

Vellalar College for Women (Autonomous), Erode - 12

“College with Potential for Excellence”

(Reaccredited with ‘A’ Grade by NAAC & Affiliated to Bharathiar University)



DEPARTMENT OF PHYSICS

B.Sc., PHYSICS

CBCS PATTERN

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Submitted to the Academic Council

23.04.2016

VELLALAR COLLEGE FOR WOMEN (AUTONOMOUS), ERODE – 12.
DEPARTMENT OF PHYSICS
B.Sc Physics

Objective and Scope of the Course:

Physics, a fundamental science has grown into one of the most advanced fields of study, with the recent advances and rapid developments.

- The B.Sc Physics course should now serve the students with a broader range of skills, motivation and needs.
- The students should achieve a meaningful level of competence.
- The emphasis is on providing the students conceptual understanding, analytical and problem - solving skills.
- To introduce the students to contemporary topics in addition to conventional subjects.
- The completion of the course will make the students eligible for admission to M.Sc - Physics, Electronics, Material Science, Medical Physics, Nano Science and Technology and MCA apart from getting job opportunities from various quarters and becoming entrepreneurs.

Structure:

| Part | Components | Semester | Marks | Credits | Number of Choices |
|------|---------------------------------|--------------|-------------|------------|-------------------|
| I | Language-I | I – IV | 400 | 12 | 5 |
| II | Language-II | I – IV | 400 | 12 | - |
| III | Core Physics | I - VI | 1500 | 60 | - |
| | Elective | V - VI | 400 | 15 | - |
| | Industrial Training | | | | - |
| | Allied – I | I – II | 200 | 10 | - |
| | Allied – II | III - IV | 200 | 10 | - |
| IV | Foundation Courses | I – II | 200 | 4 | - |
| | Non Major Elective – I | III | 100 | 2 | 10 |
| | Non Major Elective – II | IV | 100 | 2 | 10 |
| | Skill Based Subjects | III , V & VI | 300 | 9 | 10 |
| | Multi skill development subject | IV | 100 | 3 | 10 |
| V | Extension Activity | | 100 | 1 | 5 |
| | | Total | 4000 | 140 | |

Additional Marks & Credits could be earned by opting UGC Add-on courses (7 Courses), Self Learning papers (10 papers) and other certificate courses offered by various Departments.

Teaching methodology: Lecture method, seminar (using LCD), Computer Assisted Learning, Problem solving, Group Discussion and e-Learning.

Evaluation: Periodical test (Announced & Unannounced), Problem test, Assignment and Seminar.

| Vellalar College for Women (Autonomous), Erode - 12. | | | | | | | | | |
|---|-------------------|-------------------------|---|-------------|------------|------------|-----|-------|-----------|
| Bachelor of Science in Physics | | | | | | | | | |
| 2016 - 2017 & onwards | | | | | | | | | |
| Course Content and Scheme of Examinations (CBCS Pattern) | | | | | | | | | |
| Semester I | | | | | | | | | |
| Part | Study Component | Subject Code | Title of the Paper | Inst. Hrs./ | Exam. Dur. | Max. Marks | | | Credits |
| | | | | | | CIA | ESE | Total | |
| I | Language I | 15TAMU101/ 14HINU101 | Tamil/Hindi | 6 | 3 | 25 | 75 | 100 | 3 |
| II | Language II | 13ENLU101 | English | 6 | 3 | 25 | 75 | 100 | 3 |
| III | Core | 10PHUC101 | Mechanics, Properties of Matter and Acoustics | 3 | 3 | 25 | 75 | 100 | 3 |
| | | 15PHUC102 | Heat, Thermodynamics and Statistical Methods | 3 | 3 | 25 | 75 | 100 | 3 |
| | | 09PHUCP01 | Practical I | 3 | - | - | - | - | - |
| | Allied I | 11CHUA001 | Chemistry Paper I | 4 | 3 | 20 | 55 | 75 | 4 |
| | | 15CHUAP01 | Chemistry Practical | 3 | - | - | - | - | - |
| IV | Foundation Course | 09FOCU1ES | Environmental Studies | 2 | 3 | - | 100 | 100 | 2 |
| | | | | | | | | | 18 |
| Semester II | | | | | | | | | |
| I | Language I | 15TAMU202/ 14HINU202 | Tamil/Hindi | 6 | 3 | 25 | 75 | 100 | 3 |
| II | Language II | 13ENLU202 | English | 6 | 3 | 25 | 75 | 100 | 3 |
| III | Core | 15PHUC203 | Electricity, Magnetism and ElectroMagnetism | 3 | 3 | 25 | 75 | 100 | 3 |
| | | 09PHUC204 | Nuclear and Particle Physics | 3 | 3 | 25 | 75 | 100 | 3 |
| | | 09PHUCP01 | Core Practical I | 3 | 3 | 40 | 60 | 100 | 3 |
| | Allied I | 11CHUA002 | Chemistry Paper II | 4 | 3 | 20 | 55 | 75 | 4 |
| | | 15CHUAP01 | Chemistry Practical | 3 | 3 | 20 | 30 | 50 | 2 |
| IV | Value Education | 14VEDU2HR | Value Education and Human Rights | 2 | 3 | - | 100 | 100 | 2 |
| | | | | | | | | | 23 |

| Semester III | | | | | | | | | |
|-----------------------|------------------------|-------------------------|-------------------------------|--------------------|-------------------|-------------------|------------|--------------|----------------|
| Part | Study Component | Subject Code | Title of the Paper | Inst. Hrs./ | Exam. Dur. | Max. Marks | | | Credits |
| | | | | | | CIA | ESE | Total | |
| I | Language I | 14TAMU303/ 14HINU303 | Tamil/Hindi | 6 | 3 | 25 | 75 | 100 | 3 |
| II | Language II | 13ENLU303 | English | 6 | 3 | 25 | 75 | 100 | 3 |
| III | Core | 09PHUC305 | Optics and Spectroscopy | 4 | 3 | 25 | 75 | 100 | 4 |
| | | 09PHUCP02 | Core Practical II | 2 | 3 | - | - | - | - |
| | Allied II | 15MSUA301 | Mathematical Paper I | 7 | 3 | 25 | 75 | 100 | 5 |
| IV | Skill Based Subject I | | | 3 | 3 | 40 | 60 | 100 | 3 |
| | Basic Tamil | | | | - | 100 | - | 100 | 2 |
| | Advanced Tamil | | | 2 | 3 | 25 | 75 | | |
| | Non-Major Elective I | | | | 3 | - | 100 | | |
| | | | | | | | | | 20 |
| Semester IV | | | | | | | | | |
| I | Language I | 14TAMU404/ 14HINU404 | Tamil/Hindi | 6 | 3 | 25 | 75 | 100 | 3 |
| II | Language II | 13ENLU404 | English | 6 | 3 | 25 | 75 | 100 | 3 |
| III | Core | 11PHUC406 | Digital Electronics | 4 | 3 | 25 | 75 | 100 | 4 |
| | | 09PHUCP02 | Core Practical II | 2 | 3 | 40 | 60 | 100 | 3 |
| | Allied II | 15MSUA404 | Mathematical Paper II | 7 | 3 | 25 | 75 | 100 | 5 |
| IV | Skill Based Subject II | 13PHUS402 | Multi Skill Development Paper | 3 | 1 | 40 | 60* | 100 | 3 |
| | Basic Tamil | | | | - | 100 | - | 100 | 2 |
| | Advanced Tamil | | | 2 | 3 | 25 | 75 | | |
| | Non-Major Elective II | | | | 3 | - | 100 | | |
| * ONLINE EXAMINATIONS | | | | | | | | | 23 |

| Semester V | | | | | | | | | | |
|---------------------------------|-------------------------|--------------|--|-------------|------------|------------|-----|-------|-------------|------------|
| Part | Study Component | Subject code | Title of Paper | Inst. Hrs./ | Exam. Dur. | Max. Marks | | | Credits | |
| | | | | | | CIA | ESE | Total | | |
| III | Core | 12PHUC507 | Mathematical Physics | 5 | 3 | 25 | 75 | 100 | 5 | |
| | | 09PHUC508 | Atomic and Solid State Physics | 5 | 3 | 25 | 75 | 100 | 5 | |
| | | 09PHUC509 | Electronic Circuits and Devices | 6 | 3 | 25 | 75 | 100 | 6 | |
| | | 13PHUCP03 | Core Practical III | 3 | 3 | - | - | - | - | |
| | | 13PHUCP04 | Core Practical IV | 2 | 3 | - | - | - | - | |
| | Elective I | 08PHUE501 | Programming in C and C++ | 5 | 3 | 25 | 75 | 100 | 5 | |
| | | 08PHUEP01 | Practical | 1 | 3 | - | - | - | - | |
| IV | Skill Based Subject III | | | 3 | 3 | 25 | 75 | 100 | 3 | |
| | | | | | | | | | 24 | |
| Semester VI | | | | | | | | | | |
| III | Core | 09PHUC610 | Quantum Mechanics and Relativity | 6 | 3 | 25 | 75 | 100 | 6 | |
| | | 09PHUC611 | Communication Electronics | 6 | 3 | 25 | 75 | 100 | 6 | |
| | | 13PHUCP03 | Core Practical III | 3 | 3 | 40 | 60 | 100 | 3 | |
| | | 13PHUCP04 | Core Practical IV | 2 | 3 | 40 | 60 | 100 | 3 | |
| | Elective I | 08PHUEP01 | Practical | 3 | 3 | 40 | 60 | 100 | 3 | |
| | Elective II | 12PHUE602 | Fundamentals of Microprocessors | 4 | 3 | 25 | 75 | 100 | 4 | |
| | Elective III | 08PHUE6PV | Project | 3 | 3 | - | - | 100 | 3 | |
| IV | Skill Based Subject IV | | | 3 | 3 | 25 | 75 | 100 | 3 | |
| V | Extension Activity | | NCC/NSS/Physical Education/YRC/ Green Society / Citizen Consumer Club / Enterprenurship Development Programme | - | - | - | - | 100 | 1 | |
| | | | | | | | | | 32 | |
| Total (I - VI Semesters) | | | | | | | | | 4000 | 140 |

| Skill Based Subjects | | |
|-----------------------------|---------------------|---|
| S.No. | Subject Code | Title of the Paper |
| 1 | 15PHUS301 | Energy Management (Cafeteria System) |
| 2 | 13PHUS402 | Multi Skill Development Paper |
| 3 | 11PHUS503 | MATLAB (Cafeteria System) |
| 4 | 11PHUS604 | Mobile Communication (Cafeteria System) |

| Basic Tamil / Adv.Tamil / Non - Major Elective | | |
|---|---------------------|--|
| S.No | Subject Code | Title of the Paper |
| 1 | 14TMLU301 | Basic Tamil* |
| 2 | 14TMLU402 | |
| 3 | 14ADTU301 | Advanced Tamil** |
| 4 | 14ADTU402 | |
| 5 | 15PHUN301 | Physics in Everyday Life |
| 6 | 15PHUN402 | Environmental Pollution : Physical Aspects |

* For Students, whose Part I in Secondary Education is not Tamil.

** For Students, whose Part I in Higher Secondary Education is not Tamil

| Self Learning Papers | | | | | |
|-----------------------------|---------------------|---------------------------------|------------------------|------------------|----------------|
| S.No | Subject Code | Title of the Paper | Exam. Dur. Hrs. | Max.Marks | Credits |
| 1 | 13AUGSL05 | General Awareness (Online Exam) | 1 | 100 | 5 |
| 2 | 13PHUSL01 | Health Physics (Optional) | 3 | 100 | 5 |

DEPARTMENT OF PHYSICS

B.Sc. Physics

Question Paper Pattern

(2013-2014 onwards)

PART III CORE AND ELECTIVE SUBJECTS

Duration: 3hrs

Marks: 75

Section- A (10x1=10 Marks)

Multiple Choice Questions: (Q.No. 1-5) (One from each Unit)

Fill up / True or False : (Q.NO. 6 - 10) (One from each Unit)

Section- B (5x5=25 Marks)

Answer all the Questions (either or pattern)

One Question from each unit. Out of 10 Questions any two from different units may be problems.

