**ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN, PALANI**

**(AUTONOMOUS)**

**RE-ACCREDITED WITH $B^{++}$ GRADE BY NAAC**

**(Affiliated to Mother Teresa Women's University, Kodaikanal)**

**DEPARTMENT OF PHYSICS**

# CURRICULUM FRAMEWORK AND SYLLABUS FOR OUTCOME BASED EDUCATION

**IN**

## B.Sc., (PHYSICS)

**&**

## EXTRA-CREDIT COURSES

**UNDER**

**CHOICE BASED CREDIT SYSTEM**

**2019-2022**

**PREAMBLE:**

The Department of Physics was established in 1970. The Department focuses mainly on strengthening the economically backward students. The faculty of our Department works with their might to help the students grow in their academic stature. The research activity of the faculty is ever growing and they contribute research articles to the reputed journals. The students are with the impetus to score well in the examinations. Academic activities like seminars, workshops and exhibitions on various topics are conducted so that our students get well exposed to the recent developments in the subject. In framing the curriculum, much focus is given on various areas of interest in the field of Physics so that the students will have updated knowledge in the subject. The syllabus is flexible, giving way for Mathematics and Chemistry as Ancillary subjects. The entire course of study is to be effected under the Choice Based Credit System. The framed syllabus and allocation of courses for the various semesters have an integrated approach to theory classes and laboratory experiments. The allocation of the courses for successive semesters is such as to give students continuous link to the overall study of the subject. In the fast changing environment, besides the core subjects, application oriented subjects also find a place in the curriculum for the purpose of self employment. The syllabi include self study portions, seminars, guest lectures, field visits to recent trends in the field and familiarize the students with oral and presentation skill. The syllabus includes skill based course (computer literacy and MS office) and core elective (computer programming in C) to provide computer knowledge and to use computers with confidence for programming and report preparations. The syllabus provides a clear knowledge and better understanding of principles of physics together with the practical, analytical and mathematical skills. The syllabus includes Communicative English to work productively with other people, to communicate effectively and learn independently.

## Bloom's Taxonomy in fixing the Learning Objectives:

Since the Academic year 2019 – 2020, the curriculum for B.Sc., (Physics) has been designed and the learning objectives and outcomes of the programmes are set, following the Bloom's Taxonomy Cognitive Domain. Accordingly, it is broken into six levels of learning objectives of each course. They are -

K1 / Knowledge = Remember

K2 / Comprehension = Understand

K3 / Application = Apply

K4 / Analysis = Analyze

K5 / Evaluation = Evaluate

K6 / Synthesis = Create

## Bloom's Taxonomy Action Verbs:

**K1 / Knowledge**: Arrange, Define, Describe, Duplicate, Identify, Label, List, Match, Memorize, Name, Order, Outline, Recognize, Relate, Recall, Repeat, Reproduce, Select, State

**K2 / Comprehension**: Classify, Convert, Defend, Describe, Discuss, Distinguish, Estimate, Explain, Express, Extend, Generalize, Give example(s), Identify, Indicate, Infer, Locate, Paraphrase, Predict, Recognize, Rewrite, Review, Select, Summarize, Translate

**K3 / Application**: Apply, Change, Choose, Compute, Demonstrate, Discover, Dramatize, Employ, Illustrate, Interpret, Manipulate, Modify, Operate, Practice, Predict,
Prepare, Produce, Relate, Schedule, Show, Sketch, Solve, Use, Write

**K4 / Analysis**: Analyze, Appraise, Breakdown, Calculate, Categorize, Compare, Contrast, Criticize, Diagram, Differentiate, Discriminate, Distinguish, Examine, Experiment, Identify, Illustrate, Infer, Model, Outline, Point out, Question, Relate, Select, Separate, Subdivide, Test

**K5 / Evaluation**: Appraise, Argue, Assess, Attach, Choose, Compare, Conclude, Contrast, Defend, Describe, Discriminate, Estimate, Evaluate, Explain, Judge, Justify, Interpret, Relate, Predict, Rate, Select, Summarize, Support, Value

**K6 / Synthesis**: Arrange, Assemble, Categorize, Collect, Combine, Comply, Compose, Construct, Create, Design, Develop, Devise, Explain, Formulate, Generate, Plan, Prepare, Rearrange, Reconstruct, Relate, Reorganize, Revise, Rewrite, Set up, Summarize, Synthesize, Tell, Write

## Mapping COs with POs:

For each programme, the Educational objectives and the Specific objectives are specified. The programme outcomes are designed according to the curriculum, teaching, learning and evaluation process. For each course, the definite outcomes are set, giving challenge to the cognitive domain. The course outcomes are mapped with the programme outcomes. The performance of the stakeholders is assessed and the attainment rate is fixed, by using the measurements 'high', 'medium' and 'low'. The restructuring of the curriculum is done based on the rate of attainment.

## Institutional Objectives:

- Women Education
- Women Empowerment
- Self-reliance and
- Making Model Citizens.

## Programme Educational Objectives:

- **PEO1:** To provide the students with the basic foundation in Physics, the scientific method (especially the interplay of theory and experiment) and to motivate scientific enthusiasm and curiosity and the joy of learning.
- **PEO2:** To develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools.
- **PEO3:** To provide students with the tools needed to analyze problems, apply mathematical formalism and experimentation, and synthesize ideas.
- **PEO4:** To provide the students with employment and technical skills necessary for successful careers in Physics and related fields.
- **PEO5:** To expertise the students in scientific or technical quantitative reasoning abilities.

## Programme Specific Objectives:

- Students will demonstrate an understanding of concepts of Physics
- Students will understand the interplay between theory and experiment
- Students will exhibit curiosity and enthusiasm for learning science
- Students will demonstrate an ability to analyze problems
- Student will successfully carry out experiments to arrive at scientific results

- Students will successfully apply computing tools to problems
- Students will communicate well orally and in writing in scientific context
- Students will be able to use laboratory devices and electronics in scientific applications.

## Programme Outcomes:

**On completion of the B.Sc., (Physics) programme, certain outcomes are expected.**

- **PO1:** Students will demonstrate an understanding of core knowledge in Physics.
- **PO2:** Students will show that they have learned laboratory skills, enabling them to take measurements in a Physics laboratory and analyze the measurements to draw valid conclusions.
- **PO3:** Students will demonstrate written and oral communication skills in communicating Physics-related topics.
- **PO4:** Students will pursue their higher studies and undertake research work.
- **PO5:** Students will take up future academic carrier and establish themselves in global scenario.

## Mapping PEOs with IOs:

| **Programme Educational Objectives** | **Institutional Objectives** | | | |
|---|---|---|---|---|
| **B.Sc., (Physics)** | **1** | **2** | **3** | **4** |
| **PEO1:** To provide the students with the basic foundation in Physics, the scientific method (especially the interplay of theory and experiment) and to motivate scientific enthusiasm and curiosity and the joy of learning. | * | | | |
| **PEO2:** To develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. | | * | | |
| **PEO3:** To provide students with the tools needed to analyze problems, apply mathematical formalism and experimentation, and synthesize ideas. | | | * | |
| **PEO4:** To provide the students with employment and technical skills necessary for successful careers in Physics and related fields. | | | | * |
| **PEO5:** To expertise the students in scientific or technical quantitative reasoning abilities. | | | | * |

## COMMON ACADEMIC STRUCTURE

### B.Sc., (Physics) / 2019 - 2022

| Title of the Course | Hours | | Marks | | | Credits |
|---|---|---|---|---|---|---|
| | Theory | Practical | CIE | CE | Total | |
| **SEMESTER – I** | | | | | | |
| Part-I Tamil-I | 6 | | 25 | 75 | 100 | 3 |
| Part-II English-I | 6 | | 25 | 75 | 100 | 3 |
| Part-III: Core – I: Mechanics and Properties of Matter | 4 | | 25 | 75 | 100 | 4 |
| Core II: Electricity and Electromagnetism | 4 | | 25 | 75 | 100 | 4 |
| Core Practical – I: | | 2 | | | | |
| Ancillary – I: Mathematics - I | 5 | | 25 | 75 | 100 | 5 |
| Part-IV: SBC – I Waves and Oscillations | 2 | | 25 | 75 | 100 | 2 |
| Part – V: VBE: Yoga & Meditation (Theory &Practical) | 1 | | 25 | 75 | 100 | 2 |
| **Total** | **28** | **2** | | | **700** | **23** |
| **SEMESTER – II** | | | | | | |
| Part-I Tamil | 6 | | 25 | 75 | 100 | 3 |
| Part-II English | 6 | | 25 | 75 | 100 | 3 |
| Part-III: Core III: Thermal Physics | 8 | | 25 | 75 | 100 | 4 |
| Core Practical - I | | 3 | 40 | 60 | 100 | 4 |
| Ancillary – II: Mathematics-II | 5 | | 25 | 75 | 100 | 5 |
| Part-IV SBC: Computer Fundamentals and MS Office | 2 | | 25 | 75 | 100 | 2 |
| **Total** | **27** | **3** | | | **600** | **21** |
| **SEMESTER – III** | | | | | | |
| Part I-Tamil | 6 | | 25 | 75 | 100 | 3 |
| Part II-English | 6 | | 25 | 75 | 100 | 3 |
| Part – III: Core IV- Optics | 6 | | 25 | 75 | 100 | 5 |
| Core Practical - II | | 3 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Ancillary – I: Chemistry-I | 3 | | 25 | 75 | 100 | 3 |
| Ancillary Practical | | 2 | | | | |
| Part-IV: SBC: Material Science | 2 | | 25 | 75 | 100 | 2 |
| Part-IV: NME – I: Astro-Physics | 2 | | 25 | 75 | 100 | 2 |
| **Total** | **25** | **5** | | | **600** | **18** |
| **SEMESTER – IV** | | | | | | |
| Part-I-Tamil | 6 | | 25 | 75 | 100 | 3 |
| Part-II-English | 6 | | 25 | 75 | 100 | 3 |
| Part – III: Core-V- Basic Electronics | 4 | | 25 | 75 | 100 | 5 |
| Core-VI-Relativity & Atomic Physics | 4 | | 25 | 75 | 100 | 4 |
| Core Practical-II | | 3 | 40 | 60 | 100 | 4 |
| Ancillary – II: Chemistry II | 3 | | 25 | 75 | 100 | 3 |
| Ancillary Practical | | 2 | 40 | 60 | 100 | 4 |
| Part-IV: SBC: Nano Science & Nano Technology | 2 | | 25 | 75 | 100 | 2 |
| PART V: Extension Activities | | | | | 100 | 1 |
| **Total** | **25** | **5** | | | **900** | **29** |
| **SEMESTER – V** | | | | | | |
| Part – III: Core –VII: Advanced Mechanics | 6 | | 25 | 75 | 100 | 5 |
| Core – VIII: Digital Electronics | 6 | | 25 | 75 | 100 | 4 |
| Core Practical - III | | 3 | | | | |
| Core Practical - IV | | 3 | | | | |
| Core Elective: I Computer Programming in 'C'/Fundamentals of Microprocessor 8085 | 5 | | 25 | 75 | 100 | 5 |
| Core Elective: II: Energy Physics / Mathematical Physics | 5 | | 25 | 75 | 100 | 5 |
| Part-IV: SBC: Computer Programming in 'C' –Practicals | | 2 | 40 | 60 | 100 | 2 |
| **Total** | **22** | **8** | | | **500** | **21** |
| **SEMESTER – VI** | | | | | | |
| Part-III: Core – IX: Solid State Physics | 7 | | 25 | 75 | 100 | 5 |
| Core – X: Nuclear and Particle Physics | 6 | | 25 | 75 | 100 | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Core Practical - III | | 3 | 40 | 60 | 100 | 4 |
| Core Practical - IV | | 3 | 40 | 60 | 100 | 4 |
| Major Elective: III<br>Laser, Fibre Optics & Spectroscopy /<br>Communication Electronics | 5 | | 25 | 75 | 100 | 5 |
| Part – IV: SBC: Project | | 2 | 75 | 25 | 100 | 2 |
| Part-IV: NME – II:<br>Types of Energy & their Utilization | 2 | | 25 | 75 | 100 | 2 |
| Part – V: Environmental Studies | 2 | | 25 | 75 | 100 | 2 |
| **Total** | **22** | **8** | | | **800** | **28** |

