
10. https://youtu.be/wvl0QAQCJyc
11. https://youtu.be/4nbBAG-848c
12. https://youtu.be/nJXB0yD_wEw
13. https://youtu.be/K4Do_yWJt2k
14. https://youtu.be/HH58VmUbOKM
15. https://youtu.be/DjnDX28l4xA
16. https://youtu.be/iVYGOWAtZCQ
17. https://youtu.be/SQtOYCei-Pc
18. https://youtu.be/kykp-S8S5dU

| | | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| **PS23AP1** | **ALLIED PHYSICS PRACTICALS** (For I BSc Chemistry Sem I and II and II BSc Mathematics Sem III and IV) | III | - | - | 3 Hrs / week | 3 |

**Preamble**

To enable the student to gain practical knowledge

**Course Outcomes**

On the successful completion of the course, students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1. | Gain knowledge in the scientific methods and learn the process of measuring different Physical variables | K1 |
| CO2. | Educate The Basics Of Instrumentation, Data Acquisition And Interpretation of Results | K2 |
| CO3. | Enhance The Students Understand The Concepts In Materials Properties | K2 |
| CO4. | Have a deep knowledge of fundamentals of optics, electric circuits, magnetism and sound | K3 |

**Mapping with Programme Outcomes**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|---|---|---|---|---|---|---|
| CO1. | S | S | S | S | M | S |
| CO2. | S | S | S | S | S | S |
| CO3. | S | M | S | M | M | M |
| CO4. | S | M | M | S | M | S |
| CO5. | S | S | S | S | M | S |

S- Strong; M-Medium; L-Low

## Syllabus

**List of Experiments**
**Any Eighteen**

1. Young's Modulus –Non- Uniform bending –Pin and Microscope
2. Young's Modulus – Uniform bending – Optic lever
3. Rigidity modulus - Static torsion
4. Rigidity Modulus - torsional pendulum
5. Moment of inertia - torsional pendulum
6. Acceleration due to gravity - compound pendulum
7. Thermal conductivity of a bad conductor – Lee's disc method
8. AC frequency - Sonometer
9. Refractive index of solid prism - spectrometer
10. Refractive index of liquid-Hollow prism - spectrometer
11. Wave length- Grating - Minimum deviation method - Spectrometer
12. Low range Ammeter Calibration - Potentiometer
13. Low range Voltmeter Calibration - Potentiometer
14. Moment of a magnet in the Tan C position
15. Volt-Ampere characteristic of a p-n junction diode in the forward and reverse directions
16. Logic gates - Verification of the truth table
17. Characteristics of Zener diode
18. Closed loop gain of Operational Amplifier in Inverting mode
19. Closed loop gain of Operational Amplifier in Non Inverting mode.

## Pedagogy

Demonstration and Practical Sessions

## Course Designers:

1. Mrs. T. Poongodi

| PS23C02 | HEAT AND THERMODYNAMICS | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | III | 86 | 4 | - | 6 |

## Preamble

The aim of this course is to acquire knowledge in heat transfer, entropy, production of low temperature and liquefaction of gases, thermal radiation and statistical thermodynamics.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1. | Understand the central concepts and basic idea on specific heat, entropy, quantum theory of radiation | K2 |
| CLO2. | Apply the concepts of low temperature physics in liquefaction of gases | K3 |
| CLO3. | Use the tools needed to formulate and solve problems in thermodynamical systems such as gases, heat engines etc | K3 |
| CLO4. | Become familiarize with the concepts of thermodynamical potentials. | K3 |
| CLO5. | Distinguish the particles based on the concepts and principles of Statistical Physics | K4 |

## Mapping with ProgrammeLearning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | M | M | S | S | M | S |
| CLO2 | S | S | S | S | M | S |
| CLO3 | S | S | S | M | M | S |
| CLO4 | S | S | S | S | L | S |
| CLO5 | S | S | S | S | S | S |

S- Strong; M-Medium; L-Low

## Syllabus

**Unit I** **18 Hrs**

**Kinetic theory of gases**

Postulates of kinetic theory of gases – derivation of expression for pressure exerted by gas - Maxwell's Law of Distribution of Velocities(no derivation), Mean Free Path - Brownian motion – Langevin'stheory of Brownian motion – Einstein's theory of Brownian motion– degree's of freedom – Maxwell's law of equipartition of energy - van der Waal's equation of state – critical constants –experimental determination of critical constants.

**Quantum Theory of Specific Heat**

Specific heat of solids - Dulong and Petits law and the deduction – failure of Dulong and Petit's law – Einstein's theory and its limitation – Debye theory of specific heat of solids – specific heat of gases – Variation of specific heat of diatomic gases with temperature – applications of high specific heat capacity of water.

**Unit II** **17 Hrs**

**Low Temperature Physics**

Methods of production of low temperatures – Expression for temperature inversion – Principle of regenerative cooling - Joule Thomson effect – Porous plug experiment – its theory and result – Joule Thomson effect for perfect and real gases –Liquefaction of Hydrogen & Helium – Helium I and Helium II -Lamda point - super fluidity – adiabatic demagnetization – application in refrigerators and deep freezers.

**Unit III** **16 Hrs**

**Thermal Physics**

Quantum theory of radiation- Planck's hypothesis – average energy of Planck's oscillator – Planck's radiation law and its experimental verification -Derivation of Planck's law– Derivation of Wein's law and Rayleigh-Jean's from Planck's law – Stefan's and Wein's displacement laws from Planck's law –Room heaters and radiators in cars - solar thermal system (water heater)

**Unit IV** **18 Hrs**

**Laws of Thermodynamics and Entropy**

First law of thermodynamics and it's consequences – Isothermal and adiabatic processes – reversible, irreversible and quasi-static processes – second law and entropy - physical significance of entropy - Entropy of a perfect gas - Thermo dynamic potentials- internal energy (U)- Helmtzholtz function (F)- Gibb's function (G) and enthalpy (H) – significance of thermodynamic potentials - Maxwell's thermodynamics relation – the (Tp-dS) equation – Clapeyron's latent heat equation using Maxwell's thermodynamics relation – understanding entropy in steam engines.

**Unit V** **17 Hrs**

**Statistical Physics**

Probability- Macrostate and microstate – phase space – thermodynamic probability – Ensembles – Kinds of Ensembles(concepts only) – Maxwell's Boltzmann distribution law- Maxwell's Boltzmann distribution in terms of temperature – quantum statistics – Bose Einstein distribution law – Fermi - Dirac distribution law – Comparison of three statistics.

## Text Books

| S. No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | Brijlal N Subrahmanyam P.S.Hemne | Heat Thermodynamics and Statistical Physics and applications | S. Chand | 2012 | 3rd edition |
| 2 | R.Murugeshan Er. KiruthigaSivaprasath | Thermal Physics | S.Chand | 2012 | 3rd edition |

## Reference **Books**

| S. No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | A.B Gupta H.P. Roy | Thermal Physics | Arunabha Sen | 2005 | 1st edition |
| 2 | Agrawal Prakash | Thermal Physics | PragatiPrakashan | 2015 | 27th edition |
| 3 | Agrawal Prakash | Thermodynamics and Statistical Physics | PragatiPrakashan | 2015 | 27th edition |

## Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction,Weblinks, NPTEL Lectures.

## Course Designers

1. Dr. G. Praveena

| PS23A02 | ALLIED PHYSICS PAPER- II (For Chemistry) | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | III | 71 | 5 | - | 4 |

## Preamble

This paper introduces the student to the basic concepts of AC Circuits, Magnetic materials, electronics and digital electronics

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Explore the fundamental concepts of physics | K1 |
| CLO2 | Import knowledge about the importance of material properties, heat, sound, optics, atomic and nuclear physics. | K2 |
| CLO3 | Understand the energy involved in nuclear reaction | K2 |
| CLO4 | Carry out the practical by applying these concepts | K3 |
| CLO5 | Get depth knowledge of physics in day today life | K3 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | M | L | L |
| CLO2 | S | M | S | M | S | L |
| CLO3 | S | M | S | L | M | S |
| CLO4 | S | M | S | S | S | S |
| CLO5 | S | M | S | M | S | M |

S- Strong; M-Medium; L-Low

## Syllabus

**Unit – I** **14 Hrs**

**Alternating currents:**

Mean and RMS values of AC -Series and parallel resonant circuits-Power factor- power factor of an ac circuit containing resistance, inductance and capacitance -Transformer-

construction- working-losses.

**Unit – II** **14 Hrs**

**Magnetic materials:**

Magnetic Induction – Magnetization – Relation between the three magnetic vectors B, H and M – Magnetic susceptibility – Properties - diamagnetic – paramagnetic – ferromagnetic – anti ferromagnetism and ferrimagnetism – Electron theory of magnetism — Weiss's theory of ferromagnetism - energy loss in hysteresis – importance of hysteresis curves.

**Unit – III** **14 Hrs**

**Semiconductor Diodes:** P and N type semiconductors - PN Junction Diode - Current Flow Mechanism in Forward and Reverse Biased Diode - Zener Diode and Voltage Regulation - Principle and structure of (1) LEDs (2) Photodiode (3) Solar cell - Transistor – Characteristics of CB, CE and CC Configuration – Transistor biasing – Voltage divider biasing.

**Unit - IV** **14 Hrs**

**Two - terminal Devices and their Applications**: Rectifier Diode: Half- wave Rectifiers - Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency - **Amplifiers:** Single stage amplifier (CE) **- Sinusoidal Oscillators:** Barkhausen's Criterion for self - sustained oscillations - RC Phase shift oscillator, determination of Frequency-Hartley oscillator.

**Unit – V** **15 Hrs**

**Digital Electronics:**

Boolean algebra-DeMorgan's theorem-OR, AND, NOT, XOR NOR and NAND gates-NOR andNAND gates as universal building blocks-half adder, full adder-RS flip flop-JK flip flop Operational amplifier: Characteristics-virtual ground-summing point-inverting and non invertingamplifier-adder-subtractor.

**Text Book**

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | R. Murugesan | Electricity and Magnetism | S.Chand and Co | 2005 | Revised Edition |
| 2 | V.K. Metha | Principles of electronics | S.Chand and Co | 1980 | 1st Edition |
| 3 | Murugesan R | Allied Physics | S.Chand and Co | 2005 | 1st edition |

## Reference Books

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | V. Vijayendran | Introduction to Integrated Electronics | Viswanathan Publishers | 2005 | 1st Edition |

## Pedagogy

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, Power Point Presentation

**Reference Links:**

1. Mean and RMS values of AC - https://www.youtube.com/watch?v=qDHsokTcgck
2. Series & Parallel Resonant Circuits - https://www.youtube.com/watch?v=G8KLJjq1E2o
3. Transformer | Principle, Construction, Working and Efficiency - https://www.youtube.com/watch?v=i29dCoSGa38
4. Magnetization - https://www.youtube.com/watch?v=C-OoUvKXbLU&t=2s
5. Diamagnetic – paramagnetic – ferromagnetic - https://www.youtube.com/watch?v=wK7Jr1g4_ws
6. P and N type semiconductors - https://www.youtube.com/watch?v=5ZNeDxfgYAE
7. Different types of diodes - https://www.youtube.com/watch?v=-EqOEiEQGLI
8. Diode rectifier circuits - https://www.youtube.com/watch?v=Xmu31a-59vw
9. Single stage amplifier - https://www.youtube.com/watch?v=NEiVSbPYWNE
10. RC Phase Shift Oscillator - https://www.youtube.com/watch?v=Gvb4GIV5ig8
11. Hartley Oscillator - https://www.youtube.com/watch?v=3B_sBX_11Zw
12. Boolean Algebra and Logic gates - https://www.youtube.com/watch?v=JQBRzsPhw2w
13. Flip-flop - https://www.youtube.com/watch?v=LTtuYeSmJ2g
14. Operational amplifier - https://www.youtube.com/watch?v=jsKSfaFQ4d4

## Course Designers

1. Dr. G. Praveena

| PS23CP1 | CORE PRACTICALS I | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | III | - | - | 3hrs/week | 4 |

## Preamble

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, Sound, Heat, Optics, Electricity and Magnetism.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1. | Apply knowledge of mathematics and physics fundamentals and an instrumentation to arrive solution for various problems. | K2 |
| CLO2. | Understand the usage of basic laws and theories to determine various properties of the materials given. | K2 |
| CLO3. | Understand the application side of the experiments | K2 |
| CLO4. | Use standard methods to calibrate the given low range voltmeter and ammeter and to measure resistance of the given coil and various physical quantities. | K3 |
| CLO5. | Use of basic laws to study the spectral properties and optical properties of the given prism. | K3 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | L | L | L | L |
| CLO2 | S | S | S | S | M | M |
| CLO3 | S | S | S | S | M | M |
| CLO4 | S | S | S | S | M | M |
| CLO5 | S | S | S | S | M | M |

S- Strong; M-Medium; L-Low

## Syllabus

**List of Experiments**
**(any 16)**

1. Determination of Young's Modulus of the given rectangular beam by Non Uniform bending using Optic lever.
2. Determination of Young's Modulus of the given rectangular beam by Uniform bending using pin and microscope.
3. Determination of Rigidity modulus of the material of the given rod by using Static torsion apparatus.
4. Determination of Rigidity modulus of the material of the suspension wire using Torsion pendulum.
5. Determination of Moment of Inertia of the given disc by torsional oscillations.
6. Determination of frequency of AC mains using Sonometer.
7. Determination of Acceleration due to gravity using Compound pendulum.
8. Determination of thermal conductivity of the given bad conductor using Lee's disc method.
9. Determination of Refractive index of the given solid prism using Spectrometer
10. Determination of Refractive index of a liquid using hollow prism - Spectrometer
11. Determination of wavelength of prominent lines of mercury spectrum using grating by minimum deviation method using Spectrometer
12. Calibration of a low range voltmeter using Potentiometer
13. Calibration of a low range ammeter using Potentiometer
14. Determination of unknown resistance of the given coil of wire using potentiometer.
15. Determination of Moment of a magnet using deflection magnetometer by Tan C method.
16. Determination of $B_H$ by measuring the field along the axis using deflection magnetometer.
17. Determination of Temperature co-efficient of resistance of a Thermistor using Wheatstone's bridge.
18. Determination of Spring Constant of different metals.
19. Determination of frequency of tuning fork using Melde's apparatus.
20. Determination of Planck's constant using different Leds.

## Pedagogy:

Demonstration and practical sessions

## Course Designers:

1. Dr. P. Meena
2. Dr. G. Praveena

| PS23C03 | ELECTRICITY AND MAGNETISM | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | **THEORY** | **58** | 2 | - | 4 |

## Preamble

The aim of this course is i) to acquire in-depth knowledge in electrostatics and magnetostatics so that students would apply theories of static and moving charges and extend its applications to instruments involving electric and magnetic fields and ii) to give idea on the fundamentals of electromagnetic conduction and electromagnetic waves.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO 1 | Recall the basic knowledge of scalar, vector fields, AC/DC circuits and electromagnetic wave. | K1 |
| CLO 2 | Understand the concept of different laws in electrostatics, generation of currents and the variation of current in magnetic field. | K2 |
| CLO 3 | Apply theorems to construct and solve electrical circuits. | K3 |
| CLO 4 | Analyze the generation of magnetic fields by electrical currents through circuital laws. | K4 |

## Mapping with Programme Learning Outcomes

| **CLOs** | **PLO1** | **PLO2** | **PLO3** | **PLO4** | **PLO5** | **PLO6** |
|---|---|---|---|---|---|---|
| CLO 1 | M | M | S | S | M | S |
| CLO 2 | S | M | S | S | M | S |
| CLO 3 | S | M | S | S | S | S |
| CLO 4 | S | M | S | S | S | S |

S- Strong; M-Medium;

## Syllabus

**Unit I** **12 Hrs**

**Vector Analysis**:

Scalar and Vector fields, **gradient of a scalar field, divergence of a vector field, Curl of a vector field and their physical significance**[1,2,3,4], Vector Integration, Line, surface and volume integrals of Vector fields, Gauss divergence theorem and Stoke's theorem of vectors (Statement and proof only)

**Electrostatic Field:**

Electric field, Continuous charge distribution, **Divergence and curl of electrostatic fields; Field lines, flux**[5,6] and Gauss' law statement and its proof, applications of Gauss's law – uniformly

charged spherical shell and conducting sphere, infinite line of charge, uniform infinite cylindrical charge and infinite plane sheet of charge, **Coulomb's Law**[7,8].

