Course Name : Bachelor of Science
Discipline : Physics
CHOICE BASED CREDIT SYSTEM
(For those who join in June 20122 and after)

III year B.Sc. PHYSICS

Semester	Part	Subject Name	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
V	Core 6	Analog Electronics	4	4	25+75=100				✔					✔			U2PHC51/ **U24PHC51**	No Change
	Core 7	Optics & Spectroscopy	4	4	25+75=100				✔					✔			U2PHC52/ **U24PHC52**	No Change
	Core Lab 3	**LAB :**General Physics	3	-	-				✔					✔	✔	✔	-	-
	Core Lab 4	**LAB :** Electronics	3	-	-				✔					✔	✔	✔	-	-
	Core	Project & Area Study	2	-	-				✔					✔	✔	✔	-	-
	Allied	General Chemistry-III	4	4	25+75=100												U2CHA5X3/ **U24CHAX51**	No Change
	Allied Lab	**LAB:** Organic Analysis	2	-	-												-	-
	SBS 3	Electrical Wiring	2	2	25+75=100				✔						✔		U1PHS51/ **U24PHS51**	No Change
	SBS 4	Physics of Human Anatomy	2	2	25+75=100				✔							✔	U1PHS52/ **U24PHS52**	No Change
	NME 1	Basic Physics	2	2	25+75=100				✔					✔			U2PHN51/ **U24PHN51**	No Change
	SBE	**Employability Skills**	2	1	25+75=100											✔	**U24PS51**	**New**
	Total		**30**	**19**														

VI	Core 8	Atomic & Nuclear Physics	4	4	25+75=100				✔					✔			U1PHC61/ **U24PHC61**	No Change
	Core 9	Digital Electronics	4	4	25+75=100				✔					✔			U3PHC62/ **U24PHC62**	No Change
	Core 10	Classical & Statistical Mechanics	4	4	25+75=100				✔					✔			U4PHC63/ **U24PHC63**	No Change
	Core Lab 3	**LAB :** General Physics	3	5	40+60=100				✔					✔	✔	✔	U2PHC6P1/ **U24PHCP61**	No Change
	Core Lab 4	**LAB :** Electronics	3	5	40+60=100				✔					✔	✔	✔	U3PHC6P2/ **U24PHCP62**	No Change
	Allied	General Chemistry-IV	4	4	25+75=100												U3CHA6X4/ **U24CHAX61**	No Change
	Allied	**LAB:** Organic Qualitative Analysis	2	2	40+60=100												U1CHA6PX2/ **U24CHAXP 61**	No Change
	SBS 6	Biomedical Instrumentation	2	2	25+75=100				✔							✔	U2PHS61/ **U24PHS61**	No Change
	NME 2	Solar Energy	2	2	25+75=100				✔					✔			U2PHN61/ **U24PHN61**	No Change
	Core	Project & Area Study	2	4	100 (Internal only)				✔					✔	✔	✔	U3PH6PR/ **U24PH6PR**	No Change
	Total		**30**	**36**														

Self-Learning Course:

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

CORE PAPER 6	**ANALOG ELECTRONICS**	Hours : 4
SEMESTER : V		Credit : 4
Contact hours per Week – 4 hours		
Contact hours per Semester – 60 hours	**Subject Code:** U2PHC51/ **U24PHC51**	

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.

TransistorCharacteristics: 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 forstudy:

"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.

CORE PAPER 7	**OPTICS & SPECTROSCOPY**	Hours : 4
SEMESTER : V		Credit : 4
Contact hours per Week – 4 hours		
Contact hours per Semester – 60 hours	**Subject Code:** U2PHC52/ **U24PHC52**	

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, 8threvised 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.

