PERIYAR EVR COLLEGE (AUTONOMOUS & ACCREDITED), TRICHY- 23
PG AND RESEARCH DEPARTMENT OF PHYSICS
B.Sc. PHYSICS (2015-16 ONWARDS)
COURSE PATTERN

S.No	Part	COURSE	Hours	Credits	Internal Exam	External Exam
SEMESTER I							
01	I	Tamil I	6	3	25	75
02	II	English I	6	3	25	75
03	III	CC01 - Properties of Matter and Acoustics	6	5	25	75
04	III	CC02- Core Practical I	2	-	-	-
05	III	FAC1 - Mathematics I	4	4	25	75
06	III	FAC2 - Mathematics II	2	-	-	-
07	IV	Value Education	2	2	25	75
08	IV	SBE – I - Fox-Pro	2	4	25	75
		Total	**30**	**21**	150	450
SEMESTER II							
09	I	Tamil II	6	3	25	75
10	II	English II	6	3	25	75
11	III	CC02 - Core Practical I	4	4	25	75
12	III	CC03 - Mechanics and Relativity	6	4	25	75
13	III	FAC2 - Mathematics II	2	3	25	75
14	III	FAC3 - Mathematics III	4	4	25	75
15	IV	Environmental Studies	2	2	25	75
		Total	30	23	175	525
SEMESTER III							
16	I	Tamil III	6	3	25	75
17	II	English III	6	3	25	75
18	III	CC04 - Thermal Physics	4	4	25	75
19	III	CC05 - Core Practical II	2	-	-	-
20	III	SAC1 – Chemistry - I	4	3	25	75
21	III	SAC2 - Chemistry II - Practical	2	-	-	-
22	III	ME I - Energy Physics	4	5	25	75
23	IV	SBE – II - MS-Excel Lab	2	4	25	75
		Total	30	22	150	450
SEMESTER IV							
24	I	Tamil IV	6	3	25	75
25	II	English IV	6	3	25	75
26	III	CC05 - Core Practical II	4	4	25	75
27	III	CC06 - Optics and Spectroscopy	6	4	25	75
28	III	SAC2 - Chemistry-II Practical	2	3	25	75
29	III	SAC2 - Chemistry III	4	3	25	75
30	IV	NME I - Everyday Physics	2	2	25	75
		Total	30	22	175	525

S.No	Part	COURSE	Hours	Credits	Internal Exam	External Exam
		SEMESTER V				
31	III	CC07 - Electricity and Magnetism	6	5	25	75
32	III	CC08 - Atomic Physics	6	5	25	75
33	III	CC09 - Basic Electronics	6	4	25	75
34	III	CC10 - Core Practical III	4	4	25	75
35	III	ME II - Programming in C	5	5	25	75
36	IV	NME - II Non Conventional Energy Resources	2	2	25	75
37	V	Extension Activity	1	1	25	75
		Total	30	26	175	525
		SEMESTER VI				
38	III	CC11 - Wave mechanics and Nuclear Physics	6	5	25	75
39	III	CC12 - Solid State Physics	6	4	25	75
40	III	CC13 - Digital Electronics	5	4	25	75
41	III	CC14 - Core Practical IV	5	4	25	75
42	III	ME III - Electronic Instrumentation	5	4	25	75
43	IV	SBE III - C Programming	2	4	25	75
44	V	Gender Equality	1	1	25	75
		Total	30	26	175	525
		Grand Total	180	140	1000	3000

Non Major Electives offered by Department of Physics

1. Everyday Physics.

2. Non renewable energy resources.

Skill based Electives offered by Department of physics

S.No	Course	Semester	Title
1	Skill based Elective	I	FOXPRO Lab
2	Skill based Elective	II	MS Excel Lab
3	Skill based Elective	III	C Programming

SEMESTER I   **CODE: CC01**

CORE COURSE I

PROPERTIES OF MATTER AND ACOUSTICS

UNIT I: ELASTICITY

Stress, Strain – Moduli of elasticity – Work done – relation between elastic moduli – Poisson's ratio – Determination of rigidity modulus by static torsion method – Bending moment – Cantilever – Non – uniform bending: pin and microscope method – Searle's method for q, n, and σ.

UNIT II: VISCOSITY

Motion in a viscous medium – Coefficient of viscosity and its dimension – Poiseuille's formula – Experiment to determine the coefficient of viscosity of a liquid - Stoke's formula and Experiment – Surface Tension: Definition, Explanation – Excess of pressure inside a curved surface – Surface Tension by drop weight method – Interfacial Surface Tension – Experiment - Variation of S.T. with temperature.

UNIT III: GRAVITATION AND SPACE PHYSICS

Newton's law – Boy's method of finding 'g' – Gravitational potential and Intensity due to a sphere and shell – Variation of 'g' with altitude, latitude and rotation of earth – Escape velocity – Stationary orbits – Orbital velocity – Launching of satellites (basic ideas).

UNIT IV: OSMOSIS AND DIFFUSION

Osmosis – Osmotic pressure – Laws of osmotic pressure – Experiment – Lowering of vapour pressure – Elevation of boiling point and depression of freezing point – Diffusion - Coefficient of diffusion - Fick's laws – Determination of diffusivity – Applications.

UNIT V: ACOUSTICS

Intensity of sound – Decibel – Intensity level –Laws of transverse vibrations – Melde's string method – Acoustics of buildings – Sabine's formula – Ultrasonics – Production by piezoelectric and magnetostriction method – Properties – Applications.