**Unit II** **12 Hrs**

**Electric potential:**

**Introduction to potential**, **Comments on potential**[9,10], Poisson's and Laplace's equations, Potential of a localized charge distribution, electrostatic boundary value problems – Uniqueness theorem

**Electrical Images:**

Solution of field problems in case of a point charge near a grounded conducting infinite plane. Boundary value problems: in uniform external field for (1) insulated Conducting Sphere **(2) conducting spherical shell and (3) dielectric sphere**[11,12,13].

**Unit III** **11 Hrs**

**DC currents:**

Growth and decay of charge in series RC circuit, **Growth and decay of current in series LR circuit**[14]**,** Growth and Decay of charge in series LCR circuit - **Damped, under-damped and over-damped conditions**

**AC Circuits:**

Series resonance circuit- Parallel LCR Circuit – Complex form of LCR circuits- j operator method - Characteristics of LCR Circuit: (1) Resonance, (2) Quality Factor, (3) Band Width and (4) Sharpness of Resonance - power consumed by the above circuits.

**Unit IV** **12 Hrs**

**Magnetic Field:**

Magnetic force between current elements and definition of Magnetic Field **B**. Biot-Savart's Law and its simple applications: long straight wire and **circular loop**[15]**.** Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole). Ampere's Circuital Law and its application to (1) Solenoid and **(2) Toroid. Properties of B: curl and divergence**[15,16,17]**.** Differential form of Ampere's circuital law- Magnetic scalar and Vector Potential -Importance.

**Unit V** **11 Hrs**

**Electromagnetic waves:**

Equation of continuity – Displacement current – Significance of displacement current – Derivation of Maxwell's equations – Maxwell's equations in integral form **- Differential form – Plane electromagnetic waves – Transverse nature of electromagnetic waves**[18,19,20] **-** Maxwell's equations in free space-Electromagnetic waves in free space- Poynting theorem (Statement and Proof)

**Text Books**

| S. No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | R. Murugesan | Electricity and Magnetism | S. Chand & Co Pvt Ltd | 2019 | 8th Edition |
| 2 | Dr. K. K. Tewari | Electricity and Magnetism | S. Chand & Co Pvt Ltd | 2016 | Revised Edition |
| 3 | Brijlal and N. Subrahmanyam | Electricity and Magnetism | S. Chand & Co Pvt Ltd | 2017 | 18th Edition |

## Reference Books

| S. No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | David J Griffith | Electrodynamics | Prentice Hall | 2015 | 4th Edition |
| 2 | Edward M. Purcell | Electricity and Magnetism, Berkeley Physics Course – Volume 2 | Tata Mc-Graw Hill Education | 2013 | 3rd Edition |
| 3 | D C Tayal | Electricity and Magnetism | Himalaya Publishing House | 2009 | Revised edition |
| 4 | Sehgal, Chopra, Sehgal | Electricity and Magnetism | S. Chand and sons | 2020 | 2nd edition |
| 5 | A S Mahajan, A A Rangwala | Electricity and Magnetism | S. Chand and sons | 2017 | 6th edition |

## Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction

## Course Designer

1. Dr.N.Priyadharsini

## References For E-Content

1. https://www.youtube.com/watch?v=W8N8XswNei8
2. https://www.youtube.com/watch?v=gLsoAjuRWCw
3. https://www.youtube.com/watch?v=SZCsFS9izfQ
4. https://www.youtube.com/watch?v=v3ZC4Mo1fS0
5. https://www.youtube.com/watch?v=VBCzo91uUi8
6. https://www.youtube.com/watch?v=_4VC3IHbuW8
7. https://www.youtube.com/watch?v=2GQTfpDE9DQ
8. https://www.youtube.com/watch?v=rYjo774UpHI
9. https://www.youtube.com/watch?v=j3GrOKre__0
10. https://www.youtube.com/watch?v=PEcPcNMfNks
11. https://www.youtube.com/watch?v=-SakEHbtryA
12. https://www.youtube.com/watch?v=jippPv6Gz14
13. https://www.youtube.com/watch?v=7YbLDlbv17w
14. https://www.youtube.com/watch?v=04THKYsONKA
15. https://www.youtube.com/watch?v=I8X1EpH_VQY
16. https://www.youtube.com/watch?v=sFre-bMvBeI
17. https://www.youtube.com/watch?v=yr0RkoUHgf0
18. https://www.youtube.com/watch?v=CX7X6YrVUdk
19. https://www.youtube.com/watch?v=pn9yxCxzJfY
20. https://www.youtube.com/watch?v=HvK35jjMb5I

| PS23CP2 | PHYSICS PRACTICALS II | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | **PRACTICAL** | - | - | 3 hrs/Week | 2 |

## Preamble

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Understand the usage of basic laws and theories to determine various properties of the materials given. | K2 |
| CLO2 | Understand the application side of the experiments. | K2 |
| CLO3 | Apply knowledge of mathematics and physics fundamentals and an instrumentation to arrive solution for various problems. | K3 |
| CLO4 | Use standard methods to calibrate the given high range voltmeter and to measure the elasticity and thickness of the given material. | K3 |
| CLO5 | Use of basic laws to study the spectral properties and optical properties of the given prism and grating. | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | L | L | L | L |
| CLO2 | S | S | S | S | M | M |
| CLO3 | S | S | S | S | M | M |
| CLO4 | S | S | S | S | M | M |
| CLO5 | S | S | S | S | M | M |

S- Strong; M-Medium; L-Low

## Syllabus

**List of Experiments**
**Any 16**

1. Young's Modulus – Uniform Bending – Koenig's Method
2. i-d curve- μ of the prism-Spectrometer
3. Dispersive Power of Grating – Spectrometer- Wave length of Mercury Spectral Lines by minimum deviation method
4. Refractive index (μ) of the material of the prism lens – Newton's rings method
5. Calibration of High Range Voltmeter –Potentiometer
6. Wave length of Mercury Spectral Lines – Grating - Normal Incidence –Spectrometer
7. Young's Modulus –Non-Uniform Bending – Koenig's Method
8. Thickness of a thin wire – Air Wedge method
9. EMF of thermocouple –Potentiometer
10. High resistance by i) Charging ii) Leakage using Ballistic Galvanometer
11. Comparison of Mutual Inductance's – Ballistic Galvanometer
12. Measurement of dielectric constant - Parallel Plate Capacitor Method
13. Series Resonant Circuit
14. Parallel Resonant Circuit
15. i) Verification of Truth Tables of IC Gates: OR, AND, NOT, XOR, NOR, and NAND

    ii) Verification of Demorgan's theorem using Logic Gates
16. Verification of Truth Table of Half and Full Adders
17. Verification of NAND as a Universal Building Block
18. Verification of NOR as a Universal Building Block
19. Verification of Truth Tables of Half and Full Subtractor

## Pedagogy

Demonstration

## Course Designer

1. Dr.M.Lavanya

| PS23A03 | ALLIED PHYSICS PAPER- I (For Mathematics) | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | **THEORY** | **58** | 2 | - | 4 |

## Preamble

This paper introduces the student**s** to the basic concepts of Elasticity, Rotational motion, Heat and thermodynamics, Sound, Optics, Atomic and Nuclear Physics

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Define the fundamental concepts of material properties, heat, sound, optics, atomic and nuclear physics | K1 |
| CLO2 | Demonstrate the practical concepts behind the optics, heat and sound through experimental setup | K2 |
| CLO3 | Apply the fundamental properties and the associated laws to understand physical systems | K2 |
| CLO4 | Analyze the thermo dynamical, optical properties of matter and to find its applications in various fields | K3 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | M | L | L |
| CLO2 | S | M | S | M | S | L |
| CLO3 | S | M | S | L | M | S |
| CLO4 | S | M | S | S | S | S |

S- Strong; M-Medium; L-Low

## Syllabus

**Unit – I** **11 Hrs**

**Properties of Matter**

Elasticity: Moduli of elasticity[1,2]- bending moment-expression – Young's modulus by uniform and non-uniform bending-theory and experiment[3]- I–section girders-Torsion pendulum-couple per unit twist-work done in twisting –determination of the rigidity modulus of the material of the wire.

**Unit - II** **11 Hrs**

**Transmission of Heat**

**Conduction process:** Thermal conductivity[4,5]- Rectilinear field along a bar- Measurement of Thermal conductivity of a bad conductor by Lee's disc method

Convection process: Lapse rate-stability of atmosphere- Green house effect

Radiation process: Solar constant- Pyroheliometer- solar energy and its applications (flat plate collector & solar cooker)[6,7,8,9,10] - concentration solar collector, Fresnel Lenses method.

**Unit - III** **11 Hrs**

**Thermodynamics, Sound:**

Thermodynamics: Thermodynamic variables – Extensive and Intensive variables- Maxwell's Thermodynamic relation- Thermodynamic potential- Significance- relation of thermodynamics potentials with their variables

**Ultrasonics:** Piezo electric & Magnetostriction method – Principle- Construction – Working and Applications[11,12,13].

**Unit - IV** **11 Hrs**

**Optics:**

Dispersion: Dispersive power-combination of prisms to produce (i) deviation without dispersion (ii) dispersion without deviation-direct vision spectroscope.

Interference: Air wedge-determination of diameter of a wire-Newton's rings-determination of refractive of a liquid

Polarisation: Production, detection and analysis of different types of polarized light-quarter and half wave plates[14,15,16]

**Unit - V** **12Hrs**

Atomic Physics: Vector atom model[17] -Quantum numbers associated with vector atom model -Pauli's exclusion principle-excitation and ionization potential-experimental determination-**Franck and Hertz method[17].**

Particle Physics: Elementary particles – classification[18]- particles and antiparticles- conservation laws and symmetry- Quark model.

**Books for Study:**

| S. No | Authors | Title of the Book | Publishers | Year of Publication |
|---|---|---|---|---|
| 1 | Brijlal Subramanium | Heat and thermodynamics | S.Chand and Co, 16th Edition. | 2012 |
| 2 | Brijlal Subramanium & Hemne.P.S, | Heat thermodynamics and Statistical Physics | S.Chand and Co, 12th edition | 2011 |
| 3 | Brijlal Subramanium | Optics | S.Chand and Co, 21st Edition | 2012 |
| 4 | Murugeshan R | Allied Physics | S.Chand and Co, 1st Edition | 1998 |

**Books for Reference:**

| S. No | Authors | Title of the Book | Publishers | Year of Publication |
|---|---|---|---|---|
| 1 | Jayaprakash. N | Heat and thermodynamics | S Chand and Co, 16th Edition. | 2012 |
| 2 | Mathur D.S | Properties of Matter | S Chand and Co, 2nd Edition | 1970 |
| 3 | Murugesan R | Modern Physics | S.Chand and Co , 9th edition | 2013 |

**Pedagogy**

Chalk and talk, PPT, Seminar, Group discussion, Interaction

**Course Designers:**

1. Dr.G.Vanitha

**References For E-Content**:

1. https://youtu.be/qQhOYbztNIQ
2. https://youtu.be/gcI-bkr7ilg
3. https://youtu.be/7tr4qWPgP40
4. https://youtu.be/N5GAHntU_nQ
5. https://youtu.be/hDP6egLrsdM
6. https://youtu.be/nmsPcTzIkrw
7. https://youtu.be/rAhvvyQBUt0
8. https://youtu.be/TUaTNzZ00oM
9. https://youtu.be/tDB3zP9MEZc
10. https://youtu.be/wvl0QAQCJyc
11. https://youtu.be/4nbBAG-848c
12. https://youtu.be/nJXB0yD_wEw
13. https://youtu.be/K4Do_yWJt2k
14. https://youtu.be/HH58VmUbOKM
15. https://youtu.be/DjnDX28l4xA
16. https://youtu.be/iVYGOWAtZCQ
17. https://youtu.be/SQtOYCei-Pc
18. https://youtu.be/kykp-S8S5dU

| PS23AP1 | ALLIED PHYSICS PRACTICALS (For I BSc Chemistry Sem I and II and II BSc Mathematics Sem III and IV) | Category | L | T | P | Credit |
|---|---|---|---|---|---|---|
| | | PRACTICAL | - | - | 3 Hrs/ week | 3 |

## Preamble

To enable the student to gain practical knowledge

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Gain knowledge in the scientific methods and learn the process of measuring different Physical variables | K1 |
| CLO2 | Educate The Basics Of Instrumentation, Data Acquisition And Interpretation of Results | K2 |
| CLO3 | Enhance The Students Understand The Concepts In Materials Properties | K2 |
| CLO4 | Have a deep knowledge of fundamentals of optics, electric circuits, magnetism and sound | K3 |

## Mapping with Programme Learning Outcomes

| CLO | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | S | M | S |
| CLO2 | S | S | S | S | S | S |
| CLO3 | S | M | S | M | M | M |
| CLO4 | S | M | M | S | M | S |

S- Strong; M-Medium;

## Syllabus

**List of Experiments**
**Any Eighteen**

1. Young's Modulus –Non- Uniform bending –Pin and Microscope
2. Young's Modulus – Uniform bending – Optic lever
3. Rigidity modulus - Static torsion
4. Rigidity Modulus - torsional pendulum
5. Moment of inertia - torsional pendulum
6. Acceleration due to gravity - compound pendulum
7. Thermal conductivity of a bad conductor – Lee's disc method
8. AC frequency - Sonometer
9. Refractive index of solid prism - spectrometer
10. Refractive index of liquid-Hollow prism - spectrometer
11. Wave length- Grating - Minimum deviation method - Spectrometer
12. Low range Ammeter Calibration - Potentiometer
13. Low range Voltmeter Calibration - Potentiometer
14. Moment of a magnet in the Tan C position
15. Volt-Ampere characteristic of a p-n junction diode in the forward and reverse directions
16. Logic gates - Verification of the truth table
17. Characteristics of Zener diode
18. Closed loop gain of Operational Amplifier in Inverting mode
19. Closed loop gain of Operational Amplifier in Non Inverting mode.

## Pedagogy

Demonstration and Practical Sessions

## Course Designers:

1. Mrs. T. Poongodi

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23C04 | FUNDAMENTALS OF DIGITAL ELECTRONICS | Theory | 58 | 2 | - | 4 |

## Preamble

The aim of this course is to make students acquire knowledge about Boolean algebra, logic circuits, designing counters and the basic concepts of memory and programmable logic device.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Outline the fundamental concepts and techniques used in digital electronics. | K1 |
| CLO2 | Understand the various basic and complex digital circuits | K2 |
| CLO3 | Apply the acquired knowledge to build and troubleshoot digital circuits. | K3 |
| CLO4 | Design and analyze the working of digital circuits and system. | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | M | M | S | S |
| CLO2 | S | S | S | **S** | **S** | S |
| CLO3 | S | S | **S** | **S** | **S** | M |
| CLO4 | S | S | S | M | S | M |

S- Strong; M-Medium; L-Low

## Syllabus

**Unit I**

**Number Systems, Logic gates and Boolean algebra** **12 Hrs**

Number Systems-Binary-octal-Hexadecimal and its conversions-Binary Codes- BCD codes-8421 code-Excess 3 code-Grey code -Logic gates – AND, OR, NOT, NAND, NOR gates – Boolean algebra- operators – logic expressions De-Morgan's theorem – laws and rules of Boolean algebra – truth table – reducing Boolean expressions – Karnaugh maps – simplification of digital circuits - Ancient arithmetical operations.