General Chemistry - III

Hours per week: 4 **Credits: 4** **Subject Code:** U2CHA5X3/ **U24CHAX51**

Course Outcome:

CO1: To know the basic requirements of chemical calculation.
CO2: To acquire fundamental knowledge on bonding.
CO3: To get the basic knowledge on coordination compounds
CO4: To gain fundamental knowledge on adsorption and catalysis
CO5: To study the principles of water analysis, and sewage treatment

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:

Units-I & IV

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

Units II & 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 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.

e-Resources:

1. https://www.mlsu.ac.in/econtents/1844_SPOT%20I.pdf
2. https://www.pearson.com/content/dam/one-dot-com/one-dot-com/us/en/higher-ed/en/products-services/course-products/tro-chemistry-4e-info/pdf/chapter10.pdf
3. https://byjus.com/jee/coordination-compounds/
4. https://www.egyankosh.ac.in/bitstream/123456789/30954/1/Unit-7.pdf
5. https://www.vedantu.com/jee-main/chemistry-surface-chemistry
6. https://www.studyadda.com/notes/neet/chemistry/surface-nuclear-chemistry-भतल-और-नभकय-रसयन/adsorption-and-adsorption-isotherm/19355

SKILL BASED PAPER 3	**ELECTRICAL WIRING**	Hours : 2
SEMESTER : V		Credit : 2
Contact hours per Week – 2 hours		
Contact hours per Semester – 30 hours	**Subject Code:** U1PHS51/ **U24PHS51**	

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-Deltaconversion.

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 forstudy

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

SKILL BASED PAPER 4	**PHYSICS OF HUMAN ANATOMY**	Hours : 2
SEMESTER : V		Credit : 2
Contact hours per Week – 2 hours		
Contact hours per Semester – 30 hours	**Subject Code:** U1PHS52/ **U24PHS52**	

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 neurobiophysics and functionof 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

NON MAJOR ELECTIVE 1	**BASIC PHYSICS**	Hours : 2
SEMESTER : V		Credit : 2
Contact hours per Week – 2 hours		
Contact hours per Semester – 30 hours	**Subject Code:** U2PHN51/ **U24PHN51**	

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.

EMPLOYABILITY SKILLS

Course Title : Employability Skills	**Total Hours : 30 Hours**
Course Code : U24PS51	**Total Credits : 1**

COURSE OUTCOMES:

On completing this course, students can/are able to

Cos	CO STATEMENT
CO1:	enhance their skills in solving quantitative aptitude problems
CO2:	expertise themselves in solving verbal and non-verbal reasoning problems.
CO3:	prepare for various public and private sector exams and placement drives.
CO4:	interpret the concepts of LOGICAL REASONING Skills.
CO5:	analyze the problems logically and approach the problems in a different manner

Unit I: Quantitative Aptitude – I **6 Hours**

H.C.F. and L.C.M. of Numbers - Average - Percentage - Profit and Loss - Ratio and Proportion - Time and Work - Time and Distance - Train Speed.

Unit II: Quantitative Aptitude – II **6 Hours**

Area related problems - Problems on Ages - Boat and Stream - Simple Interest - Compound Interest – True discount – Calendar – Clocks - Data Interpretation - Bar Graphs - Pie Chart.

Unit III: Verbal Reasoning – I **6 Hours**

Analogy - Classification – Series - Coding & Decoding - Coded inequality - Blood relations - Direction sense test.

Unit IV: Verbal Reasoning – II **6 Hours**

Number Test - Ranking and Time Sequence Test - Seating arrangements - Alphabet Test - Logical Venn Diagram.

Unit V: General Knowledge **6 Hours**

Abbreviations & Acronyms - Famous Personalities - Important Days (National & International) - Capital Cities and Currencies – Current affairs - Sports – RBI & Banking Terms – Basics of Computers and Internet.

Reference Books:

1. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S Chand Publishing company; Revised edition (21 February 2017).

2. R.S.Agarwal, A modern approach to logical reasoning, S Chand Publishing company; August 2022.
3. R.S.Agarwal, A Modern Approach To Verbal Reasoning (Old Edition), S Chand Publishing company.
4. R.S.Agarwal, Advanced objective general knowledge revised edition, S Chand Publishing company, 2017.

e-Resources:

1. https://www.cuemath.com/numbers/hcf-and-lcm/
2. https://www.geeksforgeeks.org/speed-time-distance-formula-and-aptitude-questions/
3. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://cdn1.byjus.com/wp-content/uploads/2020/06/Boat-Stream-Sample-Questions.pdf
4. https://www.hitbullseye.com/Simple-Interest-and-Compound-Interest.php
5. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://examsdaily.in/wp-content/uploads/2018/09/br.pdf
6. https://testbook.com/objective-questions/mcq-on-direction-and-distance--5eea6a0e39140f30f369e42a
7. https://unacademy.com/content/cat/study-material/data-interpretation-and-logical-reasoning/ranking-and-time-sequence/
8. https://www.toppr.com/guides/computer-aptitude-and-knowledge/basics-of-computers/basic-computer-terminology/