Books for Study:
1.   Properties of Matter – D.S. Mathur, S. Chand & Co., New Delhi - 2004
2.   Properties of Matter – R. Murugesan, S. Chand & Co., New Delhi - 2004
3.   Sound – R.L Saihgal, S. Chand & Co., 1998.
4.   Properties of Matter - Sundaravelusamy (Tamil medium book)

SEMESTER I & II   **CODE: CC02**

CORE COURSE-II
MAJOR PRACTICAL –I

(Any 12 experiments only)

1. Non-uniform bending - pin and microscope.

2. Uniform bending - pin and microscope.

3. Determination of viscosity - capillary flow method

4. Static torsion - determination of 'n'.

5. Torsional pendulum - determination of 'n' and M.I.

6. Compound pendulum - determination of 'g' and 'k'.

7. Surface tension and interfacial surface tension - drop weight method.

8. Specific heat capacity of a liquid - Newton's law of cooling method.

9. Sonometer - determination of A C frequency.

10. Melde's string – Two modes.

11. Spectrometer – Refractive index of a solid prism.

12. Air wedge - determination of thickness of a thin wire.

13. Potentiometer - calibration of low range voltmeter

14. Meter bridge - specific resistance.

15. Study of characteristics of a junction diode.

16. Study of characteristics of a Zener diode.

SEMESTER I   **CODE: SBE1**

SKILL BASED ELECTIVE I

FOX-PRO PRACTICALS

1. Address – data base – creating structure, inputting data, listing selected fields, appending data and saving.

2. Deposit – database file – structure, input and other operations, deleting, packing and recalling records.

3. Modifying structure of existing database file including new fields – editing & viewing with browse command.

4. Payroll – creating structure and using formula – replace command.

5. Using mathematical and financial functions.

6. Rank list database file – sorting and indexing.

Books for study:

Fox - pro 2.5 for DOS & windows made simple – R. K. Taxali, BPB publications – New Delhi -1996.

SEMESTER II   **CODE: CC03**

CORE COURSE-III

MECHANICS AND RELATIVITY

UNIT I: DYNAMICS AND RIGID DYNAMICS

Impulse - Impact - Laws of impact - Impact of a smooth sphere on a horizontal plan - Direct and oblique impact between two spheres. Moment of inertia - Angular momentum and kinetic energy of a rotating body - Theorem of parallel and perpendicular axis - Compound Pendulum: Determination of acceleration due to gravity and radius of gyration.

UNIT II: STATICS

Centre of Gravity - C.G of a solid hemisphere - Hollow hemisphere-Solid cone – Friction - laws of friction - Co-efficient of friction - Cone of friction - Angle of friction - Static and Dynamic friction - Equilibrium of a body on a rough inclined plane with and without the application of an external force.

UNIT III: HYDROSTATICS

Fluid pressure and it properties–Centre of pressure of a rectangular, triangular and irregular lamina immersed in a liquid - Floating bodies - Laws of floatation - Stability of floating bodies – Metacentre - determination of metacentric height of a ship - Variation of atmospheric pressure with altitude.

UNIT IV: CLASSICAL MECHANICS

Mechanics for a system of particles – Constraints - Conservation theorem for linear momentum and energy – Degrees of freedom-Phase space - Configuration space – Principle of virtual work - D'Alemberts Principle- Lagrangian equation from D'Alemberts Principle. Application: simple pendulum.

UNIT V: RELATIVITY

Newton's laws and their limitations- Inertial frames – Galilean transformations and invariance - Michelson-Morley experiment-Explanation of results - Postulates of special theory of relativity – Lorentz transformation – Relativity of space and time - Mass energy equivalence - Physical significance.

Books for Study:

1. Mechanics - D.S. Mathur, S. Chand & Co, New Delhi.

2. Dynamics - M. Narayanamoorthy, National Publishing Co, Madras.

3. Statics, Hydrostatics and Hydrodynamics - M. Narayanamoorthy and Nagarathinam, the National Publishing Co. Madras.

4. Mechanics - R. Murugesan, S. Chand & Co – New Delhi.

5. Classical Mechanics - J. C. Upadhyaa, Himalaya Publishing House.

6. Classical Mechanics - H. Goldstein.

SEMESTER III   **CODE: CC04**

CORE COURSE-IV

HEAT AND THERODYNAMICS

UNIT I: THERMODYNAMICS
        Zeroth and First law of thermodynamics – Isothermal and Adiabatic process – work done during isothermal and adiabatic process – reversible and irreversible process – second law of thermodynamics – Carnot's reversible engine - efficiency in terms of temperature – entropy – change in entropy in reversible and irreversible process – temperature entropy diagram – Maxwell's thermodynamic equation.

UNIT II: LOW TEMPERATURE PHYSICS
        Vander Waal's equation of state – values of critical constants in terms of a and b – Porous plug experiment – theory of porous plug experiment – Joule Kelvin effect – Liquefaction of hydrogen by Dewar method – Liquefaction of helium by H. K. Onnes method – Helium I & II properties – Adiabatic demagnetization – Principle of air conditioning and refrigeration.

UNIT III: TRANSMISSION OF HEAT
        Conduction – Coefficient of thermal conductivity – Measurement of thermal conductivity – Forbe's method – Lee's disc method for bad conductor – Thermal radiation – block body – Stefan's law – deduction of Newton's law from Stefan's law – Solar constant – temperature of the Sun – Determination of solar constant by water flow Pyrheliometer.

UNIT IV: CALORIMETRY
        Specific heat of solids and liquids – Dulong and Petit's law – Variation of specific heat with temperature – Newton's law of cooling – Specific heat capacity of liquid by cooling – specific heat capacity of gases – Mayer's relation- determination of C_v by Joly's differential steam calorimeter – determination of C_p by Regnault's method.

UNIT V: STATISTICAL MECHANICS
        Statistical equilibrium – probability theorem in statistical thermodynamics – Maxwell – Boltzmann's distribution law – Application to ideal gas – Phase space – Fermi-Dirac distribution law – Bose-Einstein distribution law – comparison of three statistics – Application to photon gas (Plank's radiation law).

Books for Study:
1. Heat and Thermodynamics – J.B. Rajam and C.L. Arora S. Chand Publications, 1979.
2. Thermodynamics and Statistical Physics – Sharma and Sarkar, Himalaya Publishing House, 1988.
3. Heat and Thermodynamics – Brijlal and N. Subramanian, S. Chand Limited, 2001.
4. Statistical Mechanics – Satya Prakash and C. Agarwal
5. Thermal Physics – R. Murugesan, S. Chand & Co, New Delhi.