**Total Credits - 140**

## EXTRA-CREDIT COURSES

| S.No | Title of the Course | Internal Marks | Credits |
|---|---|---|---|
| 1 | Course- I: Astronomy | 100 | 2 |
| 2 | Course -II: Electrical Appliances | 100 | 2 |
| 3 | Course -III: Biomedical Instrumentation | 100 | 2 |

**SEMESTER – I**

**Programme:** B.Sc., **Subject:** Physics

**Semester:** I **Course:** Mechanics and Properties of Matter

**Course Type**: Core I **Course Code**: MUPC1

**Contact Hours**: 4 hours / week **Credits**: **4**

**CIA:** 25 **CE: 75**

**Course Outcomes:**

On completion of the course, the student will be able to,

- Get knowledge about forces in their daily type and understand the principle of rocket propulsion.
- Gain information on rolling concepts.
- Learn the basic concepts of gravitation laws.
- Identify the type of forces, type of supports and the reactions.
- Understand the principles, basic equations and apply them to unseen.

## COURSE CONTENT

**Unit – I: Conservation Laws**:

Impulse and momentum - Conservation of linear momentum- center of mass – collision: Direct and oblique – Final velocities - loss of Kinetic energy.

**Rocket Motion:**

Expression for thrust and velocity - multistage rocket – escape velocity.

**Motion of Rigid Body:**

Moment of inertia - Parallel and perpendicular axes theorems -M.I. of circular disc - solid sphere - hollow sphere and cylinder about all axes -compound pendulum - Torque and angular momentum - Relationship between them - K.E. of rotation – conservation of angular momentum - Top processional motion-gyroscopic motion and gyrocompass.

**Unit II : Gravitation:**

Kepler's laws of planetary motion and derivation of law of gravitation - Newton's universal law of Gravitation - Boy's method of determimg G -Acceleration due to Gravity - compound pendulum - Bar pendulum - Minimum time period - variation of g with altitude and depth - variation of g with rotation of the earth - Difference between mass and weight - Gravitational field - Gravitational potential - Gravitational potential energy -Gravitational potential due to uniform solid sphere.

**Unit-III : Elasticity:**

Definitions: Yield point, Elastic limit,Elastic fatigue and Elastic moduli - Poisson's ratio-Determination of Poisson's ratio for rubber - work done in deforming a body - Relation between Elastic constants (Y, G, K and γ)- limiting value of γ – Torsion - Twisting of a cylinder-Torsion Pendulum- Bending of beams-Bending moment-Basic assumptions for theory of Bending-Cantilever-Determination of 'Y' by Uniform bending (Pin & Microscope)- Determination of 'Y' by Non -Uniform bending (Scale &Telescope)- I Section girders-Determination of elastic constants by Searle's method.

**Unit-IV: Viscosity:**

Introduction–Stoke's Law-Co-efficient of viscosity-Stream lined & Turbulent motion-Rate of flow–equation of continuity-Bernoulli's theorem: Statement & Proof-Applications: Ventruimeter and Pitot tube-Poiseuille's method for coefficient of viscosity-Stoke's formula for highly viscous liquid-Ostwald's viscometer.

**Unit-V: Surface Tension:**

Introduction-surface tension-explanation of surface tension- pressure difference across a curved surface-examples of surface tension-surface energy and surface tension-capillarity- examples of capillarity -expression for surface tension-experiment to determine surface tension of water-Jaeger's method for determining surface tension of liquid at various temperatures.

Prescribed Text:

- Brijlal and Subramaniam, *Properties of Matter,* Eurasia Publishing House, 1991.

Books for Reference:

- R.Murugeshan,*Mechanics, Properties of Matter and Sound* , S.Chand Company,1999.
- D.S.Mathur, *Elements of Properties of Matter,* Shyam Lal Charitable Trust, 1992.

********

**Programme:** B.Sc., **Subject:** Physics

**Semester:** I **Course:** Electricity and Electromagnetism

**Course Type:** Core Course II **Course Code**: MUPC2

**Contact Hours**: 4 hours / week **Credits:** 4

**CIA:**25 **CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Use the concepts of electricity and magnetism to express physical processes and related technical improvements.
- Apply Maxwell's equations for electromagnetic wave propagation.
- Calculate inductances
- Apply Gauss, Ampere's and Faraday's laws in the context of advanced electrical devices.
- Design, setup and carry out experiments and compare with theoretical predictions.

## COURSE CONTENT

**Unit-I: Electrostatics & Capacitors:**

Electric field and flux – Gauss' law – Application of Gauss field due to charge sphere – Coulomb's theorem - mechanical force on the surface of a charged conductor – electric potential – equipotential surface - relation between electric field and electric potential – Capacity of a condenser – types of condensers :spherical, cylindrical and parallel plate condensers — energy stored in a capacitor.

**Unit-II: Electric Circuits:**

Kirchhoff's laws-application of Kirchhoff's law to Wheat stone's bridge-Sensitiveness of a Wheat stone's bridge – Carey Foster's Bridge –experiment to determine the resistance and resistivity of a wire- Potentiometer: Measurement of Potential and Calibration of voltmeter – Measurement of current and calibration of Ammeter – Measurement of Resistance.

**Unit – III: Alternating Current and AC Current:**

R.M.S for effective value of A.C – mean value of the alternative e.m.f – Phase difference – Resistance, Capacitance and Inductance are connected to A.C. source - LCR series and parallel resonance circuits - Impedance and Q factor–Power in AC circuit –power factor –Transformers : theory, losses and uses.

AC bridges for measuring inductance – Maxwell's bridge – Owen's bridge – Anderson's bridge –Desauty's bridge.

**Unit-IV: Electromagnetic Induction:**

Laws of electromagnetic induction - Self-inductance – Mutual inductance – Determination of Mutual inductance (M) – coefficient of coupling - eddy current – uses.

**Unit-V: Magnetism:**

Magnetic fields – Magnetic Flux – Biot Savart law- Force on a current element in magnetic field - Torque on a current loop in a uniform magnetic field - Ampere's law.

Moving coil Galvanometer: Dead beat and Ballistic – Damping correction – Applications – Determination of figure of merit of dead beat Galvanometer – Experiment to determine charge sensitivity of ballistic galvanometer – Experiment to find absolute capacity of a condenser – Experiment to compare the capacities of condensers – Experiment to compare the electromotive forces of the cells.

**Prescribed Text :**

- R.Murugeshan, *Electricity and Electromagnetism*, S.Chand &Company, 2002.

**Book for Reference:**

- K.K. Tewari , *Electricity and Magnetism*, S.Chand & Company, 1990.
- Brijlal Subramaniam,*Electricity and Magnetism* , S.Chand & Company, 2002.
- Nagarathinam and Lakshmi Narayan, *Electricity and Magnetism*

**Programme:** B.Sc.,

**Subject:** Physics

**Semester:** I

**Course:** Waves and Oscillations

**Course Type:** SBC-I

**Course Code**: MUPW01

**Contact Hours:** 2 hours / week

**Credits:** 2

**CIA: 25**

**CE: 75**

**Course Outcomes:**

On completion of the course the student will be able to,

- Understand the significance of longitudinal and transverse waves
- Distinguish between the phase velocity of a travelling wave and the group velocity of a wave group.
- Derive and solve the equations of motions for physical systems that undergo SHM. Demonstrate the laws of transverse vibration of a stretched string using sonometer
- Know the production and applications of ultrasonic waves, factors affecting acoustics of buildings

## COURSE CONTENT

**Unit-I : Sound:**

Classification of sound- characteristics of musical sound-Loudness-Weber Fechner law-Longitudinal and Transverse waves – Relation between wavelength, frequency and wave velocity – characteristics of progressive waves – Intensity of sound – Phase velocity and group velocity – Beats (definition only).

**Unit-II : Theory of Transverse Vibrations:**

Theory of Transverse vibrations along a stretched string - Verification of I, II, and III laws using sonometer – Melde's string experiment: Frequency determination of an electrically maintained turning fork.

**Unit-III: Simple Harmonic Motion:**

S.H.M – S.H.M as the projection of uniform circular motion – Composition of two S.H.Ms of the same periods at right angles to each other - Lissajou's figures – Free vibrations of a body – Damped vibrations – Forced oscillations.

**Unit-IV: Ultrasonics:**

Ultrasonics – Properties- Production: Magnetostriction method, Piezoelectric method - Methods of Detection - Applications.

**Unit-V: Acoustics of Buildings:**

Reverberation- Reverberation time-Sabine's formula(definition only)-Absorption coefficient and its determination- Factors affecting acoustics of buildings and their remedies.

**Prescribed Text:**

- R.Murugeshan, *Properties of matter and Acoustics* , S.Chand, 2002.
- C.L.Arora ,*Waves, Vibrations and Sound* , S.CHAND &Company, 1999.
- Ashok K. Ganguli , *A Text Book of Waves and Oscillations,* S.Chand & Company,1989.
- S.R.Shankara Narayana, *Waves and Oscillations*, Sultan Chand & Sons, 1988.

**Books For Reference:**

- R.Murugeshan, *Mechanics, Properties of Matter and Sound* , S.Chand, 2002.
- G. Senthil Kumar, *Engineering Physics* , VRB Publishers, 2002.

*******

**SEMESTER - II**

**Programme:** B.Sc., **Subject:** Physics

**Semester:** II **Course:** Thermal Physics

**Course Type:** Core Course-III **Course Code:** MUPC3

**Contact Hours:** 8 hours / week **Credits:** 4

**CIA:** 25 **CE:** 75

**Course Outcomes:**

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

- Understand the equation, theorem and degrees of freedom of a thermo dynamical system.
- Apply the concepts of low temperature physics in liquefaction of gases
- Apply the concepts and laws of thermo dynamics to solve problems in thermo dynamics systems such as gases, heat engines etc.,
- Use the concepts and principles of black body radiation to analyse radiation process in thermo dynamics systems.
- Become familiarize with the properties of systems close to absolute zero

## COURSE CONTENT

**Unit-I : Kinetic Theory of Gases and Vanderwall's Equation:**

Introduction-Postulates of kinetic theory of gases-Expression for the pressure of a gas- Kinetic energy per unit volume of a gas-Kinetic interpretation of temperature-Derivation of gas equation-Derivation of gas laws-Degrees of freedom and Maxwell's law of equi-partition of energy-Atomicity of gases-Maxwell's law of distribution of velocity(no derivation) –Zartmann-Ko's method to verify Maxwell's law of velocity distribution-Mean free path-Expression for mean free path-Transport phenomena: Viscosity and thermal conductivity of gases -Behavior of Gases at high pressure-Vander wall's equation of state.