**Unit II**

**Arithmetic circuits and Flip flops** **12 Hrs**

Half adder- full adder – Parallel binary adder, half subtractor – full subtractor – Parallel binary Subtractor, parity generator – encoder – decoder.

Flip flop –NAND Latch- RS Flip Flop- Edge triggered RS Flip Flop, D and T Flip Flop - JK Flip Flop, Master Slave Flip Flop – Sequential circuit concepts in ancient India.

**Unit – III**

**Registers and Counters** **12 Hrs**

Registers – Shift Registers-Shift left and Shift right registers – Ring Counter – Johnson's Counter - Asynchronous / Ripple counters – modulus counter- Mod 3, 4, 5, 6, 7, 8 and 9 counters - Decade counter - Synchronous Counters.

**Unit – IV** **11 Hrs**

**A/D & D/A Converters**

Digital to Analog (D/A) converter- Binary weighted resistor method – R / 2R Ladder Network - Analog to Digital (A/D) Converter – counter type - Dual slope integrator – successive approximation A/D Converter.

**Unit – V** **11 Hrs**

**Semiconductor memory**

Read only memory – Random access memory – PROM – EPROM-SRAMs –DRAMs - Digital IC Characteristics –Resistor Transistor Logic (RTL) – Transistor Transistor Logic (TTL) – Schottky TTL – Emitter Coupled Logic (ECL).

**Books for Study:**

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | Malvino & Leach | Digital principles and applications | Tata Mc Graw Hill | 1995 | **5th** Edition |
| 2 | M. Morris Mano | Digital Logic & Computer Designs | Prentice Hall of India. | 2014 | 4th Edition |
| 3 | Vijayendran V | Introduction to Integrated electronics | S.Viswanathan (Printers & Publishers, Chennai) | 2005 | 1st Edition |
| 4 | Swami Sri Bharatikrishna tirthaji | Vedic Mathematics | Motilal Bararsidass | 1998 | 1st Edition |

**Books for Reference:**

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | ChatterjiB.N | - Digital Computer technology | Khanna Publishers, Delhi | 1986 | **2nd** Edition |
| 2 | Puri V K | Digital Electronics circuits and systems | Tata McGraw Hill Publishing Company Limited New Delhi | 1997 | **1st** Edition |

| | | | | | |
|---|---|---|---|---|---|
| 3 | S Salivahanan S Arivazhagan | Digital Circuits and Design | Vikas Publishing House Private Limited | 2007 | **3rd**Edition |
| 4 | Mahamahopadhyaya Ganganatha Jha | The Nyaya Sutras of Gautama | Motilal Bararsidass | 1984 | 2nd Edition |

**References For E-Content**

https://www.youtube.com/watch?v=A-gWV5liKxM
https://www.youtu.be/IeWcvAsz88o
https://www.youtu.be/AzyG_wL3qMY
https://youtu.be/sJXTo3EZoxM
https://youtu.be/DqCDQH44y9
https://youtu.be/feBvhLFQEDk
https://youtu.be/vu0wgiDlrRs
https://youtu.be/iaIu5SYmWVM
https://www.youtube.com/watch?v=SAcVlreweOc
https://www.youtube.com/watch?v=dpq1uqFcKnM
https://youtu.be/p4R0Ej6FCn0
https://youtu.be/nemTyWV5lv8
https://youtu.be/r787m_IaR1I

**Pedagogy**

Chalk and Talk lectures, Seminar, Interaction, Power Point Presentation, E-content

**Course Designer**

Mrs. D. Niveditha

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| **PS23CP2** | **PHYSICS PRACTICALS II** | Practical | - | - | 3 hrs/ Week | 4 |

## Preamble

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Understand the usage of basic laws and theories to determine various properties of the materials given. | K1, K2 |
| CLO2 | Understand the application side of the experiments. | K2 |
| CLO3 | Apply knowledge of mathematics and physics fundamentals and an instrumentation to arrive solution for various problems. | K3 |
| CLO4 | Use standard methods to calibrate the given high range voltmeter and to measure the elasticity and thickness of the given material. | K3 |
| CLO5 | Use of basic laws to study the spectral properties and optical properties of the given prism and grating. | K3 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | L | L | L | L |
| CLO2 | S | S | S | S | M | M |
| CLO3 | S | S | S | S | M | M |
| CLO4 | S | S | S | S | M | M |
| CLO5 | S | S | S | S | M | M |

S- Strong; M-Medium; L-Low

## Syllabus

**List of Experiments**
**Any 16**

1. Young's Modulus – Uniform Bending – Koenig's Method
2. i-d curve- μ of the prism-Spectrometer
3. Dispersive Power of Grating – Spectrometer- Wave length of Mercury Spectral Lines by minimum deviation method
4. Refractive index (μ) of the material of the prism lens – Newton's rings method
5. Calibration of High Range Voltmeter –Potentiometer
6. Wave length of Mercury Spectral Lines – Grating - Normal Incidence –Spectrometer
7. Young's Modulus –Non-Uniform Bending – Koenig's Method
8. Thickness of a thin wire – Air Wedge method
9. EMF of thermocouple –Potentiometer
10. High resistance by i) Charging ii) Leakage using Ballistic Galvanometer
11. Comparison of Mutual Inductance's – Ballistic Galvanometer
12. Measurement of dielectric constant - Parallel Plate Capacitor Method
13. Series Resonant Circuit
14. Parallel Resonant Circuit
15. i) Verification of Truth Tables of IC Gates: OR, AND, NOT, XOR, NOR, and NAND

    ii) Verification of Demorgan's theorem using Logic Gates
16. Verification of Truth Table of Half and Full Adders
17. Verification of NAND as a Universal Building Block
18. Verification of NOR as a Universal Building Block
19. Verification of Truth Tables of Half and Full Subtractor

## Pedagogy

Demonstration

## Course Designer

Dr.M.Lavanya

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23A04 | PHYSICS PAPER- II | Theory | 58 | 2 | - | 4 |

## Preamble

This paper introduces the student to the basic concepts of AC Circuits, Magnetic materials, electronics and digital electronics

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Remember the fundamental concepts of physics. | K1 |
| CLO2 | Understanding the importance of electronics, digital circuits and magnetic materials. | K2 |
| CLO3 | Apply the acquired knowledge of physics in day today life. | K3 |
| CLO4 | Analyze the concept of electronics, digital circuits and magnetic materials and to recognize their applications in various real time problems. | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | M | M | L |
| CLO2 | S | S | S | S | L | M |
| CLO3 | S | S | S | S | M | M |
| CLO4 | S | S | S | S | M | S |

S- Strong; M-Medium; L-Low

## Syllabus

**Unit – I** **12 Hrs**

**Alternating currents:**

Mean and RMS values of AC – Alternating current relation between current and voltage in Pure R, C and L - Analysis of AC circuits containing i) resistance and inductance, ii) resistance and inductance iii) capacitance and resistance - Series and parallel resonant circuits - Power factor- - Transformer-construction-working-losses.

**Unit – II** **11 Hrs**

**Magnetic materials:**

Magnetic Induction – Magnetization – Relation between the three magnetic vectors B, H and M

–BH curve Experiment -Magnetic susceptibility – Properties - diamagnetic – paramagnetic – ferromagnetic – anti ferromagnetism and ferrimagnetism – Electron theory of magnetism - Weiss's theory of ferromagnetism - energy loss in hysteresis – importance of hysteresis curves.

**Unit – III** **11 Hrs**

**Semiconductor Diodes:** P and N type semiconductors - PN Junction Diode - Current Flow Mechanism in Forward and Reverse Biased Diode - Zener Diode and Voltage Regulation - Principle and structure of (1) LEDs (2) Photodiode (3) Solar cell - Transistor – Characteristics of CB, CE and CC Configuration – Transistor biasing – Voltage divider biasing.

**Unit - IV** **12 Hrs**

**Two - terminal Devices and their Applications**: Rectifier Diode: Half- wave Rectifiers - Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency - **Amplifiers:** Single stage amplifier (CE) and Multi stage amplifier (CE)

**Sinusoidal Oscillators:** Barkhausen's Criterion for self - sustained oscillations - RC Phase shift oscillator, determination of Frequency- Hartley oscillator.

**Unit – V** **12 Hrs**

**Digital Electronics:**

Analog and Digital Signals- Boolean algebra- Boolean theorem- Simplification of Boolean expression- DeMorgan's theorem-OR, AND, NOT, XOR NOR and NAND gates-NOR and NAND gates as universal building blocks-half adder, full adder-flip flops - RS flip flop-JK flip flop (Truth table and circuit).

**Operational amplifier:** Characteristics-virtual ground-summing point-inverting and non- inverting amplifier-adder-subtractor.

## Text Books

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | R. Murugesan | Electricity and Magnetism | S.Chand andCo | 2005 | Revised Edition |
| 2 | V.K. Metha | Principles of electronics | S.Chand andCo | 1980 | 1st Edition |
| 3 | Murugesan R | Allied Physics | S.Chand and Co | 2005 | 1st edition |

## Reference Books

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | V. Vijayendran | Introduction to Integrated Electronics | Viswanatha nPublishers | 2005 | 1st Edition |

## Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction

## Course Designer

Mrs. B. Veena

**Reference Links:**

Mean and RMS values of AC - https://www.youtube.com/watch?v=qDHsokTcgck
AC Circuit Analysis - https://www.youtube.com/watch?v=flRocvQxQw4
Series & Parallel Resonant Circuits - https://www.youtube.com/watch?v=G8KLJjq1E2o
Transformer - Principle, Construction, Working and Efficiency - https://www.youtube.com/watch?v=i29dCoSGa38
Magnetization - https://www.youtube.com/watch?v=C-OoUvKXbLU&t=2s
BH Curve Experiment - https://www.youtube.com/watch?v=1GGsbU698x8
P and N type semiconductors - https://www.youtube.com/watch?v=5ZNeDxfgYAE
Different types of diodes - https://www.youtube.com/watch?v=-EqOEiEQGLI
Diode rectifier circuits - https://www.youtube.com/watch?v=Xmu31a-59vw
Single stage amplifier - https://www.youtube.com/watch?v=NEiVSbPYWNE
Multistage amplifier - https://www.youtube.com/watch?v=vDePe-if1gs
RC Phase Shift Oscillator - https://www.youtube.com/watch?v=Gvb4GIV5ig8
Hartley Oscillator - https://www.youtube.com/watch?v=3B_sBX_11Zw
Boolean Algebra and Logic gates - https://www.youtube.com/watch?v=JQBRzsPhw2w
Flip-flop - https://www.youtube.com/watch?v=LTtuYeSmJ2g
Operational amplifier - https://www.youtube.com/watch?v=jsKSfaFQ4d4

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| **PS23AP1** | **PHYSICS PRACTICALS** | Practical | - | - | 3 Hrs / week | 2 |

## Preamble

To enable the student to gain practical knowledge

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Gain knowledge in the scientific methods and learn the process of measuring different Physical variables | K1 |
| CLO2 | Educate The Basics Of Instrumentation, Data Acquisition And Interpretation of Results | K2 |
| CLO3 | Enhance The Students Understand The Concepts In Materials Properties | K2 |
| CLO4 | Have a deep knowledge of fundamentals of optics, electric circuits, magnetism and sound | K3 |

## Mapping with Programme Learning Outcomes

| CLO | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | S | M | S |
| CLO2 | S | S | S | S | S | S |
| CLO3 | S | M | S | M | M | M |
| CLO4 | S | M | M | S | M | S |

S- Strong; M-Medium;

## Syllabus

**List of Experiments**
**Any Eighteen**

20. Young's Modulus –Non- Uniform bending –Pin and Microscope
21. Young's Modulus – Uniform bending – Optic lever
22. Rigidity modulus - Static torsion
23. Rigidity Modulus - torsional pendulum
24. Moment of inertia - torsional pendulum
25. Acceleration due to gravity - compound pendulum
26. Thermal conductivity of a bad conductor – Lee's disc method
27. AC frequency - Sonometer
28. Refractive index of solid prism - spectrometer
29. Refractive index of liquid-Hollow prism - spectrometer
30. Wave length- Grating - Minimum deviation method - Spectrometer
31. Low range Ammeter Calibration - Potentiometer
32. Low range Voltmeter Calibration - Potentiometer
33. Moment of a magnet in the Tan C position
34. Volt-Ampere characteristic of a p-n junction diode in the forward and reverse directions
35. Logic gates - Verification of the truth table
36. Characteristics of Zener diode
37. Closed loop gain of Operational Amplifier in Inverting mode
38. Closed loop gain of Operational Amplifier in Non Inverting mode.

## Pedagogy

Demonstration and Practical Sessions

## Course Designers:

Mrs. T. Poongodi

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23C04 | FUNDAMENTALS OF DIGITAL ELECTRONICS | Theory | 58 | 2 | - | 4 |

## Preamble

The aim of this course is to make students acquire knowledge about Boolean algebra, logic circuits, designing counters and the basic concepts of memory and programmable logic device.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Outline the fundamental concepts and techniques used in digital electronics. | K1 |
| CLO2 | Understand the various basic and complex digital circuits | K2 |
| CLO3 | Apply the acquired knowledge to build and troubleshoot digital circuits. | K3 |
| CLO4 | Design and analyze the working of digital circuits and system. | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | M | M | S | S |
| CLO2 | S | S | S | **S** | **S** | S |
| CLO3 | S | S | **S** | **S** | **S** | M |
| CLO4 | S | S | S | M | S | M |

S- Strong; M-Medium; L-Low

## Syllabus

**Unit I**

**Number Systems, Logic gates and Boolean algebra** **12 Hrs**

Number Systems-Binary-octal-Hexadecimal and its conversions-Binary Codes- BCD codes-8421 code-Excess 3 code-Grey code -Logic gates – AND, OR, NOT, NAND, NOR gates – Boolean algebra- operators – logic expressions De-Morgan's theorem – laws and rules of Boolean algebra – truth table – reducing Boolean expressions – Karnaugh maps – simplification of digital circuits - Ancient arithmetical operations.

**Unit II**

**Arithmetic circuits and Flip flops** **12 Hrs**

Half adder- full adder – Parallel binary adder, half subtractor – full subtractor – Parallel binary Subtractor, parity generator – encoder – decoder.

Flip flop –NAND Latch- RS Flip Flop- Edge triggered RS Flip Flop, D and T Flip Flop - JK Flip Flop, Master Slave Flip Flop – Sequential circuit concepts in ancient India.

**Unit – III**

**Registers and Counters** **12 Hrs**

Registers – Shift Registers-Shift left and Shift right registers – Ring Counter – Johnson's Counter - Asynchronous / Ripple counters – modulus counter- Mod 3, 4, 5, 6, 7, 8 and 9 counters - Decade counter - Synchronous Counters.

**Unit – IV** **11 Hrs**

**A/D & D/A Converters**

Digital to Analog (D/A) converter- Binary weighted resistor method – R / 2R Ladder Network - Analog to Digital (A/D) Converter – counter type - Dual slope integrator – successive approximation A/D Converter.

**Unit – V** **11 Hrs**

**Semiconductor memory**

Read only memory – Random access memory – PROM – EPROM-SRAMs –DRAMs - Digital IC Characteristics –Resistor Transistor Logic (RTL) – Transistor Transistor Logic (TTL) – Schottky TTL – Emitter Coupled Logic (ECL).