SEMESTER III & IV   **CODE: CC05**

CORE COURSE-V

MAJOR PRACTICAL II

Any 12 experiments only

1. Cantilever - determination of 'q'- mirror and telescope method.

2. Viscosity of a highly viscous liquid - Stoke's method.

3. Lee's disc - thermal conductivity of a bad conductor.

4. Newton's rings - determination of R and refractive index

5. Potentiometer - Ammeter calibration

6. EMF of Thermocouple - Direct Deflection

7. Carey Foster's Bridge method - Determination of specific resistance.

8. Potentiometer - specific resistance.

9. Determination of M and B_H using deflection and vibration magnetometer.

10. Figure of merit – table galvanometer.

11. Potentiometer - temperature coefficient of resistance.

12. Spectrometer – Liquid prism.

13. Transistor Characteristics – CE mode.

14. Grating – minimum deviation method.

15. Comparison of magnetic moment – Deflection magnetometer.

16. Specific heat capacity – Joule's calorimeter.

SEMESTER III   **CODE: ME1**

ELECTIVE CORE - I

ENERGY PHYSICS

UNIT I: SUN

The characteristics of Sun - Solar constant - Electromagnetic energy spectrum - spectral distribution - Solar radiation on earth's surface - Solar angles - Types of Pyrheliometers - Angstrom Pyrheliometer, Eppley Pyrheliometer, Abbots silver disc Pyrheliometer - Estimation of average Solar radiation.

UNIT II: SOLAR COLLECTORS

Liquid flat plate collectors - General characteristics - Collection efficiency - Focusing type solar collectors - Concentrator and Receiver geometric - General characteristics of focusing collectors - Optic losses - Construction of reflectors.

UNIT III: SOLAR HEATERS AND COOLERS

Solar air heaters: types, performances and applications – storage system: electrical storage, thermal storage, chemical storage and pebble bed storage.

Solar cooling systems - Vapour compression systems and heat pumps - Absorption air conditioning - Open and cooling system - Natural methods of air conditioning.

UNIT IV: SOLAR GENERATORS

Solar thermal power generation - Solar still - Solar pump - Solar pond - Solar cooker - selective coating. Conversion of light into electrical energy - Photovoltaic power generation - types of solar cells.

UNIT V: OTHER ENERGY SOURCES

Fossil fuel resources - Need for alternate energy resources - Biological conversion – Biogas – Geothermal - Ocean Thermal Energy Conversions - Wind power - Basic principles of Magneto-hydrodynamics - Solar production of hydrogen - Liquid hydrogen as a fuel in future.

Books for Study and Reference:

1. Solar energy utilization - G. D. Rai - Khanna Publications, New Delhi, 1993.
2. Solar energy – C. G. Agarwal.

SEMESTER III   **CODE: SBE II**
SKILL BASED ELECTIVE COURSE - II

MS EXCEL PRACTICALS

1.   Profit and loss -   inputing data and use of formula.

2.   Deposit – worksheet – calculation of simple interest, compound interest etc

3.   Mark list – worksheet – sorting – copying cells – handling decimals.

4.   Pie diagrams and bar charts – Plan expenses, unemployment etc.

5.   Use of functions – statistical, mathematical and financial.

SEMESTER IV   **CODE: CC06**

CORE COURSE VI
OPTICS AND SPECTROSCOPY

UNIT I: GEOMETRICAL OPTICS

Cardinal points and Cardinal planes – Chromatic aberration in lenses and achromatic condition – Spherical aberration in a lens and methods of minimizing it – Huygens's and Ramsden's eyepieces – construction, theory, merits and demerits.

UNIT II: DIFFRACTION

Rectilinear propagation of light – Zone plate – Fresnel and Fraunhofer diffraction – Plane diffraction grating – Determination of wavelength – Absent spectra – Overlapping spectra – Dispersive and resolving powers of a grating – Comparison between prism and grating spectra.

UNIT III: POLARIZATION

Transverse nature of light – double refraction – Huygen's explanation of double refraction – Nicol prism – Quarter wave plate and Half wave plate – theory, production and analysis of circularly, elliptically and plane polarized light – Fresnel's theory of optical rotation – Specific rotation – Laurent's half shade Polarimeter – Bi-quartz method – determination of specific rotation of sugar solution.

UNIT IV: SPECTROSCOPY

Spectra – continuous, line and band spectra – Solar spectrum – Electromagnetic spectrum – Ultra-violet spectrum – Instrumentation – Infra Red spectrum – Instrumentation – Applications of IR spectra – Raman effect – Experimental study of Raman effect – Quantum theory – Applications.

UNIT V: FIBER OPTICS

Optical fiber: structure, principle and classifications – Theory of propagation – Numerical aperture – Coherent bundle – Fiber optic sensors – active and passive – Fiber endoscope – Fiber optic communication systems (Block Diagram) and their advantages.

Books for Study:

1. Optics – Brijlal and Subrahmanyam – S. Chand & Co, 2012.
2. Optics – Ajoy Ghatak – Tata Mc Graw Hill – New Delhi, 2005.
3. Optics and spectroscopy – R. Murugeshan, S. Chand Publishing, New Delhi, 2010.

SEMESTER IV   **CODE: NME I**

NON MAJOR ELECTIVE COURSE - I

EVERYDAY PHYSICS

UNIT I: LASER AND FIBER OPTICS

Laser applications in industries: cutting, welding, hole drilling - LIDAR and Laser tracking - Laser in medicine - Fiber optic communication system – Advantages – Holography – Application of holography.

UNIT II: ELECTRICITY

Condenser – Principle of a capacitor - types: mica, paper, variable, electrolytic and guard ring condenser – Atmospheric Electricity - Causes of atmospheric electricity – Lightning Conductor.

UNIT III: ELECTROCHEMISTRY

Electrolysis – Applications of electrolysis – Simple voltaic cell – Daniel cell – Lechlanche cell - Dry cell – Atomic battery - Standard cells: Lead acid accumulator, Nickel Iron Accumulator.

UNIT IV: OPTOELECTRONIC DEVICES

Photodiode - Phototransistor - Photoconductor – LED - LCD - Solar cell.
         (principle, construction, working and applications)

UNIT V: SOLAR ENERGY

Solar air heater, Design of solar cooling system – Natural methods of air conditioning - Ocean thermal Electric conversion (open and close cycle) – Wind energy Conversion (horizontal and vertical types).

Books for study:

1. Optics and Spectroscopy – R. Murugeshan, S. Chand, New Delhi, 2010.
2. Electricity and magnetism – Brijlal and Subramanyam, Ratan Prakashan Mandir, 1966.
3. Modern physics – R. Murugeshan, S. Chand, New Delhi, 2008.
4. Solar energy utilization – G. D. Rai, Khanna publications, New Delhi, 1993.