SEMESTER - VI

CORE PAPER 8	**ATOMIC AND NUCLEAR PHYSICS**	Hours : 4
SEMESTER : VI		Credit : 4
Contact hours per Week – 4 hours		
Contact hours per Semester – 60 hours **Subject Code:** U1PHC61/ **U24PHC61**		

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

CORE PAPER 9	**DIGITAL ELECTRONICS**	Hours : 4
SEMESTER : VI		Credit : 4
Contact hours per Week – 4 hours		
Contact hours per Semester – 60 hours	**Subject Code:** U3PHC62/ **U24PHC62**	

Objectives:

To understand different numbersystems and Boolean algebra.

- To get knowledge aboutdifferentlogicgates.
- To studythe differentarithmetic circuits.
- To understand the functioningof flip-flops, counters andRegisters.

UNIT-I: (12hours)

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

UNIT-II: (12hours)

Logicgates: Introduction–The basic gates OR,AND,NOT– TTL logics –Universal logicgates-NAND, NOR- TTL logic– Positive and negative logic.

Combinational logic circuits: Boolean laws and theorems– Sumofproducts method–Truth table toKarnaughmap–Pairs, quads, and octets– Karnaugh simplification– Don't-care conditions– Product of sum method– Product of sum simplification

UNIT–III (12hours)

ArithmeticCircuits: 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– 1to16Demultiplexers–1 of 16 Decoder – BCD to decimal decoder– Seven-Segment decoder- Encoders.

Flip flops: RSflip flops– Gatedflip flops–Edge triggered RS flip flops– Edgetriggered D flip flop – Edge triggered JK flip flop– JK masterslave flip flop.

UNIT–V (12hours)

Registers: Types ofRegisters–Serial in - Serial out Shift Registers– Serial in– Parallel out and parallel in – serial out shift registers.

Counters: Asynchronous counter – Synchronous counter –decadecounters (Mod-5 counter, mod -10 counter)

Books forstudy:

1. Digital Principles andApplications byDonaldLeach, Albert Paul Malvino,Goutam Saha, Tata McGraw 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.

CORE PAPER 10	**CLASSICAL & STATISTICAL MECHANICS**	Hours : 4
SEMESTER : VI		Credit : 4
Contact hours per Week – 4 hours		
Contact hours per Semester – 60 hours	**Subject Code:** U4PHC63/ **U24PHC63**	

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 superiorityof Lagrangianmechanics over Newtonian Approach.
- understand thefundamental postulates and distribution laws ofstatistical mechanics.

UNIT–I **(12hours)**

SpaceandTime–Inertialframes–
Mechanicsofaparticle:Conservationoflinearmomentum– Conservationofangularmomentum– Conservationofenergy–Mechanicsofasystemof particles: Conservation of linear momentum – Conservation of angular momentum – Conservation ofenergy – Constraints – Degrees offreedom underconstraints – Forces of constraint– Difficulties introduced bythe constraints and their removal.

UNIT–II **(12hours)**

Generalized coordinates– Principleof virtual work– D'Alemberts principle – Lagrange's equations from D'Alemberts principle – Applications (SimplePendulum,Compound Pendulum, Atwood's Machine) –Lagrange'sequations in presenceofNon-conservative forces –Hamilton's Principle andLagrange's equations– Superiorityof Lagrangianmechanics overNewtonian Approach.

UNIT–III **(12hours)**

Generalizedmomentumandcycliccoordinates–HamiltonianfunctionH– Physicalsignificance–Hamilton'sequations–Hamilton's equationsindifferentcoordinate system– Simple applications(Harmonicoscillator,motionofaparticle ina centralforcefield,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. ClassicalMechanics – J.C. Upadhyaya, reprint2012, Himalaya Publishing House.
   UnitI: 1.2, 1.4, 1.6, 1.7,2.3
   UnitII: 2.4– 2.7, 2.9, 2.11, 2.12
   UnitIII: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.
   UnitIV: 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, 17thedition, S. Chand & Company pvt. Ltd.