**Unit – II: Low Temperature Physics:**

Inter molecular attraction- Porous plug experiment with theory-Joule Kelvin effect-Temperature of Inversion-Liquefaction of Gases: Air, Oxygen & Helium – Properties of Liquid Helium-I & II-Production of low temperatures using adiabatic demagnetization.

**Unit-III: Transmission of Heat:**

Conduction- Co- efficient of Thermal conduction-Rectilinear flow of Heat along a Bar-Cylindrical flow of heat -Thermal conductivity of Glass-Heat flow through a compound wall-Accretion of ice in ponds- Thermal conductivity of a bad conductor using Lee's method -Wiedmann-Franz 's law- Applications of conduction.

Convection-Lapse rate: definition, expression -convective equilibrium of the atmosphere - Applications of convection.

Radiation-Black body-Stefan's law of radiation-Mathematical derivation of Stefan's law-Determination of Stefan's constant (Laboratory method)-Derivation of Newton's law of cooling from Stefan's law- Distribution of Energy in the spectrum of a black body: Wien's law and Rayleigh Jeans law-Planck's formula for blackbody radiation-deduction of Wien's law and Rayleigh Jeans law from Planck's formula –applications of radiation-Solar constant – determination of solar constant using water flow pyrheliometer - Temperature of the sun -Solar spectrum.

**Unit-IV: Thermodynamics**:

Thermodynamic system-Thermal Equilibrium and concept of Temperature (Zeroth law of thermodynamics)-concept of Heat-comparison of Heat and Work-First law of thermodynamics - First law of thermodynamics for a change in state of a closed system-Applications of first law of thermodynamics-Isothermal and adiabatic process-Gas equation during Adiabatic process- - Reversible and Irreversible process.

**Unit-V: Second and Third Laws of Thermodynamics:**

Second law of thermodynamics-Carnot's reversible engine-Carnot's engine and Refrigerator-Carnot's theorem-Entropy and the second law of thermodynamics-Entropy changes of a closed system during an irreversible process-entropy change in reversible and irreversible process.

Third law of Thermodynamics-Temperature-Entropy diagram-Entropy of a perfect gas-Maxwell's Thermo dynamical relations-Helmholtz function- Gibb's function-enthalpy-Cp, Cv and γ-Joule Kelvin coefficient-Equilibrium between liquid and its vapour -First order Phase Transitions.

**Prescribed Text:**

- Brijlal & Subramaniam , *Heat and Thermodynamics* , S.CHAND & Company, 2002.

**Books for Reference:**

- J.B. Rajam, *A Text book of Heat,* S.Chand &Company, 1970.
- Sears and Salinger , *Thermodynamics and Statistical Mechanics,*
- Saha & Srivastava ,*Treatise on Heat*, THE Indian Press Private Limited, 1972.
- D.S.Mathur, *Heat and Thermodynamics,* Shyam Lal Charitable Trust, 1992.

*******

**Programme:** B.Sc., **Subject:** Physics

**Semester:** II **Course:** Computer Fundamentals & MS Office

**Course Type: SBC-II** **Course Code:** MUPCM2

**Contact Hours: 2 hours / week** **Credits:** 2

**CIA:** 25 **CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Describe the usage of computers and why computers are essential components in business and society.
- Work with the basic features of Word, create high quality document designs and layouts.
- Be able to modify worksheet data and structure and format data in a Worksheet
- Be able to sort data, manipulate data using formulas and functions and add and modify charts in a worksheet
- Solve common business problems using appropriate Information Technology applications and systems.

## COURSE CONTENT

**Unit – I: Computer Fundamentals:**

Introduction – History of computers – Characteristics of computers – Need for a computer – Computer applications – Concept of computer – Structure of computer (Block Diagram & components) – Classification of computers – Types of computer.

**Unit –II: Input & Output Devices:**

Input devices – Keyboard – Mouse – Bar code Reader – Output devices – Monitor – Printer Impact of non – impact printers – Main memory – Secondary storage devices.

**Unit – III: Windows:**

Introduction – Elements of window – Various types of icons – Run through on window – Windows basic – Program manager – The file manager – Control panel.

**Unit – IV: Ms Word:**

Windows Layout – Menus – File – Edit – View – Insert tools – Tables –Windows – Saving & exiting – Spell check – Table creation – Inserting pictures- Mail merge.

**UNIT -V: EXCEL:**

Building a Worksheet – Selecting Worksheet items – Using Autofill – Adding rows and columns – Copying and Moving information – Creating and Copying formulas –Naming ranges s– Using functions – Improving the appearance of worksheet – Changing column Width – Formatting Text and Numbers – Using auto format – Spell Checking – Using Chart Wizard – Creating, Enhancing and Printing a chart.

**Prescribed Text:**

- Sanjay Saxena, *MS Office 2000 for every one* , VIKAS Pubishing House, 2013.

**Books for Reference:**

- Anita Goel, *Computer Fundamentals*
- Seema Sirpal, *Computer Basics,*
- Torben Lage Frandsen,*Microsoft Office Excel*

*******

**Programme:** B.Sc.,
**Subject:** Physics

**Semester:** I & II
**Course:** Major Practical -I

**Course Type:** Core Practical Course-I
**Course Code:** MUPP1

**Contact Hours:** 3 hours / week
**Credits:** 4

**CIA:** 40
**CE:** 60

**Course Outcomes:**

On completion of the course the student will be able to,

- Apply knowledge of mathematics and physics fundamentals and an instrumentation to arrive solution for various problems
- Understand the usage of basic laws and theories to determine various properties of the materials given.
- Gain knowledge in the scientific methods and learn the process of measuring different Physical variables
- Understand the application side of the experiments
- Use standard methods to calibrate the given low range voltmeter and ammeter and to measure resistance of the given coil.

**List of Experiments:**

1. Estimation of errors
2. Acceleration due to gravity– Compound Pendulum
3. Rigidity Modulus of a rod – Static Torsion apparatus
4. Rigidity Modulus of a wire – Torsion Pendulum
5. Young's Modulus – Uniform bending – Pin and Microscope
6. Young's Modulus – Uniform bending – Scale and Telescope
7. Young's Modulus – Non-Uniform bending – Pin and Microscope
8. Young's Modulus – Non-Uniform bending – Scale and Telescope
9. Voltmeter Calibration (Low Range) – Potentiometer
10. Voltmeter Calibration (High Range) – Potentiometer
11. Ammeter Calibration – Potentiometer
12. Resistance & Resistivity – Potentiometer
13. Resistance & Resistivity– Carey – Foster's bridge
14. Laws of transverse vibration-verification – Sonometer

15. Frequency of a Fork – Sonometer

16. Thermal Conductivity if a bad conductor – Lee's disc method

*******

**SEMESTER – III**

**Programme:** B.Sc.,
**Subject:** Physics

**Semester:** III
**Course:** Optics

**Course Type:** Core Course-IV
**Course Code:** MUPC4

**Contact Hours:** 6 hours / week
**Credits:** 5

**CIA:** 25
**CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Know about lenses and different defects arising in using lenses.
- Know to use lenses in constructing eyepieces and the formation of rainbows.
- Understand the function of interferometers.
- Understand the concept of diffraction and the theory of diffraction grating.
- Understand the phenomenon of polarization and apply the concept of optical activity in polarimeters.

## COURSE CONTENT

**Unit –I: Lenses and Aberrations:**

Lens – Refraction through lenses – Aberrations: Chromatic aberration & Spherical aberration – Minimization of aberrations – Coma – Astigmatism.

**Unit- II: Eyepieces, Dispersion and Rainbows:**

Ramsden's eyepiece – Huygen's eyepiece – Oil immersion objective – Dispersion – Dispersion through a prism – Cauchy's dispersion formula – Theory of Rainbows – Primary and Secondary Rainbows.

**Unit –III: Interference:**

Interference in thin films - colour of thin films – Air wedge –Determination of diameter of thin wire – Testing of planeness - Newton's rings – Determination of $\lambda$ and $\mu$ of a liquid - Michelson interferometer – Types of fringes - visibility of fringes –Applications: Determination of wavelength of monochromatic light and determination of difference in wavelengths of two spectral lines

**Unit –IV: Diffraction:**

Fresnel and Fraunhofer classes of diffraction – Fresnel's explanation for the rectilinear propagation of light – Zone plate - Fresnel's diffraction at a straight edge – Fraunhofer diffraction at single slit, double slit and circular aperture – Theory of diffraction grating –

Determination of wavelength – Dispersive power of a grating - Rayleigh's criterion for resolving power of a grating.

**Unit -V: Polarisation:**

Double refraction – Nicol prism : construction and working - Huygen's explanation – Production, Detection and Analysis of Plane, Circularly and Elliptically polarized light – Quarter and Half wave plates – Optical rotation – Fresnel's theory of optical rotation - Biot's laws – Laurent's half shade Polari meter.

**Prescribed Text:**

- Brijlal and Subramaniam, *Optics,* S.Chand &Company, 1988

**Book for Reference:**

- S.P. Singh and J.P. Agarwal, *Optics,*K.Nath & Co, 2014.
- Sathya prakash , *Optics,* Sultan Chand & Sons, 1985.
- R. Murugeshan, *Optics & Spectroscopy,* S.Chand & Company,2002.

******

**Programme:** B.Sc.,
**Subject:** Physics
**Semester:** III
**Course:** Material Science
**Course Type:** SBC-II
**Course Code:** MUPMS3
**Contact Hours:** 2 hours / week
**Credits:** 2
**CIA:** 25
**CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Understand the conducting properties of metals, insulators and semiconductors based on band theory
- Acquire knowledge about the behavior of different types of dielectric materials
- Know the function of optical devices like LED, LCD, Photoconductor etc,
- Understand the physical properties of nano materials and advanced ceramic materials
- Apply the behavior of various modern engineering materials like Polymers, Biomaterials, and Non-liner materials in recent development.

## COURSE CONTENT

**Unit I: Conducting Materials:**

Introduction – free electron theory – electrical conductivity – thermal conductivity – Wiedemann – Franz law – classification of solids on the basis of band theory – conducting materials – electrical resistivity in Alloys.

**Unit-II: Dielectric Materials:**

Dielectric materials - definitions –different types of polarization – dielectric loss - local field (or) internal field – Clausius – Mosotti equation – dielectric break down – different types of dielectric materials.

**Unit-III: Optical Materials:**

Introduction- Optical properties in metals, Insulators and Semiconductors- Excitons- Traps - Colour Centres -Fluorescence and Phosphorescence-Fluorescent Screen-Light-Emitting Diode(LED)-LED operating principle-LED materials-Liquid Crystal Displays-The liquid crystal-Liquid crystal materials-Advantages of LCDs-Thermography-Photoconductivity-Phontoconductor-Performance of a Photodetector - Photo conductive materials.

**Unit-IV: Modern Engineering Materials-I:**

Metallic glasses as transformer core material-Nanophase Materials-Synthesis-Variation of physical properties with geometry-Shape memory alloys-Advanced ceramic materials-Introduction-Classification of ceramics materials-Properties of materials-Applications of advanced ceramics.

**Unit-V: Modern Engineering Materials-II:**

Introduction – Classification of polymers- Polymerization –Properties of polymers- Bio Materials-Metals and alloys in biomaterial-Ceramic biomaterials-Composite biomaterials-Polymer biomaterials-Biopolymers-Tissues grafts-Biomaterials in ophthalmology- Dental materials-Non Liner material-Non Liner optical materials-Second harmonic generation-Optical Mixing- Applications of non-liner materials.

