Course Name : **Bachelor of Science**
Discipline : **PHYSICS**
(For those who joined in June 2022 and after)

Course Objectives:

- Nowadays most of the students prefer to join Professional Colleges after completing their higher secondary School studies. Only limited students wish to join Science Colleges.
- The curriculum of B.Sc. Physics programme is now carefully designed to create interest in Physics and in order to prepare the students to meet the challenges of Society locally or globally.
- After the successful completion of this course, a B.Sc. degree holder would be able to face various competitive examinations and take up any job requiring the graduateship.

Also, the degree holder will become equipped to undergo various post graduate courses in Physics and related subjects and to give full assistance to researchers in various research and development laboratories.

Course Scheme:

VIRUDHUNAGAR HINDU NADARS' SENTHIKUMARA NADAR COLLEGE
(An Autonomous Institution Affiliated to Madurai Kamaraj University)
[Re-accredited with 'A' Grade by NAAC]
Virudhunagar – 626 001.

Semester	Part	Subject	Hour	Credit	Int+Ext =Tot	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject Code	Revised/ New/No Change/ Interchanged If Revised % of Change
I	Part 1	Tamil	6	3	25+75=100		✔					✔					**U22PT11**	
	Part 2	English	6	3	25+75=100				✔	✓		✓					**U22PE11**	
	Core 1	Mechanics and Sound	5	4	25+75=100				✔				✓				**U22PHC11**	Revised 40%
	Core Lab	General Physics I	3	-	25+75=100				✔				✓				-	-
	Allied	Algebra and Trigonometry	6	4	25+75=100				✔				✓				**U22MAAX11**	Revised 40%
	SBS 1	Solar Thermal and Photovoltaic systems	2	2	25+75=100				✔				✓				**U22PHS11**/ U3PHS11	No Change
	SBS 2	Materials Science	2	2	25+75=100				✔				✓				**U22PHS12/** U3PHS12	No Change
	Part IV SLC*	Value Education	-	3	25+75=100				✔		✓	✓					**U22VE11**	
II	Part 1	Tamil	6	3	25+75=100		✔					✔					**U22PT21**	
	Part 2	English	6	3	25+75=100				✔	✓		✓					**U22PE21**	
	Core 2	Properties of Matter	4	4	25+75=100				✔				✓				**U22PHC21**	
	Core 3	Heat and Thermodynamics	5	4	25+75=100				✔				✓				**U22PHC22**	

	Core Lab	Lab: General Physics I	3	2	40+60=100				✔				✓				**U22PHCP21**	Revised 45%
	Allied	Calculus And Matrices	6	4	25+75=100				✔				✓				**U22MAAX21**/ U2MAA2X2	Revised 20%
	Part IV SLC*	Environmental Studies	-	2	25+75=100				✔				✓				**U22ES21**	

SEMESTER - I

Course Title : MECHANICS AND SOUND	**Total Hours : 5**
Course Code : U22PHC11	**Total Credits : 4**

Course Outcomes:

COs	CO Statement
CO1	Learn different types of impact and projectile motion
CO2	Understand the concepts of Centre of Gravity of different shapes of solids and centre of Pressure of laminas immersed in liquid
CO3	Get knowledge about angular momentum, torque and Rocket Motion
CO4	Learn the Characteristics of wave motion and Interference of Sound waves
CO5	Verification of laws of transverse vibration of strings and understanding acoustics of buildings

UNIT: I **15 Hours**

Impact of elastic bodies: Impulse of a force - what is collision? - Fundamental principles of impact - Oblique impact of a smooth sphere on a fixed smooth plane - Direct impact of two smooth spheres - Loss of kinetic energy due to direct impact of two smooth spheres - Oblique impact of two smooth spheres - Loss of kinetic energy due to oblique impact.
Projectile Motion: Range on an inclined plane - Range and time of flight down an inclined plane - Two body problem and the Reduced Mass.

UNIT: II **15 Hours**

Center of Gravity: Introduction - Center of gravity of a right solid cone - Center of gravity of a solid hemisphere - Center of gravity of a solid tetrahedron - Center of gravity of a compound body - Equilibrium of Bodies suspended and supported - Stability of equilibrium - Curved surface on another surface.

Hydrostatics: Center of pressure - Center of pressure of a rectangular lamina immersed vertically in a liquid with one edge in the surface of the liquid - Floating Bodies - Experimental determination of the metacentric height of a slip - Atmospheric pressure.

UNIT: III **15 Hours**

Centre of Mass: Centre of mass - Motion of centre of mass of a system of particles -Conservation of linear momentum - Angular momentum - Relation between torque and Angular momentum - Angular momentum of a system of particles - Conservation of Angular momentum
Rocket motion: Principle - Theory - Velocity of rocket at any instant - Rocket propulsion system - Specific impulse - Multistage rocket - Shape of the rocket.

UNIT: IV **15 hours**

Sound - Wave motion - Characteristics of wave motion - Transverse wave motion -Longitudinal wave motion - Definitions - Relation between frequency and wavelength

Interference and Beats: Properties of longitudinal progressive waves - Interference of Sound waves - Special cases - Conditions for Interference of Sound waves - Energy distribution Due to Interference of Sound waves - Beats - Analytical treatment of beats

UNIT: V **15 Hours**

Vibrations in Strings: Velocity of Transverse waves along a stretched string - Laws of transverse vibration of strings - verification of the laws of transverse vibration of strings - Melde's experiment.
Doppler effect: Observer at rest and source in motion - source at rest and observer in motion - when both the source and observer are in motion –
Acoustics of Buildings - Reverberation - Factors affecting the acoustics of buildings - Sound distribution in auditorium - Requisites for good acoustics.

Text Books:

(1) Mechanics and Mathematical Physics - R. Murugesan, S. Chand & Company Pvt. Ltd. 2014.
UNIT- I: 1.1 - 1.7, 2.1- 2.4,
UNIT- II: 3.1, 3.2, 3.4, 3.6, 3.7, 3.10, 3.11, 4.3, 4.4, 4.7, 4.8
UNIT- III: 13.1- 13.14
(2) A Text Book of Sound - N. Subrahmanyam and Brij Lal, VIKAS Publishing House Pvt Ltd. 2nd Edition, 2004
UNIT- IV: 4.1-4.8, 6.6-6.9, 6.13, 6.14
UNIT- V: 7.1, 7.3-7.5, 8.1-8.4, 10.14, 10.15, 10.20-10.22

Reference Books:

(1) Fundamental of Physics - D. Halliday, Resnick and J. Walker, Wiley, 6th Edition, New York. 2001.

(2) Sears and Zemansky's University Physics by H. D. Young, R. A. Freedman, A. L. Ford, Publisher: Pearson, 10th Edition, 2015.
(3) Mechanics by R.K. Shukla. and A. Srivastava New Age International, 2006

Allied 1 [Ancillary - Mathematics]

Course Title: ALGEBRA AND TRIGONOMETRY	**Total Hours: 90** **Contact Hours per Week : 6**
Course Code: U22MAAX11	**Total Credits: 4**

Objectives:

- To enable the students to sum the series
- To develop the skills of solving equations

Course Outcomes
On completing this course, students can/are

Cos	CO Statement
CO1:	Gain knowledge on various series like binomial series, logarithmic series, trigonometric series.
CO2:	Develop the ability to solve equations and understand the nature of roots of higher order equations.
CO3:	Acquire knowledge on hyperbolic functions.

Unit I Binomial Theorem [18 Hours]
Binomial theorem for rational index – Some important particular cases of the Binomial expansion – Sign of terms in the Binomial expansion – Numerically greatest term – Application of the binomial theorem to the summation of series.
(Text Book 1: Chapter 3: Sections 5, 6, 7, 8, 10) (Solved problems only)

Unit II Exponential and Logarithmic Series [18 Hours]
The exponential theorem – Summation – Problems of the form $\sum_{n=0}^{\infty} f(n) \cdot \frac{x^n}{n!} = (a_0 + a_1 x + a_2 x^2 + \cdots + a_r x^r)e^x$ where $f(n)$ is a polynomial – Logarithmic series – Using the different forms of the logarithmic series finding the sums of the certain series – Series which can be summed up by the logarithmic series.

(Text Book 1: Chapter 4: Sections 2, 3, 3.1, 5, 7, 9) (Solved problems only)

Unit III Theory of Equations [18 Hours]
Formation of Equations - Relation between roots and coefficients
(Text Book 2 - Chapter 2: Sections: 2.1 and 2.2, Solved problems only (pages 57 – 61 and 64-78)**).**

Unit IV Theory of Equations [18 Hours]
Transformation of equations - Newton's method – Horner's method
(Text Book 2 - Chapter 2: Sections: 2.4 and 2.5 (pages 92 – 108)**).**

Unit V Trigonometry [18 Hours]
Expressions for Hyperbolic functions.
(Text Book 2 - Chapter 4: pages 195 -204, Sections 4.4 (pages 214 -228). Solved problems only**)**

Text Book (s):

1. T.K.Manicavachagom pillai, T.Natarajan and K.S.Ganapathy, Algebra, Volume I, S.Viswanathan (Printers & Publishers), Pvt., Ltd, 2008.
2. Arumugam, Isaac, Ancillary Mathematics, Paper 1 Revised, New Gamma Publishing House, 2002.

Reference Book (s):

1. Arumugam, Isaac, Classical Algebra, New Gamma Publishing House.
2. Arumugam, Isaac, Summation of Series and Trigonometry, New Gamma Publishing House.

Course Title : SOLAR THERMAL AND PHOTOVOLTAIC SYSTEMS	**Total Hours : 2**
Course Code : U22PHS11/ U3PHS11	**Total Credits : 2**

Course Outcomes:

COs	CO Statement
CO1	Understand the fundamentals and need for conventional Energy Sources and non-conventional Energy Sources.
CO2	Study about Sun and Solar radiation
CO3	Learn about Solar collector, Solar water heater and Solar Cookers
CO4	Learn about Solar Furnaces, Solar Dryer and Solar Distillation
CO5	Study the Solar PV systems and their applications

Unit I: Fundamental of Energy – science and technology **6 Hours**

Energy Consumption & Standard of living - Classification energy sources – Consumption trends of primary energy Sources – Importance of Non-Conventional Energy Sources - Advantage and disadvantage of conventional Energy Sources - Salient Features of Non-Conventional Energy Sources.

Unit II: Solar Energy – Basics **6 Hours**

The Sun as a Source of energy – The Earth – Sun, Earth radiation Spectrum – Measurements of Solar radiation (Pyranometer, Pyrheliometer, Sunshine recorder).

Unit III: Solar Thermal System **6 Hours**

Solar Thermal System – Solar collector – Classification - Comparison of concentrating and non-concentrating types (Flat-plate collector) of solar collector-Performance Indices-Liquid flat plate collector – Solar water heater – Solar Cookers-Box type solar cooker-Paraboloidal dish type solar cooker.

Unit IV: Solar Thermal System **6 Hours**

Solar Furnaces - Solar Greenhouse – Regulation of internal environment of greenhouse-Typical winter greenhouse-Typical summer greenhouse-Solar Dryer – Solar Distillation.

Unit V: Solar Photovoltaic System **6 Hours**

Solar Photovoltaic systems – Solar cell fundamentals - Semiconductor – A pn junction– Solar cell, Module, Panel and Array construction – Solar cell – Solar PV systems - Classification – Solar PV Applications- Water pumping- Lighting – Village Power.

Text Book

B. H. Khan. Non-conventional energy sources. New Delhi: Tata Mcgraw Hill (P) Ltd. 2006.
Unit I: Chapter 1 – 1.1, 1.3, 1.4, 1.5, 1.8, 1.9
Unit II: Chapter 4 – 4.1, 4.2, 4.3, 4.7
Unit III: Chapter 5 – 5.1(5.1.1,5.1.2,5.1.3,5.1.4), 5.2, 5.6 (5.6.1,5.6.2)
Unit IV: Chapter 5 – 5.7, 5.8 (5.8.1,5.8.2,5.8.3),5.9, 5.10
Unit V: Chapter 6 – 6.1(6.1.1,6.1.2), 6.4(6.4.1), 6.8, 6.9(6.9.2,6.9.3,6.9.5)

Reference Book

1. Solar energy Fundamentals, Design, Modelling and Applications by G.N. Tiwari, Narosa Publishing House, 2016
2. Solar Energy Utilization by G D Rai, Khanna Publishers, New Delhi, 2012

Course Title : MATERIALS SCIENCE	**Total Hours : 2**
Course Code : U22PHS12/ U3PHS12	**Total Credits : 2**

Course Outcomes:

COs	CO Statement
CO1	Study bonding in solids and crystal structure
CO2	Understand the electronic theory of solids
CO3	Understand the behaviour of Dielectric materials
CO4	Study Magnetic properties of solids
CO5	Study Nanophase materials and nonlinear materials

UNIT - I: **6 Hours**

Crystal Geometry – Introduction-Fundamental terms of Crystallography - Types of Crystals - Crystal structures of materials- Simple cubic, Body centred and Face centred cubic crystal structures.