SEMESTER V   **CODE: CC07**

CORE COURSE VII

ELECTRICITY AND MAGNETISM

UNIT I: ELECTROSTATISTICS

Gauss theorem and its applications – Coulomb's law - Force on the surface of a charged conductor - Electrostatic energy of the medium - Electric potential and field due to a uniformly charged disc at an axial point, at the centre of the disc – Capacitors - Expression for the capacity of a spherical capacitor - Energy of a capacitor - Loss of energy due to sharing of charges.

UNIT II: CURRENT ELECTRICITY

Laplace's law - Biot - Savort's law - Application to field along the axis of a circular coil and solenoid - force on the conductor in a magnetic field - Kirchoff's laws - Wheatstone's network - Carey Foster's bridge – determination of temperature coefficient.

UNIT III: MAGNETIC INDUCTION

Introduction – Magnetic field, flux density - Intensity of Magnetization – Susceptibility – Permeability - Relation between B and H - Cycle of Magnetization-Retentivity – Coercivity – Hysteresis – B - H loop - Ballistic method of plotting.

UNIT IV: ELECTROMAGNETIC INDUCTION

Laws of electromagnetic induction - Expression for induced emf - Self inductance of a solenoid - Rayleigh's method of finding self inductance of a coil - Mutual inductance - Determination of mutual inductance between pair of coils – Coefficient of coupling - Eddy current and its applications.

UNIT V: DC AND AC CIRCUITS

Growth and decay of current in an LR circuit - Growth and decay of charge in a CR circuit - Determination of high resistance by leakage - AC Circuits: LR, CR, and LCR circuits (Series and parallel) - Comparison – Sharpness of resonance - Power factor - Wattless current - Skin effect.

Books for study and references:

1. Electricity and Magnetism - Brijlal and Subramanyam - Ratan Prakashan Mandir - New Delhi - 1995
2. Magnetism and Electricity - Khare and Srivastava - AtmaRam and sons - New Delhi.
3. Electricity and Magnetism - R. Murugeshan, S. Chand, New Delhi, 2008

SEMESTER V   **CODE: CC08**
CORE COURSE VIII

ATOMIC PHYSICS

UNIT I: ATOM MODELS

Sommerfeld's relativistic atom model – Elliptical orbits for Hydrogen – Relativistic variation of electronic mass – fine structure of the Hα line – Vector atom model – Spatial quantization - Spinning electron – Various quantum numbers – Pauli's exclusion principle - Periodic classification of elements – Electronic configuration of elements - Bohr magnetron – Experimental confirmation of Vector Atom Model – Stern – Gerlach experiment.

UNIT II: ZEEMAN EFFECT

Zeeman effect – Debye's explanation of normal Zeeman effect – Anomalous Zeeman effect – Theoretical explanation – Lande 'g' factor – Measurement of atomic magnetic moment – Paschen - Back effect – Explanation of Stark effect (no proof).

UNIT III: X-RAYS CRYSTALLOGRAPHY

X - rays – Continuous and characteristics X - rays – Hard and soft X - rays – Mosley's law and their importance – X - ray study of crystal structures – Laue's method – Rotating crystal method – Powder crystal method.

UNIT IV: PHOTOELECTRIC AND COMPTON EFFECT

Photoelectric effect – Lenard, Richardson and Compton experiments – Laws of Photoelectric emission – Einstein's photoelectric equation – Millikan's experiment – Determination of Plank's constant - Photo Voltaic cells – Photo conductive cells – applications of photoelectric cells – Photo multiplier – Photodiodes and Phototransistors –Compton Effect – Theory and experimental verification.

UNIT V: LASERS

Stimulated emission – Population inversion – Temporal and spatial coherence – He – Ne laser – Carbon dioxide laser – Semi conductor laser – Dye laser – Medical, Industrial and Scientific applications of laser.

Books for Study:
1. Modern Physics – R.Murugesan – S. Chand & Co, New Delhi, 2008.
2. Lasers Theory and Applications – Thyagarajan and Ghatak – McMillan, Plenum Press, 1981.
3. Solid State Physics – S. L. Gupta & V. Kumar – K. Nath and Co., Meerut.
4. Atomic Physics – J. B. Rajam – S. Chand & Co.
5. Concepts of Modern Physics – A Beiser – Tata Mc Graw Hill, 1987.

SEMESTER V   **CODE: CC09**

CORE COURSE IX

BASIC ELECTRONICS

UNIT I: SEMICONDUCTOR DIODE

Intrinsic semiconductor - Extrinsic semiconductor - N-type and P-type semiconductor - PN junction - Junction diode - Volt-ampere characteristics - Zener diode – Half wave and full wave rectifier - Bridge rectifier – Efficiency - Ripple factor.

UNIT II: TRANSISTORS

Bipolar junction transistor - Transistor action - Configurations of transistor - CB,CE and CC - Characteristics CB, CE & CC connection - Comparison - Transistor biasing circuit - Fixed bias circuit - Voltage divider biasing circuit - Essential of a transistor biasing circuit – FET - construction and working - Output characteristics - parameters.

UNIT III: TRANSISTOR AMPLIFIERS

Single stage transistor amplifier – Working - Practical circuit of transistor amplifier - Phase reversal - Voltage gain - Classification of amplifiers - Multistage amplifier - R.C coupled transistor amplifier - Audio power amplifier - Difference between voltage and power amplifiers - Classifications of power amplifiers - Push Pull amplifier.

UNIT IV: FEEDBACK IN AMPLIFIERS AND OSCILLATORS

Feedback in amplifier - Voltage gain of feedback amplifier - Advantages of negative feedback - Emitter follower - Positive feedback - Amplifier as an oscillator - Hartley and Colpitt's oscillator – Multivibrators: Astable, Mono - stable and bistable multivibrator using transistors

UNIT V: INTEGRATED CIRCUITS

Integrated Circuits – Monolithic - IC fabrication - IC components – Resistor – Capacitors – diodes – Transistor - IC package and Symbols - Operational amplifier - Inverter –Adder – Subtractor - Differentiator and Integrator.

Books for Study:

1.   Principles of Electronics - V. K. Metha - S. Chand & Co.
2.   Elements of Electronics - Anand Prakash, Chopra and Segal – S. Chand & Co.
3.   Basic Electronics and Linear circuits - Bhargava Kulshreshtra and Gupta, Tata Mc Graw Hill, 1989.
4.   Integrated circuits and Semiconductor devices - Deboo and Burrous – Mc Graw Hill, 1987.