**Prescribed Text:**

- Dr.S.Asath Bahadur,A.ChitraDevi and Dr.S.Sanakaranarayanan**,** *Material Science*
- Dr.P.Mani , *A Text book of Engineering Physics II* , Dhanam Publications, 2011.

**Book for Reference:**

- Dr.V.Chinnathambi and U.Sankar **,** *Material Science.*

*******

**Programme:** B.A./B.Sc./B.Com., **Subject:** Optional to all Disciplines

**Semester:** III **Course:** Astrophysics

**Course Type:** NME-I **Course Code:** MUPN1

**Contact Hours:** 2 hours / week **Credits:** 2

**CIA:** 25 **CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Learn fundamental concepts in astrophysics that will equip them to better understand new scientific discoveries made in the coming years
- Apply basic physical principles from a broad range of topics in physics to astronomical situation,
- Come to view science as a constantly evolving process instead of a static set of rules and equations
- Clearly understand about stars and our galaxy
- Understand astrophysics as a way to describe our real physical world

## COURSE CONTENT

**Unit-I: Telescopes:**

Reflecting and refracting telescopes - telescope mountings - equatorial and azimuth mounting.

**Unit -II: Earth and Moon:**

Earth - diameter, motion, spin, as a clock, interior, surface, atmosphere. Moon - motion, interior, surface, solar and lunar eclipses.

**Unit-III: Solar Systems:**

Planets orbital periods and distance - Bode's law - Asteroids, comets, meteors and meteorites, satellites, scales and regularities of planets.

**Unit-IV: Stars:**

Distance by parallax method, motion of stars, intrinsic properties of stars , sun and stars comparison , determination of mass , radius , luminosities and atmospheric temperature of stars - Hertzsprung – Russel diagram , binary stars , stars clusters , pulsating stars , white dwarfs , exotic stars.

**Unit-V: Galaxies:**

**Milky Way Galaxy:**

Size of the galaxy, inter stellar medium, radio astronomy and interstellar gas, structure of the Milky Way galaxy - motions, rotations and mass evaluation of Milky Way galaxy, density wave theory of spiral arms.

**Prescribed Texts:**


- K.S.Krishnaswamy, *Astrophysics,* New age international Ltd.,publishers, 1996.
- S.Kumaravelu & Susheela Kumaravelu, *Astronomy*
- R.D.Chopman, *Discovering Astronomy,* W.H.Freeman Company, 1978.
- J.V.Narliker, *The Frontier,* IIT, Maras series, 1989.


********

**SEMESTER – IV**

**Programme:** B.Sc.,

**Subject:** Physics

**Semester:** IV

**Course:** Basic Electronics

**Course Type:** Core Course-V

**Course Code:** MUPC5

**Contact Hours:** 4 hours / week

**Credits:** 5

**CIA:** 25

**CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Apply the knowledge of basic semiconductors physics.
- Analyze the characteristics of various electronic devices like diode transistor etc,
- Classify and analyze the various circuits configurations of transistors.
- Analyze simple circuits like rectifiers, amplifiers, oscillators etc,
- Become aware of the latest technological changes in electronic devices.

## COURSE CONTENT

**Unit –I: Semiconductor Physics:**

Semiconductor- Intrinsic Semiconductor-Extrinsic Semiconductor-N type semiconductor-P type semiconductor- Majority and minority carriers- Donor and acceptor impurities- Fermi level-PN junction- Properties of PN junction- Biasing a PN junction -Current flow in a forward Biased PN junction-V-I characteristics of PN junction.

**Unit –II: Semiconductor Diode and Regulated Power Supplies:**

Introduction – Semiconductor diode- Crystal diode as a Rectifier- Half wave Rectifier- Full wave Rectifier- Bridge Rectifier

Theory of tunnel diode- Avalanche and Zener breakdown- Zener diode-Zener voltage regulators- Three terminal regulated power supplies- Choke input filter-Capacitance input filter-RC and LC filters-voltage multipliers-clipping and clamping circuits.

**Unit –III: Transistors:**

Transistors – biasing the transistor for active region – Transistor action- relation connecting $\alpha$ and $\beta$ of a transistor – three modes of transistor connection - transistor characteristics in CE, CB and CC modes – load line – Quiescent point – Fixed bias – universal divider bias – emitter feedback bias. Field Effect Transistors (FET) –Junction Field Effect Transistors (JFET) – P channel and N channel JFET - Characteristics of an N channel JFET – applications of JFET –

metal oxide semiconductor FET (MOSFET) – types – characteristics – applications – Uni junction transistor (UJT) and its characteristics.

**Unit –IV: Amplifiers:**

Amplifiers – CE, CB, CC amplifiers – calculation of voltage gain, current gain, input and output impedance in each case – power amplifiers – class A and class B push pull amplifiers – frequency response of amplifiers.

**Unit –V: Oscillators & Multivibraters:**

Feedback – types of feedback – advantage of negative feedback – Barkhausen criterion – Hartley, Colpitt's and Phase shift oscillators – multivibrators using transistors (Astable, Monostable, Bistable) - relaxation oscillators using UJT.

**Prescribed Text:**


- Ambrose and Devaraj, *Elements of Solid-state Electronics*, Mera Pubications, 1993.
- G.Jose Robin & Ubald Raj, *Electronics*, Indira Publications, 2004.
- M.Palaniappan, *Electronics*, L.M.N Publications, 2000.


**Books for Reference:**


- Gupta Kumar, *Electronics*, Pragati Prakashan, 2014.
- B.L. Theraja, *Electronics*, S.Chand Company, 2002.


*******

**Programme:** B.Sc.,

**Subject:** Physics

**Semester:** IV

**Course:** Relativity and Atomic Physics

**Course Type:** Core Course-VI

**Course Code:** MUPC6

**Contact Hours:** 4 hours / week

**Credits:** 4

**CIA:** 25

**CE:** 75

**Course Outcomes:**

On completion of the course, the student will be able to,

- Understand the concepts of constant relative motion of different bodies in different frame of reference
- Understand the critical potential and its experimental determination
- Explain the structure of atoms
- Learn the photoelectric effect and photoelectric cells
- Analyze the diffraction of X-rays and Compton effect

## COURSE CONTENT

**Unit- I: Theory Of Relativity:**

Concepts of Space, Time and Mass- Frames of Reference: Inertial and Non- Inertial frames – Newtonian Relativity- Galilean transformation equations -Michelson-Morley experiment – Interpretation of the Michelson-Morley experiment- Postulates of Special theory of relativity– The Lorentz transformation equations –Length contraction – Time dilation- Time dilation – Illustration of time dilation and length contraction – The twin paradox–Variation of mass with velocity– Mass-energy equivalence.

**Unit- II: Critical Potentials:**

Excitation of atoms -Critical potentials: Excitation and Ionization potential- Methods of excitation of atoms: Electronic Bombardment, Collisions of atoms and high temperatures and Irradiation of atoms with light- Experimental determination of critical potentials: Franck and Hertz's method.

**Unit- III: Atom Models:**

Review of Bohr atom model - Sommerfield's relativistic model – vector atom model – various quantum numbers – LS and JJ coupling – Pauli's Exclusion principle – Periodic classification of elements – Magnetic dipole moment due to orbit motion and spin motion – Bohr Magneton – Stern and Gerlach experiment-Fine structure of Sodium D lines-Zeeman effect: Normal and

Anomalous-Experimental set up-Quantum theory of normal Zeeman effect-Paschen-Back effect –Stark effect.

**Unit- IV: Photo Electric Effect:**

Discovery of photoelectric effect – Results on photoelectric effect – Failure of the electromagnetic theory – Einstein's theory of photoelectric effect – Millikan's experiment – Photoelectric cells.

**Unit –V: X-Rays:**

Diffraction of x-rays – Bragg's law – Bragg x-ray spectrometer – X-ray spectra – Characteristic X-rays spectrum – Moseley's law – Compton scattering theory – Experimental verification.

Prescribed Text:

- R.Murugesan, *Modern Physics*, S.Chand & Company, 1984.

**Books For Reference**

- J.B.Rajam, *Modern Physics*, S.Chand & Company, 1967
- Sehgal, Chopra, Sehgal *Modern Physics*, S.Chand & Sons, 1986.

*******

**Programme:** B.Sc.,
**Subject:** Physics

**Semester:** III &IV
**Course:** Major Practical-II

**Course Type:** Core Practical Course -II
**Course Code:** MUPP2

**Contact Hours:** 3 hours / week
**Credits:** 4

**CIA:** 40
**CE:** 60

**Course Outcomes:**

On completion of the course the student will be able to,

- Apply knowledge of mathematics and physics fundamentals and an instrumentation to arrive solution for various problems
- Understand the usage of basic laws and theories to determine various properties of the materials given**.**
- Gain knowledge in the scientific methods and learn the process of measuring different Physical variables
- Understand the application side of the experiments by using spectrometers, Microscopes and learned to construct electrical bridges
- Acquire practical knowledge about many theories related to lenses, aberrations, refractive indices, wavelengths, capacitances and resistances.

**LIST OF EXPERIMENTS:**

1. Determination of refractive index of a prism – spectrometer
2. Airwedge – Thickness of wire – Microscope
3. Newton's Rings – Radius of curvature – Microscope
4. Prism – I-d curve, to find n – spectrometer
5. Prism – I-I' curve, to find n – spectrometer
6. Grating – Normal incidence Dispersive power – Spectrometer
7. Resolving power of grating – Spectrometer
8. Voltage sensitivity and current sensitivity – B.G
9. Charge sensitivity –B.G
10. Comparison of e.m.fs – B.G
11. Comparison of capacitances – B.G
12. Comparison of capacitances – Desauty's bridge (A.C)
13. Frequency of the Fork – Melde's String

14. Resolving power of telescope
15. Dispersive power of a prism – Spectrometer
16. Newton's Rings – 'n' of a lens

******

**Programme:** B.Sc.,

**Subject:** Physics

**Semester:** IV

**Course:** Nanoscience & Nanotechnology

**Course Type:** SBC-IV

**Course Code:** MUPNN4

**Contact Hours:** 2 hours / week

**Credits:** 2

**CIA:** 25

**CE:** 75

**Course Outcomes:**

On completion of the course, the student will be able to,

- Learn about the background on Nanoscience
- Understand the synthesis of nanomaterials and their application and the impact of nanomaterials on environment.
- Apply their learned knowledge to develop Nanomaterials
- Impart the basics of Carbon nanotubes and its synthesis techniques
- Apply the applications of Nanotechnology in various fields

## COURSE CONTENT

**Unit I : Nanomaterials:**

Introduction to Nanoscience & Nanotechnology- nanomaterials – different forms of nanaomaterials – synthesis of nanomaterials- top-down and bottom-up approach- Properties of nanophase particles: Physical, Magnetic, Mechanical and Optical properties**.**

**Unit II: Synthesis Of Nanomaterials:**

Techniques for synthesis of nanomaterials: Ball milling, Plasma arcing, chemical vapour deposition, Sol gel and Electrodeposition.

**Unit III: Carbon Nanotubes (CNT):**

Carbon – carbon nanotubes (CNT) – types of CNT- fabrication of carbon nanotubes – electric arc discharge method – pulsed laser deposition – chemical vapour deposition.