UNIT - II: **6 Hours**

Electron Theory of Solids - Introduction - electrical conduction - classification of conducting materials - Drude Lorentz theory - Expressions for electrical conductivity and thermal conductivity – Wiedemann - Franz Law.

UNIT - III: **6 hours**

Dielectric Materials - Introduction - definitions - different types of Polarization - Clausius - Mosotti equation - Dielectric properties - Applications.

UNIT - IV: **6 hours**

Magnetic Materials - Introduction - magnetic parameters - classification of magnetic materials - Ferro magnetic materials - Hard and Soft magnetic materials.

UNIT - V: **6 Hours**

New Materials - Nonlinear materials: Introduction-Principle, classification, properties: Polarisation-Frequency doubling. Nanophase Materials: Introduction - Synthesis - Properties of Nanophase materials

Text Book

Materials Science - V.Rajendran, McGraw-Hill Education(India) private limited, Chennai, Sixth reprint, 2017
Unit - I : 2.1- 2.3, 2.5-2.8
Unit - II :7.1- 7.8
Unit - III : 18.1 -18.3,18.7,18.12,18.16
Unit - IV : 19.1-19.2,19.4,19.8,19.11
Unit - V : 25.1 -25.4.2,28.1-28.2,28.10

Reference Book

1. Fundamentals of Solid State Physics - Saxena, Gupta and Saxena, Pragati Prakashan Publications Ltd., 2015, Reprint, 15th edition.
2. Introduction to Solids – Azaroff, Tata Mc Graw Hill Publications, 1993, Reprint
3. Solid State Physics - R.K Puri and V.K. Babbu, S.Chand Limited, 2008.

SEMESTER - II

Course Title : PROPERTIES OF MATTER	**Total Hours : 4**
Course Code : U22PHC21	**Total Credits : 4**

Course Outcomes

COs	CO Statement
CO1	Understand the principles of Elasticity
CO2	Study about bending of beams
CO3	Understand the concept of fluid dynamics and Osmosis.
CO4	Understand the concepts of viscosity and its applications.
CO5	Learn the importance of surface tension of liquids

UNIT - I: **12 Hours**

Elasticity:

Introduction - Different moduli of elasticity - Relation between volume strain and linear strain - work done in strain-Behaviors of wire under progressive tension - Relation between the elastic moduli - Determination of Poisson's ratio for rubber - Torsion of a body - Work done in twisting a wire -Torsional oscillation of a body - Rigidity modulus by torsion pendulum (Dynamic torsion method).

UNIT - II: **12 Hours**

Bending of beams:

Definition - Expression for bending moment - Depression of the loaded end of a cantilever - Measurement of E (Cantilever depression) - Oscillation of a cantilever - Depression at the mid - point of a beam loaded at the middle - Uniform bending of a beam - Measurement of Young's modulus - by bending of a beam.

UNIT - III: **12 hours**

Fluid Dynamics and Osmosis

Rate of flow of fluid-Lines and tubes of flow-Equation of continuity of flow-Energy of a liquid in flow-Bernoulli's theorem-Important applications of Bernoulli's theorem (Venturimeter and Pitot tube only)- Osmosis and Osmotic pressure-Laws of osmotic solution-Osmosis and vapour pressure of a solution.

UNIT - IV: **12 hours**

Viscosity:

Viscosity-Fugitive Elasticity-Critical velocity-Significance of Reynold's number- Poiseuille's formula for the flow of a liquid through a horizontal capillary tube – Criticism of Poiseuille's equation - Corrections to it – Motion in a viscous medium – Stoke's law-Determination of coefficient of viscosity of a liquid- Stoke's falling body.

UNIT - V: **12 hours**

Surface Tension:

Molecular forces-Molecular range-Sphere of influence-Explanation of surface tension-Surface film and surface energy-Free energy of surface and surface tension-Units and dimensions of surface tension-Pressure difference across a liquid surface-Determination of surface tension of a bubble-Work done in blowing a bubble-Curvature, pressure and surface tension(case of a spherical surface only)

Text Books

1. Properties of Matter - R.Murugeshan and Er. Kiruthiga, S. Chand & Co. Pvt Ltd. 2014.

Unit - I: 1.1, 1.2, 1.4–1.9, 1.12, 1.13
Unit - II: 1.14 –1.21

2. Elements of Properties of Matter – D.S.Mathur , S. Chand & Co. Pvt Ltd. (Reprint 2018).

Unit III: 12.1 -12.6, 13.7 – 13.10
Unit - IV: 12.7 – 12.12,12.15,12.16
Unit - V: 14.1 – 14.10

Reference Books

1. Mechanics and Properties of Matter - C.L. Arora, S. Chand & Co. 1999
2. Concept of physics by H.C.Verma, Bharati Bhawan publishers and distributors (2015).

Course Title : HEAT AND THERMODYNAMICS	**Total Hours : 5**
Course Code : U22PHC22	**Total Credits : 4**

Course Outcomes:

COs	CO Statement
CO1	Derive ideal gas equation, transport phenomena of gases
CO2	Study the fundamentals of thermodynamics, Carnot engine and to understand reversible, irreversible process, entropy and change in entropy
CO3	Understand conduction & convection and to study the fundamental laws of black body radiation
CO4	Understand the concept of specific heat capacity and experimental determination of C_v & C_p
CO5	Study Joule-Thomson effect, liquefaction of gases and to understand the working of Refrigerator & Air-conditioner

UNIT - I: Kinetic Theory of Gases **15 hours**

Concept of Ideal or Perfect gas – Kinetic model – Brownian motion - Degrees of freedom - Maxwell's law of Equipartition of energy – Critical constants - Van der Waals' equation of state – Estimation of critical constants – Molecular collisions - Mean free path - Expression for the mean free path - Transport phenomena – ***Viscosity***: Transport of momentum – ***Thermal conductivity***: Transport of thermal energy – ***Self Diffusion***: Transport of mass

UNIT - II: Thermodynamics **15 Hours**

Zeroth law of thermodynamics –First law of thermodynamics – Work done during isothermal & adiabatic process - Reversible & Irreversible process - Heat engine – Definition of efficiency – Carnot's ideal heat engine – Carnot's cycle – Second law of thermodynamics – Carnot's theorem – Change in entropy - Change of entropy in a reversible and irreversible cycle –Temperature – entropy diagram - Third law of thermodynamics.

UNIT - III: Transmission of Heat **15 hours**

Thermal Conduction: Introduction – Coefficient of thermal conductivity – Steady state – Lee's disc method of determining the thermal conductivity of a bad conductor

Convection: Introduction – Convection in the atmosphere – Lapse Rate – Stability of the atmosphere – Greenhouse effect

Thermal Radiation: Introduction – Fery's black body – Wien's black body – Energy distribution in black body radiation – Planck's hypothesis – Planck's law of radiation – Wien's law – Rayleigh-Jean's law – Stefan's law – Derivation of Newton's law of cooling from Stefan's law – Determination of Stefan's constant – Solar constant – Determination of solar constant – Water flow pyroheliometer.

UNIT - IV: Thermometry and Calorimetry **15 Hours**

Platinum resistance thermometer – Thermistor - Specific heat capacity - Dulong and Petit's law - Calorimetry basic concepts – Principle of calorimetry or method of mixtures – The two specific heat capacities of a gas – Difference between the two specific heat capacities – Joly's differential steam calorimeter for finding C_v – Regnault's method to find C_p - Thermoelectric thermometer - Newton's law of cooling – Einstein's theory of specific heat capacity – Debye's theory of specific heat capacity of a solid

UNIT - V: Low Temperature Physics **15 Hours**

Joule-Thomson effect – Porous Plug experiment – Theory of Porous Plug experiment – Expression for the Joule-Thomson cooling produced in a Van der Waals gas - ***Liquefaction of gases :*** Introduction – Regenerative cooling – Liquefaction of Air (*Linde's process & Claude's process*) - Liquefaction of hydrogen - Liquefaction of helium - Practical applications of low temperatures – Refrigeration – Electrolux refrigerator – Frigidaire – Air-conditioning - Air-conditioner – Effects of CF_2Cl_2 on ozone layer.

Text Book:

1. **Heat, Thermodynamics and Statistical Physics** - Brijlal, N.Subrahmanyam and P.S. Hemne, S. Chand & Co. Pvt. Ltd., New Delhi, 2018 (Reprint)
   Unit - I : 1.2, 1.3, 1.13, 1.18-1.9, 2.4, 2.8, 2.10, 2.13, 3.1, 3.2, 3.5-3.8, 3.11, 3.16
   (Page No.5-7,14-15,21-23, 51, 54-58, 83-89, 91-92)
   Unit - II : 4.2, 4.7, 4.12-4.13, 4.20-4.24, 4.28, 4.29, 5.2, 5.4, 5.6, 5.7, 5.15)
   (Page No.109-110, 112-113, 121-123, 132-137, 139-141, 174-180, 189-190)

2. **Thermal Physics** - R.Murugeshan and Er.Kiruthiga Sivaprasath, S.Chand & Co. Pvt. Ltd., New Delhi, 2014 (Reprint)
   Unit - III : 4.1 – 4.4, 11.1 - 11.5, 4.5 - 4.12, 4.16, 4.17, 4.20, 4.25, 4.26
   (Page No.74-85, 93-94, 98-100, 105-107, 185-188)
   Unit - IV : 1.1 - 1.4, 1.6, 1.7, 1.10 – 1.13, 6.1 – 6.4
   (Page No.1-9, 12-16,135-140)
   Unit - V : 3.1 – 3.10, 3.13 – 3.18, 3.21
   (Page No.53-61, 64-72)

Reference Books:

1. **Heat and Thermodynamics** - D.S. Mathur, S. Chand & Co. Pvt. Ltd., New Delhi, 2008
2. **Heat and Thermodynamics** - Mark W Zemansky, Richard H Dittman, Mc Graw Hill Education; 8th edition, 2017)

Course Title : LAB : GENERAL PHYSICS - I	**Total Hours : 3**
Course Code : U22PHCP21	**Total Credits : 2**

Course Outcomes:

COs	CO Statement
CO1	Student can get basic practical knowledge about General Physics
CO2	Understand the practical and theory knowledge of Lee's disc method and Spectrometer
CO3	Do the experiments on Sound
CO4	Do experiments based on Viscosity
CO5	Do experiments based on Surface Tension

1. Estimation of instrumental errors (Screw gauge, Vernier Caliper, Travelling Microscope and Spectrometer)
2. Determination of Young's Modulus by Uniform bending (Pin & Microscope) method.
3. Determination of Young's Modulus by Non-Uniform bending (Optic lever) method.
4. Determination of Young's Modulus by Cantilever depression method.
5. Determination of Rigidity Modulus and Moment of inertia using Torsion pendulum with loads.
6. Determination of Frequency of AC mains using Sonometer.
7. Verification of laws of vibration using Sonometer.
8. Determination of Frequency of Tuning fork using Melde's String.
9. Determination of 'g' using Compound pendulum.
10. Determination of Thermal conductivity of bad conductor using Lee's disc method.
11. Determination of Refractive index of glass Prism using Spectrometer.
12. Determination of Coefficient of viscosity of a liquid using Stoke's method.
13. Determination of Coefficient of viscosity of water by Poiseuille's flow method
14. Determination of Viscosity of liquid using Ostwald Viscometer.
15. Determination of Surface Tension by Capillary rise method.

Allied 2 [Ancillary - Mathematics]

Course Title: CALCULUS AND MATRICES	**Total Hours: 90** **Contact Hours per Week : 6**
Course Code: U22MAAX21/ U2MAA2X2	**Total Credits: 4**

Objectives:

- To know the applications of differential and integral calculus
- To develop the skills of solving simultaneous equations

Course Outcomes
On completing this course, students can/are

Cos	CO Statement
CO1:	Apply the reduction formula to solve problems in integral calculus.
CO2:	Utilize the concept of vector differentiation to find the curl, divergence of a given vector.
CO3:	Construct the evolutes of any curve using differential calculus.
CO4:	Develop the skills of solving simultaneous equations by making use of the rank of matrices.
CO5:	Find the eigen values, eigen vectors of a given matrix.