SEMESTER V   **CODE: CC10**

CORE COURSE X

MAJOR PRACTICAL III

(Any 15 experiments only)

1.   q - by Non-uniform bending - Koenig's method.

2.   Spectrometer - i-d curve.

3.   Spectrometer - i-i' curve.

4.   Spectrometer - Dispersive power of the material of the prism.

5.   Spectrometer   - Prism – Cauchy's constant

6.   Determination of M and B_H -Tan C position

7.   Spectrometer - grating-normal incidence method

8.   Field along the axis of the coil – determination of 'm'.

9.   Comparison of magnetic moments by vibration magnetometer

10.   Potentiometer - calibration of high range voltmeter.

11.   Potentiometer - Calibration of high range ammeter

12.   Potentiometer - EMF of a thermocouple

13.   Potentiometer -Temperature coefficient of a thermistor.

14.   C program to solve the quadratic equation

15.   C program to find the largest and smallest of given numbers

16.   C program to arrange the numbers in ascending/descending order

SEMESTER V   **CODE: ME II**

ELECTIVE CORE II

PROGRAMMMING IN C

UNIT I:

Structure of a C programming - Character set - Data types - Tokens, identifiers, keywords - Variables and constants - Operators - Arithmetic relational, logic - Assignment, increment, decrement - Bit wise and conditional operators - Special operators - comma, size of, pointer operator – Arithmetic expressions- input-output statements - getchar( ), putchar( ), scanf & printf.

UNIT II:

Control statement - if-if else – Nested if-else - Else if ladder - Switch statement - go to statement - While, do while - for - Continue statement. Arrays - one dimensional array-two dimensional array – Declaration & initialization of Arrays-character array - declaring & initializing character array - string functions - strcat(), strcmp(), strcpy( ),strlen( ).

UNIT III:

Defining function - return values and their types - category of function (functions with no argument with no return values, arguments with return values, no arguments with return values) - storage classes (automatic, external, static, register)

UNIT IV:

Structures and unions – defining - declaration-accessing a structure member - structure initializing the structure - array of structure- array within structure - structure with in structure (basic idea only) – pointer - accessing the address of the variable - declaring & initializing a pointer variable – Files - file pointer - opening and closing files - formatted I/O with files (fscanf, fprintf).

UNIT V:

Simple programs **–** Addition of two numbers - Area of the triangle, and circle - Time period of the simple pendulum - Average of n numbers - Conversation of Fahrenheit to Celsius and Celsius to Fahrenheit - Solving quadratic equations - Finding the factorial using recursion - Smallest and largest element in an array - Ascending and descending order - Names in alphabetical order.

Books for Study:

1.   Programming in C (ANSI)-E.Balagurusamy-4th edition - Tata Mc Graw Hill Pub. New Delhi.
2.   Programming in C R. Subburaj - Vikas Pub. House Pvt Ltd, New Delhi.
3.   The spirit of C - Mullish Cooper - Jaico Pub. House - New Delhi.

SEMESTER V   **CODE: NME II**

NON MAJOR ELECTIVE II

NON – CONVENTIONAL ENERGY RESOURCES
(To be offered to the students of other departments)

UNIT I: RENEWABLE ENERGY SOURCES

Conventional energy sources: Electricity production by water, radioactive materials and fossil fuel – Energy resources and their availability – Need for alternative energy resources – Types of renewable energy resources – Advantages.

UNIT II: SOLAR ENERGY FUNDAMENTALS

Physical principle of conversion of solar radiation into heat – Basic idea of solar collectors – Applications of solar energy – Solar water heating – Solar electric power generation – Solar cooker – Solar energy in space.

UNIT III: WIND ENERGY

Basic principle of wind conversion – Types of wind mills – Advantages and disadvantages of wind energy conversion (WECs) – Applications of wind energy.

UNIT IV: OTHER FORMS OF ENERGY

Energy from biomass – Biogas generation – KVIC biogas plant – Biogas from plant waste – Main applications of biogas – Basic ideas of ocean thermal electric conversion (OTEC).

UNIT V: ENERGY FOR THE FUTURE

Basic principle for tidal power – Advantages and limitations of tidal power generation – Use of hydrogen as an energy sources – Production of hydrogen by solar method - Hydrogen as a fuel in future.

Books for Study:
1. Solar energy Utilization – G. D. Rai, Khanna publications, New Delhi, 1993.
2. Principle and practices of Solar Energy – C. P. Anantha Krishnan and Sethu Rao.

SEMESTER-VI   **CODE: CC11**
CORE COURSE XII

WAVEMECHANICS AND NUCLEAR PHYSICS

UNIT I: PROPERTIES OF NUCLEUS, PARTICLE ACCELERATORS, DETECTORS

Properties of Nucleus – size, charge, mass spin – Nuclear magnetic dipole moment – Electric quadrupole moment – Binding energy – Packing fraction – Nuclear forces – Nuclear model – Liquid drop model (qualitative treatment only) – Accelerator – Betatron – Proton synchrotron – Detector: G.M. Counter – Wilson's cloud chamber.

UNIT II: INDUCED RADIOACTIVITY AND RADIOACTIVE SPECTRA

Nuclear reaction – Induced radioactivity – Artificial transmutation – Techniques – Applications of radio isotopes – Discovery and detection of Neutron – basic properties of neutron – Theory of Alpha decay – Alpha ray spectra – Fine structure – Beta ray spectra – Neutrino hypothesis – Gamma ray spectra – Internal conversion – Nuclear isomerism.

UNIT III: NUCLEAR FUSION AND ELEMENTARY PARTICLES

Nuclear fusion – Hydrogen cycle – Carbon – Nitrogen cycle – Stellar energy – Plasma – Elementary particles – Classifications - Baryons and Leptons – Antiparticles: mesons, μ, π, k and strange particles – Conservation of laws - Quarks.

UNIT IV: DUAL NATURE OF MATTER

de Broglie's concepts of matter waves – de Broglie's wavelength – Wave velocity and group velocity for the de Broglie's waves – Experimental study of matter waves – Davison and Germer experiment – G.P. Thomson's experiment for verifying de Broglie's relation – Heisenberg's uncertainty principle.