**Unit IV: Properties & Applications Of CNT:**

Properties of CNT: Electrical, Mechanical, Physical, Chemical and Thermal properties- Applications of CNT: Electrical and Electronics, Computer, Chemical, Mechanical and Battery technology

**Unit V: Applications of Nanotechnology:**

Nanomedicine: Drug delivery, Therapy Techniques, Anti-Microbial Techniques- Nanoelectronics- Nanotechnology and Spaceflight-fuel cells and Nanotechnology-Solar cells and Nanotechnology-Nano Battery.

**Prescribed Text:**


- P.K.Sharma, *Origin and Development of NanaoTechnology*
- Dr.P.Mani, *Engineering Physics–II* , Dhanam Publication, 2011.
- Manoj Bhatia, *Nanotechnology*, Anmol Publication, 2010.


**Books for Reference:**


- G.P.Singh, *Basics of Nano Physics*, Anmol Publications, 2011.
- Dr.N.L. Kaushik, *Nanotechnology and Micromachines*


********

**SEMESTER – V**

**Programme:** B.Sc.,
**Subject:** Physics
**Semester:** V
**Course:** Advanced Mechanics
**Course Type:** Core Course- VII
**Course Code:** MUPC7
**Contact Hours:** 6 hours / week
**Credits:** 5
**CIA:** 25
**CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Define and demonstrate knowledge of the different formalism in classical dynamics of a system.
- To apply the formalism to obtain equations of motion for simple systems.
- Distinguish between different types of particles and statistics
- Understand the matter waves and the uncertainty relation
- Understand the idea of wave function and to solve schrodinger equation for simple potential

## COURSE CONTENT

**Unit–I : Classical Mechanics-Lagrangian:**

Generalized coordinates – Generalized velocities – Generalized momentum – Degrees of freedom under constraints – D'Alembert principle – Lagrangian function – Lagrangian equation (Derivation)

Application of Lagrangian's Equation – simple pendulum – compound pendulum – Atwood's machine- Simple Harmonic Oscillator.

**Unit –II: Classical Mechanics-Hamiltonian:**

Hamiltonian- Hamiltonian equation with derivation-Physical significance of Hamiltonian function- General features of motion under inverse square law- Kepler's problem

Application of Hamiltonian equations of motion- simple pendulum – compound pendulum- Linear Harmonic Oscillator –motion of a particle in a central field.

**Unit –III: Statistical Mechanics:**

Microscopic and Macroscopic descriptions – Ensembles – phase space – probability – fundamental postulates to statistical mechanics – thermodynamic probability – Boltzmann's theorem on entropy and probability – statistical equilibrium.

Maxwell – Boltzmann distribution law – Maxwell – Boltzmann distribution in terms of temperature – molecular energies in an ideal gas – Maxwell Boltzmann velocity distribution law – quantum statistics – Bose-Einstein statistics – Bose Einstein distribution law - photon gas – Plank's law of radiation – deduction of Wien's and Rayleigh-Jeans laws.

Fermi – Dirac statistics - Fermi-Dirac distribution law – electron gas – Fermi energy – comparison of three statistics.

**Unit-IV:Wave Mechanics:**

Matter waves – De Broglie's theory – De Broglie wavelength – experimental verification – Davission and German experiment – G.P.Thomson's experiment with relativistic correction.

Wave velocity and group velocity – particle velocity and group velocity – Heisenberg's uncertainty principle – illustration (i) diffraction of electron in a grating (ii) electron viewed through a microscope.

**Unit-V: Quantum Mechanics:**

Basic postulates of wave mechanics – Momentum operators – Energy operators - The Schrodinger wave equation – wave function – interpretations to $\psi$ – application of Schrodinger particle in one dimensional box – Linear harmonic oscillator – zero point energy – the barrier penetration problem and tunnel effect.

**Prescribed Text:**

- M.Palaniappan, *Elements of Theoretical Physics*, S.Chand & Company, 2002.

**Books for Reference:**


- Gupta Kumar, *Classical Mechanics*, A Publication of Pragati Prakashan, 2014.
- Schiff, *Quantum Mechanics*, Mc Graw – Hill Book Company, 1968.
- Goldstein, *Classical Mechanics*, Narosa Publishing House, 1988.
- Garg Bansal & Gosh, *Thermal Physics*, S.Chand & Company, 2002.


********

**Programme:** B.Sc.,
**Subject:** Physics

**Semester:** V
**Course:** Digital Electronics

**Course Type:** Core Course-VIII
**Course Code:** MUPC8

**Contact Hours:** 6 hours / week
**Credits:** 4

**CIA:** 25
**CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Students are able to understand the basic concepts of number system.
- They will get the knowledge of logic gates and the applications of logic gates in different digital circuits.
- Students gain the know-how of multivibrators
- They are able to construct counters and registers using flipflops.
- They come to know basic concepts of operational amplifier and their applications.

## COURSE CONTENT

**Unit –I : Number System:**

Binary addition – Binary to Decimal conversion – Decimal to Binary conversion – Binary Subtraction – Multiplication – 4 bit BCD codes – Hexadecimal code.

**Unit –II: Logic Gates:**

OR, AND & NOT gates – Positive and negative logic – their implementation – calculation of output voltages - OR, AND, NOT gates – Boolean logic diagrams and truth tables for these – Boolean equations of logic circuits – NOR, NAND gates – DeMorgan's theorem – NAND, NOR as universal building blocks – laws and theorems of Boolean algebra – two input TTL NAND gates – DTL, RTL circuits – logic cards – Experimental investigation of equivalence of Boolean expressions of exclusive OR function and investigation of logical properties of the exclusive OR - Half adder and Full adder properties and their implementation with EX-OR.

**Unit-III: Multivibrators Using ICs:**

The RS Flip Flop - clocked RS Flip Flop, JK Flip Flop. The Schmitt trigger (using 555Timer) - Monostable multivibrator and Astable multivibrator using IC 555- working (No derivations) and uses - Duty cycle.

Unit –IV: Counters And Registers:

Binary counter – decade counter – four bit binary counter – shift register – ring counter – A/D conversion – D/A conversion.

**Unit-V: Operational Amplifier:**

OP-AMP characteristics resistance feedback – expression for gain (inverting mode only) – virtual earth – application as adder, subtractor, integrator and differentiator – analog computer.

**Prescribed Text:**

- Ubal Raj & G.Jose Robin, *Digital Electronics*, Indira Publication, 2004.
- Malvino and Leach, *Digital Principles and Computer Design*

**Books for Reference:**

- Milman & Halkins, *Integrated electronics*
- Morris Mano, *Digital Principles and Computer Design*

*********

**Programme:** B.Sc.,

**Subject:** Physics

**Semester:** V

**Course:** Computer Programming in C

**Course Type:** Core Elective-I

**Course Code:** MUPE1

**Contact Hours:** 5 hours / week

**Credits:** 5

**CIA:** 25

**CE:** 75

**Course Outcomes:**

On completion of the course, the student will be able to,

- Students get a basic knowledge of fundamental concepts of 'C' programming language
- Students become bale to write algorithm and are able to draw flow charts.
- They come to know how to write simple programmes in 'C'
- They gained thorough knowledge of various control statements, if, if-else, do-while, while switch case. They understand how to use 'for' loops to create iteration
- They are able to write programs with structure, union and pointers

## COURSE CONTENT

**Unit –I: Introduction to C:**

The C character set – Identifiers and keywords - data types – Constants – Variables – Declaration – Expressions - Various types of Operators – Bit wise operations - Input and output functions and writing simple programs.

Conditional and unconditional control statements – Branching, Looping - Nested control structures – Switch – Break – Continue – Goto.

Sum of n-natural numbers – To find the Fibonacci series – To find the roots of a quadratic equation $ax^2+bx+c=0$. To find and print Armstrong numbers - To find simple interest and Compound interest.

**Unit –II: Function:**

Over view – Defining a function – Accessing a function – Passing arguments to a function – Recursion – Library function – the preprocessor directives. Storage classes - Scope of the variables – Automatic variables – Global variables – Static variables – Register variables.

To determine the factorial of a given number – check whether given number is odd or even. Using function to sum integer values between 1-N using recursion techniques.

**Unit –III: Arrays:**

Defining, initialization rules and processing of arrays and subscripted variables – Passing arrays to functions – Multi dimensional arrays – Arrays and strings.

To arrange the given set of numbers in ascending order – To arrange given set of numbers in descending order - To find the largest number in the given set of numbers – To multiply two matrices of order (l x m) And (m x n) – To add and subtract two matrices.

**Unit –IV: Pointers & Files:**

Fundamentals – Declaration - Accessing a variable – Pointers and Arrays – Dynamic memory allocation – Pointers and functions – Pointers and strings.

Introduction – Defining and Opening file – Closing a file – Input & Output operations on files.

**Unit –V: Structures and Unions:**

Introduction – Defining and initializing a structure – accessing and giving values to member – structure within structures – arrays of structures – arrays within structures.

Union – declaration and initializing a union – To prepare the salary bill for employees of a company.

**Prescribed Text:**

- D. Arulselvam, *Programming in C and Application* , Muthamil Publishers, 1999.

**Books For Reference:**

- E. Balagurusamy, *Programming in C*, Tata Mc Graw – Hill Publishing Company, 2002.
- Jayasree, *Computer programming in C*

*******

**Programme:** B.Sc., **Subject:** Physics

**Semester:** V **Course:** Fundamentals of Microprocessor 8085

**Course Type:** Core Elective-I **Course Code:** MUPE1

**Contact Hours:** 5 hours / week **Credits:** 5

**CIA:** 25 **CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Get a basic knowledge of fundamental of microcomputer and microprocessor 8085
- understand the instruction set of microprocessor 8085
- Know the various addressing modes
- Write simple assembly language programs
- Write programs for given case studies

## COURSE CONTENT

**Unit-I: Microcomputer Organization and 8085 Microprocessor:**

Microcomputer arrangement – Memory, a general discussion – Read Only Memory (ROM) – Random Access Memory (RAM) – Microprocessor as CPU – Input unit – Output unit – System bus and bus structure – Execution of an instruction.

Introduction to Intel processors – Pin functions of 8085 – Architecture of 8085.

**Unit-II: Instruction Set of 8085 – I:**

Machine language and Assembly language – Programmer's model of 8085 – Data transfer instructions –I – Arithmetic instructions – Logic instructions - Special instructions – Assembly language to Hex code.

**Unit-III: Instruction Set of 8085 – II:**

Data transfer instructions-II – Branch instructions – Stack and Stack related instructions – I/O and Machine control instructions – 8085 addressing Modes.

**Unit-IV: Assembly Language Programmes:**

Addition, Subtraction, Multiplication and Division (for 8-bits and BCD only)– Square and Square root – Sorting and Searching – Debugging a program.

**Unit-V: Assembly Language Programmes- Case Studies:**

Assembly Language Programmes - N- Factorial, largest among two numbers, generating the Fibonacci (binary), Ascending and descending order and Code Conversion.

**Prescribed Text:**

- V.Vijayendran, *Fundamentals of Microprocessor-8085,* S. Viswanathan Pvt Lmt., 2007.

**Books for Reference:**

- Ramesh S. Gaonkar, *Microprocessor*, Ponram International Publishing Pvt Lmt., 2006.
- Ajit Pal, *Microprocessor Principles and Applications*
- A.Nagoor Kani, *Microprocessor and Its Applications*, Mc Graw Hill Education Private Limted, 2013.