11. a (or) b

12. a (or) b

13. a (or) b

14. a (or) b

15. a (or) b

Section- C (5x8=40 Marks)

Question No. 16 –23

Answer any **Five**

At least One Question from each unit and not more than two from the same unit.

Allied Papers

Duration: 3hrs

Marks: 55 Section- A (10x1=10 Marks)

Pattern same

as that for core papers.

Section- B (5x3 =15 Marks)

Section- C (5x6 =30 Marks)

PART IV Foundation Course and Non Major Elective Papers

(except NME-1: Physics in Everyday Life)

Duration: 3hrs

Marks: 100

Answer any 5 out of 8 Questions. Each Question Carries 20 marks

Questions must be from all Units and not more than two from a Unit.

NME-1: Physics in Everyday Life

Two Questions from each Unit(Unit I,II & III) and one Question from each Unit(Unit IV &V).

PART IV Skill Based Subjects

Duration: 3hrs

Marks: 75

Answer any 5 out of 8 Questions. Each Question Carries 15 marks

Questions must be from all Units and not more than two from a Unit.

* Skill Based Subject – II Multi skill Development Paper will have no external examination. The department concerned should award 100 marks in the ratio of 40:60 for CIA and and ONLINE Examination respectively.

Career Oriented Add on Courses

Duration: 3 hours

Marks: 75

Answer any 5 out of 8 Questions. Each Question Carries 15 marks.

Questions must be from all units and not more than two from a unit.

Self Learning Subjects

Duration: 3 hours

Marks: 100

Answer any 5 out of 8 Questions Each Questions carries 20 Marks

Questions must be from all units and not more than two from a unit.

Distribution of Marks for Internal Assessment

(2013-2014 onwards)

| Theory Papers (Core, Elective, Skill Based Subjects) | | Allied |
|---|------------|---------------|
| Two tests of one hour duration each: | | |
| Avg. of two Int. tests | - 10 marks | 8marks |
| Model Examination | - 10 marks | 8marks |
| Seminar/Assignment | - 5 marks | 4marks |
| | ----- | ----- |
| | 25 marks | 20marks |
| | ----- | ----- |

Practicals

Two practical tests of three hour duration each

| Core, Elective & Skill Based Subjects | | Allied |
|--|------------|---------------|
| Avg. of two Int. tests | - 10 marks | 5 marks |
| Model Examination | - 10 marks | 5 marks |
| Continuous Evaluation | - 15 marks | 7 marks |
| Record | - 5 marks | 3 marks |
| | ----- | |
| | 40 marks | 20 marks |
| | ----- | ----- |

Distribution of Marks for End Semester Examination [ESE]

Practicals

| | Core, Elective & Skill Based Subjects | Allied |
|------------|--|-----------------|
| ESE | 60 marks | 30 marks |
| Experiment | 50 marks | 25 marks |
| Record | 10 marks | 5 marks |

SEMESTER I

Core Paper I

MECHANICS, PROPERTIES OF MATTER AND ACOUSTICS

Instructional Hrs. : 45

Sub. Code: 10PHUC101

Max. Marks : CIA - 25; ESE – 75

Credits:3

Objective: The concept of Mechanics, Properties of matter are central to the whole of Physics. The paper suits the needs of UG Physics students. It also provides basic concepts of Acoustics.

UNIT I

9 Hrs.

Rigid Body Dynamics: Rigid Body-Rotational and Vibrational Motion-Torque Moment of Inertia- Radius of Gyration-Kinetic Energy of Rotation-M.I of a Fly Wheel-Experimental Determination-Precession-The Gyrostat-Gyrostatic Applications-*M.I of a Diatomic Molecule-its Rotational Energy States.*

UNIT II

9 Hrs.

Gravitational Field & Potential: Nature of Motion Under Center Forces-Kepler's Laws-Newton's Law of Gravitation- Gravitational Potential and Field-Gravitational Potential and Field Due To (i) Spherical Shell. (ii) *Solid Sphere*-Boys Method of Determining "G".

UNIT III

9 Hrs.

Elasticity: Elastic Constants of An Isotropic Solids - Relations Connecting Them - Poisson's Ratio-Bending of Beams - Bending Moment of A Bent Beam-Cantilever - Static and Dynamic Method - Uniform and Non-Uniform Bending - Torsion In a Wire - Rigidity Modulus-Determination By Static and *Dynamic Methods.*

UNIT IV

9 Hrs.

Surface Tension, Production and Measurement of Low Pressures: Surface Tension and Surface Energy – Pressure on Curved Surface of a Liquid - *Variation of Surface Tension with Temperature* - Jaeger's Method – Laws of Diffusion - Diffusion Pump – Pirani and Kundsen Gauge.

UNIT V

9 Hrs.

Types of Vibration: Simple Harmonic Motion - Types of Vibrations - Undamped Vibrations – Damped Vibrations – Forced Vibrations – Resonance and Sharpness of Resonance.

Acoustics of Buildings: Factors Affecting the Acoustics of Buildings - Sabine's Reverberation formula.

Ultrasonics: Production by Piezo - Electric Method - *Applications.*

Note: *Italics* Self Study Topics

TEXT BOOKS

1. **Murugasen R.**, “*Properties of Matter*”, S.Chand & Company, New Delhi, Revised Edition 2008.
2. **Brijlal & Subrahmanyam N.**, “*Properties of Matter*”. Eurasia Publishing House (Pvt) Ltd, New Delhi, Fifth Edition 1989.
3. **Brijlal & Subrahmanyam N .**, “*A Text book of Sound*”, Vami Educational Books – Second Revised and Enlarged Edition. Vikas Publishing House, New Delhi. 1978.

REFERENCE BOOKS

1. **Mathur D.S.**, “*Mechanics*” –S.Chand and Company (Pvt), Ltd., New Delhi, Second Edition Reprinted 1986.
2. **MathurD.S.**, “*Elements of Properties of Matter*”, Shyam Lal Charitable Trust , Eleventh New Delhi, Edition 1992.,
3. **Saihgale R.L.**, “*A Text books of sound*”. S.Chand & Co., New Delhi. First Edition Reprinted 1977.

SEMESTER I

Core Paper II

HEAT, THERMODYNAMICS AND STATISTICAL METHODS

Instructional Hrs . : 45

Sub. Code: 15PHUC102

Max. Marks: CIA - 25; ESE – 75

Credits: 3

Objective: The paper fulfills the requirements of UG students. It helps to learn about the behaviors of Thermo dynamical system.

UNIT I

9 Hrs.

Equation of State of a Real Gas: Van Der Waal's Equation of State - *Critical Constants*.

Quantum Theory of Specific Heat: Dulong and Petit's Law and the Deduction - Failure of Dulong and Petit's Law - Einstein Theory and its Limitations - Debye's Theory - *Specific Heat of Di-Atomic Gases*.

UNIT II

9 Hrs.

Entropy: Principles of Increase of Entropy - Temperature-Entropy Diagram - Entropy of A Perfect Gas
Thermodynamic Potentials: Internal Energy (U), Helmholtz Function(F), Gibb's Function(G), and Enthalpy(H) - Maxwell's Thermodynamic Relations - *(T-ds) Equations* - *Clausius Latent Heat Equation From Maxwell's Thermodynamic Relations*.

UNIT III

9 Hrs.

Production of Low Temperature and Liquefaction of Gases: Method of Production of Low Temperatures: Joule Thomson Effect - Porous Plug Experiment - Theory and Results - Joule Thomson Effect for Perfect and *Real Gases* – Superfluidity – Helium-I and Helium-II - *Lamda Point* - Adiabatic Demagnetization.

UNIT IV

9 Hrs.

Thermal Radiation: Quantum Theory of Radiation - Planck's Hypothesis - Average Energy of Planck's Oscillator - Planck's Radiation Law and Its Experimental Verification - Wien's Law and Rayleigh- Jeans's Law in Relation to Planck's Law - *Stefan's Constant and Wien's Constant from Planck's Law*.

UNIT V

9 Hrs.

Statistical Thermodynamics: Statistical Equilibrium - Probability Theorems in Statistical Thermodynamics - Maxwell-Boltzmann Distribution Law - Maxwell-Boltzmann Distribution Law In Terms of Temperature - Quantum Statistics - Phase Space – Fermi-Dirac Distribution Law - Bose – Einstein’s Distribution Law (Qualitative Study Only) – *Comparison of Three Statistics.*

Note: *Italics* denotes Self Study Topics

TEXT BOOKS

1. **Brijilal and Subramaniam**, “*Heat and Thermodynamics*” S.Chand & Co., New Delhi
First Edition, Reprint 2006.
2. **Murugesan, & Kiruthiga Sivaprasath** “*Thermal Physics*”. S.Chand & Co., New Delhi,
First Edition, 2004.
3. **Singal, Agarwal and Sathya Prakash** “*Heat and Thermodynamics and Statistical Physics*”
Pragati Prakashan Publications., First Edition, Reprinted 1995.

REFERENCE BOOKS

1. **Mathur D.S.**, “*Heat and Thermodynamics*”, S.Chand & Co., New Delhi , First Edition,
5th Reprint 2008.
2. **Sharma J.K and Sarkar K.K.**, “*Thermodynamics and Statistical Physics*”Himalaya
Publishing House, Bombay, Third Revised Edition, 1991.
3. **Gupta.A.B., Roy.H.P.**, “*Heat and Thermodynamics*” New Century Book House, Chennai.
First Edition, 1995.

SEMESTER II

Core Paper III

ELECTRICITY, MAGNETISM & ELECTROMAGNETISM

Instructional Hrs . : 45

Sub. Code: 15PHUC203

Max. Marks: CIA - 25; ESE – 75

Credits: 3

Objective: The domain of electricity and magnetism extends over the whole of nature. The concepts taught through the course can be applied to several fields of relevance e.g. optics, Material science, Biophysics, Atomic physics, Nuclear physics etc. Theoretical and practical skills developed can be extended to industrial applications.

The student gains the knowledge of electrical behavior of charge and magnetic properties of materials.

UNIT I

9 Hrs.

Electro Statistics: Gauss Theorem - Application of Gauss Theorem - Coulomb's Law: Proof Mechanical Force Experienced by Unit Area of a Charged Surface Energy Stored per Unit Volume in an Electric Field.

Principle of Capacitors: Parallel Plate Capacitor - Force of Attraction between Plates of a Charged Parallel Plate Capacitor Polarization in Dielectric Materials. *Types of Capacitors: Guard Ring Capacitor - Electrolytic Capacitor - Variable Capacitor.*

UNIT II

9 Hrs.

Magnetic Properties Of Materials: Electron Theory of Magnetism - Langevin Dia, Para and Ferromagnetism - *Magnetic Susceptibility and Magnetic Permeability* - Hysteresis - Area of the Hysteresis Loop – Ferro Magnets – Determination of Susceptibility - Guoy's Method.

UNIT III

9 Hrs.

Helmholtz Equations of Varying Current: Growth and Decay of Current in an Inductive–Resistive Circuit - Charging and Discharging of a Capacitance through a Resistance - Charging And Discharging of a Capacitance through an Inductance and a Resistance - Discharge of a Capacitance through an Inductance – Oscillatory Circuits - *Force on a Current Carrying Conductor - Theory of Ballistic Galvanometer.*

UNIT IV

9 Hrs.

AC Circuit Analysis and Network Theorems: LCR Series Resonance Circuit - LC Parallel and *L, R and C Parallel Resonance Circuits* - Power Consumed By the Above Circuits - Q-Factor and Bandwidth of Response of a tuned Circuit - Sharpness of Resonance - Network Theorems: Thevenin and Norton Theorems.