CORE LAB (Major)	**LAB: GENERAL PHYSICS**	Hours : 3
SEMESTER : V & VI		Credit : 5
Contact hours per Week – 6 Hours		
Contact hours per Semester – 45 hours	**Subject Code:** U2PHC6P1/ **U24PHCP61**	

1. Determination ofRefractive Index of the given Small angled prismusing Spectrometer.
2. Determination ofRefractive Index of the given prism by I – I' curvemethod 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 methodusing Spectrometer.
4. Determination ofResolving Power of a grating using Spectrometer.
5. Determination ofthe 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 ofSelf inductance of the coil using Maxwell's bridge (AC method).
9. Determination ofSelf inductance of the coil using Owen's bridge (AC method).
10. Determination ofImpedance & Power factor using LR circuit.
11. Determination ofImpedance & Power factor using CR circuit.
12. Determination ofMutual Inductance of the given coils using Spot Galvanometer.
13. Comparison of Mutual Inductance between two coils using Spot Galvanometer.
14. Determination ofHigh Resistance by leakage method using Spot Galvanometer.
15. Determination ofangle of Acceptance and Numerical aperture of the given Fiber optic cable.

CORE LAB (Major)	**LAB: ELECTRONICS**	Hours : 3
SEMESTER : V & VI		Credit : 5
Contact hours per Week – 6 Hours		
Contact hours per Semester – 45 hours	**Subject Code:** U3PHC6P2/ **U24PHCP62**	

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 ofColpitt 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.

General Chemistry - IV

Hours per week: 4 **Credits: 4** **Subject Code:** U3CHA6X4/ **U24CHAX61**

CO1: To study the basics of chemical kinetics.
CO2: To acquire basic idea about drugs.
CO3: To gain knowledge on chromatographic techniques.
CO4: To understand the classification of proteins, structure of hormones and basics of vitamins
CO5: To study the chemistry of a few useful compounds

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 Hour**

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 –s structure of some sex hormones – oestrone and progesterone. Vitamins – Classification of vitamins – Sources and deficiency diseases of vitamins A, B1, 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.

e-Resources:

1. https://www.vssut.ac.in/lecture_notes/lecture1425072667.pdf
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8046889/
3. https://collegedunia.com/exams/chromatography-chemistry-articleid-4111
4. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMB1102.pdf

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Part III – LAB: Organic Qualitative Analysis

Hours per week: 2 **Credits: 2** **Subject Code:** U1CHA6PX2/ **U24CHAXP61**

Course Outcome

CO1: To acquire knowledge on the analysis of simple organic compounds.
CO2: To understand the basic principles to confirm the presence of saturation/unsaturation and aliphatic/aromatic nature of organic compounds
CO3: To confirm the presence of elements in the organic compounds other than carbon, hydrogen and oxygen
CO4: To get the knowledge on confirming the functional group present in an organic compound by preparing a solid derivative
CO5: To know the fundamental strategies of organic reactions.

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.

e-Resources:

- https://www.youtube.com/watch?v=JAQ060bSZG8
- https://www.youtube.com/watch?v=FUo428guKt0
- https://www.youtube.com/watch?v=9kD9sRAf2TM
- https://www.youtube.com/watch?v=o_Ehw_gFWtc

SKILL BASED PAPER 6	**BIO MEDICAL INSTRUMENTATION**	Hours : 2
SEMESTER : VI		Credit : 2
Contact hours per Week – 2 hours		
Contact hours per Semester – 30 hours	**Subject Code:** U2PHS61/ **U24PHS61**	

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 forstudy:

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

NON MAJOR ELECTIVE 2	**SOLAR ENERGY**	Hours : 2
SEMESTER : VI		Credit : 2
Contact hours per Week – 2 hours		
Contact hours per Semester – 30 hours	**Subject Code:** U2PHN61/ **U24PHN61**	

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

PROJECT & AREA STUDY		Hours : 2
SEMESTER : V & VI		Credit : 4
Contact hours per Week – 2 hours		
Contact hours per Semester – 30 hours	**Subject Code:** U3PH6PR/ **U24PH6PR**	

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.