**********

**Programme:** B.Sc., **Subject:** Physics

**Semester:** V **Course:** Energy Physics

**Course Type:** Core Elective-II **Course Code:** MUPE2

**Contact Hours:** 5 hours / week **Credits:** 5

**CIA:** 25 **CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Acquire knowledge on energy sources available in the world
- Understand solar energy collection and storage processer
- Apply solar energy in various home applications
- Know the recent development in biomass conversion technologies
- Apply the methods of ocean thermal electric power generation in various applications.

## COURSE CONTENT

**Unit- I: An Introduction to Energy Sources:**

Energy consumption as a measure of prosperity – World Energy Future – Energy Sources and their availability – Commercial or Conventional energy sources – NonConventional sources – Renewable energy sources – other forms of solar energy – wind – Biomass – Geothermal and OTEC.

**Unit- II: Solar Energy Collection and Storage:**

Introduction – Physical Principles of the conversion of solar radiation into heat – Flat plate collectors – Concentrating collectors – Focusing type – Advantages and disadvantages of concentrating collectors over flat plate collectors. Solar energy storage – Solar energy storage systems – Solar pond.

**Unit-III: Solar Photo Voltaic Cells:**

Introduction - Solar thermal electric conversion – Solar electric power generation – Solar photo voltaic – Solar cell principle – Basic Photo voltaic system for power generation – Solar cell connecting arrangements – Battery storage – Applications of photo voltaic system − Advantages and disadvantages of photo voltaic conversion.

**Unit-IV: Application of Solar Energy:**

Introduction - Solar water heating – Space heating – Passive and active heating systems - Agriculture and industrial applications - Solar distillation – Solar pumping – Solar furnace –

Solar cooking – Design principles and constructional details of box type solar cooker – Solar green house – Advantages of solar green house.

**Unit –V: Energy From Biomass:**

Introduction – Biomass conversion Technologies – Wet processes – Dry processes – Biomass generation – Classification of Biogas Plants – Types of Biogas plants.

**Energy from Ocean:**

Introduction – Ocean Thermal Electric conversion – Methods of ocean thermal electric power generation – Energy from Tides.

**Prescribed Text:**

- G.D. Rai , *Non- Conventional Sources of Energy*, Khanna Publishers, 2005.

**Books for Reference:**

- G.D. Rai, *Solar Energy Utilizationin*, Khanna Publishers, 2001.
- H.C. Jain, *Non-Conventional Sources of Energy*
- M.P. Agarwal, *Solar Energy*

**Programme:** B.Sc., **Subject:** Physics

**Semester:** V **Course:** Mathematical Physics

**Course Type:** Core Elective-II **Course Code:** MUPE2

**Contact Hours:** 5 hours / week **Credits:** 5

**CIA:** 25 **CE:** 75

**Course Outcomes:**

On completion of the course, the student will be able to,

- Solve ordinary and partial differential equations in physical sciences.
- Use Green Functions
- Use Fourier series and integral transformations and understand the basic theory of vectors and tensors.
- Understand the functions of complex variables and elements of distribution theory
- Analyse Fourier series

## COURSE CONTENT

**Unit –I: Vectors:**

Introduction – representation of vectors – kinds of vectors- addition of vectors – subtraction of vectors – multiplication of vectors - vectors space or linear space – conditions for a physical quantity to be represented by a vector – resolution of vectors – linear combination of vectors – product of four vectors – reciprocal system of vectors – vector equations – simple applications of vectors to mechanics.

**Unit-II: Vector Analysis:**

Differentiation of vectors – rules for differentiation – partial differentiation of vectors – rules for partial differentiation – the scalar and vector fields – directional derivatives – level surfaces – the gradient of a scalar field – the gradient of sum of two scalar point functions – the gradient of product of two scalar point functions – the divergence of a vector – point function – the divergence of sum of two vector functions – the divergence of product – the curl or rotation of a vector point function - curl of the sum of gradient of scalar product in terms of curl – to express divergence of vector product in terms of curl.

**Unit –III: Matrices:**

Definitions and notations – equality of matrices – addition of matrices and its properties - multiplication of matrices and its properties - partitioning of matrices – product of matrices by partitioning – special matrices with their properties – rank of a matrix - theorem on rank – solutions of linear equations – Cramers rule – characteristic matrix and characteristics equations of a matrix.

**Unit-IV: Beta And Gamma Function:**

Definition – symmetry property of beta function – evaluation and transformation of Gamma function - relation between beta and Gamma function.

**Unit-V: Differential Equation:**

Introduction – solution of differential equations of first order – solution of second order differential equations with constant co-efficient -power series solution- Frobenius' method.

**Prescribed Text:**

- B.D. Gupta, *Mathetical Physics*, Vikas Publishing House Pvt Lmt., 1978.
- Sathya Prakash, *Mathematical Physics*, Sultan Chand & Sons, 1997.

********

**Programme:** B.Sc., **Subject:** Physics

**Semester:** V **Course:** Computer Programming in‘C’-Practical

**Course Type:** SBC-V **Course Code:** MUPCP5

**Contact Hours:** 2 hours / week **Credits:** 2

**CIA:** 40 **CE:** 60

**Course Outcomes:**

On completion of the course the student will be able to,

- write simple programme in ‘C’
- use control statements and simple if else statements in writing programmes
- write programmes using switch case
- write programme using for loop
- write programme using functions

**List of Programmes:**

1. Arranging data in ascending / descending order.
2. Finding area of a triangle.
3. Finding standard deviation of a collection of data.
4. Fahrenheit to Celsius conversion.
5. Upper and lowercase conversion.
6. Sum of the digits.
7. Sum of the given series. Sum = $x+x^2+x^3+\ldots+x^{15}$.
8. Reversing the numbers.
9. Reversing the string.
10. Compound interest calculation.
11. Simple interest calculation using function.
12. Factorial of a number.

*********

# SEMESTER - VI

**Programme:** B.Sc., **Subject:** Physics

**Semester:** VI **Course:** Solid State Physics

**Course Type:** Core Course-IX **Course Code:** MUPC9

**Contact Hours:** 7 hours / week **Credits:** 5

**CIA:** 25 **CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- A detailed study of crystallography is given to the students through this course.
- The study of defects in solids makes the students to understand the structural defects of crystals.
- The students are able to get knowledge of lattice vibrations in crystals.
- They get detailed ideas of the properties of different magnetic materials.
- The students get thorough knowledge of superconductors and superconducting materials and their applications.

## COURSE CONTENT

**Unit- I: Crystal Structure**:

Introduction – Basic concepts of crystallography - Symmetry elements – Bravais lattice – Crystal planes and Miller indices – Reciprocal lattice– Classification of crystal systems- Basic definitions of crystal structure – Simple cubic (SC) structure – Body centered cubic (BCC) structure - Face centered cubic (FCC) structure – Hexagonal close packed (HCP) structure – Determination of crystal structure: The Laue method of X – ray diffraction -The rotating crystal method – The powder method (Debye – Scherrer method).

**Unit-II: Defects in Solids:**

Crystal Imperfections-point defects: Schottky Defect, Frankel defect, impurity defects and Electronic defects-Line defects: edge dislocation-Surface defects: Grain Boundaries, Tilt boundaries, Twin boundaries and Stacking faults-Volume defects: effects of crystal imperfections

**Unit-III: Specfic Heat Capacity Of Solids:**

Lattice vibrations – Vibrations of monoatomic one dimensional lattice – Vibrations of diatomic one dimensional lattice – Phonons – Basic definitions – Dulong and Petit’s law – Classical

theory of specific heat capacity – Einstein's theory of specific heat – Debye's theory of specific heat.

**Unit- IV: Magnetic Materials:**

Introduction – Basic definitions – Classification of magnetic materials – Diamagnetic materials – Classical theory of diamagnetism (Langevin theory) - Paramagnetic materials - Langevin theory of Para magnetism – Weiss theory of Paramagnetism - Ferromagnetic materials - Weiss theory of Ferromagnetism - Domain theory of ferromagnetism - distinction between magnetic materials.

**Unit –V: Superconductivity:**

Introduction – Properties of superconductors – Critical temperature - Critical field - Isotope effect - Meissner effect – Entropy – Specific heat - Types of superconductors - Type-I superconductors – soft superconductors - Type-II superconductors – hard superconductors – Intermediate or vortex state – BCS theory of superconductors – Electron – Lattice – Electron interaction – Cooper pair – Existence of energy gap - London equations – First order London equation – Second order London equation – penetration depth – Josepson Effect – DC Josepson effect - AC Josepson effect – Superconducting materials – Applications of superconductors.

**Prescribed Text:**

- Dr.K.Illangovan, *Solid State Physics*, MJP Publishers, 2013.

**Books For Reference:**


- C.M. Kachhava, *Solid State Physics*
- C.Kittal, *Solid Sstate Physics*, John Wiley & Sons Pvt. Ltd, 2007.
- S.O.Pillai, *Solid Sstate Physics*, New Age International Ltd, 2002.


*******

**Programme:** B.Sc., **Subject:** Physics

**Semester:** VI **Course:** Nuclear and Particle Physics

**Course Type:** Core Course-X **Course Code:** MUPC10

**Contact Hours:** 6 hours / week **Credits:** 4

**CIA:** 25 **CE:** 75

**Course Outcomes:**

After successful completion of the course the student is expected to

- Gain a clear picture of nuclear composition and various nuclear models
- Have a deep knowledge about Radio activity, nuclear Fission and Nuclear Fusion, the relevance of nuclear transformation.
- Understand the working of nuclear detectors and counters, realize the importance of Cosmic rays and its effects on earth
- Become familiar with nuclear particles and different particle accelerators
- classify different kinds of reactions between elementary particles

## COURSE CONTENT

**Unit-I: Nucleus:**

Nucleus spin, Magnetic dipole moment - Electric quadruple moment - effect on spectral lines (Hyper fine structure).

Nuclear stability - Theories of nuclear composition – Proton – Electron – Hypothesis – Proton-Neutron hypothesis - Nuclear forces - Yukawa's theory - Discovery of meson - models of the nuclear structure - The liquid drop model - semi empirical binding energy formula – Shell model evidences - collective model.

**Unit-II: Nuclear Energy:**

Nuclear fission – energy released in fission – Explanation on the basis of liquid drop model. Nuclear fusion - Thermonuclear reactions - Proton- proton cycle - Carbon nitrogen cycle - Energy release in controlled thermo nuclear reaction –Design of thermonuclear reactor.

**Unit-III: Particle Accelerators And Detectors:**

Particle accelerators and detectors – Synchrocyclotron - Betatron - Electron Synchrotron - Proton synchrotron (Bevatron).

Ionization chamber - The Wilson cloud chamber - Bubble chamber - Photographic emulsion technique - G.M.counter.

**Unit-IV: Radio Activity & Nuclear Reactions:**

Alpha rays – Range - Geiger Nuttal law - Experimental determination by Geiger Nuttal experiment - Disintegration energy – Theory of $\alpha$ - decay (Qualitative).

Beta- Rays - Beta rays spectra – Origin - Neutrino theory of Beta decay - Electron capture - Gamma rays - Determination of wavelength by Dumond method - Origin of Gamma rays - Internal conversion.

Q value - threshold energy - nuclear transmutation by alpha particles, protons, deuterons, neutrons and electrons - Photo disintegration – Cross-Section.

**Unit-V: Cosmic Rays and Elementary Particles:**

Cosmic rays – discovery - origin of cosmic rays - latitude effects – east- west effect - altitude effect – north - south effect - primary & secondary cosmic rays - cosmic rays showers - positron discovery - pair production & annihilation of matter - Van Allen belts.