**Books for Study:**

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | Malvino & Leach | Digital principles and applications | Tata Mc Graw Hill | 1995 | **5th** Edition |
| 2 | M. Morris Mano | Digital Logic & Computer Designs | Prentice Hall of India. | 2014 | 4th Edition |
| 3 | Vijayendran V | Introduction to Integrated electronics | S.Viswanathan (Printers & Publishers, Chennai) | 2005 | 1st Edition |
| 4 | Swami Sri Bharatikrishna tirthaji | Vedic Mathematics | Motilal Bararsidass | 1998 | 1st Edition |

**Books for Reference:**

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | ChatterjiB.N | - Digital Computer technology | Khanna Publishers, Delhi | 1986 | **2nd** Edition |
| 2 | Puri V K | Digital Electronics circuits and systems | Tata McGraw Hill Publishing Company Limited New Delhi | 1997 | **1st** Edition |

| | | | | | |
|---|---|---|---|---|---|
| 3 | S Salivahanan S Arivazhagan | Digital Circuits and Design | Vikas Publishing House Private Limited | 2007 | **3rd**Edition |
| 4 | Mahamahopadhyaya Ganganatha Jha | The Nyaya Sutras of Gautama | Motilal Bararsidass | 1984 | 2nd Edition |

**References For E-Content**

https://www.youtube.com/watch?v=A-gWV5liKxM
https://www.youtu.be/IeWcvAsz88o
https://www.youtu.be/AzyG_wL3qMY
https://youtu.be/sJXTo3EZoxM
https://youtu.be/DqCDQH44y9
https://youtu.be/feBvhLFQEDk
https://youtu.be/vu0wgiDlrRs
https://youtu.be/iaIu5SYmWVM
https://www.youtube.com/watch?v=SAcVlreweOc
https://www.youtube.com/watch?v=dpq1uqFcKnM
https://youtu.be/p4R0Ej6FCn0
https://youtu.be/nemTyWV5lv8
https://youtu.be/r787m_IaR1I

**Pedagogy**

Chalk and Talk lectures, Seminar, Interaction, Power Point Presentation, E-content

**Course Designer**

Mrs. D. Niveditha

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| **PS23CP2** | **PHYSICS PRACTICALS II** | Practical | - | - | 3 hrs/ Week | 4 |

## Preamble

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Understand the usage of basic laws and theories to determine various properties of the materials given. | K1, K2 |
| CLO2 | Understand the application side of the experiments. | K2 |
| CLO3 | Apply knowledge of mathematics and physics fundamentals and an instrumentation to arrive solution for various problems. | K3 |
| CLO4 | Use standard methods to calibrate the given high range voltmeter and to measure the elasticity and thickness of the given material. | K3 |
| CLO5 | Use of basic laws to study the spectral properties and optical properties of the given prism and grating. | K3 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | L | L | L | L |
| CLO2 | S | S | S | S | M | M |
| CLO3 | S | S | S | S | M | M |
| CLO4 | S | S | S | S | M | M |
| CLO5 | S | S | S | S | M | M |

S- Strong; M-Medium; L-Low

## Syllabus

**List of Experiments**
**Any 16**

1. Young's Modulus – Uniform Bending – Koenig's Method
2. i-d curve- μ of the prism-Spectrometer
3. Dispersive Power of Grating – Spectrometer- Wave length of Mercury Spectral Lines by minimum deviation method
4. Refractive index (μ) of the material of the prism lens – Newton's rings method
5. Calibration of High Range Voltmeter –Potentiometer
6. Wave length of Mercury Spectral Lines – Grating - Normal Incidence –Spectrometer
7. Young's Modulus –Non-Uniform Bending – Koenig's Method
8. Thickness of a thin wire – Air Wedge method
9. EMF of thermocouple –Potentiometer
10. High resistance by i) Charging ii) Leakage using Ballistic Galvanometer
11. Comparison of Mutual Inductance's – Ballistic Galvanometer
12. Measurement of dielectric constant - Parallel Plate Capacitor Method
13. Series Resonant Circuit
14. Parallel Resonant Circuit
15. i) Verification of Truth Tables of IC Gates: OR, AND, NOT, XOR, NOR, and NAND

    ii) Verification of Demorgan's theorem using Logic Gates
16. Verification of Truth Table of Half and Full Adders
17. Verification of NAND as a Universal Building Block
18. Verification of NOR as a Universal Building Block
19. Verification of Truth Tables of Half and Full Subtractor

## Pedagogy

Demonstration

## Course Designer

Dr.M.Lavanya

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23A04 | PHYSICS PAPER- II | Theory | 58 | 2 | - | 4 |

## Preamble

This paper introduces the student to the basic concepts of AC Circuits, Magnetic materials, electronics and digital electronics

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Remember the fundamental concepts of physics. | K1 |
| CLO2 | Understanding the importance of electronics, digital circuits and magnetic materials. | K2 |
| CLO3 | Apply the acquired knowledge of physics in day today life. | K3 |
| CLO4 | Analyze the concept of electronics, digital circuits and magnetic materials and to recognize their applications in various real time problems. | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | M | M | L |
| CLO2 | S | S | S | S | L | M |
| CLO3 | S | S | S | S | M | M |
| CLO4 | S | S | S | S | M | S |

S- Strong; M-Medium; L-Low

## Syllabus

**Unit – I** **12 Hrs**

**Alternating currents:**

Mean and RMS values of AC – Alternating current relation between current and voltage in Pure R, C and L - Analysis of AC circuits containing i) resistance and inductance, ii) resistance and inductance iii) capacitance and resistance - Series and parallel resonant circuits - Power factor- - Transformer-construction-working-losses.

**Unit – II** **11 Hrs**

**Magnetic materials:**

Magnetic Induction – Magnetization – Relation between the three magnetic vectors B, H and M

–BH curve Experiment -Magnetic susceptibility – Properties - diamagnetic – paramagnetic – ferromagnetic – anti ferromagnetism and ferrimagnetism – Electron theory of magnetism - Weiss's theory of ferromagnetism - energy loss in hysteresis – importance of hysteresis curves.

**Unit – III** **11 Hrs**

**Semiconductor Diodes:** P and N type semiconductors - PN Junction Diode - Current Flow Mechanism in Forward and Reverse Biased Diode - Zener Diode and Voltage Regulation - Principle and structure of (1) LEDs (2) Photodiode (3) Solar cell - Transistor – Characteristics of CB, CE and CC Configuration – Transistor biasing – Voltage divider biasing.

**Unit - IV** **12 Hrs**

**Two - terminal Devices and their Applications**: Rectifier Diode: Half- wave Rectifiers - Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency - **Amplifiers:** Single stage amplifier (CE) and Multi stage amplifier (CE)

**Sinusoidal Oscillators:** Barkhausen's Criterion for self - sustained oscillations - RC Phase shift oscillator, determination of Frequency- Hartley oscillator.

**Unit – V** **12 Hrs**

**Digital Electronics:**

Analog and Digital Signals- Boolean algebra- Boolean theorem- Simplification of Boolean expression- DeMorgan's theorem-OR, AND, NOT, XOR NOR and NAND gates-NOR and NAND gates as universal building blocks-half adder, full adder-flip flops - RS flip flop-JK flip flop (Truth table and circuit).

**Operational amplifier:** Characteristics-virtual ground-summing point-inverting and non- inverting amplifier-adder-subtractor.

## Text Books

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | R. Murugesan | Electricity and Magnetism | S.Chand andCo | 2005 | Revised Edition |
| 2 | V.K. Metha | Principles of electronics | S.Chand andCo | 1980 | 1st Edition |
| 3 | Murugesan R | Allied Physics | S.Chand and Co | 2005 | 1st edition |

## Reference Books

| S.No | Authors | Title of the Book | Publishers | Year of Publication | Edition |
|---|---|---|---|---|---|
| 1 | V. Vijayendran | Introduction to Integrated Electronics | Viswanatha nPublishers | 2005 | 1st Edition |

## Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction

## Course Designer

Mrs. B. Veena

**Reference Links:**

Mean and RMS values of AC - https://www.youtube.com/watch?v=qDHsokTcgck
AC Circuit Analysis - https://www.youtube.com/watch?v=flRocvQxQw4
Series & Parallel Resonant Circuits - https://www.youtube.com/watch?v=G8KLJjq1E2o
Transformer - Principle, Construction, Working and Efficiency - https://www.youtube.com/watch?v=i29dCoSGa38
Magnetization - https://www.youtube.com/watch?v=C-OoUvKXbLU&t=2s
BH Curve Experiment - https://www.youtube.com/watch?v=1GGsbU698x8
P and N type semiconductors - https://www.youtube.com/watch?v=5ZNeDxfgYAE
Different types of diodes - https://www.youtube.com/watch?v=-EqOEiEQGLI
Diode rectifier circuits - https://www.youtube.com/watch?v=Xmu31a-59vw
Single stage amplifier - https://www.youtube.com/watch?v=NEiVSbPYWNE
Multistage amplifier - https://www.youtube.com/watch?v=vDePe-if1gs
RC Phase Shift Oscillator - https://www.youtube.com/watch?v=Gvb4GIV5ig8
Hartley Oscillator - https://www.youtube.com/watch?v=3B_sBX_11Zw
Boolean Algebra and Logic gates - https://www.youtube.com/watch?v=JQBRzsPhw2w
Flip-flop - https://www.youtube.com/watch?v=LTtuYeSmJ2g
Operational amplifier - https://www.youtube.com/watch?v=jsKSfaFQ4d4

| COURSE CODE | COURSE NAME | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| **PS23AP1** | **PHYSICS PRACTICALS** | Practical | - | - | 3 Hrs / week | 2 |

## Preamble

To enable the student to gain practical knowledge

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Gain knowledge in the scientific methods and learn the process of measuring different Physical variables | K1 |
| CLO2 | Educate The Basics Of Instrumentation, Data Acquisition And Interpretation of Results | K2 |
| CLO3 | Enhance The Students Understand The Concepts In Materials Properties | K2 |
| CLO4 | Have a deep knowledge of fundamentals of optics, electric circuits, magnetism and sound | K3 |

## Mapping with Programme Learning Outcomes

| CLO | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | S | M | S |
| CLO2 | S | S | S | S | S | S |
| CLO3 | S | M | S | M | M | M |
| CLO4 | S | M | M | S | M | S |

S- Strong; M-Medium;

## Syllabus

**List of Experiments**
**Any Eighteen**

1. Young's Modulus –Non- Uniform bending –Pin and Microscope
2. Young's Modulus – Uniform bending – Optic lever
3. Rigidity modulus - Static torsion
4. Rigidity Modulus - torsional pendulum
5. Moment of inertia - torsional pendulum
6. Acceleration due to gravity - compound pendulum
7. Thermal conductivity of a bad conductor – Lee's disc method
8. AC frequency - Sonometer
9. Refractive index of solid prism - spectrometer
10. Refractive index of liquid-Hollow prism - spectrometer
11. Wave length- Grating - Minimum deviation method - Spectrometer
12. Low range Ammeter Calibration - Potentiometer
13. Low range Voltmeter Calibration - Potentiometer
14. Moment of a magnet in the Tan C position
15. Volt-Ampere characteristic of a p-n junction diode in the forward and reverse directions
16. Logic gates - Verification of the truth table
17. Characteristics of Zener diode
18. Closed loop gain of Operational Amplifier in Inverting mode
19. Closed loop gain of Operational Amplifier in Non Inverting mode.

## Pedagogy

Demonstration and Practical Sessions

## Course Designers:

Mrs. T. Poongodi

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23C05 | ELECTRONICS | Theory | 88 | 2 | - | 5 |

## Preamble

This course helps the students to gain basic ideas of the construction and working of electronic devices and circuits and to understand the fundamentals of communication systems.

## Course Learning Outcomes

On the successful completion of the course, students will

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO 1 | Be familiar with the basic concepts of construction and working of electronic devices and optical fibers | K1 |
| CLO 2 | Apply the knowledge to understand the working of amplifiers, oscillators and multivibrators | K3 |
| CLO 3 | Understand the principles of modulation and demodulation | K2 |
| CLO 4 | Apply the knowledge to understand the working of special types of diodes | K3 |
| CLO 5 | Apply the principles of feedback in amplifiers and oscillators | K3 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO 1 | S | M | S | M | S | M |
| CLO 2 | S | S | M | S | S | M |
| CLO 3 | S | S | S | S | S | S |
| CLO 4 | S | S | S | S | S | S |
| CLO 5 | S | S | S | S | S | S |

S- Strong; M-Medium;

## Syllabus

**Unit I**

**Electronic Devices: 18 Hrs**

Kirchhoff laws- Network Theorem: **Thevenin's and Norton's theorem** -PN junction- formation – properties - applying voltage-current flow VI characteristics- breakdown voltage and knee voltage. Crystal diode as a rectifier-resistance. Half wave rectifier-**Full wave rectifier**-Centre tap and Bridge Rectifier-Efficiency-Ripple factor- comparison. Filter circuits-types. **Zener diode**-equivalent circuit- Voltage stabilizer -Photo diode-characteristics-applications- Tunnel Diode-Tunnel diode oscillator-Varactor diode-Application of Varactor diode –Transistors -introduction-origin of the name transistor-naming the transistor terminals-Transistor Action-Transistor symbols – Transistor connections-relation between the current amplification factors-Transistor as an amplifier in common emitter connection-Transistor load line analysis- characteristics of common emitter connection-operating point-cut off and saturation points

**Unit II 18 Hrs**

**Amplifiers:**

**Multistage transistor amplifiers**-Role of Capacitors in Transistor Amplifiers-Gain frequency and bandwidth- Properties of decibel gain- RC coupled amplifier -Transformer coupled amplifier.

**Amplifiers with negative feedback**-Principles of negative voltage feedback-gain-Advantages of negative voltage feedback- Principle of negative current feedback-gain-Effects of negative current feedback- emitter follower.

**Operational amplifier:** Basic concepts- **Ideal Operational Amplifier**- Inverting OP-AMP - Non inverting OP-AMP-Characteristics- CMRR- Applications of OPAMP- inverting amplifier as adder-Subtractor-differentiator-**integrator**.

**Unit III 17Hrs**

**Oscillators and Multivibrators**

Barkhausen's criteria for self sustained oscillations-Hartley oscillator –frequency and condition for sustained oscillations **-Colpitt's oscillator** –frequency and condition for sustained oscillations-crystal oscillator-Phase shift oscillators-Analysis - **Wien bridge oscillator** – Analysis.

Astable, monostable and bistable Multivibrators

**Unit IV** **17Hrs**

**Modulation & Demodulation**

Radio Broadcasting, Transmission and Reception-Modulation-**Need for modulation**-**Types of Modulation**-Amplitude Modulation-Modulation factor-Analysis of Amplitude Modulated wave-Sideband frequencies in AM waves-Transistor AM modulator-Superheterodyne AM Receiver -Frequency modulation (FM)- Theory of Frequency modulation – Comparison of FM and AM-Demodulation-Essentials in demodulation-Phase modulation (PM)-definition–analysis-**comparison of AM, FM and PM**

**Unit V** **18Hrs**

**Fiber Optics and special purpose diodes**

Fiber construction- Application of Fiber cables. - Propagation of light waves in an optical fibre – Acceptance angle and Acceptance cone of a fibre – Numerical Aperture (NA) – NA of a graded Index Fibre – **Classification of Optical fibers** –Step index Fiber- Step index Monomode Fiber- Graded index Multimode Fiber

Tunnel diode- **LED**-Structures of LED-LED materials - **semiconductor Laser diode LED** – The process involved in LEDS – Modulation bandwidth and Spectral Emission of LEDS-PIN photo detector.