Unit I Curvature [18 Hours]
Radius of curvature – center of curvature – Evolutes for ellipse, parabola and hyperbola only (p-r equations excluded).
(Text Book 1: Chapter 3: Sections: 3.2 (Pages 125 -134)**)**

Unit II Evaluation of definite integrals [18 Hours]
Reduction formulae 1 to 8.
(Text Book 1: Chapter 3: Sections: 3.3 and 3.5 (pages 147-156 and 166-170). Solved problems only**)**

Unit III Vector Calculus [18 Hours]
Vector differentiation – Gradient – Velocity – Acceleration – Divergence – Curl.
(Text Book 3: Chapter 1: Sections: 1.4, 1.5. Solved problems only (pages 6 – 32)**)**

Unit IV Matrices [18 Hours]
Inverse of a matrix – Rank of a matrix – simultaneous equations.
(Text Book 2: Chapter 7: Problems only. Pages 179-209**)**

Unit V Matrices [18 Hours]
Cayley Hamilton Theorem (Statement only) **–** Eigen values – Eigen vectors**.**
(Text Book 2: Chapter 7: pages 210-232. Solved problems only**)**

Text Book :

1. Arumugam, Isaac, Ancillary Mathematics, Paper 1 Revised, New Gamma Publishing House, 2002.
2. Arumugam, Isaac, Ancillary Mathematics, Paper III, New Gamma Publishing House, 2006.
3. Arumugam, Isaac, Ancillary Mathematics, Paper II (Revised), New Gamma Publishing House, 2004

Reference Book :

1. T. K. Manickavasagam Pillay and others, Vector Calculus, S. Viswanathan Printers pvt. Ltd.
2. Arumugam, Isaac, Calculus Revised, New Gamma Publishing House.
3. Arumugam, Isaac, Modern Algebra, New Gamma Publishing House

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VIRUDHUNAGAR HINDU NADARS' SENTHIKUMARA NADAR COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

[Re-accredited with 'A' Grade by NAAC]

Virudhunagar – 626 001.

Course Name : **Bachelor of Science**

Discipline : **Physics**

CHOICE BASED CREDIT SYSTEM

(For those who join in June 2018 and after)

Semester	Subject	Hours	Credit	Int.+Ext. =Total	**Local**	**Regional**	**National**	**Global**	**Professional Ethics**	**Gender**	**Human Values**	**Environment & Sustainability**	**Employability**	**Entrepreneurship**	**Skill Development**	Subject Code	Revised / New / No Change / Interchanged & Percentage of revision
III	Tamil / Hindi	6	3	25+75=100		✔					✔					U3PT3/ U1PH3	Revised / 60 %
	English	6	3	25+75=100				✔	✓		✓					U3PE3	Revised / 90 %
	Core 3 Electrostatics and Current Electricity	4	4	25+75=100				✔				✓				U3PHC3	Interchanged / 10%
	Core LAB: General Physics II	2	--	--				✔				✓				--	Revised
	Allied Maths: Differential Equations and Laplace Transform	6	4	25+75=100				✔				✓				U3MAA3X3	Revised / 10%
	Allied: General Chemistry-I	4	4	25+75=100				✔				✓				U3CHA3X1	Revised / 20%
	Allied-LAB: Volumetric Analysis	2	--	--				✔				✓				--	
IV	Tamil / Hindi	6	3	25+75=100		✔					✔					U2PT4/ U1PH4	Revised / 60 %
	English	6	3	25+75=100				✔	✓		✓					U3PE4	Revised / 65 %
	Core 4 Electromagnetism	4	4	25+75=100				✔				✓				U3PHC4	Interchanged / 20 %
	Core : LAB: General Physics II	2	2	40+60=100				✔				✓				U3PHC4P	Revised / 18 %
	Allied Maths: Statistics, Groups and Fourier Series	6	4	25+75=100				✔				✓				U3MAA4X4	Revised / 10%
	Allied: General Chemistry-II	4	4	25+75=100				✔				✓				U2CHA4X2	No change
	Allied-LAB: Volumetric Analysis	2	2	40+60=100				✔				✓				U2CHA4PX1	No change

Year	Part	Subject	Credit	Int=Total	Code
I & II	Part V	NSS/ NCC/ Physical Education – Sports/YRC/RRC	1	100=100	U2NS4/ U2NC4/ U2PS4/ U1YR4/ U1RR4

Self-Learning Courses:

Subject	Semester	Credit	Ext =Tot	Subject Code
Human Rights	IV	5	100 = 100	U1CSL41

SEMESTER : III	ELECTROSTATICS AND CURRENT ELECTRICITY CORE PAPER	Hours : 4 Credit : 4

Subject Code : U3PHC3

Objectives

- To understand the fundamentals electrostatic parameters Electric Field, Gauss's law and its application Electric Dipole.
- To study about Electric Potential, Capacitances different types Capacitor and Energy Stored in Capacitor.
- To learn about Ohm's law, Kirchhoff's Laws and its applications.
- To impart knowledge about Thermoelectricity, Chemical Effect of Current and different types of Cells.
- To study the Theory of Dielectric, Applications of Laplace's equation and experimental method to find dielectric constants.

UNIT – I **12 Hours**

Basic Concepts – Coulomb's law – Superposition Principle – Electric Field – Electric Field due to a Point Charge – Electric Dipole – Potential Energy of a Dipole in Uniform Electric Field - Lines of Force. Flux of the Electric Field – Gauss's Law (with proof) – Differential form of Gauss Law – Application of Gauss's Law – An Insulated Conductor – Electric Field due to a Uniformly Charged Sphere – Electric field due to an isolated uniformly charged Conducting Sphere.

UNIT – II **12 Hours**

Potential Difference – Electric Potential as line Integral of Electric Field – Potential at a point due to a Point Charge – Relation between Electric Field and Electric Potential – Potential at a point due to a uniformly charged Conducting Sphere – Potential due to a uniformly charged non conducting solid sphere. Capacitors: Introduction – Capacitance of a Spherical Capacitor (outer sphere earthed) - Capacitance of a Spherical Capacitor (inner sphere earthed) - Capacitance of a Cylindrical Capacitor – capacitance of a Parallel plate capacitor – Effect of a Dielectric - capacitance of a Parallel plate capacitor partly filled with a Dielectric Slab – Capacitors in Series and Parallel – Energy stored in a charged capacitor – Loss of energy on sharing of charges between two capacitors.

UNIT – III **12 Hours**

Theory of Dielectrics: Introduction – Relation between Polarisation Vector and Density of Polarisation Charge – Gauss's Law in Dielectrics – Electric Displacement D – Electric Susceptibility – Dielectric in an Electric Field – Uniqueness theorem regarding electric potential

– Applications of Laplace's Equation – Dielectric Sphere in a Uniform Field – Dielectric Constant of a solid- Hopkinson's Null Method.

UNIT – IV **12 Hours**

Current and Current density – Expression for current density – Equation of Continuity – Ohm's law and Electrical Conductivity – Kirchhoff's laws – Wheatstone's network and sensitiveness - Carey Foster Bridge – Potentiometer- Meacurement of low resistance: Kelvin double bridge method- Comparison of Capacitances of Two Capacitors – capacitance of a capacitor (Kelvin's Null Method).

UNIT – V **12 Hours**

Seebeck effect – Laws of thermo e.m.f – Measurement of thermo EMF using potentiometer- Peltier Effect – Thomson Effect – Thermodynamics of Thermocouple – Thermo-Electric Diagrams – Uses of Thermo Electric Diagrams. Chemical Effect of Electric Current: Introduction – Electrical Conductivity of an Electrolyte – Determination of Specific Conductivity of Electrolytes (Kohlrausch Bridge) – Arrhenius theory of Electrolyte Dissociation – Secondary Cells – Standard Cells – Gibbs-Helmholtz Equation for the emf of a Reversible Cell – Calculation of emf of Daniel Cell

Text Book:

R.Murugeshan. ***Electricity and Magnetism***. New Delhi: S.Chand & Company Pvt. Ltd; Reprint 2015. VII Edition.

UNIT - I: 1.1-1.7, 1.11, 2.1- 2.6
UNIT - II: 3.1-3.6, 4.1 – 4.9, 4.11.
UNIT - III: 17.1 – 17.5, 17.8 – 17.10, 17.14
UNIT - IV: 6.1 – 6.4, 6.6, 7.1 – 7.5
UNIT - V: 8.1- 8.8, 9.1 – 9.8

Reference Books:

1. D. Halliday, Resnick and J. Walker. ***Fundamentals of Physics***, New York: Wiley; 2010. 6th Edition.
2. K.K. Tewari. ***Electricity and Magnetism*.** New Delhi: S. Chand & Co Ltd; 1996.

Ancillary Mathematics III – Differential Equations and Laplace Transforms

Contact Hours per Semester: 90 Hrs Subject Code:U3MAA3X3

Contact Hours per Week: 6 Hrs Credit: 4

Objectives:

- To enable the students to know the methods of solving differential equations and Partial differential equations
- To understand the Laplace transform, inverse Laplace transform and its applications.

Unit I: Differential Equations: Equations of the first order and of the first degree (Type A, Type B, Type C) – Linear Equation (Type D) – Bernouilli's equation (Type E).

Chapter II: Sections: 1 - 5

Unit II: Linear equations with constants coefficients – Definitions – The operator D – Complementary function of a linear equations with constants coefficients – Particular integral: General method of finding particular integral – Special methods for finding P.I.

Chapter V: Sections: 1, 2, 3, 4, 4.1, 4.2.

Unit III: The Laplace Transforms – Definition – Properties and basic results – Laplace transform of periodic functions - Some general theorems – Evaluation of certain integrals using the Laplace transform.

Chapter V: Sections: 1, 1.1, 1.2, 2, 3, 4 and 5.

Unit IV: The Inverse Laplace Transforms – Definition – Basic results on Inverse Laplace transforms of functions – Solution of ordinary differential equations with constant coefficients using Laplace transformation technique

Chapter V: Sections: 6, 7 and 8.

Unit V: Partial Differential Equations of the First Order – Definition – Classification of integrals – Singular integral – General integral – Derivation of partial differential equations – Lagrange's method of solving the linear equation – Special methods and standard forms (Standards I to IV)

Chapter XII: Sections: 1, 2, 3, 3.1, 3.2, 4, 5, 5.1 to 5.4

Text Book:

1. S. Narayanan and T.K. Manicavachagom Pillay, Differential Equations and its Applications, Reprint October 2014, S. Viswanathan (Printers & Publishers) Pvt Ltd.,

Reference Books:

1. Arumugam, Issac, Ancillary Mathematics, Paper I, Revised 2002, New Gamma Publishing House, Palayamkottai.
2. Arumugam, Issac, Ancillary Mathematics, Paper II, Revised 2004, New Gamma Publishing House, Palayamkottai.

Semester I – Part III – Allied Subject – General Chemistry-I

Hours per week: 4 **Subject Code: U3CHA3X1** **Credits: 4**

- To know the basics ideas about organic chemistry
- To know the details about periodic table and its periodic properties.
- To learn Chemical equilibrium and its importance in industrial processes
- To acquire knowledge about petroleum and petrochemical products.

Unit I: Basic concepts of organic chemistry **12 Hours**

Organic compounds – general properties and classification of organic compounds – functional groups – homologous series. IUPAC Nomenclature for simple acyclic compounds (Aliphatic compounds). Isomerism – types of structural isomers and stereoisomerism – R-S configuration of one asymmetric carbon and cis-trans isomerism with examples.

Unit II: Detection and estimation of elements **12 Hours**

Detection of nitrogen, halogens and sulphur – Estimation of carbon and hydrogen by Liebig's combustion method – estimation of nitrogen by Dumas method – estimation of halogens by Carius method. Determination of empirical and molecular formula – structural formula. Types of reactions – addition, elimination and substitution reactions.

Unit III: Periodic table, periodic properties and Hydrogen **12 Hours**

Periodic table

Long form of the periodic table – general characteristics of groups and periods – classification of elements on the basis of electronic configuration.

Periodic properties

Atomic and ionic radii – electron affinity – ionization energy – electronegativity.

Hydrogen

Isotopes of hydrogen – preparation, properties and uses of Deuterium-ortho and para hydrogen.

Unit IV: Chemical equilibrium and Ionic equilibrium 12 Hours

Characteristic of Chemical equilibrium– Reversible reaction – Equilibrium law - Equilibrium constant- Equilibrium constant in terms of partial pressures- Kc and Kp relationship – Le Chatelier's principle-Synthesis of Ammonia by Haber process.

Acids, bases and salts – pH – Buffer solution – Henderson equation and its significance. Electrolyte: Classification and example – Ostwald's dilution law.