Classification of Elementary particles - properties of Elementary particles-Antiparticles.

**Prescribed Text:**

- R.Murugesan, *Modern Physics*, S.Chand & Company, 2002.
- M.Palaniappan, *Nuclear Physics*, L.M.N Publication, 2000.

**Books for Reference:**

- J.B.Rajam, *Modern Physics*, S.Chand & Company, 1967.
- Sehgal, Chopra, *Modern Physics*, Sultan Chand & Sons, 1998.

*******

**Programme:** B.Sc., **Subject:** Physics

**Semester:** V&VI **Course:** Major Practical-III

**Course Type:** Core Practical Course-III **Course Code:** MUPP3

**Contact Hours:** 3 hours / week **Credits:** 4

**CIA:** 40 **CE:** 60

**Course Outcomes:**

On completion of the course the student will be able to,

- Gain broad knowledge of experimental methods and measurements
- Gain knowledge and understanding the components and handling equipments
- Be familiarized with the experimental techniques
- Get idea about experimental setup and arrangement of devices
- Verify the experimental results with theoretical values

**List of Experiments:**

1. LCR – Series Resonance Circuits
2. LCR – Parallel Resonance Circuits
3. Determination of self inductance L – Maxwell's bridge
4. Determination of self inductance L – Owens's bridge
5. Determination of self inductance L – Anderson's bridge
6. M1/M2 – comparison of Mutual Inductance – B.G
7. Determination of Mutual Inductance – B.G
8. Solar Spectrum – Fraunhoffer lines – Spectrometer
9. Cauchy's constants – Spectrometer
10. Hartmann's Interpolation formula – Spectrometer
11. Resolving powers of a prism – Spectrometer
12. Small angled prism – Spectrometer
13. Determination of absolute capacity of a condenser –B.G
14. Boltzmann's constant using transistor
15. Determination of wavelength of spectral lines of mercury – Grating minimum deviation - Spectrometer
16. Impedance and power factor - LR – Circuit.

********

**Programme:** B.Sc., **Subject:** Physics

**Semester:** V&VI **Course:** Major Practical-IV

**Course Type:** Core Practical Course-IV **Course Code:** MUPP4

**Contact Hours:** 3 hours / week **Credits:** 4

**CIA:** 40 **CE:** 60

**Course Outcomes:**

On completion of the course, the student will be able to,

- Remember the applications of semiconductor devices
- Gain the idea and principles of electronics practically
- Access the action of electronic devices such as diode, transistor etc.,
- Impart the broad knowledge of experimental methods and measurements
- Gain knowledge and understanding the components and handling equipments

**List of Experiments:**

1. Zener diode as a voltage regulator
2. Logic gates using discrete components.
3. Bridge rectifier.
4. Junction diode characteristics[ Forward bias] and Zener diode characteristics[ Reverse bias]
5. Voltage multiplier using Diodes.
6. Operational amplifier as an adder and a subtractor.
7. Hartley oscillator.
8. Colpitt's oscillator.
9. Verification of truth tables of logic gates using ICs
10. NAND and NOR as Universal gates
11. XOR and XNOR using ICs
12. Multiplexer and De-Multiplexer
13. Verification of De-Morgan's theorems
14. Verification of truth tables of Half and Full adder
15. Verification of truth tables of Half and Full subtractors
16. D/A Converter

**Programme:** B.Sc., **Subject:** Physics

**Semester:** VI **Course:** Laser, Fibre Optics& Spectroscopy

**Course Type:** Core Elective-III **Course Code:** MUPE3

**Contact Hours:** 5 hours / week **Credits:** 5

**CIA:** 25 **CE:** 75

**Course Outcomes:**

**On completion of the course, the student will be able to,**

- Expose the Laser fundamentals
- Get adequate knowledge about Industrial and medical applications of laser and apply in for day-today applications
- Recognize and classify the structures of Optical fiber and types.
- Understand the Optical sensors and and apply in for day-today applications
- Able to recognize different regions for different spectroscopy and the applications of all types of spectroscopy

## COURSE CONTENT

**Unit-I: Laser:**

Introduction – Attenuation of light in an optical medium – thermal equilibrium – Interaction of light with matter – absorption – Spontaneous emission – Einstein's prediction – stimulated emission – Einstein relations – light Amplification - condition for stimulated emission to dominate spontaneous emission to dominate absorption transition – population inversion – active medium – pumping meta stable states- principal pumping schemes – optical resonant cavity.

**Unit-II: Laser Types and its Applications:**

Types of laser – ruby laser – Nd – YAG – laser –He - Ne laser – $co_2$ laser – theory of LED – LED materials – types of LED –laser diode –Ga-As –laser – Ga-Al-As - Laser – comparison chart for all the lasers – applications of laser Based on their properties – material processing holography – difference between a photography & holography.

**Unit-III: Fibre Optics:**

Introduction – Optical fiber – features of optical fibers – principle of light ray propagation through optical fiber – propagation of light in optical fibers.- types of optical fibers- single and multimode fibers –difference between single and multimode fiber – step index and graded index (grin) fibers – differences between step – index fiber and graded index fiber – fiber optics

communication system –engineering and industrial applications of optical fibers –fiber optics sensors – applications of fiber optic sensors – phase and polarization fiber sensors – liquid level sensors – laser Doppler velocimeter sensor – displacement sensor.

**Unit –IV: IR, UV and Raman Spectroscopy:**

Types of spectra - absorption and emission spectra – IR spectra sources – detectors – Wadsworth prism-mirror spectrograph - application IR spectroscopy - UV spectroscopy – sources – detectors – quartz spectrograph – application UV spectroscopy - Raman effect – experimental study of Raman - quantum theory of Raman effect – Raman fluorescent spectra - applications of Raman effect.

**Unit-V: Resonance and Mossbauer Spectroscopy:**

Resonance spectroscopy – nuclear magnetic resonance (NMR) – introduction – theory – experimental arrangement – applications of NMR – Nuclear quadrupole resonance – introduction –instrumentation – applications of NQR – electron spin resonance spectroscopy (ESR) - introduction and theory -instrumentation – applications of ESR - Mossbauer spectroscopy – introduction – principles – Experimental method – the effect of magnetic field applications.

**Prescribed Text:**


- R.Murugeshan and Kiruthiga Sivaprasath, *Optics and spectroscopy*, S.Chand & Company, 2002.
- Colin.N.Banwell and Elaine.M .Mccash, *Fundamentals of molecular spectroscopy*
- G. Senthil Kumar, *Engineering Physics – I*, VRB Publishers Pvt Ltd, 2005.


********

**Programme:** B.Sc., **Subject:** Physics

**Semester:** VI **Course:** Communicating Electronics

**Course Type:** Core Elective-III **Course Code:** MUPE3

**Contact Hours:** 5 hours / week **Credits:** 5

**CIA:** 25 **CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Acquire knowledge on recent developments in the scientific and technological fields based on electronic principles
- Apply different modulation and demodulation techniques in advanced electronic communications
- Analyze generation and detection of AM and FM signals and comparison between them
- Indentify different radio receiver circuits and role of AGC.
- Apply the recent developments in the field of information technology and internet

## COURSE CONTENT

**Unit-I: Modulation:**

Introduction – Modulation – Methods of modulation – Amplitude modulation – Percentage modulation – Upper and lower frequencies - Upper and lower side bands – Forms of amplitude modulation – Generation of SSB – Methods of amplitude modulation – AM modulating circuits – Frequency modulation (qualitative), digital modulation(qualitative).

**Unit-II: Demodulation:**

Introduction – Essentials of AM detection – Diode detector for AM signals – Transistor detectors for AM signals – FM detection – Quadrature detector – Frequency conversion – Super heterodyne AM receiver – FM receiver – Comparison between AM and FM – The four fields of FM.

**Unit-III: Radio Receivers**:

Introduction – Super heterodyne receivers – Choice of intermediate and oscillator frequencies – Image rejection – Adjacent channel selectivity – Spurious responses – Tracking – Automatic gain control – Double conversion receivers.

**Unit- IV: Antennas, TV Transmission & Reception:**

Types of antennas – Dipole antenna – Yogi antenna – Parabolic reflection – Introduction to transmission lines – Characteristic impedance – Principles of transmission & reception of colour TV signals.

**Unit –V: Digital Communication:**

Communication – starting along the high way – the practical uses of communications connectivity – telephone related communication services – video/voice communication, video conferencing and picture phones – on line information services – the internet – shared resources work group computing – electronic data interchange and intranets – telecommunicating the virtual offices – using a micro computer to communicate analog and digital signals – modems, ISDN levels and cables – modems communications channels – communications data transmission.

**Prescribed Text:**

- B.L.Theraja , *Basic Electronics (Solid state),* S.Chand, 1987.
- Dennis Roddy And John Coolen, *Electronic communication,* Dorling Kindersley India Pvt. Lmt., 2008.
- A.Ubald Raj & G.Jose Robin, *Basic electronics and applied electronics,* Indira Publications, 2004.

**Books for Reference:**

- V.K.Metha, *Principles of Electronics*, S.Chand & Company, 2008.
- Keneddy & Davis, *Electronic Communication System*

****

**Programme:** B.A./B.Sc./B.Com., **Subject:** Optional to all Disciplines

**Semester:** VI **Course:** Types of energy and Their Utilization

**Course Type:** NME-II **Course Code:** MUPN2

**Contact Hours:** 2 hours / week **Credits:** 2

**CIA:** 25 **CE:** 75

**Course Outcomes:**

On completion of the course the student will be able to,

- Learn fundamental concepts of energy
- Impart the usage of non-renewable energy sources
- Apply basic characteristics of renewable sources of energy and technologies for their utilization
- Give review on utilization trends of renewable sources of energy
- Interpret the advantages and disadvantages of different renewable and non-renewable sources of energy

## COURSE CONTENT

**Unit-I: Introduction to Energy:**

Introduction -work-energy-exchange of energy-power-units for energy**.**

**Unit-II: Conventional Energy Sources and their Availabilities:**

Introduction-fossil fuels-coal-petroleum-searching petroleum source-refining petroleum-agricultural and organic wastes-magneto hydrodynamic generation.

**Unit-III: Nonconventional Energy Sources –I:**

Introduction-solar energy-heating of building -cooling of building-solar electric power generation: stream generation-solar photovoltaic cell.

**Unit-IV: Nonconventional Energy Sources –II:**

Energy from biomass and biogas-wind energy-energy from hydropower-energy from ocean – tidal energy-ocean thermal energy-geothermal energy-storage of energy.

**Unit-V: Energy and Environment:**

Introduction-disadvantage of fossil fuels –burning of fuels-effect of emission of $Co_2$ & Co-pollution due to heating effects-effect of radioactive element.

**Prescribed Text:**

- G.D.RAI, *Non Conventional Energy Sources*, Khanna Publishers, 2005.

**[ANCILLARY COURSES TO OTHER DISCIPLINES]**

**Programme:** B.Sc., **Subject:** I Maths / II Chemistry

**Semester:** I / III **Course:** Mechanics, Properties of Matter and Thermal Physics

**Course Type:** Ancillary - I **Course Code:** MUPA1/MUPA3

**Contact Hours:** 3 hours / week **Credits:** 3

**CIA:** 25 **CE:** 75

**Course Outcomes:**

On completion of the course, the student will be able to,

- Analyze the behavior of objects in circular and rotational motion
- Understand the gravitational force and variation of 'g' with altitude and depth
- Understand various properties of matters and apply in experimental measurements
- Acquire knowledge of heat transfer processes
- Apply the heat transfer processes for day-today activities

## COURSE CONTENT

**Unit –I: Rotational Motion and Gravitation:**

Angular velocity - Normal acceleration (no derivation) – Centrifugal and centripetal force – Torque and angular acceleration – Work and Power in rotational motion. – Angular momentum – K.E of rotation – Moment of inertia – Laws of parallel and perpendicular axes theorems – Moment of inertia of circular ring, circular disc.