**Books for Study:**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | Mehta V.K & Rohit Mehta | Principles of Electronics (Unit I, II &III) | Tata McGraw Hill | 2012, 11th Edn |
| 2 | B. L Theraja | Basic Electronics- Solid State (Unit I and II) | S. Chand & Company Ltd | 2009, 5th Edn |
| 3 | Gupta Kumar | Handbook of Electronics (Unit II) | Pragati Prakashan | 2007, 34th Edn |
| 4 | Dennis Roddy &John Coolen | Electronic Communicatio (Unit IV) | PHI | 1995, 4th Edn |
| | George Kennedy & Bernard Devis | Electronic Communication systems (Unit IV) | Tata Mc Graw-Hill | 2005, 28th Edn |
| 5 | Millman and Halkias | Integrated Electronics (Unit II) | Tata Mc Graw Hill | 2005, 41st Edn |
| 6 | Subir Kumar Sarkar | Optical Fibers and Fiber Optic Communication Systems (Unit V) | S. Chand &Co | 2001, 2nd Edn |

**Books for Reference:**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | Bernard Grob | Basic electronics | Tata McGraw-Hill | 2007, 2nd Edn |

| | | | | |
|---|---|---|---|---|
| 2 | R S Sedha | Applied Electronics | S.Chand | 2004, 24th Edn |

## E Resources

1. https://youtu.be/NPqLUFN9tAE
2. https://youtu.be/I2nrBITEVls
3. https://youtu.be/qhXZuVFhVzo
4. https://youtu.be/WYKsYvLJ7HE
5. https://youtu.be/OPvs7A554Rw
6. https://youtu.be/LXzvN_8qmgQ
7. https://youtu.be/1fgw-ONlAcc
8. https://youtu.be/xMvb_druL18
9. https://youtu.be/mHvV_Tv8HDQ
10. https://youtu.be/x_APePdtrfQ
11. https://youtu.be/JkhRKvOPuHw
12. https://youtu.be/3_2k4fYtbpo
13. https://youtu.be/NJ0ZIvKfLD8
14. https://youtu.be/llLf49pDeQc

## Pedagogy

Chalk and talk, PPT, Seminar, Group discussion, Interaction

## Course Designer:

Dr. J. Balavijayalakshmi

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23C06 | SOLID STATE PHYSICS | Theory | 88 | 2 | - | 5 |

## Preamble

The objective of this paper is to enable the students to have a physical understanding of matter from an atomic view point. Topics covered include the structure, super conductivity and electrical properties of matter and its applications.

## Course Learning Outcome

On successful completion of the course the students will be able to

| CLO number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO 1 | Outline the importance of solid state physics in the modern society | K1 |
| CLO 2 | Explore the relationships between chemical bonding & crystal structure and their defects | K2 |
| CLO 3 | Understand the basic properties of metals, insulators and semiconductors and their technological applications | K2 |

| | | |
|---|---|---|
| CLO 4 | Extend their knowledge in theoretical fundamentals of electron theory and super conductivity | K3 |
| CLO 5 | Transfer their knowledge level from theoretical physical subjects towards the understanding of basic properties of solid state matter | K2 & K3 |

**Mapping with Programming Learning Outcomes**

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO 1 | S | S | S | S | S | S |
| CLO 2 | S | S | S | M | S | S |
| CLO 3 | S | S | S | M | S | M |
| CLO 4 | S | M | S | L | M | S |
| CLO 5 | S | S | S | S | S | S |

S- Strong; M-Medium; L-Low

**Syllabus**

**Unit I** **17Hrs**

**Crystal Lattices**

Introduction to solids- Lattice - Translation Vectors - Lattice with a Basis–Unit cell - Primitive Cell–Lattice parameters - Symmetry operations -Crystal Systems and Bravais Lattices—point groups and space groups (Concepts only) –Metallic Crystal Structures -SC, BCC, FCC and HCC structures – Other cubic structures - diamond cubic structure-Zinc blend structure-Sodium Chloride structure- Caesium Chloride structure- Polymorphism and Allotropy.

**Unit II**

**Crystal Planes** **17Hrs**

Introduction –Nomenclature of crystal directions - Nomenclature of crystal planes-–Miller indices –Procedure for finding Miller indices- Reciprocal Lattices (Concept and Properties) - Diffraction of X-rays by Crystals (Bragg's formulation) - Crystal imperfections and defects (elementary ideas only)

**Ancient Indian Metallurgy and Crystal Structure:**

Overview of India's rich metallurgical heritage-Wootz Steel: The Science Behind Damascus Blades- (basic ideas only)[14].

**Unit III**

**Electron Theory of Metals** **19 Hrs**

**Classical Free electron theory** – Electrical conductivity, Relaxation Time, Collision time and mean free path-Breakdown of classical theory - Quantum free electron theory-Fermi-Dirac statistics and electronic distribution in solids-Density of states- Fermi Surface - Electrical conductivity of a metal from quantum free electron theory- Band theory of solids - Kronig Penney model – Brillouin Zones – Distinction between Metals, Semiconductors and insulators on the basis of band theory.

**Unit IV**

**Dielectric and Magnetic Properties of Materials** **18 hrs**

Polarization- Local Electric Field at an Atom- Depolarization Field- Electric Susceptibility Polarizability - Clausius-Mossotti Equation- Classical Theory of Electric Polarizability - Response of a substance to magnetic field- Classification of magnetic materials- Atomic Theory of Magnetism- The origin of permanent magnetic moment-Classical Langevin Theory of Diamagnetism - Sources of Para magnetism- Langevin Classical Theory of Para magnetism Ferromagnetism- The Weiss molecular Exchange field Curie temperature – Ferromagnetic Domains- Discussion of B-H Curve. Hysteresis and Energy Loss

**Unit V** **17 Hrs**

**Superconductivity**

Introduction – Explanation for the occurrence of superconductivity – General properties of superconductors-Meissner effect-Type I and Type II superconductors- London equations and penetration depth- energy gap in superconductors –Superconductors in A.C fields Thermodynamics of superconductors –BCS theory - Applications of superconductors

**Books for study:**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | M. Arumugam | Solid state Physics (Units I to III) | Anuradha agencies | 2009, 1st Edn |
| 2 | Pillai .S.O | Solid state Physics (Unit IV &V) | New age International Private Limited | 2011, 6th Edn |

**Books for Reference:**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | Kittel | Solid state Physics | Wiley student edition | 2007, 8th Edn |
| 2 | Gupta and Kumar | Solid state Physics | K. Nath & Co | 1992, 8th Edn |
| 3 | Arthur Beiser | Concepts of Modern Physics | Tata McGrew Hill | 2008, 6th Edn |
| 4 | Dekker | Solid state Physics | Macmillan & Co limited | 1967, 1st Edn |

**E Resources**

1. https://youtu.be/i5VykZxXjzc
2. https://youtu.be/MZS9SBRfI4o
3. https://youtu.be/v72AQhCtixI
4. https://youtu.be/4IUoAwWmYsc
5. https://youtu.be/Mz314lyi1f0
6. https://youtu.be/PDgvNPMxrsY
7. https://youtu.be/4IcXvmnVolc
8. https://youtu.be/2xOAb68agy0

9. History of Science and Technology in India By Dr. Binod Bihari Satpathy. https://margheritacollege.in/admin_portal/all_mrgclg_files/department_studymat/History%20of%20science%20and%20technology%20in%20India9577.pdf

**Pedagogy**

Chalk and talk, PPT, Seminar, Group discussion, Interaction

**Course Designer**

1. Dr. G. Praveena

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| **PS23E01** | **MATHEMATICAL PHYSICS** | Theory | 58 | 2 | - | 5 |

## Preamble

The aim of this course is to make students acquire knowledge in mathematics and the learners are expected to provide extensive mathematical formalism for understanding and interpreting various physical problems.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1. | Remember the basic concepts band knowledge on mathematical methods | K1 |
| CLO2. | Understand the various techniques in solving physical problems on Vectors, Matrices, differential equations, Complex numbers and functions. | K2 |
| CLO3. | Apply the acquired knowledge on various analytical techniques to obtain the solution for complex physics problems | K3 |
| CLO4. | Analyse and interpret the solutions obtained by mathematical methods | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | M | M | S | S |
| CLO2 | S | S | S | **S** | **S** | S |
| CLO3 | S | S | **S** | **S** | **S** | M |
| CLO4 | S | S | S | M | S | M |

S- Strong; M-Medium;

## Syllabus

**Unit I**

**Vectors** **12 Hrs**

Vectors with applications -Vector algebra – addition of vectors – multiplication of a vector by a scalar – orthogonal resolution of vectors – rotation of coordinates – product of two vectors – some physical applications of the product of two vectors – product of three vectors and four vectors – reciprocal system of vectors – differentiation of vectors.

**Unit II**

**Matrix** **12 Hrs**

Definition- Four basic algebra operations for matrices - Equality of matrices - Addition of matrices - Multiplication of a matrix by a number - Matrix multiplication –partitioning of matrices - transpose of a matrix – the conjugate of a matrix – the conjugate transpose - Symmetric and antisymmetric matrices – Hermitian and skew Hermitian matrix -determinant of matrix – singular and non-singular matrices – adjoint of a matrix - Orthogonal matrix- Unitary matrix - Rotation matrices - Trace of a matrix – rank of matrix.

**Unit – III**

**Complex Analysis** **11 Hrs**

Complex Numbers–Review – Complex Conjugates – Modulus and argument of a Complex number – Graphical representation - functions of complex variables - Analytic function -Cauchy Riemann conditions – Laplace Equations – Harmonic Functions– Problems

**Unit – IV**

**Differential Equations of First Order:** **12 Hrs**

Order and degree of a differential equation – formation of differential equation – solution – differential equation of the first order and first degree – variables separable – Homogeneous differential equation – equation reducible to homogeneous form - linear differential equation – equations reducible to the linear form (Bernoulli equation).

**Unit – V**

**Introduction to Neural Networks** **13 Hrs**

What are neural networks? (The Spark of PDP) – Forward Pass: From Inputs to Activations - Cost Functions: Measuring Error – Optimization: The Power of Gradient Descent – Back propagation: Learning Begins – Training a Neural Network (End – to – End) – Experiments: Feel the Network – Overfitting & Generalization – Think Like PDP: Reflection as understanding – Beyond Supervised: Autoencoders (Optional Intro) – Final Reflection: Why Architecture Exist.

**Books for study:**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | B.D. Gupta | Mathematical Physics | Vikas Publishing House | 2022, 4th Edn |
| 2 | Satyaprakash | Mathematical Physics | Sultan Chand &Sons | 2021, 6th Edn |
| 3 | H.K. Dass | Mathematical Physics | S.Chand and Co | 2019, 8th Edn |
| 4 | Gupta S.P | Statistical Methods | S.Chand and Co | 2021, 46th Edn |
| 5 | David E Rumelhart, James L McClelland | Parallel Distributed Processing | MIT Press | 1987, 1st Edn |

**Books for References:**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | P.K Chattopadhyay | Mathematical Physics | Wiley Eastern Ltd. | 2022, 3rd Edn |
| 2 | N.P. Bali | Statistics | Laxmi Publications | 2020, 4th Edn |
| 3 | S.S.Rajput | Mathematical Physics | Pragati Pragasam, Meerut | 2019, 11th Edn |

**E Resources**

1. https://youtu.be/VFRW0f0XUU8
2. https://youtu.be/ZM2-Bb8Zdt0
3. https://youtu.be/gPnWm-IXoAY
4. https://youtu.be/TBpDMLCC2uY
5. https://youtu.be/p48uw2vFWQs
6. https://youtu.be/gYacCtBJ8VA
7. https://youtu.be/BZxZ_eEuJBM
8. https://youtu.be/-HF7jgvtxl8
9. https://youtu.be/0V282K1cmOk
10. https://youtu.be/MQOookEYLoU
11. https://youtu.be/gd1FYn86P0c

**Pedagogy**

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, power point presentation.

**Course Designers**

1. Dr. M. Lavanya

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| **PS23CP3** | **PHYSICS PRACTICAL III** | Practical | - | - | 6 Hrs/ Week | 4 |

## Preamble

This course helps the student to acquire practical knowledge to design the basic electrical circuits using diodes, transistors, etc. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience to design the circuits. It also helps them to understand the applications of solar cells.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1. | Understand Basic laws and theories involving diodes, transistors, solar cells, thermistors etc., | K1 |
| CLO2. | Understand the given concepts and its physical significance | K2 |
| CLO3. | Apply the theory to design the basic electrical circuits | K3 |
| CLO4. | Use these basic circuits to create amplifier circuits, oscillator circuits, regulated power supplies etc., | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | S | S | S |
| CLO2 | S | S | S | M | M | S |
| CLO3 | S | S | S | M | M | S |
| CLO4 | S | S | S | S | S | S |

S- Strong; M-Medium;

## Syllabus

**List of Experiments**
**(Any 16)**

1. Determination of Absolute Mutual Inductance – Ballistic Galvanometer
2. Determination of Absolute Capacity- Ballistic Galvanometer
3. Cauchy's Constant**s** using Spectrometer
4. Dispersive power of a prism using Spectrometer
5. μ of a prism – Stoke's formula – Spectrometer
6. Characteristics of Junction Diode
7. Characteristics of Zener Diode
8. Transistor Characteristics - Common Emitter Configuration
9. Characteristics of FET
10. Characteristics of UJT
11. R-C Coupled Amplifier – Single Stage
12. Emitter Follower
13. Voltage Doubler
14. Regulated low Range power supply
15. Closed loop Gain Op Amp (Inverting & Non inverting)
16. Op Amp as adder in inverting mode & Subtractor
17. Op Amp as Differentiator & Integrator
18. Op Amp - Astable Multivibrator
19. Characteristics of Laser diode
20. Study of characteristics of photodiode (solar cell)
21. Colpitts Oscillator
22. Hartley Oscillator
23. Determination of Band Gap using Thermistor.
24. Measurement of Resistance using Carey Fosters Bridge.

## Pedagogy:

Demonstration and practical sessions

## Course Designers:

1. Dr. M. Lavanya
2. Dr. N. Priyadharsini

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| **PS23SB01** | **PROGRAMMING IN C** | Theory & Practical | 24 | 4 | 17 | 3 |

## Preamble

The main objective of this course is to i) train the students to the basic concepts of programming language ii) to provide exposure to problem solving through programming iii) also create foundation for students to learn other complex programming languages like C++, Java etc.,

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Recall the fundamental concepts of C programming | K1 |
| CLO2 | Understand the characteristics of operators, arrays, structures | K2 |
| CLO3 | Apply the acquired knowledge to design programs and algorithms | K3 |
| CLO4 | Analyze and develop programs for simple real time applications | K4 |

## Mapping with Programme Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO 1 | S | M | M | M | S | S |
| CLO 2 | S | S | S | S | M | M |
| CLO 3 | S | S | S | M | S | M |
| CLO 4 | S | M | S | S | S | S |

S- Strong; M-Medium; L-Low

**Unit I** **9 Hrs**

**Introduction to C and Operators with Expressions**

C character set - C tokens - Key words and identifiers-**Constants- Variables - Date types and sizes**- Declaration of variables –Assigning valued to the variables –Arithmetic operators - relational and logical operators-assignment operators **- increment and decrement operator-Conditional operator**-Bit wise and Special operator - Arithmetic Expression-Evaluation of expression – Precedence of arithmetic operations-Type conversion in expressions.

**Unit II** **9 Hrs**

**Statements and Loops - I & Loops - II**

IF Statement – **IF ELSE Statement- Nesting IF ELSE Statements- Switch Statements** - GO TO Statements - While Statements – DO statements – For Statements- Jumps in loops - Simple Programs

**Unit III** **8 Hrs**

**Arrays and Structures**

One Dimensional array – Two dimensional Array- Initializing two-dimensional Array- Multidimensional arrays - Dynamic Arrays. **Structure definition – Giving values to members- Structure initialization – Comparison of structure variables**- Arrays of Structures – Arrays within Structure – Structure with in Structures.