UNIT V

9 Hrs.

Dynamics of Charged Particles: Charged Particles in a Uniform and Constant Electric Field - Charged Particle in an Alternating Electric Field - *Charged Particle in a Uniform and Constant Magnetic Field* - Magnetic Focusing - Charged Particle in Combined Electric and Magnetic Field When the Fields are parallel and are in Mutually Perpendicular Directions.

Note: *Italics* denotes Self Study Topics

TEXT BOOKS

1. **Brijlal & Subramaniam N.**, "*Electricity and Magnetism*", S.Chand & Company New Delhi, Tenth Edition 1981.
2. **Murugesan R.**, "*Electricity and Magnetism*" S.Chand & Company Ltd., New Delhi 4th revised edition, 2002.
3. **Nagaratnam N., Lakshmi Narayanan N.**, "*Electricity and Magnetism*" The National Publishing Company. 2nd Revised Edition. Chennai 1988.

REFERENCE BOOKS

1. **Tewari k.k.**, "*Electricity and Magnetism with Electronics*" S.Chand & Company, New Delhi, Second Edition, 1992.
2. **Seghal, D.C., Chopra, K.L., Seghal, N.K.**, "*Electricity and Magnetism*", S.Chand & Company, New Delhi, 5th Edition. 2009.
3. **Emerson M.Pugh., Emerson W.Pugh.**, "*Principles of Electricity and Magnetism*" Wesley London, First Edition. 1965.

SEMESTER II

Core paper IV

NUCLEAR AND PARTICLE PHYSICS

Instructional Hrs . : 45

Sub. Code: 09PHUC204

Max. Marks: CIA - 25; ESE – 75

Credits: 3

Objective: To provide the students an approach to the physics of atoms and nucleus. To help students to appreciate the close link between various interrelated developments. The syllabus envisions providing a base for the student who aspires to be a nuclear scientist.

UNIT I

9 Hrs.

General Properties of Atomic Nuclei: Introduction – Nuclear Forces – Meson's Theory of Nuclear Forces – Theories of Nuclear Composition – Proton Electron Hypothesis – Models of Nuclear Structure – Liquid Drop Model – Shell Model.

Particle Accelerators - *Synchrocyclotron* – *Betatron* – Electron and Proton Synchrotron.

UNIT II

9 Hrs.

Radio Activity: Introduction - Geiger Nuttal Experiment – Geiger Nuttal Law – Alpha Particle Disintegration Energy – Origin of Line and Continuous Spectrum – Neutrino Theory of Beta Decay – K. Electron Capture – Origin of Gamma Rays – Absorption of Gamma Rays – *Natural Radio Active Series* – *Law of Successive Disintegration* – *Radio Active Equilibrium Radio Active Dating*.

UNIT III

9 Hrs.

Artificial Transmutation of Elements: Discovery of Artificial Transmutation – Rutherford's Experiment – Bohr's Theory of Nuclear Disintegration - Nuclear Reactions - Energy Balance in Nuclear Reactions - and The Q-Value - *Nuclear Transmutations* - *Transmutation By (I) Alpha Particle (Ii) Protons (Iii) Deuterons and Neutrons* – The Scattering Cross Section and Its Determination – Production of Radioisotopes and Their Uses.

Detectors of Nuclear Radiations - Ionization Chamber – Geiger Muller Counter – Proportional Counter – Wilson's Cloud Chamber – Bubble Chamber – Basic Principles and Working.

UNIT IV

9 Hrs.

Nuclear Fission, Fusion and Reactors: Nuclear Fission – Energy Released in Fission – Bohr Wheeler Theory of Nuclear Fission – Chain Reaction – Multiplication Factor – Natural Uranium and Chain Reaction – Design of Nuclear Reactor – Breeder Reactor - Nuclear Reactor Programmes in India – Nuclear Fusion – *Sources of Stellar Energy – Thermo Nuclear Reactions – Transuranic Elements.*

UNIT V

9 Hrs.

Elementary Particles: *Baryons – Leptons – Mesons – Particles and Antiparticles* – Concept of Antimatter – Strong Interaction – Electro Magnetic Interaction – Gravitational Interaction – Elementary Particle Quantum Numbers – Conservation Laws and Symmetry – Charge Conjugation – Parity and Time Reversal – Cpt Quark Model.

Note: *Italics denotes Self Study Topics*

TEXT BOOKS

1. **Murugesan R.**, “*Modern Physics*”, S.Chand & Company Ltd., New Delhi, sixth Revised Edition, 1998.
2. **Seghal, Chopra and Seghal.**, “*Modern Physics*”, Sultan Chand & Sons., New Delhi, 7th Thoroughly Revised Edition.
3. **Goshal S.N.**, “*Nuclear Physics*”, S.Chand & Company Ltd., New Delhi, revised edition, 2006.

REFERENCE BOOKS

1. **Sharma R.C.**, “*Nuclear Physics*”, K.Nath & Company, fifth revised Edition, reprint 2003.
2. **Kennath .S.Krane**, “*Modern Physics*” 2, John Wiley & Sons, New York, 1998.
3. **Arthur Beiser**, “*Concepts of Modern Physics*” Tata McGraw Hill, New Delhi, 2008 Edition, 2008.

SEMESTER I & II

Core Practical I

Instructional Hrs . : 90

Sub. Code: 09PHUCP01

Max. Marks: CIA - 40; ESE – 60

Credits: 3

Any SIXTEEN of the following:

1. Young's Modulus – Non Uniform Bending – Pin and Microscope.
2. Young's Modulus – Uniform Bending – Optic Lever.
3. Young's Modulus – Cantilever – Static Method.
4. Young's Modulus – Cantilever – Dynamic Method.
5. Rigidity Modulus – Static Torsion.
6. Compound Pendulum – Acceleration Due to Gravity.
7. Coefficient of Thermal Conductivity – Lee's Disc.
8. Refractive Index of a Liquid – Hollow Prism – Spectrometer.
9. Refractive Index of the Material of a Solid Prism - Spectrometer.
10. Refractive Index of the Material of a Solid Prism i-d – Curve - Spectrometer.
11. Wavelength of Mercury Spectral Lines – Grating – Normal Incidence – Spectrometer.
12. Wavelength of Spectral Lines – Grating – Minimum Deviation – Spectrometer.
13. Calibration of Voltmeter-Low Range — Potentiometer.
14. Calibration of Ammeter– Low Range -Potentiometer.
15. Specific Resistance – Potentiometer.
16. Moment of a Magnet – Circular coil-Deflection magnetometer.
17. Moment of a Magnet – Tan C position.
18. Characteristics of Junction Diode.
19. Sonometer – Frequency of A.C mains.
20. Temperature Coefficient of Resistance of a Thermistor – Post Office Box.

B.Sc Physics 2010-11 onwards

SEMESTER III

Core Paper V

OPTICS AND SPECTROSCOPY

Instructional Hrs. : 60

Sub. Code: 09PHUC305

Max. Marks: CIA-25; ESE-75

Credits: 4

Objective: To provide an understanding of various phenomenon of light and principles of spectroscopy.

UNIT I

12 Hrs.

Geometrical Optics:

Aberrations: Spherical Aberration in a Lens – Reducing Spherical Aberration – Coma – Aplanatic Lens – Chromatic Aberration In a Lens – *Achromatism In Prisms – Achromatic Lenses.*

Velocity Of Light: Anderson's Method – Houston's Method.

UNIT II

12 Hrs.

Physical Optics:

Interference: Fresnel's Biprism – Determination of Wavelength – Air Wedge – *Interferometry – Michelson Interferometer* – Types of Fringes – Visibility of Fringes – Determination of Wavelength of Monochromatic Light – Determination of Difference in Wavelength Between two Neighboring Spectral Lines – Standardization of the Meter – Holography.

UNIT III

12 Hrs.

Diffraction: Rectilinear Propagation of Light – Zone Plate – Fresnel & Fraunhofer Diffraction – Diffraction Pattern Due to a Straight Edge – Plane Diffraction Grating – Theory – Determination of Wavelength – Echelon Grating – Theory – *Resolving Power of a Plane Diffraction Grating.*

UNIT IV

12 Hrs.

Polarization: Double Refraction – Huygens’s Explanation of Double Refraction in Uniaxial Crystals – Production and Detection of Plane, Circularly and Elliptically Polarized Light – Optical Activity – Specific Rotation – *Laurent’s Half – Shade Polarimeter* – *Lippich Polarimeter*.

UNIT V

12 Hrs.

Laser Spectroscopy: Induced Absorption, Spontaneous Emission and Stimulated Emission – Population Inversion – Pumping – Ruby Laser – *Helium-Neon Laser* – *Gas Laser*– *Properties of Laser Beam*.

Molecular Spectroscopy: Pure Rotational Spectra – Vibrational – Rotational Spectra – Electronic Spectra – Raman Effect – Quantum Theory of Raman Effect – Experimental Study of Raman Effect – Applications.

Note: *Italics*denotes Self study Topics

TEXT BOOKS

1. **Murugesan R.**, “*Modern Physics*”, S.Chand & Company., New Delhi, 2005 Edition, 2005.
2. **Subramaniam And Brijlal.**, “*Optics*”, S.Chand & Company., New Delhi, 22nd Edition, 1994.

REFERENCE BOOKS

1. **Ajay Ghatak.**, “*Optics*”, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, First Reprint 1978.
2. **Dutta M K.**, “*Atomic and molecular Spectroscopy*”, IV Y Publishing House, New Delhi, First Edition , 2010.
3. **Vimal Kumar Jain**, “*Introduction to Atomic and Molecular Spectroscopy*” , Narosha Publishing House, New Delhi, First Edition 2007.

SEMESTER IV
Core Paper VI
DIGITAL ELECTRONICS

Instructional Hrs. : 60

Sub. Code:11PHUC406

Max. Marks: CIA-25; ESE-75

Credits: 4

Objective: To enable the students to learn Digital principles and their Applications.

UNIT I **12 Hrs.**

Number system and Codes:Decimal, Binary, Octal, Hexadecimal- Conversion of Number system- Binary Coded Decimal – Alphanumeric Codes - ASCII Code – EBCDIC Code – Error Detecting and Correcting Code – Parity – Even Parity and Odd Parity Method.

UNIT II **12 Hrs.**

Logic gates and Boolean Algebra: Positive and Negative logic – Logic Gates - NAND, NOR, XOR, XNOR – Action And Truth Table – Laws And Rules of Boolean Algebra and simplifications - *De Morgan's Theorem and Proof* – *K-map* – *Pairs, Quads, Octets, Don't care condition. Logic Diagrams.*

UNIT III **12 Hrs.**

Arithmetic and Logic Circuits: Half Adder – Full Adder – Half Subtractor – Full Subtractor – Parallel Binary Adder – Parallel Binary Subtractor Encoder Decoder D/A Converter – A/D Converter .

UNIT IV **12 Hrs.**

Sequential Circuits: Introduction – R.S Flip Flop, Clocked Flip Flop, JK Flip Flop, D Flip Flop –*Master Slave JK Flip Flop* – *Construction Circuits* – *Working.*

Counters:

Ring Counter, Ripple Counter, Mod counters: Decade Counter.

UNIT V **12 Hrs.**

Magnetic Memory : Magnetic Cores – Magnetic Core Logic – Coincident Current Memory – Memory Addressing.

Semiconductor Memory: MOS – RAM ROM, PROM, & EPROM.

Note: *Italics*denotes Self study Topics

TEXT BOOKS

1. **Malvin.**, “*Digital Computer Electronics*”, Tata McGraw Hill, New delhi, 3rd Edition, 2003
2. **Malvino & Leach.**, “*Digital principles and applications*”, Tata McGraw Hill, New Delhi, 6th Edition. 2006.
3. **Thomas C Bartee.**, “*Digital computer fundamentals*”, Tata Mc Graw Hill, New Delhi, - 6th Edition, 2001.