Unit V: Petroleum and fertilizers 12 Hours

Petroleum: Refining– composition and uses of petroleum fractions - thermal and catalytic cracking – Rating of fuels- octane number, cetane number - antiknock agents- unleaded petroleum – synthetic petrol.

Fertilizers: Role of micro and macro nutrients in plant growth - important manures – manufacture of urea - super phosphate - ammonium fertilizers, mixed fertilizers and biofertilizers.

Reference books

Unit- I & II

1. B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co., Ltd., 2008.
2. M.K.Jain and S.C Sharama., Modern Organic Chemistry, Vishal publishing Co.., 2016

Unit – III

1. R.D.Madan, Satya Prakash's Modern Inorganic Chemistry, S.Chand & Co., Ltd., 2008.
2. P.L.Soni and Mohan Katiyal, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.

Unit – IV

1. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2004.
2. ArunBahl ,B.S. Bahl and G.D.Tuli Essntials of Physical Chemistry, S.Chand & Co., Ltd., 2008.

Unit – V

1. K.S.Tewari, N.K.Vishnoi and S.N.Mehrota, A Text book of Organic Chemistry, 2nd revised edition, Vikas publishing house PVT LTD, New Delhi, 2005.
2. B.N. Chakrabarty Industrial Chemistry Oxford & IBH Oxford & IBH Publishing Company& Co, 1981.

SEMESTER : IV	ELECTROMAGNETISM CORE PAPER	Hours : 4 Credit : 4

Subject Code : U3PHC4

Objectives:

- To study about laws of induction and methods to find self and mutual inductance of coils.
- To study about the nature of transient currents in LR and CR circuits.
- To learn about the current variation in series and parallel resonance circuits and AC Bridges.
- To learn about the properties of magnetic materials.
- To impart knowledge about importance of Maxwell's equations in electromagnetism.

UNIT - I: **12 Hours**

Electromagnetic Induction: Faraday's law of Electromagnetic Induction – Faraday's law of Electromagnetic Induction in Vector form – Self-induction – Self-inductance of a long Solenoid – Determination of Self-inductance by Rayleigh's Method – Determination of Self-inductance by Anderson's Bridge Method – Mutual Induction – Mutual inductance between two Coaxial Solenoids – Experimental determination of Mutual Inductance – Coefficient of Coupling – Eddy Currents – Energy stored in magnetic field.

UNIT - II: **12 Hours**

Transient currents: Growth of Current in a circuit containing a Resistance and Inductance – Decay of Current in a circuit containing L and R – Charge and Discharge of a Capacitor through a Resistor – Measurement of high resistance by leakage – Growth of Charge in a circuit with Inductance, Capacitance and Resistance – Decay of Charge in LCR circuit.

UNIT - III: **12 Hours**

Alternating current: EMF induced in a Coil rotating in a magnetic field – Series Resonance Circuit – Parallel Resonance Circuit – Power in ac Circuit containing L, C &R – Wattless Current – Choke Coil –Skin Effect – A.C bridges introduction – Maxwell's Bridge – Owen's Bridge – De Sauty's Bridge – Wien's Bridge.

UNIT - IV: **12 Hours**

Magnetic Properties of Materials: Magnetic Induction, Magnetization – Relation between the three magnetic vectors B, H and M – Magnetic Susceptibility – Magnetic Permeability – Properties of Dia, Para and Ferro Magnetic Materials – Anti-ferromagnetism and Ferrimagnetism – The Electron Theory of Magnetism – Langevin's Theory of Diamagnetism and Paramagnetism – Weiss's Theory of Ferromagnetism – Experimental to draw M-H curve (Horizontal model) – Experiment to draw B-H curve (Ballistic method) – Energy loss due to hysteresis – The importance of hysteresis curves.

UNIT - V: **12 Hours**

Maxwell's Equations and Electromagnetic Waves: Introduction – Displacement current – Maxwell's equations in material media – Plane Electromagnetic waves in free space – Poynting Vector – Derivation of Maxwell's Equations – Physical Significance of Maxwell's Equations – Plane of Electromagnetic waves through Conducting media.

Text Book:

R.Murugeshan. ***Electricity and Magnetism***. New Delhi: S.Chand & Company Pvt. Ltd; Reprint 2015. VII Edition

Unit – I : 11.1 - 11.10, 11.16 and 21.7
Unit - II : 12.1 - 12.6
Unit - III : 13.1 - 13.6, 13.8 and 19.1 - 19.5
Unit - IV : 15.1 - 15.17
Unit - V : 16.1 - 16.6, 37.1, 37.2 and 37.5

Reference Books:

1. N.K.Sehgal, K.L.Chopra and D.L.Sehgal. ***Electricity and Electromagnetism***. New Delhi: Sultan Chand and Sons; 2009.
2. Brij Lal & N. Subramaniyam. ***Electricity and Magnetism***. New Delhi: S. Chand & Co. Pvt. Ltd; Revised Edition 2007.
3. K.K.Tiwari. ***Electricity and Magnetism.*** New Delhi: S.Chand & Co Pvt. Ltd; 2006. Revised Edition

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SEMESTER : IV	LAB: GENERAL PHYSICS II	Hours : 2 Credit : 2

Subject Code : U3PHC4P

1. Determination of number of lines per meter of the grating (N) and wavelength of prominent lines of the mercury spectrum (λ) using Spectrometer.
2. Determination of refractive index of the prism by i-d curve method using Spectrometer.
3. Determination of dispersive power of a prism using Spectrometer
4. Comparison of Capacitances of Capacitors using De Sauty's Bridge.
5. Comparison of Capacitances of Capacitors using Owen's Bridge.
6. Determination of Self inductance of the coil using Anderson's Bridge.
7. Determination of Thickness of hair using Air wedge
8. Determination of Radius of curvature of convex lens using Newton's rings.
9. Comparison of Capacitances of Capacitors using Spot galvanometer.
10. Comparison of Charge sensitiveness using Spot galvanometer.
11. Comparison of EMF's using Spot galvanometer.
12. Comparison of EMF's using Potentiometer.
13. Determination of Figure of merit using Table Galvanometer.
14. Determination of M and B_H using Tan C method.
15. Determination of M and B_H using Axial method.

Ancillary Mathematics – Statistics, Groups and Fourier Series

Contact Hours per Semester: 90 Hrs Subject Code:U3MAA4X4
Contact Hours per Week: 6 Hrs Credit: 4

Objectives:

To know the statistical methods
To introduce the abstract systems and Fourier series

Unit I: Correlation and Regression: Definition of Correlation, Usefulness, Types of correlation – Coefficient of correlation: Karl Pearson's coefficient of correlation (excluding grouped bi-variate data) – Rank correlation coefficient: Spearman's rank correlation coefficient, merits and

demerits of Rank correlation. Regression: Definition – Use of Regression analysis - Significance of regression study - difference between correlation and regression - Regression equations: Regression equation of X on Y and Regression equation of Y on X(excluding regression equation in a bi-variate grouped distribution) .

Text Book 1 - Chapter 12: Pages: 363, 364, 365, 366, 369-380,389-393, 431-434, 437-440, 445-449..

Unit II: Index Numbers: Definition – Characteristics of index numbers – Uses – Types of index numbers – Weighted Index number – Weighted average of Price relative – Quantity Index number – Consumer Price Index number.

Text Book 1 - Chapter 14: Pages: 487-491, 498-505, 519-528 and appropriate miscellaneous illustrative problems.

Unit III: Interpolation and Extrapolation: Meaning – Uses – Assumptions - Method of Interpolation: Algebraic method **(**1. Binomial Expansion method, Interpolating two or more missing values, 2. Newton's method of advancing Differences, 3. Newton-Gauss forward method, 4. Newton-Gauss backward method and 7. Lagrange's method**).**

Text Book 1 - Chapter: 16 - Pages: 611 – 627, 630 – 633 and appropriate miscellaneous illustrative problems.

Unit IV: Groups: Elementary properties of a group – Permutation groups - Subgroups - Cyclic groups – Order of an element.

Text Book 2 - Chapter 3: Sections: 3.2, 3.4, 3.5, 3.6 and 3.7.

Unit V: Fourier Series: Fourier series – Cosine and Sine series – Half range Fourier Sine series – Half range Fourier Cosine series.

Text Book 3 - Chapter 6: Full

Text Books:

1. R.S.N. Pillai and V. Bagavathi, Statistics, Seventh Edition (Reprint 2007), S. Chand & Company Ltd, India.
2. S. Arumugam and A. Thangapandi Isaac, Modern Algebra, Reprint July 2008, Scitech Publications (India) Pvt Ltd, Chennai.
3. S. Arumugam and A. Thangapandi Isaac, Sequences and Series and Fourier Series, August 2006, New Gamma Publishing House, Palayamkottai.

References:

1. Arumugam, Isaac, Statistics, New Gamma Publishing House, Palayamkottai.
2. Arumugam, Issac, Ancillary Mathematics, Paper III, August 2006, New Gamma Publishing House, Palayamkottai.

Allied – General Chemistry-II

Hours per week: 4 **Subject Code:U2CHA4X2** **Credits: 4**

Objectives:

- To learn the basics gaseous state
- To get the idea about the polymer and its applications.
- To adequate knowledge about nuclear chemistry.

Unit I: Gaseous state **12 Hours**

Postulates of kinetic theory of gases – derivation of expression for pressure of an ideal gas on the basis of kinetic theory – deducing the basic gas laws. Deviation of real gases from ideal behavior – reasons for deviation. Derivation of van der Waals gas equation – explanation of behavior of real gases on the basis of van der Waals gas equation. Liquefaction of gases –Joule-Thomson effect – inversion temperature.

Unit II: Colloids **12 Hours**

Colloidal state of matter – various types – classification. Sols – dialysis – electro osmosis- electrophorosis – stability of colloids – protective action – Hardy Schulze law – gold number.

Emulsion: types of emulsion – emulsifier.

Gels : Classification, preparation – application of colloids.

Unit III: Nuclear Chemistry **12 Hours**

Composition of the nucleus – Nuclear forces – mass defect – binding energy – Nuclear stability – Soddy's displacement law – law of radioactive disintegration. Nuclear fission – fusion –theory – application – principle of atom bomb and hydrogen bomb. Application of radioactive isotopes – medicinal field – agriculture – industry – analytical field – carbon dating.

Unit IV: Basic concepts of organic chemistry **12 Hours**

Nature of valency of carbon in organic compounds – tetrahedral arrangement of carbon – bond breaking and bond forming in organic reaction – homolytic and heterolytic cleavage – reaction intermediates – formation, stability and reactions of carbocation, carbanion and free radicals. Electrophiles and nucleophiles – definition and examples. Hybridization – definition – sp, sp^2 and sp^3 with examples.

Unit V: Polymers **12 Hours**

Polymers – general characteristics – plastics, elastomers, and fibres – thermoplastics and thermosetting plastics - methods of polymerization – bulk, suspension and solution polymerization. Uses of polycarbonates, polyurethanes, epoxy resins and teflons.

Reference Books

1. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2004.
2. P.L.Soni and Mohan Katiyal, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
3. P.L.Soni, Textbook of Organic Chemistry, Sultan Chand & Sons, 2008.
4. B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co., Ltd., 2008.

Allied - LAB: Volumetric Analysis

Hours per week: 2 **Subject Code: U2CHA4PX1** **Credits: 2**

(Exam to be conducted at the end of even Semester)

A double titration involving making up of the solution to be estimated or single titrationinvolving making up of the solution to be estimated and the preparation of standard solution.

(a) Acidimetry and alkalimetry

1. Titration between a strong acid and strong base.
2. Titration between a strong acid and weak base.
3. Titration between a weak acid and strong base.