**Unit IV**

**Programmes - I** **8Hrs**

Swapping the two variables without use of third variable and the XOR operations on two numbers using simple logical function and expressions. Generate the Fibonacci series and find the factorial of a given number using for statement. Generate prime numbers within a range and space count using if and for statement. Count the number of positives, negatives and zeroes and user input validation using if else condition, vowels and consonants using if else and for statement.

**Unit V**

**Programmes - II** **9 Hrs**

Solve the Quadratic Equation, find whether the given string is Palindrome or not and compare two string inputs using if else - else if statement. Find sum of the digits and reverse the digits using while do statement. Using array to perform transpose of a given matrix, Matrix Addition, Matrix Multiplication. Sort set of numbers in ascending and descending order using array and for condition. Lower to upper case using the array, if else and for statement.

**Text Book**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | E. Balagurusamy | Programming in ANSI C | Tata Mc Graw Hill | 2019, 8th Edn |

**Reference Books**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Byran Gottfried | Programming with C | Tata McGraw Hill | 2013, 3rd Edn. |
| 2 | V.Rajaraman | Computer Programming in C | Prentice Hall of India Pvt Ltd | 2004, 1st Edn. |
| 3 | Smarajit Ghosh | Programming in C | Prentice Hall of India Pvt Ltd | 2004, 1st Edn. |
| 4 | Yeswanth Kanethkar | Let us C | BPB Publications | 2014, 13th Edn. |
| 5 | MartinJ Gentile | An Easy Guide to Programming in C | Create Space Independent Publishing Platform | 2012, 2nd Edn |

**Reference for E-content:**

1.https://www.youtube.com/watch?v=RdJ-osV3seE
2. https://www.youtube.com/watch?v=LSLAYF1kKeQ
3. https://www.youtube.com/watch?v=rT_sDElragY
4. https://www.youtube.com/watch?v=r8AGPBJ6t3s
5. https://www.youtube.com/watch?v=_57FcSBtJNU
6. https://www.youtube.com/watch?v=OxkTCgGIWxk

**Pedagogy**

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar.

**Course Designer:**

Dr. P. Maheswari

## PROJECT AND VIVA VOCE PS23PROJ

**Objective**

To make the students to understand the importance of experimental analysis, scientific approach in solving problems related to the environment and society and to educate and train the students to write scientific papers

**Group Project & viva voce**

Each group will be comprising of 5 members and will be allotted to a staff coordinator. A specific problem will be assigned to the students or they will be asked to choose a problem/ area of interest. The topic/ area of work will be finalized at the end of IV semester, allowing scope for the students to gather relevant literature during the vacation. The research work can be carried at the college or any other organization approved by the staff coordinator and the HOD. Viva-voce/ presentation will be conducted by a panel of internal examiners including the HOD and the staff coordinator guiding the project. A PowerPoint / OHP presentation by the group before the audience will be evaluated on the basis of student's response to questions.

**Area of work**

Any topic related to physics and its applications.

**Methodology**

Each project should contain the following details:
Brief introduction on the topic
Review of literature
Materials and Methods
Experimental Results and Discussion – evidences in the form of figures, tables and photographs can be enclosed
Summary
Bibliography
The above content should not exceed 50 pages.

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23E02 | MATERIALS SCIENCE I | Theory | 58 | 2 | - | 5 |

## Preamble

The objective of this paper is to introduce the students to electron theory of solids and different types of materials based on their properties.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Remember the fundamental concepts related to electron theory of solids. | K1 |
| CLO2 | Understand the electrical, thermal, dielectric, magnetic and superconducting behaviour of different materials. | K2 |
| CLO3 | Apply concepts such as Ohm's law, Hall effect, polarization and Wiedemann-Franz law to analyse the physical properties of materials | K3 |
| CLO4 | Analyse the behaviour of solids under various physical conditions using classical and quantum models | K4 |
| CLO5 | Evaluate and distinguish different types of materials based on their physical and electronic properties for technological applications. | K5 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | M | S | M | S | M |
| CLO2 | S | S | S | **S** | **S** | M |
| CLO3 | M | S | **S** | **S** | **S** | M |
| CLO4 | M | M | S | S | S | S |
| CLO5 | S | S | S | S | S | S |

S- Strong; M-Medium;

## Syllabus

**Unit I**

**Electron Theory of Solids** **12 Hrs**

Introduction-the classical free electron theory and the quantum free electron theory- Electron energy in metals and Fermi energy- density of states- anti-symmetric nature of the wave functions of the Fermi system – explanation of covalent bonding in crystals- electron in a periodic potential- energy bands in solids- Brillouin zones – distinction between metals, insulators and semiconductors- effect mss of electron and concept of hole – the Hall effect.

**Unit II** **12 Hrs**

**Conducting materials**

Introduction- atomic interpretation of ohms law- relaxation time and electrical conductivity – relaxation time – collision time- mean free path- heat developed in a current carrying conductor- sources of resistivity of metals and alloys- thermal conductivity*- Wiedemann Franz law- thermal expansion- electrical conductivity at high frequencies- geometrical and magnetic field effects on electrical conductivity- variation of electrical resistivity due to mechanical stress (strain gauge)- different types of conducting materials.

**Unit III** **11 Hrs**

**Dielectric materials**

Introduction- fundamental definition in dielectric – different types of electric polarization- frequency and temperature effects on polarization- dielectric loss- local field or internal field – Clausius- Mossotti relation – determination of dielectric constant – dielectric break down- properties and different types on insulating materials – Ferro electric materials

**Unit IV** **12 Hrs**

**Magnetic materials**

Introduction- different type soft magnetic materials – classical theory of dia magnetism (Langevin theory)- Langevin theory of para magnetism- Weiss theory of para magnetism- Weiss of Ferro magnetism (molecular field theory on field magnetism) – Heisenberg interpretation on internal field and quantum theory of ferromagnetism- domain theory of Ferro magnetism- hard and soft materials

**Unit V** **13 Hrs**

**Superconducting materials**

Introduction- explanation for the occurrence of super conductivity – general properties of super conductors- other general observations- types of superconductors- applications of superconductors.

**Text Book**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | Arumugam. M | Material Science | Anuradha agencies-Kumbakonam | 1990, 1st Edn |

**Reference Books**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | Raghavan | Materials and engineering | Prentice Hall of India | 1990, 3rd Edn |
| 2 | Vijaya & Rangarajan | Materials Science | Tata McGraw Hill Publishing Company Ltd | 2005, 1st Edn |
| 3 | Raghavan | Materials Science | Prentice Hall | 1990, 13th Edn |

**Reference for E-content:**

1. https://www.youtube.com/watch?app=desktop&v=KHzGkBPXxLc
2. https://www.youtube.com/watch?v=AdhcrmcZcSA
3. https://www.youtube.com/watch?v=HSV-UFGvycc
4. https://www.youtube.com/watch?v=dqMkWdwjVSs

**Pedagogy**

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar.

**Course Designer:**

Dr. N. Priyadharsini

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23E03 | BIO MEDICAL INSTRUMENTATION I | Theory | 58 | 2 | - | 5 |

## Preamble

The objective of this paper is to introduce the students the basic knowledge of transducers, recorders and other bio medical instruments and devices.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Remember the basic principles of biomedical transducers, electrodes and instrumentation systems used in medical applications. | K1 |
| CLO2 | Understand the working of different biomedical transducers. | K2 |
| CLO3 | Apply concepts of biopotential recording systems like ECG and EEG. | K3 |
| CLO4 | Analyse signals from cardiovascular and neurological systems. | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | M | S | M | S | M |
| CLO2 | S | M | S | **M** | **S** | M |
| CLO3 | M | S | **S** | **S** | **S** | M |
| CLO4 | M | S | S | S | S | S |

S- Strong; M-Medium;

## Syllabus

**Unit I** **12 hrs**

**Electrodes and transducers**

Transducers for medical applications-Active transducers-Passive transducers-Electrode theory-Components of biomedical instrument system-electrodes – microelectrodes - chemical electrodes

**Unit II** **12 hrs**

Different types of transducers-Magnetic induction type-piezoelectric type-thermoelectric type-capacitive transducers-inductive transducers- linear variable differential transformer

**Unit III** **11 hrs**

**Biopotential Recorders-I**

Cardiovascular instrumentation-characteristics of recording system-electrocardiography-origin of cardiac potentials-P,R,T,S-T,Q waves-ECG lead configurations-ECG recording set up-Practical considerations for ECG recording

**Unit IV** **12 hrs**

**Biopotential Recorders-II**

Analysis of ECG signals-Phonocardiography-Heart sounds-Physical characteristics of heart sounds-Recording set up-Relationship between the heart sounds and function of the cardiovascular system-Medical applications-special; applications of phonocardiogram Electroencephalograph (EEG)-recording of evoked potentials-electromyograph

**Unit V** **13 hrs**

**Physiological Assist devices**

Pacemakers-Pacemaker batteries-Artificial heart valves-Defibrillators-Nerve and muscle stimulators-Heart lung machine-Kidney machine.

## Text Book

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | Arumugam. M | Biomedical Instrumentation (units II,III, IV& V) | Anuradha Publications | 2007, 1st Edn |
| 2 | James Cameron | Medical Physics (Units III , IV& V) | Wiley publications | 1978, 1st Edn |

## Reference Books

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | Leslie Cromwell, Fred J Weibell and Erich A.Pfeiffer | Biomedical Instrumentation and Measurements | Prentice Hall of India | 1992, 2nd Edn |

## Reference for E-content:

1. https://www.youtube.com/watch?v=PA-qoyEMLuY
2. https://www.youtube.com/watch?v=TLhtXQ7Wizo
3. https://www.youtube.com/watch?v=EONqnZS7N0c
4. https://www.youtube.com/watch?v=ocSd7opNFD8

## Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar.

## Course Designer:

Dr. G. Praveena

**SEMESTER V**

**ADVANCED LEARNERS' COURSE I**

**ENERGY PHYSICS - I**

**Subject Code: PS16AC1**

**Credits: 5**

**Objective:** To make the students understand the basic principles and applications of different forms of energy.

**Unit-I**

**Electrical Energy**

Application of heating effect of electricity: Electric heater– Electric radiation and Electric Iron – Electric welding and electric furnace –Carbon arc – Electric Lamp – Efficiency of a Lamp – Measurement of Electric Power -

Principle of production of A.C. – A.C generators – D.C generators -D.C Motors.

**Unit – II**

**Magnetic Energy**

Magnetic field (B), magnetization (M), magnetic field intensity H, Magnetic flux and flux density, magnetic materials and magnetization, Induction heater-magnetic hysteresis.

**Unit III**

**Photovoltaics & Microwaves**

The photovoltaic effect -analysis of photovoltaic cells-efficiency of solar cells-design of photovoltaic system-single crystal and polycrystalline cells-Reflex Klystron- Magnetron - Microwave oven.

**Unit IV**

**Thermal Energy**

Distribution of Energy in the thermal spectrum – Lummer and Pringsheim Experiment and its Results – Wien's Displacement Law and Radiation Law – Rayleigh Jean's Law -Planck's Radiation Law – Deduction of Wien's Law and Rayleigh – Jean's Law from Planck's law- Kirchoff's Law of radiation and its proof.

**Unit V**

**Molecular Energy & Nuclear Energy**

Maxwell's **l**aw of equipartition of Energy – Molar Specific heat capacity at constant volume and constant pressure – Total Internal Energy and Ratio of Heat capacities in monoatomic gas, Diatomic gas. Chain reaction-Controlled & uncontrolled Nuclear fission, energy released in atom bomb . Nuclear fusion-Thermo nuclear reactors- Hydrogen bomb.

**Text Book**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | Brijlal Subramaniam | Heat & Thermodynamics Units I, &II | S.Chand and Co. | 2012, 16th Edn |
| 2 | Dennis Roddy &John Coolen | Electronic Communication (Unit III) | Prentice Hall India | 1995, 4th Edn |
| 3 | Subir Kumar Sarkar | Optical Fibre and Fibre optic communication systems Unit III) | S Chand & Co | 2001, 2nd Edn |
| 4 | Singhal.S.S, Agarwal. J.P. and Sathya prakash | Heat, Thermodynamics and Statistical Physics Units I, &II | Pragati Prakashan | 1985, 9th Edn |
| 5 | Subrahmaniam. N & Brijlal S | Atomic & Nuclear Physics Unit V | Chand & Company Ltd | 2008, 3rd Edn |

**ADVANCED LEARNERS' COURSE II**

**EXPERIMENTAL TECHNIQUES & DATA ANALYSIS - I**

**Subject Code: PS16AC2**

**Credits: 5**

**Objective:** To make the students understand the principles involved in measuring devices, error measurements, the standards of measurements, performance characteristics of an instrumentation system, transducers, and vibration sensing devices.

**Unit – I**

**Basic Concept of Measurement & Transducers**

Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices, Calibration.

Transducers: capacitive, transducer-Photoelectric effect – Photoconductive Transducers-Piezoelectric transducers. Temperature and pressure transducers.

**Unit – II**

**Measurement of errors**: accuracy, precision, Significant Figures –types of errors-Statistical Analysis-Probability of errors-limiting error

**Unit – III**

**Standards of measurements**: classification of standards- Standards for Mass, Length and Volume- time and frequency standards, electrical standards, standards of temperature and luminous intensity.

**Unit – IV**

**Performance Characteristics of an Instrumentation system**

Introduction – Generalized measurement – Zero order system – Second order system – Dead time element – Specification and testing of dynamic response.

**Unit – V**

**Vibration**

Random Vibration – Shock – Analyzing vibration sensing devices – Generalized second order system – Absolute displacement – Absolute velocity and acceleration vibrating sensing devices –Velocity transducer – Banded strain gauge accelerators – Piezo electric accelerometer

**Text Book**

| S. No | Authors | Title | Publishers | Year & Edition |
|---|---|---|---|---|
| 1 | Hefnick .A.O and Cooper. W.D | Modern Electronic Instrumentation and Measurement Techniques Unit – II & III | Prentice Hall India Publications | 1981, 16th Edn |
| 2 | C.S. Rangan, G.R. Sharma and VSV Mani | Instrumentation Devices and Systems Unit – I, IV & V | Tata McGraw Hill Publications | 1983, 2nd Edn |

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23C07 | OPTICS AND SPECTROSCOPY | THEORY | 73 | 2 | - | 5 |

## Preamble

- This course provides students with a working knowledge of optical physics, including diffraction, interference, polarisation and spectroscopy, laser physics. This paper aims to impart a detailed knowledge in Optics &Spectroscopy.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | List the basic ideas in image formation and the defects involved. | K1 |
| CLO2 | Understand the central concepts and basic formalisms of interference, diffraction, polarisation and basics of spectroscopy. | K2 |
| CLO3 | Use of tools needed to formulate problems in optics and spectroscopy. | K3 |
| CLO4 | Gain Fundamental knowledge in lasers, holography and Raman effect. | K3 |
| CLO5 | To impart knowledge related to the concepts of spectroscopy. | K3 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | L | L | L |
| CLO2 | S | M | S | S | M | M |
| CLO3 | M | S | M | S | S | S |
| CLO4 | S | S | S | S | M | M |
| CLO5 | S | M | M | S | M | M |

S- Strong; M-Medium; L-Low

## OPTICS AND SPECTROSCOPY - PS23C07 – 73 HRS

**Unit I** **(15 Hrs)**

**Geometrical Optics**

Spherical aberration in lenses – reducing spherical aberration –Coma – Aplanatic lens- Oil immersion objective- Astigmatism –Curvature – Distortion – Dispersion – Angular and Chromatic dispersion – Combination of prisms to produce (i) dispersion – without deviation (ii) deviation without dispersion – Achromatism in lenses – Achromatic combination of lenses –(i) in contact (ii) and separated by a distance –Eye pieces-Ramsden's and Huygen's eyepieces

**Unit II**

**Interference** **(15 Hrs)**

Interference in thin films due to reflected and transmitted light – Fringes due to wedge shaped films – Newton's rings- Determination of wavelength of light- Refractive index of liquid– Michelson's interferometer- Applications – Determination of Wavelength, Thickness of a thin transparent films, Refractive index of gases – Fabry-Perot Interferometer – Antireflection coatings – Interference filters

**Unit III** **(14 Hrs)**

**Diffraction**

Rectilinear propagation of light- Zone plate- action and construction- comparison with convex lens-Fraunhofer diffraction – Diffraction at single slit, double slit, Diffraction grating

**Polarization**

Double refraction – Huygen's explanation in uniaxial crystals – production and detection of plane, circular and elliptically polarized light – Optical activity – Fresnel's explanation – Laurent's half shade polarimeter.