REFERENCE BOOKS

1. **Jain.R.P.**, “ *Modern Digital Electronics*”, Tata McGraw Hill, New Delhi , 3rd Edition, 2006.
2. **Morris Mano.M.**, : “*Digital Logic & Computer Design*”, Prentice Hall India First Edition, Reprint 2000 New Delhi
3. **William H.Gothmann.**, “*Digital electronics*”, Prentice Hall India, New Delhi, 2nd Edition 2006.
4. **Anokh Singh, Chhabra A.K.**, “*Fundamentals of Digital Electronics and Microprocessors*”. S.Chand & Company Ltd., New Delhi. 2nd Revised Edition 2003.

SEMESTER III & IV

Core Practicals II

Instructional Hrs. : 60

Sub. Code: 09PHUCPO2

Max. Marks: CIA-40; ESE-60

Credits: 3

Any SIXTEEN of the Following:

1. Young's Modulus – Uniform Bending – Koenig's Method.
2. Young's Modulus – Non Uniform Bending – Koenig's Method.
3. Dispersive Power of Grating – Spectrometer.
4. Cauchy's Constants and Dispersive Power of a Prism – Spectrometer.
5. μ of a Prism – Stoke's Formula.
6. μ of a Lens – Newton's Rings.
7. Thickness of Insulation – Air Wedge.
8. Calibration of Voltmeter – High Ranges-Potentiometer.
9. Temperature Coefficient Of Resistance – Carey Foster's Bridge.
10. Kater's Pendulum – Determination of Acceleration due to Gravity 'g'.
11. Spectrometer – $i - i'$ Curve.
12. Characteristics of Zener Diode.
13. Figure of Merit of B.G.
14. Comparison of Mutual Inductance – B.G.
15. Comparison of Emfs – B.G.
16. Transistor Characteristics – Common Emitter Configuration.
17. Transistor Characteristics – Common Base Configuration.
18. Field Along The Axis of The Coil – Vibration of Magnetometer – Determination of Field.
19. Hysterisis – B.H. Curve.
20. Melting Point of Wax – Thermistor – Post Office Box

B.Sc Physics 2009-10 onwards

SEMESTER V
Core Paper VII
MATHEMATICAL PHYSICS

Instructional Hrs. : 75

Sub. Code:12PHUC507

Max. Marks: CIA-25; ESE-75

Credits: 5

Objective: To enable the students to solve various mathematical problems and to understand how mathematics and physics are related.

UNIT I

15 Hrs.

Classical Mechanics: Constraints and Degrees of Freedom – Generalized Co-Ordinates – Generalized Displacement, Velocity, Acceleration, Momentum, Force and Potential Hamilton's Variational Principle – Deduction of Lagrange's Equation of Motion from Hamilton's Principle (For Conservative Systems) – Deduction of Lagrange's Equation By Differential Method – D'Alembert's Principle - Lagrange's Equation from D'Alembert's Principle – *Application of Lagrange's Equation of Motion to Simple Pendulum, Compound Pendulum and Linear Harmonic Oscillator.*

UNIT II

15 Hrs.

Interpolation: Newton's Forward and Backward Interpolation Solution of Non-Linear Equations: Bisection Method, Secant Method and *Newton Raphson Method*. Least Square Curve Fitting – Straight Line, Parabola and Exponential Curve.

UNIT III

15 Hrs.

Linear algebraic Equations: Gauss Elimination Method – Jordan Elimination Methods Jacobi Method Gauss-Seidel Iterative Methods.

Numerical Integration: Trapezoidal Rule – *Simpson's 1/3 Rule*.

First Order Differential Equations: Solution by Taylor's Series Method – *Euler's Method* – Runge Kutta Method.

UNIT IV

15 Hrs.

Statistics: Correlation – Karl Pearson’s Coefficient of Correlation – Spearman’s Rank Correlation- Correlation Coefficient – Regression – Line of Regression- *Equation to The Lines of Regression- Error of Prediction.*

UNIT V

15Hrs.

Vector Analysis: Divergence of A Vector Function – Physical Interpretation of Divergence – Curl – Physical Meaning of Curl – Line Integral – Surface Integral – Volume Integral –Stoke’s Theorem– Gauss Divergence Theorem.

Matrices and Special Function: *Orthogonal Matrix – Unitary Matrices Matrix* – Characteristic Matrix and Characteristic Equation- Eigen Values And Eigen Vectors – Cayley- Hamilton Theorem – Proof – Inverse of a Matrix

Note: *Italics*denotes Self study Topics

TEXT BOOKS

1. **Gupta, Kumar, Sharma.,**“*Classical Mechanics*”, (Unit I) Pragati Prakashan, Meerut,21st Edition, 2004.
2. **Kandaswamy P, Thilagavathi K. Gunavathi K.,**“*Numerical methods*”,(Unit – II& III) S.Chand & Company, New Delhi, 3rd Revised Edition 2007.
3. **Dass H.K.,** “*Mathematical Physics*”,(Unit IV& Unit V). S.Chand & Company, New Delhi, IV Edition.
4. **Satya Prakash.,** (Unit IV). “*Mathematical Physics*”, Sultanchand & Sons, New Delhi.

REFERENCE BOOKS

1. **Arumugam S, Thangapandi Issac A , Somasundaram .,**“*Numerical methods*” , Scitech Publications (India) Pvt. Ltd., Second Edition, 2007.
2. **Venkatraman.,**“*Numerical Methods in Engineering*”.

SEMESTER V

Core Paper VIII

ATOMIC AND SOLID STATE PHYSICS

Instructional Hrs. : 75

Sub. Code: 09PHUC508

Max. Marks: CIA-25; ESE-75

Credits: 5

Objective: This syllabus provides a platform for the students to learn about the structure and properties of solids and their relation. It helps the students to appreciate the practical utility of the various fundamental principles. This paper leads to the study of subjects such as material science, nano science, condensed matter physics, solid state ionics, etc.

UNIT I

15 Hrs.

Atomic Physics: Introduction – The Vector Atom Model – Quantum Numbers Associated with the Vector Atom Model – Coupling Schemes – *Pauli's Exclusion Principle* – *Periodic Classification of Elements* – Electronic Configuration of Some Light Elements with Symbolic Representation – Magnetic Dipole Moments Due to Orbital And Spin Motion of Electrons – Fine Structure of Sodium Line – Hyperfine Structure - Zeeman Effect- Experimental Arrangement – Expression for Zeeman Shift.

UNIT II

15 Hrs.

Crystal Structure: Crystals and Crystal Lattice – Unit Cell – *Types of Crystal System* – *Tetragonal, Hexagonal, Orthorhombic, Rhombohedral, Monoclinic, Triclinic* – Bravais Lattices – Metallic Structure – Body Centered Cubic (BCC) Structure – Face Centered Cubic (FCC) Structure – Hexagonal Close Packed Structure- Miller Indices – Procedure to Find Miller Indices of Crystal Planes – Representation of Crystal Planes in a Cubic Unit Cell – Common Planes In a Simple Cubic Structure – Study of Crystal Structure – Powder Crystal Method – Laue's Method – Rotating Crystal Method.

UNIT III

15 Hrs.

Crystal Defects & Crystal Growth: Point Defects – Line Defects – Surface Defects – *Types of Dislocations* – Edge and Screw Dislocations – Crystal Growth – Nucleation Methods – Solution and Gel Techniques – U-Tube Method – Czochralski's Crystal Growth.

B.Sc Physics – 2009-10 onwards

UNIT IV

15 Hrs.

Electron Theory of Metals: Drude – Lorentz Theory and its Applications – Sommerfield Theory – Fermi Dirac Distribution – Brillouin Zone Theory – Brillouin Zone - Relation Between Energy and Wave Number.

Super Conductivity: Super Conductivity – Occurrence of Super Conductivity - Experimental Facts of Super Conductivity - Persistent Currents - Effect of Magnetic Fields – Meissner Effect – *Type-I and Type II Super Conductors* – B.C.S. Theory of Super Conductivity.

UNIT V

15 Hrs.

Dielectric and Insulating Materials: Polarisation – Temperature and Frequency Effects – Dielectric Loss – Piezo Electric and Ferro Electric Materials - Break Down Mechanisms – Classification of Insulating Materials – Testing Them – *Ceramic and Polymer Insulating Materials* – *Liquid Insulating Materials*.

Note: *Italics* denotes Self study Topics

TEXT BOOKS

1. **Arumugam** ., “*Material Science*” ,Anuradha Agencies Publishers, Kumbakonam Revised Edition 1990.
2. **Khurimi R.S, Sedha R.S.**, “*Material Science*”, S.Chand & Company Ltd., New Delhi Sixth Edition, 1989.
3. **Murugesan R.**, “*Modern Physics*”, S.Chand & Company Ltd. New Delhi, Sixth Edition, 1998.

REFERENCE BOOKS

1. **Mandal J.N.**, “*Concepts of Solid State Physics*”, Pragati Prakashan, New Delhi, First Edition 2001.
2. **Ragavan V.**, “*Material Science And Engineering*” , Prentice Hall of India Pvt. Ltd. New Delhi, Third Edition, 1993.

SEMESTER V
Core Paper IX
ELECTRONIC CIRCUITS AND DEVICES

Instructional Hrs. : 90

Sub. Code: 09PHUC509

Max. Marks: CIA-25; ESE-75

Credits: 6

Objective: To provide the essential knowledge of semi conductors and enable the students to understand the basic principles, working and applications of semi conductor diodes, transistors, amplifiers and oscillator circuits.

UNIT I

20 Hrs.

Semiconductor Diodes and Rectifiers: Introduction to Semiconductor Theory– Special Diodes – Zener Diode, Tunnel Diode and Varactor Diode – Construction, Working, Equivalent Circuit and Applications. Opto Electronic Devices – LED, Photo Diode and LCD – Construction and Working – and Applications. DC Power Supply-Full Wave Rectifier- *Voltage Regulation* – *Zener, Transistor Regulators. Filters- Inductive and Capacitive.*

UNIT II

18 Hrs.

Transistor Circuits: Transistor Biasing and Stabilization – Leakage Currents and Total Currents In a Common Emitter and Common Base Circuit – Load Line – Q-Point – *Factors Affecting Stability of Q-Point – Stability Factor.*

Field Effect Transistor – JFET – Construction – Operation – Characteristics – Comparison of JFET and BJT.MOSFET – Construction and Working of DE MOSFET and E-only MOSFET. *UJT – Construction – Operation – Silicon Controlled Rectifier-Basic Operation.*

UNIT III

18 Hrs.

Amplifiers: Amplifiers- Single Stage and Multi Stage – Amplifiers-DC& AC Equivalent Circuits – Multistage Amplifier –RC- Transformer – Direct Coupled Amplifiers – Comparison – Transistor Power Amplifier – Difference Between Voltage and Power Amplifiers- Classification

of Power Amplifier – Collector Efficiency- Class a Transformer Coupled Amplifier – Push Pull Amplifier – *Feedback Principle – Negative Feedback – Emitter Follower.*

UNIT IV

17 Hrs.

Oscillators: Types of Oscillators – Undamped Oscillation- General Theory of Hartley and Colpitt's Oscillator– *Crystal Oscillator* –Phase Shift Oscillator- Multi Vibrator-Astable, Mono Stable and *Bi-Stable Multi Vibrator.*

UNIT V

17 Hrs.

Integrated Circuit Fabrication and Characteristics:

Integrated Circuit Technology – Basic Monolithic ICs – Epitaxial Growth –Masking and Etching – *Diffusion of Impurities* – Integrated Resistors, Capacitors and Inductors –Monolithic Diodes – The Metal Semi-Conductor Contact - Operational Amplifier –Basic Features – Op. Amp As Adder, Subtractor , *Integrator and Differentiator.*

Note: *Italics*denotes Self study Topics

TEXT BOOKS

1. Mehta, V.K., “*Principles Of Electronics*”, S. Chand & Company., New Delhi, 10th Edition, 2007.
2. Theraja B.L., “*Basic Electronics*”, S. Chand & Company, New Delhi, 5th Edition, 2009.