(b) Permanganimetry

1. Titrations between potassium permanganate and oxalic acid, ferrous sulphateand ferrousammonium sulphate.

(c) Iodometry

1. Titrations between sodium thiosulphate with potassium permanganate and potassium dichromate (demonstration only)

Course Name : Bachelor of Science
Discipline : Physics
CHOICE BASED CREDIT SYSTEM
(For those who join in June 2020 and after)

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject Code	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	Core	Core 6 - Analog Electronics	4	4	25+75=100				✔				✓				U2PHC51	No Change
	Core	Core 7 – Optics & Spectroscopy	4	4	25+75=100				✔				✓				U2PHC52	No Change
	SBS	SBS 3 - Electrical Wiring	2	2	25+75=100				✔				✓				U1PHS51	No Change
	SBS	SBS 4 - Physics of Human Anatomy	2	2	25+75=100				✔				✓				U1PHS52	No Change
	Core	NME 1 - Basic Physics	2	2	25+75=100				✔				✓				U2PHN51	No Change
	Core	LAB : Core (Major) Lab 3 – General Physics	3	-	-				✔				✓				-	-
	Core	LAB : Core (Major) Lab 4 – Electronics	3	-	-				✔				✓				-	-
	NME	LAB : Core (Major) - Project & Area Study	2	-	-				✔				✓				-	-
	Allied	General Chemistry-III	4	4	25+75=100				✔				✓				U2CHA5X3	No Change

		Employability Skills	2	2	25+75=100												U1PS51	No Change
		LAB: Organic Analysis	2	-	-				✔				✓				-	
VI	Core	Core 8 - Atomic & Nuclear Physics	4	4	25+75=100				✔				✓				U1PHC61	No Change
	Core	Core 9 - Digital Electronics	4	4	25+75=100				✔				✓				U3PHC62	No Change
	Core	Core 10 - Classical & Statistical Mechanics	4	4	25+75=100				✔				✓				U4PHC63	No Change
	SBS	SBS 6 - Biomedical Instrumentation	2	2	25+75=100				✔				✓				U2PHS61	No Change
	Core	NME 2 - Solar Energy	2	2	25+75=100				✔				✓				U2PHN61	No Change
	Core	LAB :Core (Major) Lab 3 – General Physics	3	5	40+60=100				✔				✓				U2PHC6P1	No Change
	Core	LAB : Core (Major) Lab 4 – Electronics	3	5	40+60=100				✔				✓				U4PHC6P2	Revised 13%
	NME	Core (Major) - Project & Area Study	2	5	100 (Internal only)				✔				✓				U3PH6PR	No Change (Credit 4 into 5)
	Allied	General Chemistry-IV	4	4	25+75=100				✔				✓				U3CHA6X4	
	Allied	LAB: Organic Qualitative Analysis	2	2	40+60=100				✔				✓				U1CHA6PX2	

Self-Learning Course:

Semester	Subject	Credit	Ext =Tot	Subject Code
V	Renewable Energy Sources	5	100 = 100	U1PHSL51

COURSE : III B.Sc. PHYSICS **ANALOG ELECTRONICS** Hours : 4
SEMESTER : V CORE PAPER 6 Credit : 4
Contact hours per Week – 4 hours
Contact hours per Semester – 60 hours **Subject Code: U2PHC51**

Course Objectives

In this course, the student will

- know about semiconductor principles and mobility of charges in semiconductors
- get knowledge about Diodes and Transistor biasing and their characteristics
- able to know the various applications of diodes in wave shaping circuits and power supplies
- learn about the construction and performance of different transistor amplifiers
- understand the feedback principles and working of oscillators

UNIT I **(12hours)**

Semiconductors : Energy Bands in Solids – Bonds in Solids – Valence and Conduction Bands – Conduction in Solids – Hole Formation and its Movement – Conductors, Semi conductors and Insulators – Types of Semi Conductors – Intrinsic Semiconductors – Extrinsic Semi Conductor – Majority and Minority Charge Carriers – Mobile charge carriers and Immobile ions – Drift current in good conductor – Drift current in Intrinsic Semiconductor.

The P-N Junction : The P-N Junction – Formation of Depletion Layer – Effect of Temperature on Barrier Voltage – Forward Biased P-N Junction – Forward V/I Characteristics – Reverse Biased P-N Junction – Reverse Saturation Current I_s or I_o – Reverse V/I Characteristic – Combined Forward and Reverse V/I Characteristics – Junction Breakdown.

UNIT II **(12hours)**

P-N Junction Diode: P-N Junction Diode – Diode Ratings or Specifications – Diode Testing – The Ideal Diode – The Real Diode – Diode Circuits with DC and AC Voltage Sources – Diode Fabrication – Clipper and Clamper Circuits – Zener Diode – Voltage Regulation.

DC Power Supplies: Rectifiers – Half-wave Rectifiers – Full-wave Rectifiers – Full-wave Bridge Rectifiers – Filters – Series Inductor Filter – Shunt Capacitor Filter – Effect of increasing Filter Capacitance – LC Filter – The CLC or Π Filter.

UNIT III **(12hours)**

The Basic Transistor: The Bipolar Junction Transistor – Transistor Biasing – Important Biasing Rule – Transistor Currents – Transistor Circuit Configurations – CB Configuration – CE Configuration – Relations between α and β – CC Configuration – Relation between Transistor Currents – Leakage Currents in a Transistor – Thermal Runway.

Transistor Characteristics: Transistor Static Characteristics – Common Base Test Circuit – Common Base Static Characteristics – Common Emitter Test Circuit – Common Emitter Static Characteristics – Common Collector Static Characteristics.

Load Lines and DC Bias Circuits: DC Load Line – Q-point and Maximum Undistorted Output – Need for Biasing a Transistor – Factors Affecting Bias Variations – Stability Factor – Beta Sensitivity – Stability Factor for CB and CE Circuits – Different Methods of Transistor Biasing - Base Bias – Base Bias with Emitter Feedback – Base Bias with Collector Feedback – Base Bias with Collector and Emitter Feedbacks - Voltage Divider Bias – Load Line and Output Characteristics – AC Load Line.

UNIT IV **(12hours)**

Transistor Equivalent Circuits and Models: h-parameters – The h-parameters Notation for Transistors – The h-parameter of an Ideal Transistor – The h-parameter of an Ideal CB Transistors – The h-parameter of an Ideal CE Transistors - Approximate Hybrid Equivalent Circuits – Typical values of Transistor h-parameters – Hybrid Formulas for Transistor Amplifier.

Single-Stage Transistor Amplifiers: Classification of Amplifiers – Common Base Amplifiers – Various Gains of a CB Amplifier – Characteristic of a CB Amplifiers – Common Emitter Amplifier – Various Gains of a CE Amplifier – Characteristic of a CE Amplifier – Common Collector Amplifier – Various Gains Of a CC Amplifier – Characteristic of a CC Amplifier – Uses – Comparison of Amplifier Configuration – Graphical Representation – Transformer –coupled Class-A Amplifiers – Class-B Push-Pull Amplifier.

UNIT V **(12hours)**

Feedback Amplifiers: Feedback Amplifiers – Principle of Feedback Amplifiers – Advantages of Negative Feedback – Gain Stability – Decreased Distortion – Increased Bandwidth – Forms of Negative Feedback.

Sinusoidal Oscillators: Oscillator – Comparison Between an Amplifier and Oscillator – Classification of Oscillators – Damped and Undamped Oscillators – The Oscillatory Circuit – Frequency of Oscillatory Current – Frequency Stability of an Oscillator – Essentials of a Feedback LC Oscillator – Hartley Oscillator – Colpitts Oscillator – Phase Shift Oscillator.

Books for study:

"Basic Electronics: Solid State", B.L. Theraja, S.Chand & Company Ltd., 5th Edition Reprint 2010.

Unit I	Chapter – 12: 12.18 – 12.29;
	Chapter – 13: 13.1 – 13.11.
Unit II	Chapter – 14: 14.1 – 14.17;
	Chapter – 15: 15.1 – 15.2;
	Chapter – 17: 17.5 – 17.14.
Unit – III	Chapter – 18: 18.1 – 18.13;
	Chapter – 19: 19.1 – 19.6;
	Chapter – 20: 20.1 – 20.15.
Unit – IV	Chapter – 21: 21.14 – 21.21;
	Chapter – 22: 22.1 – 22.14; 22.20; 22.24.
Unit – V	Chapter – 25: 25.1 – 25.7;
	Chapter – 28: 28.1 – 28.8; 28.12; 28.14; 28.22.

Reference Books:

1. S. Salivahanan, and N. Suresh Kumar. ***Electronic Devices and Circuits***, New Delhi: Tata McGraw - Hill; 2016. 4th Edition.
2. V.K Metha,. Principle of Electronics New Delhi: S. Chand & Company LTD; 2012. 10th Edition.

COURSE : III B.Sc. PHYSICS OPTICS & SPECTROSCOPY Hours : 4
SEMESTER : V CORE PAPER 7 Credit : 4
Contact hours per Week – 4 hours
Contact hours per Semester – 60 hours **Subject Code: U2PHC52**

Course Objectives

In this course, the student will

- know about the properties of lenses and working of system of lenses
- get knowledge of interference, theory of interference and experiments using interference
- get knowledge of diffraction principle and its types
- understand the different kinds of spectroscopic techniques and their applications

Unit I -Geometrical Optics (12hours)

Principal focus and Focal plane of Lens - Equivalent focal length of a system of two thin lenses in contact –separated by a distance- Aberrations in lenses- spherical aberration-reducing spherical aberration-chromatic aberration (longitudinal and lateral)- achromatic combination (lenses in contact and separated by a Finite distance)– Aplanatic lens.

Unit II- Physical optics – Interference (12hours)

Condition for interference- Coherent sources- Theory of Interference fringes- Colours of thin film (interference by reflected light only) - Air wedge – determination of diameter of thin wire- test for optical flatness- Newton's Rings-determination of refractive index of a liquid – Michelson's interferometer-uses - Theory of Holography.

Unit III – Diffraction (12hours)

Fresnel and Fraunhofer diffraction – Rectilinear propagation of light- Zone plate-Theory – comparison with convex lens- Fraunhofer diffraction at a single slit – double slit – Plane transmission grating –theory and experiment to determine wavelength –resolving power – resolving power of grating – resolving power of prism.

Unit IV- Polarization (12hours)

Polarization of light - Double refraction – Huygen's explanation of double refraction in uniaxial crystals- Nicol prism – Nicol prism as polarizer and analyzer- Plane, elliptical and circularly polarized light –Production and detection-Optical activity – Biot's law- Fresnel's theory of optical rotation- Laurent's half –shade Polarimeter- Determination of Specific Rotation of Sugar solution.

Unit V- Spectroscopy (12hours)

Electromagnetic spectrum- Types of molecular energies- Different spectroscopic methods an overview- spectral line width – Absorption and emission of radiation – Einstein

's coefficients-Infrared and Ultraviolet Spectroscopy – sources- detection- applications- Raman effect-experimental study- Quantum theory of Raman effect-Applications.

Books for study

1. Optics and spectroscopy – R.Murugeshan, Kiruthiga Sivaprasath, 8th revised edition, 2012, S. Chand & Company Ltd. Ram Nagar, New Delhi-110055.
   Unit I - 1.1-1.4, 1.15- 1.22
   Unit II - 2.1, 2.2, 2.5-2.12, 9.1 – 9.3

   Unit III – 3.1-3.5, 3.10-3.12, 3.23, 3.24
   Unit IV – 4.1, 4.5 – 4.8, 4.14-4.12

2. Molecular Structure and Spectroscopy – G. Aruldhas, Second edition, 2011- Prentice-Hall of India Private Ltd. New Delhi – 110 001
   Unit V - 1.1 – 1.6
3. Optics and spectroscopy – R.Murugeshan, Kiruthiga Sivaprasath, Eighth revised edition, 2012, S. Chand & Company Ltd. Ram Nagar, New Delhi-110055.
   Unit V - 5.2, 5.3, 5.5 – 5.8

Reference Books

1. A Textbook of Optics – N.Subrahmanyam & Brijilal , Twenty Fourth edition, 2010- S.Chand & Company Ltd.
2. Fundamentals of Optics – Devraj Singh, Second edition, 2015-PHI Learning Private Ltd. New Delhi.

COURSE : III B.Sc. PHYSICS **ELECTRICAL WIRING** Hours : 2
SEMESTER : V SKILL BASED PAPER 3 Credit : 2
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U1PHS51**

Course objectives

In this course, the student will

- understand the basics of AC circuits.
- learn about Electrical Installations.
- acquire the knowledge of Design of Simple Electrical Circuits.
- Will know about the guidelines for sub-circuits, fittings and Simple Wiring Schemes
- know about electrical protective devices and electrical estimation.

Unit I – Basic Concepts (6 Hours)

Ohm's law – Kirchhoff's law – Biot-Savart Law - Electromagnetic induction: Faraday's law – Lenz's law - Superposition theorem – Thevenin theorem – Norton's theorem - Reciprocity theorem –Star-Delta conversion.

Unit II – Design Considerations of Electrical Installations (6 Hours)

Electric supply system – Three Phase four wire distribution system – Protection of electric installation against overload, short circuit, earth fault and electric shock – Single phase supply – Three phase, four wire supply - Neutral and Earth wire

Unit III - Electrical Wiring **(6 Hours)**

Introduction - List of Symbols - Supply Voltages- Service Connection - Interior wiring- Guidelines for sub-circuits and fittings - Simple Wiring Schemes -Two way control of lamps -Three way control of lamps.