**Unit IV** **(14 Hrs)**

**Quantum Optics Lasers**

Spontaneous and Stimulated emission – Einstein's A & B coefficients, Population Inversion - Metastable states - Optical pumping- Modes of resonators and coherence length, Ruby & He – Neon lasers

**Holography**

Basic principle-Making a Hologram-Reconstruction of the image from the Hologram-Mathematical theory-Applications of Holography-Holographic Interferometry & Microscopy

**Unit V** **(15 Hrs)**

**Spectroscopy**

Photoelectric effect-Laws of Photoelectric Emission-Einstein's photoelectric equation - Compton effect - X ray spectra- Continuous and Characteristic spectra – Moseley's law – Application – Molecular spectra – Spectra of diatomic molecules – Pure rotation spectra-Vibration, rotation spectra- Selection rules- Raman effect – Experimental study – Raman effect in solids and gases Explanation of Raman effect – Application of Raman effect in a molecular spectra

## Text Book

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | Brijlal and Subramaniam | A Text Book of Optics (Units I , II &III) | S. Chand & Co | 2006 and 23rd edn |
| 2 | Murugesan. R | Modern Physics (Unit IV & V) | S. Chand & Co | 2013 and 17th edn |
| 3 | P.K. Chakrabarti | Geometrical and Physical Optics (UnitV) | New Central Book Agency | 2005 and 3rd edn |

## Books for Reference

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | R. Murugesan | Optics and Spectroscopy | S. Chand & Co | 2012 and 8th edn |

## Pedagogy

- Chalk and Talk lectures, Group Discussion, Seminar, Interaction, Power Point Presentation

## Course Designer

Mrs. S.Subanya

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23C08 | QUANTUM MECHANICS | THEORY | 73 | 2 | - | 5 |

## Preamble

- The aim of this course is to make students acquire sufficient knowledge in Properties of matter waves, Wave equation, Schrodinger equation and applications, Operator formalism.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Recognize basic terms in Quantum Mechanics. | K1 |
| CLO2 | Understand the basic principles of quantum particles. | K2 |
| CLO3 | Apply basics to construct and solve one particle equations | K3 |
| CLO4 | Ability to design and construct particle equations in the free and bound states as well as to analyze and interpret the results. | K4 |
| CLO5 | To understand the fundamentals and concepts in operator formalism | K5 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | M | L | L | L |
| CLO2 | S | S | S | S | S | M |
| CLO3 | S | S | S | S | M | S |
| CLO4 | S | S | S | S | M | M |
| CLO5 | S | S | S | S | M | M |

S- Strong; M-Medium; L-Low

## QUANTUM MECHANICS - PS23C08 – 73 HRS

**Unit I** **(15 Hrs)**

**Emergence of quantum concepts**

Inadequacies in Classical Physics - Quantum Theory of Light (Review)-Matter waves- De Broglie Hypothesis- Davisson -Germer Experiment-G. P. Thomson experiment-Wave-Particle Duality-Wave description of Particles by Wave Packets- Group and Phase Velocities and their relation– Heisenberg's uncertainty principle (physical significance– Elementary proof, Uncertainty Relations) - Gamma ray microscope –Non-Existence of electrons in the nucleus.

**Unit II** **(15 Hrs)**

**Elements of Quantum Mechanics**

Basic Postulates and Formalism- Schrödinger Time-independent Wave Equation (Stationary States)- Time dependent wave equation - Wave function for a free particle - Properties - Interpretation -Requirements of wave function – Normalization - Linearity and Superposition– Probability Current Density - Definition of an operator in Quantum mechanics - Eigen value and Eigen value equation -Expectations value – Ehrenfest's theorem

**Unit III**

**Eigen Value Problem** **(14 Hrs)**

Free particle - Particle in an infinitely deep 1D potential well - Step potential –Barrier Potential problem - Barrier penetration and tunnel effect (α-emission)–One dimensional rectangular potential well-Harmonic oscillator (one-dimension)

**Unit IV** **(14 Hrs)**

**Schrodinger equation in three dimensions**

Particle in an infinitely deep three dimensional quantum well- Schrodinger's equation in spherical polar co-ordinate system –Construction of Schrodinger equation for Hydrogen atom-Importance of one electron Schrodinger equation.

**Unit V** **(15 Hrs)**

**Operator Formalism**

Linear operator –Hermitian operator (Condition and examples) - Operators for momentum, kinetic energy and total energy –Hermitian character of Hamiltonian operator-Commutator - commuting and non-commuting operators – commutation relation between position and momentum, Hamiltonian - Orbital Angular momentum operator – commutation relation between $L_x$, $L_y$, $L_z$ and L - Ladder Operators $L^+$ and $L^-$ - Commutation relation between L and position.

**Text Books**

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | S.P.Singh, M.K. Bagde and Kamal Singh. | Quantum Mechanics | S. Chand & Co. | 1983 and 2nd edn |

| | | | | |
|---|---|---|---|---|
| 2 | Sathya Prakash | Quantum Mechanics | Kedarnath & Ramnath Co | 2007 and New edn |
| 3 | R. Shankar | Principles of Quantum Mechanics | Springer | 2010 and 2nd edn |
| 4 | G. Aruldhas | Quantum Mechanics | PHI | 2013 and 2nd edn |

**Books for Reference:**

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| **1** | R.Eisberg& R. Resnick | Quantum Physics Of Atom,Molecules, Solids, Nuclei & Particles | John Wiley | 2006 and 2nd edn |
| **2** | Keith Gibbs | Advanced Physics | Cambridge University Press | 1991 and 2nd edn |
| **3** | KAIL Wijewardena Gamalath – Landau,L.D., and LifshitzE.M., | Introduction to Vector spaces in Physics | Pergamon, NY | 1974 and 1st edn |
| **4** | R. Shankar | Principles of Quantum Mechanics | Springer | 2010 and 2nd edn |
| **5** | F. Schwabl | Quantum Mechanics | Springer | 1995 and 4th edn |

**Pedagogy**

- Chalk and Talk lectures, Group Discussion, Seminar, Interaction and Power Point Presentation

**Course Designer**

Dr.G.Praveena

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23C09 | ATOMIC AND NUCLEAR PHYSICS | THEORY | 73 | 2 | - | 4 |

## Preamble

- The aim of this course is to provide a coherent and concise coverage of traditional atomic and nuclear physics.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Acquire knowledge of the fundamental physics underpinning atomic and nuclear physics | K1 |
| CLO2 | Understand the concepts and potential applications of atomic and nuclear physics | K2 |
| CLO3 | Apply general considerations of quantum physics to atomic and nuclear system | K3 |
| CLO4 | Analyse production and decay reactions for fundamental particles | K4 |
| CLO5 | Expand and evaluate the theoretical predictions for nuclear reactions. | K5 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | S | L | L |
| CLO2 | S | S | S | S | S | M |
| CLO3 | S | S | S | S | M | S |
| CLO4 | S | S | S | S | L | M |
| CLO5 | S | S | S | S | M | M |

S- Strong; M-Medium; L-Low

## ATOMIC AND NUCLEAR PHYSICS - PS23C09 – 73 HRS

**Unit I**

**Atomic structure:** (**15 Hrs)**

Rutherford's experiment on scattering of alpha particles-theory of alpha particle scattering-Experimental verification- Bohr model of the atom-Effect of nuclear motion on atomic spectra -evidences in favour of Bohr s theory-critical potentials-atomic excitation – Experimental determination of critical potential - Frank and Hertz experiment- Sommerfeld's relativistic atom model – Vector atom model- Quantum numbers associated with the Vector atom model, Coupling Schemes.

**Unit II**

**Optical Spectra and electronic structure: (15 Hrs)**

Pauli's exclusion principle - Some examples of electronic configuration with their modern symbolic representation - Magnetic moment due to orbital and spin motion – Stern Gerlach Experiment – Optical spectra- Fine structure of sodium D line- Zeeman effect- Experimental arrangement, Expression for Zeeman Shift- Quantum mechanical explanation of the normal Zeeman effect - Anomalous Zeeman effect- Stark effect.

**Unit III (15 Hrs)**

**Nuclear Models**

Introduction to nucleus - Models of Nuclear structure - Liquid Drop model, Semi empirical mass formula, Shell model, Magic Nos.

**Particle accelerators and detectors**

Linear accelerators, Cyclotron, Betatron, GM counter, Ionisation chamber

**Radioactivity**

Natural radioactivity- properties of alpha, beta and gamma rays, Geiger – Nuttal Law, Gamow's theory of α- decay, β- ray spectra, magnetic Spectrograph, origin of line and continuous spectra, Neutrino theory of β – decay, k- electron capture, Gamma ray – introduction, Origin, nuclear isomerism, internal conversion, Mossbauer effect.

**Unit IV (14 Hrs)**

**Artificial Transmutation of Elements**

Discovery of Artificial Transmutation – Rutherford's Experiment, Bohr's theory of nuclear disintegration, Q – value equation- nuclear reactions, energy balance in nuclear reactions.

**Nuclear Transmutation**

Transmutation by (i) Alpha Particles (ii) Protons (iii) Deutrons (V) Neutrons, Scattering cross section, and its determination.

**Artificial radioactivity**

Discovery-preparation of radio elements-applications of radio isotopes.

**Unit V (14 Hrs)**

**Nuclear fission and fusion**

Nuclear fission, energy released in fission, chain reaction, Atom bomb, nuclear reactor, Breeder reactor, Nuclear fusion, Source of Stellar energy, thermonuclear reactions, transuranic elements.

**Elementary Particles**

Introduction, classification of elementary particles, four fundamental interactions, Elementary particle quantum numbers, conservation laws & Symmetry, Quark model.

## Text Book

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| **1** | Murugesan R | Modern Physics | S.Chand & Co | 1994 and 9th edn |

## Books for References

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | H.Semat and J.R.Albright | Introduction to Atomic and Nuclear Physics | Chapman and Hall Ltd | 1972 and 5th edn |
| 2 | S.N. Ghoshal | Atomic and Nuclear Physics | S. Chand & company | 1900 and 1st edn |
| 3 | C.L.Arora | Atomic and Molecular Physics | S Chand & company Ltd | 1999 and 1st edn |
| 4 | Beiser | Concepts of Modern Physics | Tata McGraw Hill Publishers | 2002 and 6th edn |
| 5 | Roy R.R& Nigam | Nuclear physics | Wiley Eastern Ltd | 2017 and 5th edn |
| 6 | Kenneth S Krane | Modern Physics | John Wiley and Sons, | 2012 and 3rd edn |

## Pedagogy

- Chalk and Talk lectures, Group Discussion, Seminar, Interaction and Power Point Presentation

## Course Designers

Dr. B.Punithaveni

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23E04 | MICROPROCESSOR | THEORY | 88 | 2 | - | 5 |

## Preamble

- This course deals with the basic concepts of microprocessor, programming instructions and interfacing concepts.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Basic ideas on microprocessor, memory and I/O devices | K1 |
| CLO2 | Be familiar with the basic concepts of microprocessor architecture and interfacing | K2 |
| CLO3 | To impart skills in the programming instruction sets of microprocessor | K2 |
| CLO4 | Apply the programming instructions to perform simple programs using microprocessor | K3 |
| CLO5 | Finding solution for real time applications | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | S | M | M |
| CLO2 | S | S | S | S | M | M |
| CLO3 | S | S | S | S | S | S |
| CLO4 | S | M | M | S | S | S |
| CLO5 | S | M | M | S | S | S |

S- Strong ; M-Medium ; L-Low

## MICROPROCESSOR - PS23E04 – 88 HRS

**Unit I (18 Hrs)**

Microprocessors–Microprocessor instruction set and Computer Languages – Microprocessor Architecture and its operations – Memory – Input and Output devices – Review: Logic devices for interfacing – 8085 MPU – Memory Interfacing.

**Unit II (17Hrs)**

The 8085 Programming Model – Instruction Classification – Instruction and Data format - How to write, Assemble and Execute a simple program – Overview of 8085 instruction Set- Addressing mode

**Unit III (17Hrs)**

Programming Techniques: Looping, counting and indexing – Additional data transfer and 16 bit Arithmetic instructions – Logical Operations: Rotate and Compare – Stack and Subroutines- BCD to binary –binary to BCD conversion-binary to ASCII and ASCII to Binary code conversion.

**Unit IV (18 Hrs)**

8085 interrupts – 8255A Programmable peripheral interface –Block diagram – Mode 0: Simple Input or Output – BSR Mode – Mode1: Input or Output with Handshake – Mode2: Bidirectional Data transfer- Interfacing keyboard and Seven segment display – 8254 programmable interval timer – Block diagram – Programming the 8254 – 8254 as a counter - Modes.

**Unit V (18Hrs)**

8259A programmable interrupt controller – Block diagram – Interrupt operations –Priority modes and other features - DMA Controller – Basic concepts in serial I/O – Software controlled asynchronous serial I/O – 8251A Programmable Communication Interface.

**Text Book**

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | Ramesh S.Gaonkar | Microprocessor Architecture, Programming and Applications with The 8085 | Penram International Publications | 2000 and 4th edn |

## Books for Reference

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | Douglas V. Hall | Microprocessors and digital systems | McGraw Hill | 1983 and 1st edn |
| 2 | Mohammad Refiguzzaman | Microprocessor and microcomputer based system Design | Universal bookstall | 1990 and 2nd edn |

## Pedagogy

- Chalk and Talk lectures, Group Discussion, Seminar, Interaction and Power Point Presentation

## Course Designer

Dr.J.Balavijayalakshmi

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23E05 | MATERIALS SCIENCE - II | THEORY | 88 | 2 | - | 5 |

## Preamble

- The aim of this course is to introduce the students to electron theory of solids and different types of materials based on their properties.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | List the basic concepts of conductors ,dielectric | K1 |
| CLO2 | Understand the basic laws of magnetism | K2 |
| CLO3 | Provide the students with an idea of dielectric and magnetism which are essential tools in problem solving. | K2 |
| CLO4 | Solve problems based on electron theory of solids and for different materials | K3 |
| CLO5 | Find applications of the superconductors. | K3 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | S | M | S | L |
| CLO2 | S | S | S | S | S | M |
| CLO3 | S | S | S | S | S | S |
| CLO4 | S | M | M | S | S | S |
| CLO5 | S | M | S | S | S | S |

S- Strong; M-Medium; L-Low

## MATERIALS SCIENCE – II - PS23E05 – 88 HRS

**Unit I**

**Electron Theory of Solids (18 Hrs)**

Introduction-the classical free electron theory and the quantum free electron theory- Electron energy in metals and Fermi energy- density of states- anti-symmetric nature of the wave functions of the Fermi system – explanation of covalent bonding in crystals- electron in a periodic potential- energy bands in solids- Brillouin zones – distinction between metals, insulators and semiconductors- effect mss of electron and concept of hole – the Hall effect.