REFERENCE BOOKS

1. Gayakwad Ramakant, A ., “*Linear Integrated Circuits*” , PHI, New Delhi, 2007.
2. Millman Halkias., “*Integrated Electronics*”, Mcgraw Hill, New Delhi, 2003.
3. Sedha R.S., “*Applied Electronics*”, S.Chand & Company, New Delhi, 3rd Edition, 2009.

SEMESTER V

Elective I

PROGRAMMING IN 'C' AND 'C++'

Instructional Hrs. : 75

Sub. Code: 08PHUE501

Max. Marks: CIA-25; ESE-75

Credits: 5

Objective: The general purpose, block structured, procedural computer programming language 'C' is compatible to a number of operating systems. 'C' as an intermediate language has greatly influenced other popular language like java, java script, unix etc... Including C++, originally designed as extension to 'C'.

UNIT I

15 Hrs.

Over View of C: Constants, Variables and Data Types: Features of C Language – Keywords and Identifiers – Constants, Variables – Data Types – Declaration of Variables – Assigning Values to Variables.

Operators and Expression: Arithmetic Operators – Relational Operators – Logical Operators – Assignment Operators – Increment and Decrement Operators – Conditional Operators – Bit-Wise Operators – Special Operators – *Arithmetic Expressions- Evaluation of Expression.*

Managing Input and Output Operations: Reading a Character – Writing a Character – Formatted Input – Formatted Output.

UNIT II

15 Hrs.

Control Structures in C: Decision Making - Branching - and Looping – If, If-Else, Switch Statement - Conditional Operator - Go To Statement – The WHILE, The DO and the FOR Statements.

Object Oriented Programming With C++: *Basic Concepts of OOP - Structure of C++ Program.*

Tokens, Expressions and Control Structures: Basic Data Types – Symbolic Constants – Operators in C++ - Manipulators – Type Casting – Expressions and Their Types.

Functions in C++: Functions Prototyping – Inline Functions – Default Arguments – Const Arguments.

UNIT III

15 Hrs.

Classes and Objects: Specifying a Class – Defining Member Functions – Nesting of Member Functions – Private Member Functions – Arrays Within a Class – *Static Data Members* – *Static Member Functions* – Array of Objects – Objects as Function Arguments – Friend Functions – Returning objects – Const Member Functions – Pointers to Members.

UNIT IV

15 Hrs.

Constructors and Destructors: Constructors – Parameterized Constructors – Copy Constructor – Dynamic Constructor – Destructors.

Inheritance: Single Inheritance – Multiple Inheritance – Hierarchical Inheritance – Multi Level Inheritance – *Hybrid Inheritance*.

UNIT V

15 Hrs.

Polymorphism:

Operator Overloading – Function Overloading – Overloading Unary and Binary Operator – This Pointer – Static and Dynamic Binding – Virtual Functions.

Working With Files:

Classes for File Stream Operations – Opening and Closing a File – *Error Handling During File Operations*.

Note: *Italics* denotes Self study Topics

TEXT BOOKS

1. **Balagurusamy E.**, “*Programming In ANSI C*”, Tata McGraw Hill, New Delhi, 3rd Edition, 2005.
2. **Balagurusamy E.**, “*Object – Oriented Programming With C++*”, Tata McGraw Hill, New Delhi, 3rd Edition, 2008.

REFERENCE BOOKS

1. **Bjarne Stroustrup** ., “*The C++ Programming Language*”, Pearson Education, New Delhi, 3rd Edition, 2001.
2. **Grady Booch.**, “*Object Oriented Analysis And Design*” , Pearson Education, New Delhi, 1st Edition, 2006.
3. **Khanitkar.**, “*Let Us C++*”, BPB Publications, New Delhi, 5th Edition, 2005.

SEMESTER VI
Core Paper X
QUANTUM MECHANICS & RELATIVITY

Instructional Hrs. : 90

Sub. Code:09PHUC610

Max. Marks: CIA-25; ESE-75

Credits: 6

Objective: To provide an insight into the behavior of particles at micro level and the relativistic principles.

UNIT I

18 Hrs.

Foundation of Quantum Mechanics: Inadequacy of Classical Mechanics – Dual Nature of Matter – Expression for De-Broglie Wavelength – G.P. Thomson's Experiment – Wave Packet – Relation Between Particle, Velocity and Group Velocity of De-Broglie Waves.

Heisenberg's Uncertainty Principle: Statement of Uncertainty Principle – Physical Significance – Illustration of Uncertainty Principle – Gamma Ray Microscope - *Diffraction of Electron Through a Slit* – Application of Uncertainty Principle – *Size of The Hydrogen Atom and Energy in the Ground State.*

UNIT II

18 Hrs.

Wave Function For a Free Particle: Postulates Physical Interpretation of the Wave Functions – Equation of Motion Of Matter Wave (I) Time – Independent Schrodinger Equation (II) *Time Dependent – Schrodinger Equation* – Normalized and Orthogonal Wave Function – Expectation Values of Dynamical Quantities – Probability Current Density: Particle Flux – Ehrenfest's Theorem – Eigen Value and Eigen Function-*Orthogonality of Eigen Functions.*

UNIT III

18 Hrs.

Applications of Schrödinger's Equation: Particle in a Box(One Dimensional) –Rectangular Potential Barrier – Application of Barrier Penetration –a Particle in One Dimensional well Of Finite Depth–Bound States- Linear Harmonic Oscillator.

B.Sc. Physics – 2009-2010 onwards

UNIT IV

18 Hrs.

Operators and Their Properties: The Operator Formalism in Quantum Mechanics – Dynamical Variables as Operators – Operators for Momentum, Kinetic Energy and Total Energy-Postulates of Quantum Mechanics – Hermitian Operators – Properties – *Simultaneous EigenFunctions and Commuting Operators*– Reflection Operator-The Parity Operator – *Commutation Algebra* – Commutation Relation Between Position and Momentum – Hamiltonian H and Momentum P – Commutation Rules for the Components of Orbital Angular Momentum – Commutation Relation of L^2 With Components L_x , L_y And L_z – Ladder Operators.

UNIT V

18 Hrs.

Relativity: Frames of Reference – Galilean Transformation Equations – The Ether Hypothesis – Michelson – Morley Experiment – Special Theory of Relativity – The Lorentz Transformation Equations – Length Contraction – Time Dilation – Illustration – Meson Decay – Addition of Velocities – *Variation of Mass with Velocity* – *Mass – Energy Equivalence* – *Unified Mass Unit*.

Note: *Italics* denotes Self study Topics

TEXT BOOKS

1. **Murugesan R.**, “*Modern Physics*”, S.Chand & Company., New Delhi, 2005 Edition, 2005.
2. **Satya Prakash, Singh C K.**, “*Quantum Mechanics*”, Kedar Nath Ram Nath Publications , Merrut – Tenth Edition, 1997.
3. **Singh S.P., Bagde M K, Kamal Singh**, “*Quantum Mechanics*”, S.Chand & Company., New Delhi, 2nd Edition, 1996.

REFERNCE BOOKS

1. Mathews P M, Venkatesan K, “*A Text Book of Quantum Mechanics*”, Tata Mc Hill New Delhi, 1997.
2. **Ghatak A K, Loganathan S**, “*Quantum Mechanics*”, Tata Mc Hill New Delhi, 1977.
3. **Rajput B S**, “*Advanced Quantum Mechanics*”, Pragati Prakashen Publishers, Merrut ,5th Edition, 2001.

SEMESTER VI
Core Paper XI
COMMUNICATION ELECTRONICS

Instructional Hrs. : 90

Sub. Code: 09PHUC611

Max. Marks: CIA-25; ESE-75

Credits: 6

Objectives: The syllabus envisages to provide necessary theory and applications of analog and digital communication principles and applications. Communication techniques hold the key for development.

UNIT I

20Hrs.

Modulation and Demodulation:

Amplitude Modulation – Transistor Emitter and Collector Modulator Circuits – DSBFC, SSB Generation – Suppression of Carrier – Frequency Modulation – Definition and Expression – Phase Modulation – Definition – *Comparison of AM, FM And PM*. Basic Principles of Detection – Transistor Detector – *Ratio Detector*.

UNIT II

20 Hrs.

Antenna, Transmission Lines, Radio Transmitter and Receiver:

Antenna Principle – Parameters and Their Definition Gain, Resistance, Directivity and Reciprocity– Elementary Dipole Antenna – *Current and Voltage Distribution in a Half – Wave Dipole Antenna – Directional Pattern*.

Line Equations of Transmission Lines – Short Circuit and open Ended Lines – Standing Wave Ratio and Reflection Coefficient.

Block Diagram of AM Radio Transmitter and Superhet Receiver.

UNIT III

18 Hrs.

Digital Communication:

Introduction to Digital Communication System –Pulse Code Modulation- Amplitude Shift Keying (ASK) – Band Width and Frequency Spectrum of ASK – Binary ASK Modulator – *Coherent ASK Detector- Non Coherent ASK Detector* – Frequency Shift Keying (FSK)

B.Sc Physics 2009-10 onwards

Bandwidth of Binary FSK _ Detection Of FSK Using PLL- Phase Shift Keying (PSK) –
*Generation of Binary PSK- DPSK- Generator & Demodulator – Advantages and Disadvantages
of Digital Modulation.*

UNIT IV

16 Hrs.

Broad Band Communication:

TDM, FDM-Computer Communication - Microwave Service Digital Network ISDN –
Broadband ISDN-Basic Concepts of LAN- BUS Topology – Star Topology – Ring Topology –
Hybrid Topology – *Private Branch Exchange (PVBX) –Modems Classification.*

UNIT V

16 Hrs.

Television and Satellite Communication: Block Diagram of Basic TV Transmitter and
Monochrome Receiver– Image Orthicon – Introduction to Satellite Communication System -
Basic Components – *Telemetry Tracking and Command System (Block Diagram) -Satellite
Links.*

Note: *Italics*denotes Self study Topics

TEXT BOOKS

1. **Anokh Singh & Chabra A.K.**, “*Principles Of Communication Engineering*”, S.Chand & Company, New Delhi 2006.
2. **Deshponde N.D, Deshpande D.A & Rangole.**, “*Communication Electronics*”, TMG, New Delhi, 2002.
3. **Theraja B.L.**, “*Basic Electronics*”, S.Chand & Company, New Delhi, 5th Edition , 2009.
4. **Venkatram S.**, “*Digital Communications*”, S.Chand & Company, New Delhi 2003.

REFERENCE BOOKS

1. **George Kennedy.**, “*Electronic Communication System*”, Tata McGraw Hill, New Delhi, 4thEdition, 2004.
2. **Roddy & Coolen .**, “*Communication Electronics*”, PHI, New Delhi, 4th Edition , 2006.
3. **Robert M., Gagliarasi .**, “*Satellite Communication*”, CBS, New Delhi,1994.
4. **SamshanmugamK.**, “*Digital and Analog Communication Systems*”, John Wiley, Replica Press, India, 2005.

SEMESTER VI

Elective II

FUNDAMENTALS OF MICROPROCESSORS

Instructional Hrs.: 60

Sub. Code: 12PHUE602

Max. Marks: CIA-25; ESE-75

Credits: 4

Objective: The understand the basics of Microprocessor and its applications.

UNIT I

12 Hrs.

Evolution of Microprocessors – Microprocessor Based System (Micro computer) –computer language -8085 Microprocessor – Pin Diagram- Organization of 8085- Data and Address Buses –addressing I/O devices –Registers-*Instruction Set of 8085- InstructionTypes*-Instruction classification-Data Format

UNIT II

12 Hrs.

Programming the Microprocessor:Addressing Modes –Space and Time Requirements – Programming the 8085-Programming Process- *Machine language Programming – AssemblerProgramming* – Instruction format — Assembler Directives-constants in assembly Programme Stack – Subroutines- Programming Techniques using Looping, Counting and Indexing.