UNIT V: SCHRODINGER'S WAVE MECHANICS

Basic concepts of wave mechanics – Development of Schrödinger's wave equation – Time independent and time dependent form of wave equation – Properties of wave function – Orthogonal and normalized wave function – Eigen function and Eigen values – Applications of Schrodinger's equation – Particle in a box (one dimensional).

Books for study:
1. Modern Physics – S. Murugeshan S Chand & Co, New Delhi, 1994.
2. Modern Physics – J. B. Rajam S Chand & Co
3. Nuclear Physics – Irwing Kaplan – Addison & Wesley Publishing Company, 1955.

SEMESTER-VI   **CODE: CC12**
CORE COURSE XIII

SOLID STATE PHYSICS

UNIT I: BONDING IN SOLIDS
Force between atoms – Cohesive energy – Calculation of cohesive energy – Ionic bonding – Calculation of lattice energy of ionic crystals – Calculation of Madelung constant of ionic crystals – Born- Haber cycle – Covalent bond – Metallic bond – Intermolecular bonds such as dispersion bond, dipole bond, hydrogen bonds.

UNIT II: ELEMENTARY CRYSTALLOGRAPHY
Unit cell – Lattice parameters – Crystal systems – Crystal symmetry – Rotation – Inversion axis – Translation symmetry elements – Bravais space lattice – SC, BCC, FCC, HCP – Cubic structures of diamond, zinc blende, sodium chloride – Caesium chloride – Miller indices – Separation between lattice planes in a cubic crystal.

UNIT III: SEMICONDUCTORS
Properties of semiconductors – Effects of electric field on N-type and P-type semiconductors – Conductivity in a semiconductor – Hall Effect – Determination of Hall Voltage, carrier concentration and mobility – Applications of Hall Effect.

UNIT IV: CONDUCTION AND DIELECTRIC MATERIALS
Physical properties of metals – Classification of conducting material – Free electron theory – Weidmann - Franz law – Dielectric constant – Types of polarization – Types of dielectric materials – Clausius – Mossotti equation – Applications of dielectric materials.

UNIT V: MAGNETIC MATERIAL AND SUPER CONDUCTIVITY
Types of magnetic materials – Langevein's (Classical) theory of para magnetism – Weiss theory of ferromagnetism – Properties of dia, para and ferro magnetic material – Super conductivity – Properties of super conductors – Meissner effect – BCS theory (qualitative treatment only) – Applications.

Books for Study:

1. Solid State Physics VI Edition – S.O. Pillai, New Age International (P) Publisher, Chennai.

2. Material Science – M. Arumugam, Anuratha Publications, Kumbakonam.

3. Modern Physics – R. Murugeshan – S. Chand & Co., New Delhi, 1994.

4. Fundamentals of Solid State Physics – B. S. Saxena, R. C. Gupta, P. N. Saxena – Pragati Prakashan, Meerat.

5. Solid State Physics – S. L. Gupta, V. Kumar - K. Nath & Co., - Meerut.

SEMESTER-VI   **CODE: CC13**

CORE COURSE XIV

DIGITAL ELECTRONICS AND MICROPROCESSOR

UNIT I: NUMBER SYSTEM

Decimal, Binary, Octal and Hexadecimal number systems - Code conversion- BCD codes, Excess -3, Gray code - Alphanumeric code - BCD addition, subtraction - 9's and 10's compliments - 1's and 2's compliments-subtraction using 1's and 2's compliments

UNIT II: COMBINATIONAL LOGIC SYSTEM AND DATA PROCESSING CIRCUITS

Logic gates, symbols, and their truth tables, (AND, OR, NOT, XOR, XNOR and NAND) - Universality of NAND and NOR gates - Half adder - Full adder - Half subtractor - Full subtractor – 2's compliment adder – Subtractor circuits BCD adder - Decoder (binary to decimal) - Encoder (decimal to binary) – Multiplexer - Demultiplexer.

UNIT III: SIMPLIFICATION OF BOOLEAN EXPRESSION

Boolean algebra - Fundamental concepts - Basic laws - Duality theorem - De Morgan's theorem - SOP and POS forms of expressions - Minterm - Maxterms - Reducing Boolean expressions using Boolean laws and Karnaugh's map (four variables).

UNIT IV: SEQUENTIAL LOGIC SYSTEM

R-S Flip-Flop using NAND and NOR gates - Clocked R-S Flip-Flop- D Flip-Flop - T flip-flop - J-K Flip-Flop and J-K Master - Slave Flip-flop – Counter - Ripple counter - Mod 10 counter - Ring counter - 3 bit register using D flip-flop- D/A converter - Weighted resistor method - A/D: Successive approximation method.

UNIT V: MICROPROCSEEOR

Intel 8085 microprocessor: architecture, registers, ALU - Instruction formats - Addressing modes - Types of instructions - Assembly Language Programming - Programs for addition, subtraction, multiplication and division.

Books for study:

1. Digital computer electronics - Albert Paul Malvino, Glencoe, 1992

2. Microprocessor - Badri Ram, Dhanpat Rai & Sons, 1993.

3. Digital electronics – Tokheim – Schaum Series, McGraw-Hill Education, 1994.

4. Digital electronics and microprocessor – Vijayendran, Viswanathan, S., Printers & Publishers Pvt. Ltd, 2009.

SEMESTER- VI   **CODE: CC14**

CORE COURSE XI

MAJOR PRACTICAL - IV

(Any 15 experiments only)

1. LCR Series resonant circuit

2. LCR Parallel resonant circuit

3. Regulated power supply - Zener diode

4. Logic Gates using discrete components

5. Voltage doubler and Tripler

6. Single stage RC coupled amplifier using transistor

7. Colpitt's oscillator.

8. Hartley oscillator.

9. FET Characteritics.

10. OP-AMP –adder and subtractor.

11. OP-AMP-integrator and differentiator

12. Astable multivibrator using Operational amplifier

13. Study of logic gates using ICs

14. Verification of De Morgan's laws using ICs

15. Half Adder and Full Adder using basic gates

16. RS, D and JK flip-flops

17. NAND as universal gate using ICs

18. NOR as universal gate using ICs

19. Decoder using ICs

SEMESTER-VI   **CODE: ME III**
ELECTIVE CORE III

ELECTRONIC INSTRUMENTATION

UNIT I: BASIC CONCEPTS OF MEASUREMENT

Definition - Accuracy and Precision - Type of errors - Gross error - Systematic errors - Random errors - Nature of units: Fundamental & derived quantities - Absolute units – Dimensions - Systems of mechanics units - Systems of electrical units - Introduction of SI systems of units - Dimension in electrostatic and electro magnetic system - Dimension of electrical and magnetic quantities - Standards of measurement – Standard for mass, length, volume, time & frequency - Electrical standards-standard of temperature – IEEE standards.