Unit IV - Design of Simple Electrical Circuits **(6 Hours)**

Electrical diagram – Methods of Representation for wiring diagram – Introduction to simple light and fan circuits – System of connection of appliances and accessories –Solved examples of light and fan circuits–Alarm circuits with relays.

Unit V - Electrical protective devices and Electrical estimation **(6 Hours)**

Fuses- Miniature circuit breaker (MCB)- Earth Leakage Circuit Breaker (ELCB) - Earthing- Computation of Energy consumed

Books for study

1. "**Basic Electrical Engineering**" by K. Uma Rao and A.Jayalakshmi, Sanguine Technical Publishers, Bangalore. 2014
   Unit I – 1.3, 1.5, 2.2.1, 2.7, 2.7.1, 2.7.2, 3.6-3.8, 3.10, 3.11
   Unit III – 6.1 – 6.9
   Unit V – 6.11 – 6.15

2. "**Electrical Design Estimating and Costing**" by K. B. Raina and S.K. Bhattacharya, New Age International (P) Ltd Publishers, New Delhi, 2007
   Unit II – 4.1-4.3.3, 4.3.5, 4.5.7, 4.5.8, 4.8
   Unit IV–1.3, 1.4, 2.1, 2.2, 2.3, 2.7

Reference Books

1. V.K. Mehta, "Principles of Electrical Engineering and Electronics", S. Chand & Company Ltd, 2012
2. Uppal S.L, "Electrical Wiring - Estimating and Costing", Khanna Publishers, Sixth edition 2011

COURSE : III B.Sc. PHYSICS **PHYSICS OF HUMAN ANATOMY** Hours : 2
SEMESTER : V SKILL BASED PAPER 4 Credit : 2
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U1PHS52**

Course objectives

In this course, the student will

- understand the biophysics of muscles and bones
- know the physics of audition and abut human ear
- understand the functioning of Retina and photoreceptors of eye
- learn about neuro biophysics and function of nerve system

Unit I **(6 Hours)**

Biomechanics: Biostatics - Biophysics of muscle – Muscle power – Strength of bones – Biodynamics – Locomotion on land

Unit II **(6 Hours)**

Physics of audition: Transverse and longitudinal waves – Physiological characteristics of sound – Human ear – Doppler Effect.

Unit III **(6 Hours)**

Physics of vision: Wave nature of light – Geometrical optics – Refractive power – Retina and photoreceptors – Resolving power of eye – Polarisation and vision

Unit IV **(6 Hours)**

Neurobiophysics: Anatomy of neurons – Physico-chemical nature of membrane potential – Electric analog of membrane

Unit V **(6 Hours)**

Nerve excitation – The action potential – Conduction of action potential – Synaptic transmission

Books for study:

1. "**Elementary Biophysics**", P.K. Srivastava, Narosa Publishing House Pvt. Ltd. Second Edition 2011.

Unit-I Chapter-1: 1.1-1.5.
Unit-II Chapter-4: 4.1-4.3, 4.5.
Unit-III Chapter-5: 5.1-5.4, 5.6, 5.7.
Unit-IV Chapter-11: 11.1-11.3.
Unit-V Chapter-11: 11.4-11.7.

Reference Book:

1. "Biomedical instrumentation" by Dr. M. Arumugam,Anuradha publications, Chennai, 2008 Reprint"
2. Handbook of Biomedical instrumentation by R.S. Khandpur and Raghbir Khandpur, TMH, Second edition,1987
3. Biomedical instrumentation and measurements by R. Ananda Natarajan, PHI India, Second edition,1995

COURSE : III B.Sc. PHYSICS **BASIC PHYSICS** Hours : 2
SEMESTER : V NON MAJOR ELECTIVE 1 Credit : 2
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U2PHN51**

Course objectives

In this course, the student will

- get knowledge about the Physics and its scope
- know about the Galaxies, Origin of the Universe and the Solar system
- study brief history and sources of light
- get knowledge about applications of refraction and diffraction of sound and acoustics of buildings
- understand the communication systems and various types of communication

UNIT I : **(6 Hours)**

What is Physics? – Scope and excitement of Physics – Physics, technology and society – Fundamental forces in nature – Nature of physical laws.

UNIT II : **(6 Hours)**

Galaxies – Origin of the Universe – Black Holes – Origin of the solar system – The structure of the solar system – The Sun – The Planets – Origin of the Earth – Some basic feature of the Earth

UNIT III : **(6 Hours)**

Light: Introduction – Brief history – The Sources of light – Properties of light – Dispersion – The velocity of light – Visible range

UNIT IV : **(6 Hours)**

Sound: Introduction - Applications of Reflection of Sound – Megaphone – Applications of diffraction of sound – Acoustics – Factors affecting the architectural acoustics and their remedies – Reverberation – Loudness – Processing – Echoes – Echelon effect – Resonance – Noise – Ultrasonics: Introduction – Properties of ultrasonic waves – Engineering applications.

UNIT V : **(6 Hours)**

Communication: Introduction – What is communication? – Communication process and its components – Types of communication system – Frequency ranges in communication systems – Modulation – need for modulation.

Book for study:

1. Study material prepared by Department of Physics, VHNSN College(Autonomous), Virudhunagar.

Reference Book:

1. History of Planet earth by M.N. Sastri, Himalaya Publishing House, 1993.
2. Allied Physics-II by Dr. Himanshu Kumar, Vayu Education of India, New Delhi, 2009.
3. A text book of Optics by Dr.N. Subrahmanyam Brijlal & Dr.M.N. Avadhanulu, S. Chand, 2010.
4. Principles of Communication by K.S. Srinivasan, Selva publications, 2002.

General Chemistry - III

Hours per week: 4 **Credits: 4** **Subject Code: U2CHA5X3**

Objectives:

- To know the basic requirements of chemical calculations.
- To acquire fundamental knowledge in bonding.
- To gain fundamental knowledge about adsorption, catalysis and co-ordination compounds.
- To study the principles water analysis.

Unit I – Basic chemical calculation **(12 hours)**

Significant numbers – SI Units – Dimensions – Calculation of formula weight – understanding Avogadro number – Mole concept – Mole fraction of the solvent and solute – conversion of grams into moles and moles into grams – Stoichiometric equations. Methods of

expressing concentration of the solution – Normality, molarity, molality and mole fraction – Calculations on principle of volumetric analysis.

Unit II – Theories of bonding **(12 hours)**

Types of the chemical bonds: Ionic bond, covalent bond and coordinate bond – Valence bond theory – Valence Shell Electron Pair Repulsion theory – Shapes of CH_4, H_2O and NH_3 molecules – Molecular orbital theory – Bonding and antibonding orbital – MO theory applied to homonuclear molecules – H_2, N_2 and O_2 – comparative study of VB and MO theories.

Unit III – Coordination compounds **(12 hours)**

Introduction – nomenclature – Werner's theory – Coordination number and geometry – EAN rule – Valence Bond theory and Bonding in octahedral and tetrahedral complexes – Low spin and high spin complexes – Crystal field theory (octahedral and tetrahedral splitting only) .

Unit IV – Adsorption and catalysis **(12 hours)**

Adsorption:

Definition of various terms (adsorption, absorption, adsorbent, adsorbate, sorption & desorption) – Difference between adsorption and absorption – Factors affecting the adsorption of gases on solids – Physical and chemical adsorption – Adsorption isotherms (Langmuir & Freundlich basic ideas only) – Applications of adsorption.

Catalysis:

Definition – Characteristics of catalysis – Promoters and poisons – Enzyme catalysis – characteristics of enzyme catalysis (Michaelis-Menton equation only) – Acid-base catalysis and autocatalysis – Applications of catalysis.

Unit V – Water treatment **(12 hours)**

Water quality analysis – Chemical and physical analysis of water quality parameters - Standards prescribed for water quality by WHO and Indian standards – Sea water as a source of drinking water.

Sewage treatment

Sewage – Objectives of sewage treatment – General purification reaction: aerobic and anaerobic process – Methods of sewage disposal (Bio chemical oxidation, chemical precipitation and chlorination process) – Sludge disposal (septic tank treatment and sludge digestion).

Reference Books

Unit-I

1. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2005.

Unit-II

1. P.L. Soni, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
2. R. Gopalan Textbook of Inorganic Chemistry, Universities Press Pvt. Ltd., 2012.
3. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, S.Chand & Co., 2008.
4. R.D.Madan, Satya Prakash's Modern Inorganic Chemistry, S.Chand & Co. Ltd., New Delhi, 2008.

Unit-III

1. P.L. Soni, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
2. R. Gopalan Textbook of Inorganic Chemistry, Universities Press Pvt. Ltd., 2012.
3. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, S.Chand & Co., 2008.
4. R.D.Madan, Satya Prakash's Modern Inorganic Chemistry, S.Chand & Co. Ltd., New Delhi, 2008.

Unit-IV

1. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S.Chand & Co., 2004.
2. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2005.

Unit-V

1. A.K.De, Environmental Chemistry (seventh edition), New Age International Publishers New Delhi, 2010.
2. M.M.Uppal, A Text book of Engineering Chemistry, Khanna Publishers, New Delhi 1988.

SBE- EMPLOYABILITY SKILLS

Contact Hours per week: 2 **Subject Code: U1PS51**
Contact Hours per Semester: 30 **Credits: 2**

Objectives:

To enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.

Unit I : Quantitative Aptitude – Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock. **(6-hours)**

Unit II : Quantitative Aptitude –Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships. **(6-hours)**

Unit III: Reasoning **(6-hours)**

Verbal Reasoning - Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

Unit IV: Reasoning **(6-hours)**

Verbal Reasoning - Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.

Unit V: **(6-hours)**

General Knowledge: Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.

Reference Books:

1. Verbal & Non Verbal Reasoning - R.S.Aggarwal
2. Quantitative Aptitude - R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude - R.S.Aggarwal
4. Malayala Manorama Year Book, 2014

COURSE : III B.Sc. PHYSICS **ATOMIC AND NUCLEAR PHYSICS** Hours : 4
SEMESTER : VI CORE PAPER 8 Credit : 4
Contact hours per Week – 4 hours
Contact hours per Semester – 60 hours **Subject Code: U1PHC61**

Course Outcomes :

In this course, the student will

- understand atom models.
- study the quantum mechanical explanation for the atom model.
- study the nuclear composition and its properties
- understand the nuclear structure.

- understand the Nuclear fission and fusion.

UNIT I **(12hours)**

Introduction – Rutherford's experiments on scattering of α particles – Bohr atom model – Effects of Nuclear motion on atomic spectra – Evidence in favour of Bohr's theory – Critical potential – Atomic excitation – Sommerfeld's relativistic atom model: Elliptic orbits for hydrogen – Total energy – Sommerfeld's relativistic theory – Fine structure of Hα line. The vector atom model: spatial quantization – Spinning electron – Quantum numbers associated with the vector atom model – Coupling schemes – The Pauli Exclusion Principle – Some Examples of Electro configuration with their modern symbolic representations.

UNIT II **(12hours)**

Zeeman effect – Lorentz Classical theory of normal Zeeman effect – Quantum mechanical explanation of the normal Zeeman effect – Anomalous Zeeman effect – X rays: Introduction – production of X-rays – X-ray spectra – Characteristic X-ray spectrum – Moseley's law – Compton scattering: theory and experimental verification.

UNIT III **(12hours)**

Introduction to the nucleus – Classification of nuclei – General properties of nucleus – Binding energy – Nuclear stability – Theories of nuclear composition – Nuclear forces – Meson theory of nuclear forces.

UNIT IV **(12hours)**

Models of nuclear structure – The liquid drop model – The shell model – The collective model – Determination of nuclear radius: mirror nuclei method – Fermi gas model of the nucleus.

UNIT V **(12hours)**

Nuclear fission and fusion: Discovery – Nuclear fission – Energy released in fission – Bohr and Wheeler's theory of nuclear fission - Chain reaction – Critical size for maintenance of chain reaction - Atom bomb – Nuclear reactors – Nuclear fusion –Source of stellar energy – Thermonuclear reactions – Controlled thermonuclear reaction.