UNIT III

12 Hrs.

Microprocessor Timings: Timing and Control Unit –Basic concepts,Fetch operation , Execute Cycle,Machine Cycle and State , Instruction and Data Flow – Timings of Intel 8085 – 8085 buses- OP Code Fetch Cycle – Memory And I/O Read Cycle – *Memory And I/O Write Cycles*

UNIT IV

12 Hrs.

Interfacing Memory and I/O Devices: Introduction – *Address Space Partitioning* – *Address Map*- Address Decoding using 1 to n Decoder– Memory Interfacing– Bus Contention and 2 line control-Data Transfer Schemes - Programmed Data Transfer – Synchronous, Asynchronous, Interrupt Driven Data Transfer – DMA Principles – 8255 Programmable Peripheral Interface – Programming the 8255.

UNIT V

12 Hrs.

Code Conversion:*BCD to Binary* – *Binary to BCD* — Binary to ASCII- ASCII to Binary.

Applications of Microprocessor:A temperature monitoring system –System Requirments- overall System Design-The Input Sub-System-The OutputSub-System-Hardware design-Microcontroller 8051.

Note: *Italics* denotes Self study Topics

TEXT BOOKS

1.**Aditya P Mathur.**,*“Introduction To Microprocessors”*, Tata McGraw –Hill Publishing Company Ltd., New Delhi, 3rd Edition.

2.**Ramesh Gaonkar.**, *“Microprocessor, Architecture, Programming and Applications with the 8085”*,Penram International Publishing (India)Private Limited, Mumbai, 5th Edition

REFERENCE BOOKS

1.**Ram B.**,*“Fundamentals of Microprocessors and Microcomputers”* ,Dhanpat Rai Publications(p) Ltd.,New Delhi, 6th Edition, 2005.

2. **Theagarajan R, Dhanasekaran S, Dhanabal S.**, *“Microprocessor and its applications”*.New Age international publications ,New Delhi.First Edition.1999.

3. **Anokh Singh, Chhabra A.K.**, *“Fundamentals Of Microprocessor And Its Applications”* S.Chand & Company Ltd., New Delhi, First Edition, 2005.

B.Sc. Physics – 2012-2013 onwards

SEMESTER V & VI

Core Practical III

Instructional Hrs . : 90

Sub. Code: 13PHUCP03

Max. Marks: CIA - 40; ESE – 60

Credits: 3

Any SIXTEEN of the following

1. Hartmann's Interpolation Formula – Spectrometer.
2. Solar Spectrum – Wavelength Determination – Spectrometer.
3. Determination of Thermo EMF – Potentiometer.
4. Measurement of Absolute capacity-BG.
5. High Resistance by Leakage – BG.
6. High Resistance by Charging – BG.
7. Characteristics of LED & Photodiode.
8. Characteristics of FET.
9. Characteristics of UJT.
10. UJT Relaxation Oscillator.
11. Regulated Low Range Power Supply.
12. Voltage Doubler.
13. RC Coupled Amplifier- Single Stage.
14. FET Amplifier.
15. Emitter Follower.
16. Hartley Oscillator.
17. Colpit's Oscillator.
18. Astable Multivibrator.
19. Monostable Multivibrator.
20. Bistable Multivibrator.

SEMESTER V & VI

Core Practical IV

Instructional Hrs. : 60

Sub. Code: 13PHUCPO4

Max. Marks: CIA-40; ESE-60

Credits: 3

Any Twelve of the Following:

1. Study of Filter Circuits
2. Integrator and Differentiator- Discret Components.
3. Adder and Subtractor – Operational Amplifier.
4. Integrator and Differentiator – Operational Amplifier.
5. 4 bit Binary Adder
6. Amplitude Modulation and Demodulation.
7. Frequency Modulation and Demodulation.
8. Study of Logic Gates (AND, OR, NOT) Discrete Components.
9. Study of Logic Gates (NAND, NOR) – Discrete Components.
10. De-Morgan's Theorem – Verifications – Solving Problems Using Boolean Algebra.
11. Half and Full Adder – Verification of Truth Table.
12. Half and Full Subtractor – Verification of Truth Table.
13. NAND and NOR Gate as Universal Building Blocks.
14. 8085 ALP for 8 Bit Addition, Subtraction.
15. 8085 ALP for one's Complement Masking off Most Significant 4 Bits and Setting Bits
16. 8085 ALP for Two's Complement Addition, Subtraction.
17. 8085 ALP for 8 Bit Multiplication and Division.
18. 8085 ALP for Multiplication, Addition and Sum of N Elements.

B.Sc., Physics – 2013-2014 onwards

SEMESTER V & VI

Elective Practical

Instructional Hrs. : 60

Sub. Code: 08PHUEPO1

Max. Marks: CIA-40; ESE-60

Credits: 3

Any Twelve of the Following:

C Programming

1. Write a Program that Inputs three Integers from the Keyboard and Prints THE SUM, AVERAGE, PRODUCT, SMALLEST, AND LARGEST of Three Numbers.
2. Roots of a Quadratic Equation.
3. Matrix Addition.
4. Matrix Multiplication.
5. Calculation of Half Life, Mean Life of Radioactive elements
6. Computation of Effective resistance when resistors are Connected in series and parallel
7. Arranging a Set of Numbers in Ascending Order.
8. Converting Integer in the Range 1 to 100 into Words.
9. Program to Check a Palindrome.
10. Comparison of Two Strings. The Program Should State Whether the First String is Lesser Than, Equal or Greater than the Second String.
11. Preparation of Mark Lists Using Files.
12. Write a Function Power!) To Raise a Number M to A Power N. The Function Takes a Double Value for M and In Value for N, and Return the Result Correctly. Use a Default Value of 2 or N to Make the Function to Calculate Squares When arguments is Omitted. Write a Main () That Gets the Value of M and N and Tests the Function.
13. An Electricity Board Charges the Following Rates to Domestic Users.

| | |
|-------------------------|---------------------|
| For the First 100 Units | : 40 Paise per Unit |
| For Next 200 Units | : 50 Paise per Unit |
| Beyond 300 Units | : 60 Paise Per Unit |

All Users are charged a Min I8mum of Rs.100. If the Total Cost is more Than Rs. 250.00 Then an Additional Surcharge of 15% is added. Write a Program to Read the Names of User and Number of Units Consumed and Display the Charge with Names.

14. Create a Class Float that Contains one Float Data Member Overload all the Four Arithmetic Operators So that they operate on Objects of Float.
15. Define a Class String. Using Overloaded == Operator to Compare two Strings.
16. Define a Class Complex to Represent a Complex Number. Use Overloaded + And – Operators to add and Subtract Two Complex Objects. Two Matrices.
17. Define a Class Rational to Represent a Rational Number Overload all the Four Arithmetic Operators for Objects of Rational Class.

B.Sc., Physics – 2009-10 onwards

SEMESTER VI

Elective III

PROJECT

Instructional Hrs. : 45

Sub. Code: 08PHUE6PV

Max. Marks:100

Credits: 3

- ❖ Individual/Group (Not More Than 5 Students) Project Should Be Taken Up By The Students During Semester VI And To Report Be Submitted Before 15thMarch, During That Academic Year.
- ❖ Evaluation Of The Project And Viva-Voce Be Taken Up Jointly By Internal (Project Guide) And External Examinars At The End Of The Semester.
- ❖ Continuous Progress Of The Proect Will Be Evaluated By The Guide Throughout The Semester.

Project Evaluation – 80 Marks

Viva-Voce – 20 Marks

B.Sc., Physics – 2009-10 onwards

SEMESTER III

Part IV: SKILL BASED SUBJECT I – (Offered Under Cafeteria System)

ENERGY MANAGEMENT

Instructional Hrs. : 45

Sub. Code: 15PHUS301

Max. Marks: CIA – 25; ESE – 75

Credits: 3

Objective: The main goal is to achieve and maintain optimum energy procurement and utilisation for managing the energy consumption of household appliances. Also to create awareness to minimise energy costs without affecting production and quality.

Unit I

9 Hrs.

Conventional Energy Sources

Introduction – An initial idea of energy in science – *Types of conventional energy* – thermal energy – hydro thermal energy - Nuclear energy (Qualitative Analysis only).

Unit II

9 Hrs.

Need for Non-Conventional Energy Sources

Constraints in the conventional energy sources - Global energy trends – Global warming and the green house effect – Non-Conventional energy Sources – *Energy consumption as a measure of prosperity* – World energy futures.

Unit III:

9 Hrs.

General introduction to Non-Conventional Sources

Introduction – Solar Energy – Wind Energy – Energy from Biomass and Bio Gas – Ocean thermal energy conversion – Tidal energy – *Geothermal energy*.

Unit IV:

9 Hrs.

Solar energy applications:

Solar Cooker – Solar water heater – *Solar distillation* – Solar space heater – Solar cell

Unit V:

9 Hrs.

Energy Audit and Energy Security:

Energy Conservation - Energy audit: Definition, Objectives – Calculation of energy audit

Energy Security: Meaning – Definition – Importance – Energy security threats – *short term security* – long term security.

Italics indicates Self Study Topics

TEXT BOOKS:

1. **John Andrews & Nick Jelley.**, “ *Energy Science Principles, Technologies and Impacts*”

Oxford University press , Newyork 2010.

2. **G.D.Rai.**, “*Non – Conventional Energy Sources*” Khanna Publishers, Delhi, 1996.

3. **Satyesh C.Chakraborty.**, “ *Energy opportunities & social responsibility*” Jaico publishing

House, Mumbai, First Edition 2009.

4. **Unit V** – Study Material: Provided by the Department of Physics.

REFERENCE BOOK:

1. **Janet Ramage.**, “ *Energy, A Guide book*” Oxford University Press, Newyork, 1983

SEMESTER – IV
Skill Based Subject II
MULTISKILL DEVELOPMENT PAPER

Instructional Hrs: 45

Sub Code: 13PHUS402

Max.Marks :100 (ESE – 60 CIA – 40)

Credits: 3

Aim: To equip the students with knowledge on all topics as desirable from the point of view of brilliant success in the competitive examinations.

Objective: To familiarize the students with various types of tests that are employed by the diverse examining bodies.

UNIT I

9 Hrs.

Communication: Question tag – Gerund and Infinitives – Spotting the errors – Vocabulary – Synonyms – Antonyms - Prepositions – Articles – One word substitution – Sentence completion.

UNIT II

9 Hrs.

Numerical Aptitude : Problems on numbers - Problems on Ages – Percentage - Profit and loss - Ratio & Proportion - Time & Work - Time & Distance - *Simple Interest* - Compound Interest.

UNIT III

9 Hrs.

Critical Reasoning : Logical Inference Questions and Syllogism.

Analytical Reasoning : Arrangement problems – Family / Blood Relation Qualms – Sense of Directions – Age Doubts.

Verbal Reasoning : Verbal Analogy (Letter series and number series only) – Coding and Decoding.

UNIT IV

9 Hrs.

Self Introduction

- **Presentation Skills** - Presentation through PowerPoint in Physics.

Soft Skills - Interpersonal Skills – Employability Skills – Soft Skills Training – *Resume Preparation* – Interview Tips and Questions.

UNIT V

9 Hrs.

Group Discussion – Importance – Types of GD – GD Skills – GD Etiquette(do's and don'ts) – Essential Elements of a GD – *Movements and Gestures to be avoided in a GD* -

Online Services –Reservation –Banking –Purchases –Passport application.