UNIT II: ELECTRONIC INSTRUMENTS

Introduction - Analog and digital instruments – Function of instruments - electronic versus electrical instruments - Essential of electronic instrument - Basic mater movement - Characteristics of moving coil meter movements - Variation of basic meter movement - Converting basic meter to DC ammeter, DC voltmeter, ohmmeter - Multi range DC ammeter & DC voltmeter - Electronic voltmeter - DC VTVM - Electronic voltmeter for AC - The digital voltmeter(DVM) - Q-meter.

UNIT III: BRIDGE MEASURMENT

Introduction: Wheatstone bridge - Kelvin bridge - Effect of connecting leads - Kelvin double bridge - AC bridge & their application - Condition for bridge balance - Maxwell bridge - Hay bridge - Schering bridge.

UNIT IV: TRANSDUCERS

Classification - Position transducer - Pressure transducer - Self generating inductive transducers - Linear Variable Differential Transducer (LVDT) - Piezoelectric transducer - Strain gauge - Temperature Transducer - Thermistor – Thermocouple - Acoustic Transducers: Ribbon microphone - Crystal microphone-Loud speaker.

UNIT V: DISPLAY UNITS

CRO – CRT - Normal operation of CRO – Triggered - Non triggered scopes - dual trace CRO-dual beam CRO - Lissajous figures - Frequency determination - Applications of a CRO.

Books for study:

1.   Modern electronic instrumentation and measurement techniques - Albert D

        Helfrick and William D. Cooper, Prentice - hall of India private limited,1999.

2.   Electronics & electrical measurement & instrumentation J. B. Gupta - S. K. Kataria & sons, Delhi, thirteenth edition.

3.   Basic electronics and solid state - B. L. Theraja - S. Chand & Company Ltd.,

        New Delhi - 2000.

SEMESTER VI   **CODE: SBE III**

SKILL BASED ELECTIVE III

C PRACTICALS

1.   Finding the area of the triangle.

2   Finding the area of a circle.

3.   Conversion of temperature from Centigrade to Farenheit.

4.   Conversion of temperature from Farenheit to Centigrade.

5.   Printing of characters and strings.

6.   Program for arithmetic operations.

7   Program for the factorial of a number

8.   Program for Fibonacci series

SEMESTER-III   **CODE:**
ALLIED PHYSICS- I

(FOR MATHS AND CHEMISTRY STUDENTS)

UNIT I: MECHANICS

Laws of friction - Co-efficient of friction - Cone of friction - Angle of friction - Static and dynamic friction - Equilibrium of a body on an inclined plane with and without the application of an external force – Lubricants - Centre of pressure - Centre of pressure of a rectangular lamina immersed in a liquid - Stability of floating bodies- Meta center - Determination of meta centric height of a ship.

UNIT II: PROPERTIES OF MATTER

Stress, strain, moduli of elasticity - Work done - Relation between elastic moduli-poisson's ratio - Bending moment – Cantilever - Non-uniform bending - pin and microscope method – Searle's method for q, n, sigma - I form of girders-

UNIT III: THERMAL PHYSICS

Newton's law of cooling - Specific heat capacity of a liquid - Specific heat capacity of a gas - C_P and C_V - Mayer's relation - Determination of C_V by Jolly's differential steam calorimeter - Determination of C_P by Regnault's method – Conduction - Coefficient of thermal conductivity - Lee's disc method.

UNIT IV: OPTICS AND SPECTROSCOPY

IR and UV spectroscopy - Raman effect – Experiment – Applications - Lasers and Masers - Stimulated emission - Population inversion - Ruby laser - He-Ne laser - Optical fibre - Numerical aperture - Coherent bundle - Fibre optic communication system and its advantages.

UNIT V: SOUND

Ultrasonic waves - production, properties and applications - Acoustics of buildings – Reverberation - Sabine's formula.

Books for Study and Reference:

1. Statics, Hydrostatics and Hydrodynamics - Narayanamoorthy and Nagarathinam, Nation Publishing, Chennai.
2. Sound - Saigal - S.Chand & Co. Delhi.
3. Properties of matter - D. S. Mathur, S. Chand Limited, 2008.
4. Heat and Thermodynamics - Brijlal and Subramaniam, S. Chand, Limited, 2001.
5. Optics - Brijlal and Subramaniam, S. Chand, 2006.
6. Optics - Ajoy Ghatak - Tata Mc Graw Hill, Delhi.
7. Allied Physics -1 - A. Sundaravelusamy.

SEMESTER-III   **CODE:**

ALLIED PHYSICS II
(FOR MATHS AND CHEMISTRY STUDENTS)

UNIT I: ELECTROSTATICS

Static electricity - Coulomb's law - Mechanical force on the surface of a charged conductor - Electrostatic energy in the medium – Capacitors - Principles of condenser condensers in series and parallel - Capacity of a cylindrical condenser - Energy of a charged condenser – loss of energy due to sharing of charges.

UNIT II: CURENT ELECTRICITY AND ELECTROMAGNETIC INDUCTION

Potentiometer – principle - Calibration of an ammeter - Magnetic effect due to an electric current - Laplace's law - Magnetic effect at the centre of a circular coil carrying current - Fleming's Left Hand rule - Moving coil galvanometer - Electromagnetic induction laws - Expression for induced e.m.f - Self and mutual inductance.

UNIT III: ATOMIC PHYSICS

Atom models - Bohr atom model - Vector atom model - Quantum numbers in vector atom model – Pauli's exclusion principle - X ray – Production – Properties - Continuous and characteristics of X rays - Mosley's law and its importance - Bragg's law - Miller indices- Determination of crystal structure – Laue's Method - Powder photograph method.

UNIT IV: NUCLEAR PHYSICS

Detectors - Ionization chamber - GM counter - Wilson's cloud chamber - Bubble chamber - Induced radioactivity - Artificial transmutation - Application of radio isotopes - Nuclear forces - Classification of Elementary particles.