Books for study:

1. Modern Physics – R. Murugeshan, Er. Kiruthiga Sivaprasath, 2013, 17th Edition S. Chand & Co Ltd..

Unit I: 6.1, 6.2, 6.4 - 6.6, 6.8 - 6.9, 6.11 - 6.15, 6.17
Unit II: 6.23, 6.25, 6.26, 7.1, 7.2, 7.11 – 7.14

Unit III: 27.1 - 27.8
Unit IV: 27.9 – 27.13, 28.6
Unit V: 35.1 – 35.9

Reference Books:

1. Modern Physics – Seghal Chopra & seghal sultan, Chand, 1998.
2. Atomic and Nuclear Phyics – N. Subramanyan & Birijlal, S.Chand & Co, 2000

COURSE : III B.Sc. PHYSICS **DIGITAL ELECTRONICS** Hours : 4
SEMESTER : VI CORE PAPER 9 Credit : 4
Contact hours per Week – 4 hours
Contact hours per Semester – 60 hours **Subject Code: U3PHC62**

Objectives

To understand different number systems and Boolean algebra.

- To get knowledge about different logic gates.
- To study the different arithmetic circuits.
- To understand the functioning of flip-flops, counters and Registers.

UNIT - I: (12hours)

Number Systems and Codes: Binary number system – Binary to decimal system – Decimal to binary conversion – Octal numbers and it's conversion – hexadecimal numbers and it's conversion– ASCII code – Excess 3 code – Gray code.

UNIT - II: (12hours)

Logic gates: Introduction – The basic gates OR, AND, NOT – TTL logics – Universal logic gates -NAND, NOR- TTL logic – Positive and negative logic.
Combinational logic circuits: Boolean laws and theorems – Sum of products method –Truth table to Karnaugh map – Pairs, quads, and octets – Karnaugh simplification – Don't-care conditions – Product of sum method – Product of sum simplification

UNIT – III (12hours)

Arithmetic Circuits: Binary addition – Binary subtraction – unsigned binary numbers-sign-magnitude numbers – 2's complement representation – 2's complement arithmetic – Arithmetic Building Blocks – The adder- Subtracter – Arithmetic logic units – Binary multiplication and division.

UNIT - IV: (12hours)

Data processing circuit: Introduction – Multiplexers – 16 to 1 multiplexer – Demultiplexers – 1 to 16 Demultiplexers – 1 of 16 Decoder – BCD to decimal decoder – Seven-Segment decoder- Encoders.
Flip flops: RS flip flops – Gated flip flops –Edge triggered RS flip flops – Edgetriggered D flip flop – Edge triggered JK flip flop– JK master slave flip flop.

UNIT – V (12hours)

Registers: Types of Registers – Serial in - Serial out Shift Registers – Serial in – Parallel out and parallel in – serial out shift registers.
Counters: Asynchronous counter – Synchronous counter – decade counters (Mod-5 counter, mod -10 counter)

Books for study:

1. Digital Principles and Applications by Donald Leach, Albert Paul Malvino, Goutam Saha, Tata Mc Graw Hill, (2011) Seventh Edition.

Unit:1 5.1-5.7
Unit:2 2.1-2.4, 3.1- 3.8.
Unit:3 6.1 – 6.8
Unit:4 4.1-4.6,8.1-8.5,8.6
Unit:5 9.1-9.4,10.1,10.3,10.5

Reference Books

1. Basic Electronics and Applied Electronics by Jose Robin and Ubald Raj, Indira Publications (2004).
2. An Introduction to Integrated Electronics by V.Vijeyandran, Viswanathan, S., Printers & Publishers Pvt Ltd, 2009
3. Digital Logic Circuits by Salivahanan, Arivazhahan. Published by Vikas Publishing House Pvt Ltd 2012.

COURSE : III B.Sc. PHYSICS **CLASSICAL AND STATISTICAL MECHANICS** Hours : 4

SEMESTER : VI CORE PAPER 10 Credit : 4

Contact hours per Week – 4 hours

Contact hours per Semester – 60 hours **Subject Code: U4PHC63**

Course objectives:

In this course, the student will

- understand the basic concepts classical mechanics.
- get knowledge about D'Alemberts principle and its applications
- Will know the superiority of Lagrangian mechanics over Newtonian Approach.
- understand the fundamental postulates and distribution laws of statistical mechanics.

UNIT – I **(12hours)**

Space and Time – Inertial frames – Mechanics of a particle: Conservation of linear momentum – Conservation of angular momentum – Conservation of energy – Mechanics of a system of particles: Conservation of linear momentum – Conservation of angular momentum – Conservation of energy – Constraints – Degrees of freedom under constraints – Forces of constraint – Difficulties introduced by the constraints and their removal.

UNIT – II **(12hours)**

Generalized coordinates – Principle of virtual work – D'Alemberts principle – Lagrange's equations from D'Alemberts principle – Applications (Simple Pendulum, Compound Pendulum, Atwood's Machine) – Lagrange's equations in presence of Non-conservative forces – Hamilton's Principle and Lagrange's equations – Superiority of Lagrangian mechanics over Newtonian Approach.

UNIT – III **(12hours)**

Generalized momentum and cyclic coordinates – Hamiltonian function H – Physical significance – Hamilton's equations – Hamilton's equations in different coordinate system – Simple applications (Harmonic oscillator, motion of a particle in a central force field, Compound Pendulum)

UNIT – IV **(12hours)**

Statistical basics- Probability - Principle of equal A priori probability - some basic rules of probability theory- Permutations and combinations-Microstates and microstates-

Thermodynamic probability- constraints on a system-static and dynamic systems-most probable state – life time of micro and macro states-Concept of cell in a compartment-Ensemble and average properties.

UNIT – V **(12hours)**

Degrees of freedom-Position space- Momentum space- Phase Space- The mu-space and Gamma space- Division of phase space into cells-Applications-Fundamental postulates of statistical mechanics-Statistical ensembles- Canonical ensemble-Grand canonical ensemble-Comparison of Ensembles-Theories based on statistical mechanics-Entropy and probability-Boltzmann's canonical distribution law-Application of Boltzmann's canonical distribution law.

Books for study:

1. Classical Mechanics – J.C. Upadhyaya, reprint 2012, Himalaya Publishing House.
   Unit I: 1.2, 1.4, 1.6, 1.7, 2.3
   Unit II: 2.4 – 2.7, 2.9, 2.11, 2.12
   Unit III: 3.2, 3.4 – 3.7
2. Heat Thermodynamics and Statistical Physics, Brijlal, Dr.N.Subramanyam, P.S.Hemne S.Chand& Company LTD, reprint 2012.
   Unit IV: 9.1- 9.3, 9.5-9.8, 9.10-9.15
   Unit V: 10.1-10.8, 10.10, 10.11, 10.14-10.17

Reference Books:

1. Introduction to Classical Mechanics by R.G.Takawale and P.S.Puranik, Tata Mc-Graw Hill Publishing Company Limited, New Delhi.1988.
2. Statistical Mechanics – R.K. Srivastava, J.Ashok, 2010, PHI.
3. Fundamentals of Statistical Mechanics – B.B. Laud, 2009, New age International Publishers.
4. Modern Physics – R. Murugeshan, Er. Kiruthiga Sivaprasath, 2013, 17th edition, S. Chand & Company pvt. Ltd.

COURSE : III B.Sc. PHYSICS **BIO MEDICAL INSTRUMENTATION** Hours : 2
SEMESTER : VI SKILL BASED PAPER 6 Credit : 2
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U2PHS61**

Course objectives:

In this course, the student will

- get idea about design of medical instruments and components of the Biomedical instrument system
- get knowledge about characteristics of bio potential recording system
- understand the operation and uses of ECG and EEG equipments
- understand the application of Lasers and Computers in the field of medicine

Unit I **(6 Hours)**

Design of medical instruments – Componenets of the Biomedical instrument system – Electrodes- Half cell potential – Purpose of electrode paste- Types of electrodes – Transducers–Active transducers – Magnetic induction type transducers – Piezoelectric type transducers

Unit II **(6 Hours)**

Biopotential recorders – Characteristics of recording system – Writer and Pen damping system –Electrocardiography – Origin of cardiac potential – ECG lead configurations – Practical considerations for ECG recording

Unit III **(6 Hours)**

Electroencephalography – Origin of EEG – Brain waves–Placement of electrodes – Recording setup – Analysis of EEG

Unit IV **(6 Hours)**

Computers in medicine – Lasers in medicine – Endoscopes

Unit V **(6 Hours)**

Computer Tomography – Magnetic resonance Imaging – Magnetic resonance phenomenon - Magnetic resonance spectroscopy *in vivo* – Magnetic resonance imaging

Books for study:

1. "**Biomedical instrumentation"** by Dr. M. Arumugam,Anuradha publications, Chennai, 2008 Reprint"

Unit I: Chapter II – Sections 2.2, 2.3, 2.4 (2.4.1 - 2.4.3), 2.4.4, 2.5 (2.5.1-2.5.3)
Unit II: Chapter IV – Sections 4.2, 4.2.1, 4.3 (4.3.1, 4.3.2, 4.3.4)
Unit III: Chapter IV – Sections 4.4, 4.4.1 – 4.4.5)
Unit IV: Chapter X – Sections 10.2, 10.3, 10.4
Unit V: Chapter X – Sections 10.7, 10.10, 10.10.1- 10.10.3

Reference Book:

4. Handbook of Biomedical instrumentation by R.S. Khandpur and Raghbir Khandpur, TMH, Second edition,1987
5. Biomedical instrumentation and measurements by R. Ananda Natarajan, PHI India, Second edition,1995

COURSE : III B.Sc. PHYSICS **SOLAR ENERGY** Hours : 2
SEMESTER : VI NON MAJOR ELECTIVE 2 Credit : 2
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U2PHN61**

Course objectives:

In this course, the student will

- get knowledge about the Energy Sources
- understand the Solar Energy Basics
- study the different types Solar collectors
- know about structure and working of Solar water heaters
- study the solar dryer, solar distillation and solar thermo-mechanical systems

UNIT I : **(6 Hours)**

Energy Sources: Introduction – Energy growing needs and world sources – Classification of energy resources – Non-Renewable energy resources – Renewable energy resources.

UNIT II : **(6 Hours)**

Solar Energy Basics: The Sun as a source of energy – The Earth – Extraterrestrial and Terrestrial Radiations – Spectral energy distribution of solar radiation – Depletion of solar radiation – measurements of solar radiation.

UNIT III : **(6 Hours)**

Solar Collectors: Classification – Comparison of concentrating and non-concentrating types of solar collectors – performances indices – liquid flat-plate collector – flat-plate Air heating collector – Evacuated tube collector – Modified flat-plate collector – compound parabolic concentrator – cylindrical parabolic concentrator – Fixed mirror solar concentrator – paraboloidal dish collector – central tower receiver.

UNIT IV : **(6 Hours)**

Solar Water Heater – Solar passive space heating and cooling systems – solar industrial heating systems – solar refrigeration and air-conditioning systems

UNIT V : **(6 Hours)**

Solar dryer – Solar distillation – Solar thermo-mechanical systems - solar thermal water pump – solar vapour compression refrigeration – solar-pond electric-power plant – Alternative types of slolar ponds – central tower receiver power plant – solar chimney plant.

Book for study:

1. Study material prepared by Department of Physics, VHNSN College (Autonomous), Virudhunagar.

Reference Books:

1. Non-Conventional energy resources by B H Khan, Mc Graw Hill, 2011
2. Solar energy Fundamentals, Design, Modelling and Applications by G.N. Tiwari, Narosa Publishing House, 2016
3. Solar Energy Utilization by G D Rai, Khanna Publishers, New Delhi, 2012

COURSE : III B.Sc. PHYSICS **GENERAL PHYSICS** Hours : 3
SEMESTER : V & VI Core Lab (Major) Credit : 5
Contact hours per Week – 3 hours
Contact hours per Semester – 30 hours **Subject Code: U2PHC6P1**

1. Determination of Refractive Index of the given Small angled prism using Spectrometer.
2. Determination of Refractive Index of the given prism by I – I' curve method using Spectrometer.
3. Determination of number of lines per meter of the grating (N) and wavelength (λ) of prominent lines of the mercury spectrum by minimum deviation method using Spectrometer.
4. Determination of Resolving Power of a grating using Spectrometer.

5. Determination of the wavelength (λ) of prominent lines of the mercury spectrum using Hartmann's interpolation using Spectrometer.
6. Study the frequency current relationship of a Series LCR circuit.
7. Study the frequency current relationship of a Parallel LCR circuit.
8. Determination of Self inductance of the coil using Maxwell's bridge (AC method).
9. Determination of Self inductance of the coil using Owen's bridge (AC method).
10. Determination of Impedance & Power factor using LR circuit.
11. Determination of Impedance & Power factor using CR circuit.
12. Determination of Mutual Inductance of the given coils using Spot Galvanometer.
13. Comparison of Mutual Inductance between two coils using Spot Galvanometer.
14. Determination of High Resistance by leakage method using Spot Galvanometer.
15. Determination of angle of Acceptance and Numerical aperture of the given Fiber optic cable.