REFERENCE BOOKS:

1. **Hari Mohan Prasad & Uma Rani Sinha. 2011.** Objective English for Competitive Examinations. New Delhi: Tata McGraw Hill Education Private Ltd. (Unit – I)
2. **R.S. Aggarwal, *Quantitative Aptitude*, S.Chand 2010.** (Unit - II)
3. **Edgar Thorpe, *Test of Reasoning for Competitive Examinations –4th edition*, Tata McGraw-Hill Publishing Company Limited, New Delhi.** (Unit – III)
4. **R.S. Agarwal, A Modern Approach to Verbal Reasoning(Fully Solved) –Revised Edition, S.Chand Company Limited, New Delhi, 2012.** (Unit – III)
5. **M. S. Rao, *Soft Skills Enhancing Employability-Connecting Campus with Corporate*,IK International Publishing House, NewDelhi, 2010.** (Unit – IV)
6. **Alex.K,*Soft Skills-Know Yourself and Know the World*, S.Chand Company Ltd., 2011.**(Unit V)
7. ***GroupDiscussions-Pass with Flying Colours*, G. K. Publications, NOIDA, 2012.**
8. **Jain T.S.Upkar's*SBI Clerical Cadre Recruitment Examination*.** Agar Upkar Prakashan

SEMESTER V

Part IV: SKILL BASED SUBJECT III

MATLAB

Instructional Hrs: 45

Max. Marks: CIA – 25; ESE – 75

Sub.Code: 11PHUS503

Credits: 3

Objective: To provide fundamental ideas of MATLAB which is one of the programming languages and is a simple and powerful tool used for scientific computing, interactive calculations, graphics and animation.

UNIT I

9 Hrs.

Introduction to MATLAB: What is MATLAB?. - Basics of Matlab- Matlab windows- Matrices and vectors – Matrix Manipulation - Creating and using In-line functions – Using built in functions and *on-line help- Saving and loading data.*

UNIT II

9 Hrs.

Programming on MATLAB: Script files – function files – language specific features- Advanced data objects – *Examples.*

UNIT III

9 Hrs.

Applications: Linear algebra- Curve fitting – Interpolation-Data Analysis and Statistics – *Matlab and the Internet*

UNIT IV

9 Hrs.

Graphics: Basic 2-D plots – Style options – Labels, Titles, Legends – Axis Control – *Zoom in and Zoom out*

UNIT V

9 Hrs.

Simple Programmes: Projectile motion – *Series and Parallel Resonance Circuits* – Amplitude Modulation – Basic Ideas of Image Processing.

Note: Italics denotes self study topics.

TEXT BOOK:

1.Rudra Pratap, “*Getting started with Mat lab*” – version-7, Oxford University Press, First Edition, NewDelhi, 2007.

REFERENCE BOOK:

1.Brian R.Hunt, Ronald Lipmann, Jonnathan Rosenberg., “*A Guide to MATLAB for Beginners and Experienced users*”, Cambridge University Press, UK, First Edition.2006.

SEMESTER VI

Part IV: SKILL BASED SUBJECT IV

MOBILE COMMUNICATION

Instructional Hrs: 45

Max. Marks : CIA – 25; ESE – 75

Sub. Code : 11PHUS604

Credits: 3

Objective: To introduce the basic and emerging concepts in Mobile Communication.

UNIT I

9 Hrs.

Wireless Communication Fundamentals: Introduction - History of Cellular Mobile Communication - Important Terminologies- Mobile Computing Environment – Architectonics of Mobile Computing – Functions of Mobile Computing – Mobile and Wireless Devices

Multiplexing: Space Division Multiplexing – Frequency Division Multiplexing- Time Division Multiplexing - Code Division Multiplexing.

Medium Access Control: SDMA –FDMA –TDMA –CDMA – Features- Comparison.

UNIT II

9 Hrs.

Telecommunication Systems: GSM - Mobile Services- System Architecture- GPRS- Architecture- DECT-TETRA-UMTS & IMT.

UNIT III

9 Hrs.

Cellular Wireless Network: Overview of Mobile Telephone Service (MTS) - Operation of Cellular system- Adjacent channel Interference (ACI) – Methods of reducing ACI- Basic idea of Spectrum Allocation – Frequency reuse – Improving coverage- working of a cell phone. 3G block schematic diagram and functions.

UNIT IV

9 Hrs.

Wireless LAN: Wireless Local Area Network in (WLAN) Wireless Network: Definition- Advantages and Disadvantages of LAN – Applications of WLAN- Basics ideas of HYPERLAN and Blue tooth.

UNIT V

9 Hrs.

Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Ad hoc Networks.

Wireless Application Protocol: Introduction – Main Objectives- WAP Components and Interface Architecture- Advantages of WAP.

B.Sc. Physics – 2011-2012 onwards

TEXT BOOKS

1. **Naseer Hussain.**, Shresht Series “*Mobile Computing*”, Rajalaxmi Publication, Hyderabad, 2003.
2. **Thiyagarajan,V.**, “*Telecommunications systems*” A.R.Publication, Chennai, 2006.

REFERNCE BOOKS

1. **Jochen, M.Schiller.**, “*Mobile Communication*”, Pearson Education, India 2000.
2. **WCY Lee.**, “*Mobile Cellular Telecommunication*”, New Delhi, McGraw Hill, Edition 2006.

SEMESTER III

Part IV Non Major Elective – I Offered Under Cafeteria System

PHYSICS IN EVERYDAY LIFE

Instructional Hrs. : 30

Sub. Code: 15PHUN301

Max. Marks: ESE- 100

Credits : 2

Objective: To create interest in Science and provide explanation for the phenomena that we witness in day today life. To facilitate the spread of scientific spirit. To develop an insatiable curiosity in Science.

Topics:

Physics

TEXT BOOKS

1. “ *The Hindu Speaks on Scientific Facts*” Volume I, Kasturi & Sons Ltd, Chennai, 6th Print 2004.
2. “ *The Hindu Speaks on Scientific Facts*” Volume II, Kasturi & Sons Ltd, Chennai, 6th Print 2008

Physics in Everyday Life

UNIT I

1. Why does a refrigerator produce sounds periodically?
2. Automatic wrist watches stop functioning if not worn even for a day. How does wearing them on our hand make them function?
3. How do microwave ovens cook food?
4. How does a pressure cooker work?
5. Why does milk boil and expand so rapidly at a low temperature though some quantity of water is present in it?
6. Why do electrical appliances draw more current during low voltage?
7. Why is the earthling pin in 3 pin electrical plugs bigger than the other two pins?
8. Why do high tension wires produce a humming sound?
9. How does an electric line tester glow?
10. Why does a bird not get electrocuted on sitting on a live wire?

UNIT – II

11. Why do we have sodium vapor lamp in the streets and not mercury vapor lamp?
12. What is the role on chokes and starters in tube lights? Why do they make noise?
13. Why do street lights and head lights of vehicles look like stars when viewed through glass?
14. Why is the shadow bigger than the object?
15. How do hearing aids work?
16. Is there any significance in using gravel on railway tracks?
17. How does audible sound pass through hard material such as a wall and be audible on other side?
18. Why do we not hear sound while sleeping or meditating?
19. Why does not sound travel in vacuum but light does?
20. Why does the flow of link increase when pens are about to run out of link?

UNIT – III

21. Why do metals shine?
22. Why do metallic vessels lose their initial shine after use?
23. Why does boiling milk overflow but boiling water does not?
24. Why does a steel ball pitch higher than a rubber ball?
25. How is information stored in audio and video tapes?
26. Is it true that television, fridge and other electrical and electronic gadgets should not be switched on immediately after switching off?
27. Can we use TV monitor for a computer monitor and the vice versa?
28. How does remote control of TV Work?
29. How does lighting affect TVs?
30. How does electric current cause death?

UNIT – IV

31. Can a fridge left open in a closed room be used to cool the room?
32. Why does it seem difficult to cycle up to steep hill than to push the bike up at the same speed?
33. Why does not the cycle travel backwards when we pedal in the reverse direction?
34. Why are fan wings slightly curved?
35. When viewed under the tube light why does a table fan appear to rotate backwards and forwards?
36. Can we reduce power consumption by running fans at slow speeds?
37. Will the life of florescent lamps decrease with frequent switching on and switching off?
38. Why does the boiling point of a liquid increase with pressure? Also why does the heat required for vaporization decrease and increase in the former and latter case respectively?
39. Why is it difficult to balance a stationary two wheeler?
40. How does the speed (of vehicles) measuring device used by the traffic police work?

UNIT – V

41. How does a photocopier work?
42. Why is it difficult to photograph a TV picture?
43. Why is it possible to hear noises from far away clearly on cool damp evenings? Is it because sound travels better in cool damp air than in the air?
44. How does a thermostat work?

45. While light from a candle illuminates a room, the gas(LPG) flames do not at the same time the gas stoves help cook faster. Can anyone explain?
46. How does an electric train work?
47. How does a dish antenna receive signals?
48. How is electricity produced from nuclear materials?
49. Why is it easier to pull than to push a lawn roller?
50. How does a sim card function in a cell phone?

Instruction to the question paper settings

- Three different questions from the same unit may comprise in one main question
- Two questions have to be taken from Unit I, Unit II & Unit III
- One question each from Unit IV & Unit V

SEMESTER IV

Part IV Non Major Elective – II Offered Under Cafeteria System

ENVIRONMENTAL POLLUTION: PHYSICAL ASPECTS

Instructional Hrs. : 30

Sub.Code: 15PHUN402

Max.Marks : 100

Credits : 2

Objective : To create awareness about the hazards of pollution and hence to learn the ways to prevent and control it to live in harmony with nature.

UNIT – I **6 Hrs**

Introduction: Pollution – Effects of pollution – Different types of pollution – Prevention.

UNIT – II **6 Hrs**

Air pollution – Thermal pollution

UNIT – III **6 Hrs**

Water pollution – Ocean pollution

UNIT – IV **6 Hrs**

Soil and land pollution – Radioactive pollution

UNIT – V **6 Hrs**

Noise pollution – Light pollution – Other pollution

Study Material:

Prepared by the Department of Physics.

SEMESTER I

Part IV: Foundation Course

ENVIRONMENTAL STUDIES

Instructional Hrs. : 30

Sub. Code: 09FOCU1ES

Max. Marks: 100

Credits: 2

UNIT I

The Multidisciplinary Nature Of Environmental Studies – Definition, Scope And Importance, Need For Public Awareness, Nature Resources And Associated Problems- Forest Resources, Water Resources, Mineral Resources, Food Resources, Energy Resources, Land Resources, Role Of And Individual In Conservation Of Nature Resources, Equitable Use Of Resources For Sustainable Life Style.

UNIT II

Concept Of An Ecosystem, Structure And Function Of An Ecosystem – Producers, Consumers And Decomposers, Energy Flow In The Ecosystem- Food Chain , Food Webs And Ecological Pyramids, Ecological Succession.

UNIT III

Biodiversity And Its Conservation – Introduction- Definition Genetic, Species And Ecosystem Diversity, Conservation Of Biodiversity – In- Situ And Ex-Situ Conservation Of Biodiversity.

UNIT IV

Definition, Causes, Effects And Control Measures Of Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, And Thermal Pollution. Disaster Management- Floods, Earthquake, Cyclone And Landslides.

B.Sc. Physics – 2009-2010 onwards

UNIT V

Global Warming, Ozone Layer Depletion, Acid Rain, Nuclear Accidents And Holocaust (Case Studies) Consumerism And Waste Products, Environmental Protection Act-Air, Water, Wildlife, Forest, Issues Involved In Enforcement Of Environmental Legislations Public Awareness.

FIELD WORK:

Visit To A Local Area To Document Environmental Assets – River/Forest/Grass Land/ Hill/ Mountain

Visit To A Local Polluted Site- Urban/Rural/Industrial/Agricultural.

Study Of Common Plants, Insects, Birds

Study Of Simple Ecosystems- Pond, River, Hill Slope, Etc.

TEXT BOOK:

1. “*Environmental studies*”. Published By Bharathiar University, Coimbatore.

REFERENCE BOOKS:

1. **Arumugam N., Kumarasen V.**, “*Environmental Studies*” Saras Publications, Nagercoil, First Edition Rep., 2008.
2. **Mukherjee S., Ghosh A.**, “*Environmental Studies*” , Books And Allied (P) Ltd., Kolkata. 3rd Edition, 2002.