UNIT V: DIGITAL ELECTRONICS

Introduction - Number system - Binary, Octal and Hexadecimal number systems - Logic gates - NAND and NOR gates as an Universal building block - Boolean algebra - Boolean laws - De Morgan's theorem.

Books for study:

1.   Electricity and Magnetism, R. Murugeshan, S. Chand Limited, 2008.
2.   Modern Physics, R. Murugeshan, S. Chand Limited, 2008.
3   Digital Electronics, R. P Jain, Tata Mc Graw Hill, 2010.
4.   Allied physics II, A. Sundravelsamy, Motion Mountain.

SEMESTER III &IV   **CODE:**

ALLIED PHYSICS PRACTICAL

(Any 12 experiments only)

1. Non-uniform bending-pin and microscope.

2. Surface tension and interfacial surface tension-drop weight method.

3. Co-efficient of viscosity of a liquid using graduated burette.

4. Specific heat capacity of a liquid by cooling method.

5. Lee's disc-thermal conductivity of a bad conductor.

6. Spectrometer -Refractive index of a solid prism

7. Spectrometer -grating-minimum deviation method

8. Air wedge-Thickness of wire

9. Newton's rings-radius of curvature of a convex lens.

10. Sonometer - verification of laws.

11. Carey Foster's Bridge-specific resistance.

12. Figure of merit of a table galvanometer.

13. Potentiometer-Calibration of low range voltmeter

14. Characteristics of a junction and Zener diode.

15. AND, OR and NOT logic gates-verification of truth tables using ICs

16. Verification of De Morgan's theorems using ICs

SEMESTER-III   **CODE:**
APPLIED PHYSICS – I
(For Computer Science Students)

UNIT I: ELECTROSTATICS

Fundamentals of electrostatics – Gauss theorem and its application – Intensity due to a charged Sphere - Intensity at a point between two charged parallel plane conductors - Intensity at a point due to uniformly charged cylinder – Capacity – Principle of a capacitor – Spherical and cylindrical capacitors – Capacitors in series and parallel – Energy of a charged capacitor – Energy loss due to sharing of charges – Types of capacitors.

UNIT II: MAGNETOSTATICS

Magnetic field – Magnetic flux density – Magnetization – Intensity of magnetization –Permeability – Susceptibility – Relation between them –Properties of dia, para and ferro magnetic materials – Hysteresis – BG method – coercivity, retentivity and energy loss from hysteresis loop (BH curve).

UNIT III: CURRENT ELECTRICITY

Kirchoff's laws – Carey Foster's bridge – Experimental determination of temperature co-efficient of resistance – Potentiometer – Measurement of current and resistance – Calibration of low and high range voltmeter – Fleming's left hand rule – Theory of moving coil ballistic galvanometer – Damping correction in BG.

UNIT IV: ELECTROMAGNETIC INDUCTION

Laws of electromagnetic induction – Induced e.m.f – Self inductance - Mutual inductance – Eddy current – Determination of self inductance – Raleigh's method – Coefficient of mutual induction – Absolute method – Co-efficient of coupling – Transformer theory.

UNIT V: ALTERNATING CURRENT
RMS value of current and voltage – Power in A.C Circuit – Power factor derivation – Wattless current – Choke - Series and parallel resonance circuits – Impedance – Q factor – Selectivity and Sharpness of resonance.

Books for study:
1.   Electricity and Magnetism – Brijlal and Subramanian – Ratan Prakashan Mandir – New Delhi – 1995.
2.   Electricity and Magnetism – Narayanamurthy & Nagarathinam, Penguin Books, India.
3.   Electricity and Magnetism – D. L. Seghal and Chopra, Sultan Chand & Sons, 2014.

SEMESTER-IV   **CODE:**

APPLIED PHYSICS – II
(For Computer Science Students)

UNIT I: SEMICONDUCTOR PHYSICS
Valance and Conduction bands – Insulators, Conductors and Semiconductors - Intrinsic semiconductor – Extrinsic semiconductor – PN junction Diode – Forward bias and reverse bias characteristics – Half wave rectifier – Full wave rectifier - Zener diode - characteristics - Zener diode as voltage regulated power supply .

UNIT II: TRANSISTOR
Bipolar junction transistors – CE and CB configuration – AC and DC equivalent circuits of CB and CE - Transistor biasing: voltage divider biasing – JFET – Basic construction - Theory of operation – Static characteristics of JFET - Common source JFET amplifier.

UNIT III: OPTOELECTRONICS
Light Emitting Diode – theory – construction –applications – Liquid Crystal Display – construction – working – PN Junction photo diode – Photoconductive cell – theory and working – Photo transistor – Photo Darlington – Photovoltaic solar cell – Laser Diode – theory and characteristics.

UNIT IV: OPERATIONAL AMPLIFIER
Op – Amp symbol – Polarity conventions – Ideal operational Amplifier – Virtual ground and Summing point – Applications: inverting amplifier, non inverting amplifier, unity follower, adder, subtractor, integrator, differentiator, logarithmic and anti logarithmic amplifier.

UNIT V: INTEGRATOR CIRCUIT
Introduction – Advantages of ICs, scale of integration – classification of ICs by structure – classification of ICs by function – digital integrator circuits – IC technology – monolithic ICs – fabrication of IC components: transistor, diode, capacitor, complete monolithic ICs – applications – MOS integrator circuits.

Books for Study:
1. Electronic devices and circuits – B.L. Theraja & A.K. Theraja S. Chand & company Ltd. 1999 edition.
2. Principle of Electronics by V.K. Mehta and Rohit Mehta S. Chand & company Ltd. 1999 edition.

SEMESTER III & IV   **CODE:**

APPLIED PRACTICAL FOR COMPUTER SCIENCE

(Any 12 experiments only)

1. Field along the axis of a coil-to find the field and to find the magnetic moment.
2. Series resonant circuit.
3. Zener diode characteristics.
4. PN Junction diode characteristics.
5. Potentiometer ammeter calibration.
6. Potentiometer –specific resistance of the given coil.
7. Transistor characteristics-CB mode.
8. Transistor characteristics- CE mode.
9. Zener-regulated power supply.
10. Carey Foster Bridge-Specific resistance.
11. FET-Characteristics.
12. Astable multivibrator using OP-AMP.
13. Basic logic gates using ICs.
14. Verification of De Morgan's theorem using ICs.
15. Parallel resonant circuit.
16. Half adder and Half subtractor using ICs