**Unit II (17 Hrs)**

**Conducting Properties of materials**

Introduction- atomic interpretation of ohms law- relaxation time and electrical conductivity – relaxation time – collision time- mean free path- heat developed in a current carrying conductor- sources of resistivity of metals and alloys- thermal conductivity- Wiedemann Franz law- thermal expansion- electrical conductivity at high frequencies- geometrical and magnetic field effects on electrical conductivity- variation of electrical resistivity due to mechanical stress (strain gauge)- different types of conducting materials.

**Unit III (17 Hrs)**

**Dielectric Properties of materials**

Introduction- fundamental definition in dielectric – different types of electric polarization- frequency and temperature effects on polarization- dielectric loss- local field or internal field – Clausius- Mossotti relation – determination of dielectric constant – dielectric break down- properties and different types on insulating materials – Ferro electric materials

**Unit IV (18 Hrs)**

**Magnetic Properties of materials**

Introduction- different type soft magnetic materials – classical theory of dia magnetism (Langevin theory)- Langevin theory of para magnetism- Weiss theory of para magnetism- Weiss of Ferro magnetism (molecular field theory on field magnetism) – Heisenberg interpretation on internal field and quantum theory of ferromagnetism- domain theory of Ferro magnetism- hard and soft materials

**Unit V (18 Hrs)**

**Superconducting materials**

Introduction- explanation for the occurrence of super conductivity – general properties of super conductors- other general observations- types of superconductors- applications of superconductors.

**Text Book**

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | Arumugam. M | Material Science | Anuradha agencies- Kumbakonam | 1990 and 1st edn |

## Books for Reference

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | Raghavan | Materials and engineering | Prentice Hall of India | 1990 and 3rd edn |
| 2 | Vijaya & Rangarajan | Materials Science | Tata McGraw Hill Publishing Company Ltd | 2005 and 1st edn |
| 3 | Raghavan | Materials Science | Prentice Hall | 1990 and 13th edn |

## Pedagogy

- Chalk and Talk lectures, Group Discussion, Seminar, Interaction and Power Point Presentation

## Course Designer

1. Ms. S.Subanya

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23E06 | BIO MEDICAL INSTRUMENTATION - II | THEORY | 88 | 2 | - | 5 |

## Preamble

- The objective of this paper is to introduce the students the basic knowledge of transducers, recorders and other bio medical instruments and devices.

## Course Learning Outcomes

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Recognize the technical vocabulary associated with biomedical Instrumentation. | K1 |
| CLO2 | Understand the uses of various instruments in medicine. | K2 |
| CLO3 | Understand the canonical structure of biomedical instrumentation systems. | K2 |
| CLO4 | Review the static and dynamic performance characteristics for instrumentation systems. | K3 |
| CLO5 | Understand the problem and the ability to identify the necessity of equipment to a specific problem. | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | M | S | L | L | L |
| CLO2 | S | S | S | S | M | M |
| CLO3 | S | S | S | S | M | M |
| CLO4 | S | S | S | S | S | M |
| CLO5 | S | S | S | S | S | S |

S- Strong; M-Medium; L-Low

## BIO MEDICAL INSTRUMENTATION – II - PS23E06 – 88 HRS

**Unit I** **(18 hrs)**

**Electrodes and transducers**

Transducers for medical applications-Active transducers-Passive transducers-Electrode theory-Components of biomedical instrument system-electrodes- microelectrodes-chemical electrodes

**Unit II** **(17 hrs)**

Different types of transducers-Magnetic induction type-piezoelectric type-thermoelectric type-capacitive transducers-inductive transducers- linear variable differential transformer

**Unit III** **(17 hrs)**

**Biopotential Recorders-I**

Cardiovascular instrumentation-characteristics of recording system-electrocardiography- origin of cardiac potentials-P,R,T,S-T,Q waves-ECG lead configurations-ECG recording set up-Practical considerations for ECG recording-

**Unit IV** **(18 hrs)**

**Biopotential Recorders-II**

Analysis of ECG signals-Phonocardiography-Heart sounds-Physical characteristics of heart sounds-Recording set up-Relationship between the heart sounds and function of the cardiovascular system-Medical applications-special; applications of phonocardiogram Electroencephalograph(EEG) -recording of evoked potentials-electromyograph

**Unit V** **(18 hrs)**

**Physiological Assist devices**

Pacemakers-Pacemaker batteries-Artificial heart valves-Defibrillators-Nerve and muscle stimulators-Heart lung machine-Kidney machine.

**Text Book**

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | Arumugam. M | Biomedical Instrumentation (units II,III, IV& V) | Anuradha Publications | 2007 and 1st edn |
| 2 | James Cameron | Medical Physics (Units III , IV& V) | Wiley publications | 1978 and 1st edn |

## Books for Reference

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | Leslie Cromwell, Fred J Weibell and Erich A.Pfeiffer | Biomedical Instrumentation and Measurements | Prentice Hall of India | 1992 and 2nd edn |

## Pedagogy

- Chalk and Talk lectures, Group Discussion, Seminar, Interaction and Power Point Presentation

## Course Designer:

1. Dr.M.Lavanya

**ADVANCED LEARNERS' COURSE II**

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS16AC3 | ENERGY PHYSICS - II | THEORY | SELF STUDY | | | *5 |

**Objective:** This paper aims to introduce the different nonconventional energy sources and the methods of harnessing energy from them

**Unit I**

**Solar Energy**

Solar radiation – Solar radiation outside the earth's atmosphere Solar radiation at the earth's surface – Solar Thermal Energy – Solar Thermal devices and systems:Solar water heater – Sub components of solar water heater – Solar Cooker and its merits and demerits.

**Unit II**

**Wind Energy**

Power in the wind – Types of wind energy systems –Horizontal axis wind Turbine – Vertical axis wind Turbine.

**Unit III**

**Ocean Energy**

Tidal Energy – Ocean Thermal Energy Conversion (OTEC) – Closed Cycle OTEC system – Open Cycle OTEC System

**Unit IV**

**Energy from Biomass**

Biomass feedstock-water material-energy crops-important properties of biomass-conversion of biomass to gaseous fuels-anaerobic digestion-thermal gasification.

**Unit V**

**Geothermal Energy**

Introduction- Estimates of Geothermal power – Nature of Geothermal fields – Geothermal sources – Advantages and Disadvantages of geothermal energy- Applications of geothermal energy.

**Text Book**

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | Sukhatme S.P | Solar Energy (Unit I) | Wiley publications | 1975 and 1st edn |
| 2 | Rai. G.D | Non Conventional Sources of Energy | Khanna Publishers | 2009 and 1st edn |
| 3 | Rai G.D | Solar Energy Utilization (Units II & III) | Khanna Publishers | 1987 and 1st edn |
| 4 | Yogi.D Goswami, Frank Krieth and Jan F. Krelder | Principles of Solar Engineering (Units IV & V) | Tailor & Francis | 2003 and 1st edn |

**ADVANCED LEARNERS' COURSE II**

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS16AC4 | EXPERIMENTAL TECHNIQUES AND DATA ANALYSIS - II | THEORY | SELF STUDY | | | *5 |

**Objective:** To make the students understand the concepts of data acquisition systems, data conversion, the principles of working of input and output devices, displays, amplifiers, Electronic measuring and testing instruments.

**Unit – I**

**Data Acquisition and Conversion**

Introduction – Signal conditioning of the inputs – Single channel data acquisition systems –Multi channel data acquisition system – Data conversion – Digital of Analog converter – Analog to Digital converter – Multiplexer and Sampling hold circuits.

**Unit II**

**Input – Output Devices and Displays**

Introduction – Analog display and recorder – Graphic recorder – Optical oscillograph – self balancing potentiometer – X-Y recorder – Magnetic recorder – Digital input – output devices –Punched card-paper type – output equipments – Line printer – Digital tape recording – Disk files and floppy disk.

**Unit III**

**Electronic Measuring Instruments**:

Q-meter- Vector impedance meter- Digital frequency meter – Digital voltmeter – Phase meter- RF power and voltage measurement –Power factor meter – Vector voltmeter.

**Unit –IV**

**Amplifiers**:

Instrumentation amplifiers,- isolation amplifiers-chopper amplifiers – voltage to frequency and frequency to voltage converters – frequency multipliers – logarithmic amplifiers.

**Unit –V**

**General purpose electronic Test Equipment:**

Oscilloscope : Basic principles – CRT features – Basic principles of signal displays – Block diagram of oscilloscope – Simple CRO – Vertical amplifier – Horizontal deflecting system –Delay line in triggered sweep – CRT connection – Dual beam CRO – Dual beam oscilloscope –Storage oscilloscope measurement of frequency, capacitance, inductance and Voltage wave analysers and Spectrum analysers.

**Text Book**

| S. No | Authors | Title of the Book | Publishers | Year and Edition |
|---|---|---|---|---|
| 1 | Hefnick .A.O and W.D. Cooper | Modern Electronic Instrumentation and Measurement Techniques (Unit III) | Prentice Hall India Publications | 1978 and 1st edn |
| | C.S. Rangan, G.R. Sharma and VSV Mani | Instrumentation Devices and Systems (Unit I,II,IV, V) | Tata McGraw Hill Publications | 1983 and 2nd edn |

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS23CP4 | PHYSICS PRACTICALS IV | PRACTICAL | - | - | 90 | 4 |

## Preamble

- This course helps the student to acquire practical knowledge in making use of the 8085 ALP and its logical operation also develops the program writing skills using C language. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions, thus providing a hands-on learning experience.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Define the primary functions of 8085 ALP programming | K1 |
| CLO2 | Understand the theoretical concepts and their physical significance | K2 |
| CLO3 | Apply the theory to find the solutions of practical problems | K3 |
| CLO4 | Analyze the problem studied through analytical calculation | K5 |
| CLO5 | Acquire problem solving skills and to create more problems based on physical concepts | K6 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | S | L | L | L | L |
| CLO2 | S | S | S | S | M | M |
| CLO3 | S | S | S | S | M | M |
| CLO4 | S | S | S | S | S | S |
| CLO5 | S | S | S | S | S | S |

S- Strong; M-Medium; L-Low

## PHYSICS PRACTICALS IV - PS23CP4 – 90HRS

### List of Experiments
### (Any 16)

1. 8085 ALP for 8 bit addition using Memory and register
2. 8085 ALP for 8 bit subtraction using Memory and register
3. 8085 ALP for 8 bit multiplication and division
4. 8085 ALP using control instructions (Increment/Decrement & Rotate)
5. 8085 ALP for finding the biggest and smallest element in the array
6. 8085 ALP to sort the array in ascending and descending order
7. 8085 ALP for BCD to Binary conversion
8. 8085 ALP for Binary to BCD conversion
9. 8085 ALP for Binary to ASCII conversion
10. 8085 ALP for ASCII to Binary conversion.
11. RS and D Flip Flops using NAND gates
12. Thevenin Theorem
13. Norton's Theorem
14. High/ Low/ Band Pass filter
15. Construction of basic gates using Diodes and Transistor
16. Solving Simple Boolean equation using ICs.
17. Half Wave and Full Wave rectifier
18. Obtain the energy of various atoms namely H, O and N in their neutral, cationic and anionic states.
19. Obtain the energy of diatomic molecules such as $H_2$, $O_2$ and NaCl by varying their interatomic distances.

**Pedagogy**

Demonstration and practical sessions

**Course Designers:**

Dr. N. Priyadharsini
Dr. G. Praveena

| COURSE CODE | COURSE TITLE | CATEGORY | L | T | P | CREDIT |
|---|---|---|---|---|---|---|
| PS21SB02 | NON CONVENTIONAL ENERGY RESOURCES | THEORY | 43 | 2 | - | 3 |

## Preamble

- The main objective of this course is to impart theoretical knowledge non-conventional sources of energy to the students and provide them with field exposure and hands-on learning.

## Course Learning Outcomes

On the successful completion of the course, students will be able to

| CLO Number | CLO Statement | Knowledge Level |
|---|---|---|
| CLO1 | Familiarize with the basics of renewable energy sources | K1 |
| CLO2 | Understand the generation of power from non conventional energy sources available in the geographical region. | K2 |
| CLO3 | Apply and demonstrate the acquired knowledge through hands on training. | K3 |
| CLO4 | Analyse the environmental aspects of solar, wind and biomass energy resources and their prospects and limitations. | K4 |

## Mapping with Programme Learning Outcomes

| CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
|---|---|---|---|---|---|---|
| CLO1 | S | M | M | M | S | S |
| CLO2 | M | S | S | M | M | S |
| CLO3 | S | M | S | S | S | S |
| CLO4 | S | S | S | S | S | M |

S- Strong; M-Medium; L-Low

## NON CONVENTIONAL ENERGY RESOURCES - PS21SB02 – 45 HRS

**Unit I** **(8 Hrs)**

**Introduction to Energy Sources:** Energy sources and their availability – Renewable energy sources - non-conventional energy sources. An overview of Wind Energy, Tidal Energy, solar energy, biomass, geothermal energy and hydroelectric energy – Advantages of Renewable energy sources.

**Unit II** **(8 Hrs)**

**Solar energy:** Solar constant – Solar Radiation at the earth's surface - solar radiation geometry – solar radiation Measurements – Pyrheliometers – Pyranometers – schematic diagrams and principles of working - applications of solar energy – solar water heating – solar cooking – solar furnace – agricultural and industrial process heat- solar green house.

**Unit III** **(8 Hrs)**

**Wind Energy:** Introduction – Fundamentals of Wind energy – Basic components of wind energy conversion – Wind data and energy estimation - Site selection consideration - Classifications – Advantages – Disadvantages –Wind energy collectors - Applications of Wind energy.

**Bio Energy:** Biomass energy – Biomass conversion process - Photosynthesis – classification.

**Unit IV: Field Visit** (**10 Hrs)**

Students shall visit to Energy Resource laboratories in Universities/Research Organizations/ nearby industries to observe, understand the techniques and procedures adopted. Student to submit consolidated field visit reports for evaluation.

**Unit V: Group Project** (**11 Hrs)**

**(Any one mini-Project)**

Design a miniaturised working model (energy resources/energy generation/conversion/ Iot based prototypes)

The project evaluation will be done by the HoD and Staff Co-ordinator by conducting viva voce Examination.

**Text Book**

| S. No | Authors | Title of the Book | Publishers | Year and Edition |
|---|---|---|---|---|
| 1. | G.D Rai | Non-Conventional Energy Sources | Khanna Publishers | 2004 and 4th edn |
| 2. | B H Khan | Non-Convention Energy Resources | McGraw Hill Education (India) Pvt. Ltd | 2003 and 3rd edn |
| 3. | Subhas P Sukhatme | Solar energy | Tata McGraw Hill | 1996 and 2nd edn |

| | | | | |
|---|---|---|---|---|
| 4. | Kothari D.P, K.C. Singal and Rakesh Ranjan | Renewable energy sources and emerging Technologies | Prentice Hall of India | 2008 and New edn |

**Books for Reference**

| S. No | Authors | Title | Publishers | Year and Edition |
|---|---|---|---|---|
| 1. | N.K.Bansal, Manfred Kleeman & Mechael Meliss | Renewable Energy Sources and Conversion Technology | Tata McGraw Hill | 2004 and 9th edn |
| 2. | Ashok V | Non-Conventional Energy. | Desai Wiley Eastern Ltd, New Delhi. | 2022 and 2nd edn |
| 3. | Ramesh R & Kumar K U | Renewable Energy Technologies | Narosa Publishing House New Delhi | 2004 and New edn |

**Pedagogy**

- Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar, Field visit, Project Submission

**Course Designer**

Mrs. S. Subanya

**Resources of E-content**

https://archive.nptel.ac.in/courses/121/106/121106014/