Compound Pendulum expression for period – Experiment to find 'g'- variation of 'g' with attitude and depth – Artificial satellites.

**Unit –II: Elasticity:**

Elastic Modulii – Poison's ratio – Beams – Expression for bending moment – Determination of Young's modulus by uniform and non uniform bending section girders, Torsion – Expression for couple per unit twist – Work done in twisting – Torsion pendulum – Determination of rigidity modulus of the material of a wire.

**Unit-III: Viscosity & Surface Tension:**

Derivation of Poiseiuille's formula (analytical method) – Bernoulli's theorem - Proof – Applications - Pitot tube -Venturimeter.

Surface tension –Surface tension of water, Jaeger's method.

**Unit-IV: Conduction & Convection:**

Lee's disc method for conductivity of a bad conductor – Analogy between heat flow and electric current – Wiedmann – Franz law.

Convection in atmosphere – Laps rate – Stability of atmosphere – Greenhouse effect – Atmosphere pollution.

**Unit-V: Radiation:**

Stefan's law- Determination of Stefan's constant by filament heating method – Solar constant – Measurement – Water flow pyrheliometer – Temperature of the sun - Solar spectrum – Energy distribution in black body spectrum – Plank's law (no derivation) – Derivation of Wien's and Rayleigh Jeans laws from Plank's law.

**Prescribed Texts:**

- M.Palaniappan, *Ancillary Physics (Mechanics & Properties of matter*), LMN Publication, 1999.
- M.Palaniappan, *Ancillary Physics (Thermal Physics)*, LMN Publication, 1999.

**Books for Reference:**

- N.Venkatachalam, *Ancillary Physics (Mechanics & Properties of matter),* Sri Vinayaka Printers, 2003.
- N.Venkatachalam, *Ancillary Physics (Thermal Physics)*, Sri Vinayaka Printers, 2003.
- R.Murugeshan, *Ancillary Physics (Mechanics & Properties of matter),* S.Chand, 2002.
- R.Murugeshan, *Ancillary Physics (Thermal Physics)*, S. Chand & Company, 1999.

**Programme:** B.Sc., **Subject:** Physics

**Semester:** II / IV **Course:** Electricity, Electronics and Optics

**Course Type:** Ancillary Physics-II **Course Code:** MUPA2/MUPA4

**Contact Hours:** 3 hours / week **Credits:** 3

**CIA:** 25 **CE:** 75

**Course Outcomes:**

On completion of the course, the student will be able to,

- Gain deeper understanding of electrostatics
- Acquire knowledge on elementary ideas of electricity and logic gates
- Understand the working of Junction diode , Zener diode and transistor
- Use the electronic devices for doing experiments in the laboratory
- Demonstrate fundamental knowledge and insight into geometrical optics in the areas of lenses, aberrations and physical optics

## COURSE CONTENT

**Unit-I: Electrostatics:**

Gauss law (No proof) – Applications – Field due to a charged sphere and an infinite plane sheet – Field near a charged conducting cylinder – Coulomb's Theorem – Electric potential – relation between potential and field – capacitors – Expression for 'C' of parallel plate, spherical (outer sphere earthed) and cylindrical capacitors – Energy of charged capacitors – Loss of energy due to sharing of charges.

**Unit –II: Current Electricity and Logic Circuits:**

Application of Wheat stone's network in Carey Foster's bridge – Measurement of resistance and Temperature Coefficient of resistance.

Boolean algebra – De Morgan's theorem – Basic gates OR, AND and NOT gates – Inverters NOR and NAND gates - NOR and NAND gates as universal building blocks – XOR gate.

**Unit-III: Electronic Devices:**

Junction diode characteristics –Zener diode characteristics – bridge rectifier with $\pi$ filters – transistor characteristics in CE mode – single stage amplifier – feed back principle - oscillators – Hartley oscillator (Principle and circuit only).

**Unit-IV: Geometrical Optics:**

Lenses- Refraction through lenses- Aberration – Chromatic aberration-Spherical aberration-minimization of aberration- Coma- Astigmatism.

**Unit-V: Physical Optics:**

Interference in thin films – Air wedge – Newton's rings (reflected beam only)- Theory of plane transmission grating (normal incidence only) – Experiment to determine wavelength- Brewster's law - Double refraction – Nicol prism – construction, action and uses

**Prescribed Text:**

- M.Palaniappan, *Ancillary Physics (Electricity and Electronics)*, LMN Publication, 1993.
- M.Palaniappan, *Ancillary Physics (Optics and Modern Physics)***,** LMN Publication, 2000.

**Books for Reference:**

- N.Venkatachalam, *Ancillary Physics (Electricity and Electronics)*, Poppy Educational Publishers, 1994.
- R.Murugeshan, *Ancillary Physics (Electricity and Electronics)*, S.Chand, 2002.
- R.Murugeshan, *Ancillary Physics (Optics and Modern Physics)*, S. Chand, 2002.
- N.Venkatachalam, *Ancillary Physics (Optics and Modern Physics)*, Poppy Educational Publishers, 1994.

*******

**Programme:** B.Sc., **Subject:** I Maths / II Chemistry

**Semester:** II/IV **Course:** Ancillary Physics Practical

**Course Type:** Ancillary Practicals **Course Code:** MUPAP

**Contact Hours:** 2 hours / week **Credits:** 4

**CIA:** 40 **CE:** 60

**Course Outcomes:**

On completion of the course, the student will be able to,

- Gain knowledge in the scientific methods and learn the process of measuring different Physical variables
- Understand the given concepts and its physical significance
- Have a deep knowledge of fundamentals of optics and electric circuits
- Use standard methods to calibrate the given low range voltmeter and ammeter and to measure resistance of the given coil and various physical quantities
- Apply the theory to design the basic electrical circuits

**List of Experiments:**

1. Estimation of errors
2. Compound pendulum- Acceleration due to gravity
3. Torsion pendulum- Rigidity Modulus of a wire
4. Young's Modulus-Uniform bending – Pin and Microscope
5. Young's Modulus-Uniform bending – Scale and telescope
6. Young's Modulus-Non - uniform Bending – pin and microscope
7. Young's Modulus-Non - uniform Bending – scale and telescope
8. Diode characteristics
9. Potentiometer – Calibration of Ammeter
10. Air wedge – thickness of a wire
11. Carey Foster's Bridge – Resistance and Resistivity
12. Potentiometer – Calibration of low range voltmeter
13. Newton's Rings-Radius of curvature of a lens
14. Zener diode characteristics
15. AND, NOT, NAND logic gates using discrete components
16. OR, NOT, NOR logic gates using discrete components.

# EXTRA-CREDIT COURSES

**Programme:** B.Sc., **Subject:** Physics

**Semester:** I **Course:** Astronomy

**Course Type:** Extra Credit Course – I **Course Code:** UGEA

**CIA:** 100 **Credits:** 2

## COURSE CONTENT

**Unit-I: Introduction to Astronomy:**

Birth of Modern Astronomy – Celestial Sphere – Celestial Coordinates – Geocentric theory – Heliocentric theory – Planets: Terrestrial and Jovian Planets – Asteroids – Comets – Meteors.

**Unit -II: Astronomical Instruments:**

The orientation of Earth in Space – Arc and Time Units – Local Time – Standard time – Kinds of Optical Telescopes: Refracting Telescope and Reflecting Telescope – Radio Telescope.

**Unit-III: Solar Physics:**

Introduction – Physical Properties of the Sun – Structure of the Sun – Sun spots – Solar Wind – Auroras – Solar Flares – Space weather effects.

**Unit-IV: Stellar Physics:**

Classification of stars – Hertzsprung – Russell diagram – Luminasity of a star – Stellar evolution; Birth of a star, maturity, ageing stars, death of a star – White dwarfs – Neutron stars – Black holes.

**Unit-V: Galaxies:**

Galaxy Nomenclature – Types of Galaxies: Elliptical, Spiral, Barred Spiral and Irregular galaxies – Milky Way Galaxy – Star Clusters – Galactic Clusters – Pulsars – Supernova explosion.

**Prescribed Texts:**

Dr. A. Mujiber Rahman, *Introduction to Astrophysics*, 2018.

S. Kumaravelu & Susheela Kumaravelu, *Astronomy*,

**Books for Reference:**

R.D. Chopman, *Discovering Astronomy*, W.H. Freeman & Co., 1989.

J.V. Narliker, *The Frontier Between Physics and Astronomy*, IIT, Madras series, 1989.

**Programme:** B.Sc., **Subject:** Physics

**Semester:** III **Course:** Electrical Appliances

**Course Type:** Extra Credit Course – II **Course Code:** UGEEA

**CIA:** 100 **Credits:** 2

## COURSE CONTENT

**Unit-I:**

1. Electric Oven; 2. Washing Machine

**Unit-II:**

1. Refrigerator; 2. Air Conditioner – General Principles And Working

**Unit-III:**

1.Electrical Bell; 2. Room Heater

**Unit-IV:**

1.Induction Stove 2. Lightning Conductor

**Unit-V:**

Introduction – Wiring Materials and Accessories – Types of Wiring – Basic Principles of Earthing – Types of Earthing

**Prescribed Text:**

- K.Arumugam, *Instrumentation*
- R.Murugesan, *Electricity And Magnetism*
- "How Things Work", The Universal Encyclopedia of Machines.

******

**Programme:** B.Sc., **Subject:** Physics

**Semester:** V **Course:** Biomedical Instrumentation

**Course Type: Extra Credit Course – III** **Course Code:** UGEBI

**CIA:** 100 **Credits:** 2

## COURSE CONTENT

**Unit-I: Biopotentials And Electrodes:**

Transport through all membrane – Resting and Action potential – Bioelectric potentials – Design of Medical instruments – Components of the Biomedical instrument system.

**Unit-II: Transducers:**

Active transducers – Magnetic induction type transducer – Piezoelectric type transducer – Piezoelectric transducer as a pulse sensor – Photoelectric type transducer – Thermoelectric type transducer.

**Unit-III: Biopotential Recorders – I:**

Characteristic of a recording system – Electrocardiography origin of cardio Action potential – Ecocardiography – Electroencephalography (EEG) – Analysis of EEG

**Unit-IV: Biopotential Recorders – II:**

Electromyography (EMG) – Electro - retinography (ERG) and Electro - oculography (EOG) – Recorders with high accuracy – Pacemaker – Different types

**Unit -V: Advances In Biomedical Instrumentation:**

Computes in medicine – Lasers in medicine – Endoscopes – Computer Tomotography(CT) (Principle only) – Medical application of CT.

**Prescribed Text:**

- Dr.M.Arumugam, Biomedical Instrumentation, Anuradha Agencies,2006.

**Book for Reference:**


- Ohio, Aston, R. Principles of Bio medical instrumentation and measurement, Merrill Publishing Company, 1990.
- R.S. Khandpur, Handbook pf Biomedical instrumentation, Tata Mc Graw- Hill Publshing Company, 1990.


********