COURSE : III B.Sc. PHYSICS **ELECTRONICS** Hours : 3
SEMESTER : V & VI Core Lab (Major) Credit : 5
Contact hours per Week – 3 hours
Contact hours per Semester – 30 hours **Subject Code: U3PHC6P2**

1. Characteristics of Zener diode.
2. Construction and study of Bridge rectifier with π filter.
3. Construction and study of Voltage Doubler and Tripler.
4. Characteristics of Transistor (CE mode).
5. Construction and study of Single Stage Amplifier.
6. Construction and study of Hartley Oscillator.
7. Construction and study of Colpitt Oscillator.
8. Regulated power supply using IC 7805.
9. Verification of De Morgan's Laws.
10. NOR gate as a universal building block.
11. NAND gate as a universal building block.
12. Construction and study of Half Adder and Full Adder circuits using IC's.
13. Construction and study of Integrator and Differentiator circuits using IC 741.
14. Construction and study of Adder and Subtractor circuits using IC 741.
15. Construction and study of R-S & J-K flip flop using gates.

COURSE : III B.Sc. PHYSICS **PROJECT AND AREA STUDY** Hours : 2
SEMESTER : V & VI Credit : 5
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U3PH6PR**

Project and Area Study (only internal Evaluation)

Project

Project Maximum Marks 50 (Passing Minimum 20 Marks)
Project based on basic or applied Physics should be done only in our Lab.
Project report should not exceed 50 Pages.

Area Study

Maximum Marks 50 (Passing Minimum 20 Marks)
Students should visit any Institute or Lab of Scientific importance.
Students should submit a detailed report regarding the visit not exceeding 25 Pages.

General Chemistry - IV

Hours per week: 4 **Credits:4** **Subject Code: U3CHA6X4**

Objectives:

- To study the basics of chemical equilibrium.
- To acquire basic idea about drugs.
- To gain knowledge about the chromatographic techniques.
- To understand the role of bio-organic materials.

Unit I – Chemical Kinetics **(12 hours)**

Introduction – rate of reaction – rate law - rate constant - rate equation – order and molecularity of a reaction. Derivation of first order rate constant – Definition and Examples of Pseudounimolecular reactions (Inversion of cane sugar and hydrolysis of ester by acid). Second, third and zero order reactions – examples – half life period (no derivation required).

Unit-II- Drugs **(12 hours)**

Chemotherapy –Anaesthetics – General anaesthetics and local anasethetics (definition and example only). Sulpha drugs (Sulphonamides) - Synthesis and applications of sulpha drugs (sulphanilamide, sulphapyridine, sulphathiazole and sulphadiazine) – Mode of action of sulpha drugs. Antibiotics: Penicillin –Streptomycin- Chloramphenicol (chloromycetin) – Structure and mode of action of these drugs (synthesis not required).

Unit III – Chromatography **(12 hours)**

Basic principles of common types of chromatography – Paper chromatography – Thin layer chromatography – Column chromatography – Ion exchange chromatography. Applications of each techniques.

Unit IV – Proteins, Nucleic acids, Hormones and Vitamins **(12 hours)**

Definition – Classification of proteins – Colour reaction of proteins – Nucleic acids – nucleoside – nucleotides and general structure of DNA. Hormones – Classification – structure of some sex hormones – oestrone and progesterone. Vitamins – Classification of

vitamins – Sources and deficiency diseases of vitamins A, B_1, C, D, E and K (structure not required).

Unit V – Chemistry of a few useful compounds (12 hours)

Preparation and uses of CH_2Cl_2, $CHCl_3$, CCl_4, CF_2Cl_2, Bleaching powder, Phenyl, Talcum powder, Shampoo, Shave lotion, Soaps and Detergents.

Reference Books

Unit-I

1. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S.Chand & Co., 2004.
2. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2005.

Unit-II

1. B.S.Bahl and Arun Bahl, A Textbook of Organic Chemistry, S.Chand & Company Ltd, Ram Nagar, New Delhi,16th edition, 2002.
2. K.S.Tewari, N.K.Vishnol and S.N. Mehrotra A Textbook of Organic Chemistry, 3rd revised edition, 2006.
3. P.L.Soni and H.M.Chawla, Textbook of Organic Chemistry, Sultan Chand & Sons, New Delhi, 2007.

Unit-III

1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
2. B.K. Sharma, Instrumental methods of Chemical Analysis, Goel Publishing House 23rd Edition, 2004.

Unit-IV

1. S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co. Ltd., 2008.
2. K.S.Tewari N.K.Vishnol and S.N. Mehrotra A Text book of Organic Chemistry, 3rd revised edition, 2006.
3. Jaya shree Ghosh, Fundamental Concept of Applied Chemistry S.Chand & Company LTD, 2008.

Unit-V

1. R.D.Madan, Satya Prakash's Modern Inorganic Chemistry, S.Chand & Co. Ltd., New Delhi, 2008.
2. B.R.Puri, L.R.Sharma and K.C.Kalia, Principles of Inorganic Chemistry, S.Chand & Co., 2008.
3. P.L. Soni, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
4. P.K.Chattopadhyay, Modern Technology of Soaps, Detergents and Toiletries, 2nd edition, 2005.
5. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 6th edition, 1994.

Part III – Ancillary Lab II – Organic Qualitative Analysis

Hours per week: 2 Credits: 2 Subject Code: U1CHA6PX2

Objective:

- To gain fundamental knowledge about organic analysis

Organic analysis

Analysis of an organic compound containing one or two functional groups and confirmation by the preparation of solid derivative / colour reaction – acids, phenols, aldehydes, ketones, esters, nitro compounds, primary amines, amides, anilides, aliphatic diamide and monosaccharides.

Course Name : **Bachelor of Science**
Discipline : **Physics**
Self-Learning Course:

Semester	Subject	Credit	Ext =Tot	Subject Code
V	Renewable Energy Sources	5	100 = 100	U1PHSL51

SELF LEARNING

COURSE: B.Sc. PHYSICS **RENEWABLE ENERGY SOURCES** Credit : 5
Subject Code: U1PHSL51 **TOTAL MARKS: 100**

Objectives

- To get knowledge about Sun as a source of energy
- To study about solar thermal and photovoltaic devices
- To understand the basic concepts of Wind, Biomass and Geothermal energy sources

Unit I

Solar Energy Basics – Introduction – The Sun as a source of energy – The earth – Extraterrestrial and Terrestrial radiations – Spectral distribution of solar radiation – Depletion of solar radiation – Measurements of solar radiation – Solar collectors – Classification – Liquid flat plate collector – Evacuated tube collector – Solar water heater – Box type solar cooker

Unit II

Solar photo voltaic systems – Semiconductors – Solar cell classification – solar cell, Module, Panel and array construction – Solar PV systems – Solar PV applications.

Unit III

Wind energy – Introduction – Global winds – Local winds – nature of winds – Wind turbine siting – Major applications of wind power – Horizontal axis wind turbine – Environmental aspects – Wind energy programme in India

Unit IV

Biomass Energy – Introduction – useful forms of biomass, their composition and fuel properties – Biomass resources – Biomass gasification – Downdraft type – Updraft type – Biogas production from waste biomass – Availability of raw materials and gas yield - Biomass energy programme in India

Unit V

Geothermal energy – Introduction – Applications – Origin and distribution of geothermal energy – Tidal energy - Origin and nature of tidal energy – Limitations of tidal energy – Ocean thermal energy – Origin and characteristics of resource - Ocean thermal energy conversion technology.

Book for study:

Non-Conventional Energy resources, B.H.Khan, McGraw Hill, 2nd edition, 2009
Unit I : Section 4.1, 4.2, 4.4 – 4.7, 5.1, 5.1.1, 5.1.4, 5.1.7, 5.2 & 5.6.1
Unit II : Section 6.1, 6.3, 6.4, 6.8 & 6.9
Unit III: Section 7, 7.1.1, 7.1.2, 7.2, 7.2.1, 7.3, 7.4, 7.7.1, 7.12 & 7.13
Unit IV: Section 8, 8.2, 8.3, 8.6, 8.6.1, 8.6.2, 8.9, 8.9.6 & 8.11
Unit V : Section 9, 9.1, 9.2, 10.1, 10.1.1, 10.1.2, 10.3, 10.3.1, 10.3.2

Books or reference:

1. Non Conventional energy sources, G.D. Roy, Khanna publications
2. Solar energy utilization, G.D.Roy, Khanna publications

Course Name : Bachelor of Science
Discipline : Physics
CHOICE BASED CREDIT SYSTEM

VALUE ADDED COURSES

Course Name	Internal Mark = Total Mark	Subject Code
CERTIFICATE COURSE IN SOLAR ENERGY	100 = 100	V1PH1
CERTIFICATE COURSE IN MICROPROCESSOR AND ITS APPLICATIONS	100 =100	V1PH2

Hours :	CERTIFICATE COURSE IN SOLAR ENERGY	Credit :

Subject Code : V1PH1

Objectives

- To understand the fundamentals of conventional Energy Sources and non-conventional Energy Sources.
- To study about Sun and Solar spectrum.
- To learn about Solar collector, Solar water heater and Solar Cookers.
- To learn about Solar Furnaces, Solar Dryer and Solar Distillation.
- To study the Solar PV systems and their applications.

Unit I Fundamental of Energy – science and technology

Energy Consumption & Standard of living - Classification energy sources – Consumption trends of primary energy Sources – Importance of Non Conventional Energy Sources - Advantage and disadvantage of conventional Energy Sources - Salient Features of Non Conventional Energy Sources.

Unit II Solar Energy - Basics

The Sun as a Source of energy – The Earth – Sun, Earth radiation Spectrum – Measurements of Solar radiation.

Unit III Solar Thermal System

Solar Thermal System – Solar collector – Solar water heater – Solar Cookers

Unit – IV Solar Thermal System

Solar Furnaces - Solar Green house - Solar Dryer – Solar Distillation - .

Unit – V Solar Photovoltaic System

Solar Photovoltaic systems – Solar cell fundamentals – Solar cell, Module, Panel and Array construction – Solar PV systems – Solar PV Applications.

Text Book:

B. H. Khan. ***Non conventional energy sources***. New Delhi: Tata Mcgraw Hill (P) Ltd. 2006.

Unit I : Chapter 1 – 1.1, 1.3, 1.4, 1.5, 1.8, 1.9
Unit II : Chapter 4 – 4.1, 4.2, 4.3, 4.7
Unit III: Chapter 5 – 5.1, 5.2, 5.6
Unit IV: Chapter 5 – 5.7 - 5.10
Unit V : Chapter 6 – 6.1, 6.4, 6.8, 6.9

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Hours :	CERTIFICATE COURSE IN MICROPROCESSOR AND ITS APPLICATIONS	Credit :

Subject Code : V1PH2

Objectives

- To understand the fundamentals of Microprocessor Systems.
- To study about 8085 Microprocessor Architecture and Pin Details.
- To learn about Programming the Microprocessor.

Unit I

Introduction to Microcomputer Systems: Micro Computers – Number System – Review of Digital Circuits – Evolution of Microprocessor – Advantages of Microprocessor Systems.

Unit II

8085 Microprocessor Architecture and Pin Details: concept of a Program – Basic Operations – Internal Architecture – Execution of an Instruction – Arithmetic and Logical Operations – Registers – Interrupt and Serial I/O – Pin Details of the Microprocessor 8085.

Unit III

Programming the Microprocessor – I: Instruction Set – Data Transfer Operations – Arithmetic Operations – Program Examples.

Unit IV

Programming the Microprocessor – I: Logical Operations – Branching Operations – Program Examples. Programming the Microprocessor – II: Introduction – Data Transfer Instruction – Arithmetic Instructions.

Unit V

Programming the Microprocessor – II: Logical Instructions – Subroutine and Stack Programming Exercises: Eight bit Addition – Eight bit Subtraction – Block transfer of data – Finding the biggest value in a block of data.

Text Book:

R.Theagarajan, S. Dhanasekaran and S. Dhanapal. ***Microprocessor and Its Applications***. New Delhi: New Age International (P) Limited Publishers; 1997.

Unit I	:	Chapter 1 – 1.1, 1.2, 1.3, 1.4, 1.5
Unit II	:	Chapter 2 – 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8
Unit III	:	Chapter 3 – 3.1, 3.2, 3.3, 3.4
Unit IV	:	Chapter 3 – 3.5, 3.7, 3.8 and Chapter 4 – 4.1, 4.2, 4.3
Unit V	:	Chapter 4 – 4.4, 4.5 and Chapter 5 – 5.1, 5.2, 5.4, 5.6

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