B.Sc. Physics – 2009-2010 onwards

SEMESTER II
Part-IV: Value Education
HUMAN RIGHTS

Instructional Hrs. : 30

Sub. Code: 09VEDU2HR

Max. Marks: 100

Credits: 2

UNIT I

Concepts And Theories Of Human Rights - Legal And Constitutional Rights - *UDHR*
(Universal Declaration Of Human Rights UN Conventions).

UNIT II

Indian Constitution And Human Rights - Fundamental Rights And Duties - Protection Of Human Rights Act 1993- National HR Commissions – *State HR Commission*.

UNIT III

Right To Information - Freedom Of Press – Hindu Marriage Act- *Right To Inheritance*.

UNIT IV

Contemporary Issues: Child Labour - *Bonded Labour* – Female Infanticide.

UNIT V

Amnesty International – PUCL (People Union For Civil Liberties) - *PUDR (Peoples Union For Democratic Rights)*.

Note: *Italics* denotes Self study Topics

TEXT BOOKS:

1. **Jayabalan N.**, “*Studies In Human Rights*”, Mohan Pathippagam, Chennai, First Edition, 2000.

REFERENCE BOOKS:

1. **Mishra R.**, “*Human Rights*”, Sumit Enterprises, New Delhi, First Edition, 2005.

2. **Naorem Sanajaoba**, “*Human Rights- Principles, Practices, And Abuses*”, Omsons Publications, New Delhi, First Edition, 1994.

3. **Sivagami Paramasivam**, “*Human Rights – A Study*”, Sriram Computer Prints & Offset, Salem, First Edition, 1998.

B.Sc. Physics – 2009-2010 onwards

SEMESTER I / III
Allied Physics Paper - I
(MECHANICS, HEAT, SOUND, SOLAR PHYSICS, ELECTRICITY AND
MAGNETISM)

Instructional Hrs. : 60

Sub. Code: 10PHUA001

Max. Marks: CIA-20; ESE-55

Credits: 4

Objective: To provide the basic knowledge of physical laws and principles to the students of other branches of science.

UNIT I

12 Hrs

Gravitation: Newton's law of Gravitation – Definition of G – Determination of G by Boy's Method – *Mass and Density of Earth* – Acceleration due to Gravity – Determination of g by Compound Pendulum.

Elasticity: Bending of Beams – Bending Moment – Depression of Cantilever – Determination of Y by Uniform and *Non Uniform Bending Method* – Torsion in a wire – Determination of Rigidity Modulus by Torsional Pendulum – I section of Girders

UNIT II

12 Hrs

Heat and Thermodynamics, Sound: Vander Waal's Equation of State – *Critical Constants of a Gas* – Derivation of Critical Constants in terms of Vander Waals Constant – Joule - Thomson Effect – Theory of J-K Effect – Liquefaction of Hydrogen and Helium – Properties of Liquid - He I and II

Sound: Doppler Effect – Derivation and Applications – Frequency of A.C by Sonometer- Ultrasonics – Production, Properties and *Applications*.

UNIT III

12 Hrs

Solar Physics: Measurement of Solar Radiations by Pyroheliometer and Pyrometer – Solar Constants – *General Applications of Solar Energy* – Flat Plate Collector – Box Type Cooker Solar Water Heater – Solar Photovoltaic Cells- Applications of Solar Cells

Electricity: *Conversion of Galvanometer into Ammeter and Voltmeter* – Ballistic Galvanometer: Theory - Charge Sensitiveness - Measurement of Capacitance – Potentiometer – Theory – Measurement of Current, Voltage and Resistance – Electromagnetic Induction: Transformer and its Applications.

UNIT V

12 Hrs

Magnetism: Basic Concepts of Magnetic Materials – *Magnetic Properties of Dia, Para and Ferro Magnetic Materials* – Area of (B-H) Loop – Curie Temperature – Applications of Ferities in Computer Memory.

Note: Italics denote Self Study Topics

TEXT BOOKS:

1. **Brijlal & Subramaniam** “*Properties of Matter*”, Eurasia Publication House (Pvt) Ltd, New Delhi, 5th Edition, 1989.
2. **Brijlal & Subramaniam**, “*Heat and Thernodynamics*”, S.Chand and Company Ltd, New Delhi, 2006 Edition.
3. **Murugesan R**, “*Properties of Matter*”, S.Chand and Company Ltd, New Delhi Revised Edition, 2008.
4. **Murugesan R**, “*Electricity and Magnetism*”, S.Chand and Company Ltd, New Delhi 2006 Edition.
5. **Subramaniam N & Brijlal**, “*Sound*” Vikas Publising House, New Delhi, 2nd Revised Edition, 1978.

REFERENCE BOOKS:

1. **Sukhatme S P**, “*Solar Energy Utilization*” Tata Mc Graw Hill, New Delhi, 2nd Edition, 1987.
2. **Subramanian N & Brijlal**, “*Sound*” Vikas Publicating House, New Delhi, 2nd Revised Edition, 1978.
3. **Murugesan R**, “*Properties of Matter*”, S Chand and Company Ltd, New Delhi Revised Ediiton, 2008.
4. **JayaPrekash N**, “*Allied Physics I*”, JP Publications, Coimbatore, Edition 1993

SEMESTER II/ IV
Allied Physics Paper - II

(MODERN PHYSICS, ELECTRONICS AND DIGITAL ELECTRONICS)

Instructional Hrs. : 60

Sub. Code: 10PHUA002

Max. Marks: CIA-20; ESE-55

Credits: 4

UNIT I

12 Hrs

Structure of the Atom: The Vector Atom Model – *Pauli Exclusion Principle* – Coupling Schemes.

Laser: Induced Absorption, Spontaneous and Stimulated Emission – Principle of Laser – Population Inversion – Ruby Laser – Helium and Neon Laser – Semiconductor Laser – *Properties and Applications.*

UNIT II

12 Hrs

Nuclear Physics: Characteristics of Nuclear Physics- Model of Nuclear Structure – Liquid Drop Model – Shell Model – Synchrocyclotron – Betatron - Discovery of Artificial Transmutation – Transmutations by Alpha Particles – Transmutation by Protons – *Elementary Particles – Leptons – Mesons – Baryons.*

UNIT III

12 Hrs

Electronics: Construction and Characteristics of Zener Diode, Photo Diode, Light Emitting Diode (LED)- Transistor Characteristics (CE) – Qualitative Analysis of a Common Emitter Amplifier – *Phase Reversal of the output Voltage – Advantages of Common Emitter Amplification Circuit.*

UNIT IV

12 Hrs

Operational Amplifier: Circuit, Symbol, Polarity Conventions and Virtual Ground or Summing Point of an Operational Amplifier- Characteristics of an Ideal Operational Amplifier- Amplifier as an Adder – *Subtractor – Differentiator and Intergrator*

Communication Electronics: Definition of Frequency Modulation – Modulation Index – Block Diagram of a Superheterodyne Receiver – Principle of Picture Transmission and Reception – Block Diagram of a Monochrome TV Receiver - Basic Principle and Applications of Radar.

UNIT V

12 Hrs

Digital Electronics: Digital Computers – Organization of Digital Computers – *Number Systems – Binary, Octal – Hexa Decimal – ASCII and EBCDIC* – Basic Logic Design using Digital Integrated Circuits, Truth Tables, Boolean Algebra – Simple Arithmetic Circuits – Half Adder – Full Adder- Half Subtractor - Full Subtractor.

NAND and NOR as an Universal Building Block – De Morgan’s Theorems and Proof- Basic Ideas of Memory Elements.

Note: Italics denote Self Study Topics

TEXT BOOKS

1. **Albert P.Malvino and Ronald P. Leach** “*Digital Principles and Applications*” Tata McGraw Hills, New Delhi, 6th Edition, 2006.
2. **Murugaesan R,** “*Modern Physics*”, S.Chand & Company Ltd., New Delhi, 2005
3. **Theraja B.L,** “*Basic Electronics-Solid State*”, S.Chand & Company Ltd., New Delhi, 2001
4. **Mehta V.K,** “*Principles of Electronics*”, S.Chand & Company Ltd., New Delhi, 8th Edition, 2005

REFERENCE BOOKS

1. **Jayaprakash N,** “*Allied Physics- II*”, J.P.Publications, Coimbatore, Edition 1993.
2. **William H.Gothmann,** “*Digital Electronics*” Prentice- Hall of India Pvt Ltd., New Delhi, 2nd Edition, 2006.

SEMESTER II / IV

ALLIED PHYSICS PRACTICALS

Instructional Hrs. : 90

Sub. Code: 10PHUAPO1

Max. Marks: CIA-20; ESE-30

Credits: 2

Any SIXTEEN of the Following:

1. Young's Modulus – Non Uniform Bending – Pin and Microscope.
2. Young's Modulus – Uniform Bending – Optic Lever.
3. Rigidity Modulus – Static Torsion.
4. Acceleration Due to Gravity – Compound Pendulum
5. Moment of Inertia – Torsional Pendulum
6. Thermal Conductivity-Lee's Disc
7. A.C Frequency - Sonometer
8. Refractive Index of a Liquid – Hollow Prism – Spectrometer.
9. Refractive Index of a Prism - Spectrometer.
10. Refractive Index of the Material of a Solid Prism (i-d)– Curve - Spectrometer.
11. Wavelength of Spectral Lines – Grating – Minimum Deviation – Spectrometer.
12. Radius of the Curvature – Newton's Experiment
13. Low Range Ammeter Calibration – Potentiometer
14. Low Range Voltmeter Calibration – Potentiometer.
15. Specific Resistance – Potentiometer..
16. Moment of a Magnet – Tan C position.
17. Characteristics of Junction Diode.
18. Characteristics of Zener Diode.
19. Verification of Truth Tables of the gates OR,AND, NOT, NOR, NAND
20. Verification of De Morgan's Theorem.

Self Learning Paper II

MEDICAL PHYSICS

Max. Marks: 100

Sub. Code: 13PHUSL01

Credits: 5

Objective:

To provide opportunities and necessary skills for the students to take up a career as clinical technician, radiologist etc., in health related industries.

UNIT I

Human Physiological Systems:

Introduction – Cells & Their Structures- Nature Of Cancer Cells- Transport Of Ions Through The Cell Membrane – Resting & Action Potentials- Bio Electric Potentials – Difficult Systems Of Human Body.

UNIT II

Electrodes And Transducers:

Types Of Electrodes – Chemical Electrodes - pH Electrodes – PCO₂ Electrodes – PO₂ Electrode. Piezo – Electric Type – Thermo Electric Type – Photo Voltaic Type.

UNIT III

Radiology :

Introduction – X – Ray Machine – Imaging Techniques: Ultra Sonograph, MRI (Qualitative Study) Angiography – Effects Of Radiation Exposure – Radiation Protection – Radio Isotopes In Medicine.

UNIT IV

Bio Potential Recorders:

Introduction – Basic Ideas Of Electrocardiography (ECG), Echo Cardiography And Electroencephalography (EEG) .

B.Sc. Physics – 2009-2010 onwards

UNIT V

Physiological Assist devices:

Introduction – Basic Ideas Of Pacemaker, Artificial Heart Valves And Defibrillators – Heart Lung Machine – Kidney Machine – Dialysis – Hemodialysis – Peritoneal Dialysis.

TEXT BOOK

1. **Arumugam M.**, “*Biomedical instrumentation*”, Anuradha Agencies, kumakonam., First Edition, 1992.

REFERENCE BOOKS

1. **Khandpur R.S.**, “*Biomedical instrumentation*”, Tata McGraw Hill, New Delhi, First Edition, 2004.
2. **Leslie Cromwell**, “*Biomedical Instrumentation & Measurements*”, Prentice Hall Of India, New Delhi, 2nd Edition, 1996.