

B.Sc. PHYSICS

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	HRS / WEEK	CREDIT	CIA MARKS	SE MARKS	TOTAL MARKS
I	14U1LT1/ LA1/ LF1/LH1/LU1	I	Language-I		6	3	40	60	100
	14UCN1E1	II	English-I		6	3	40	60	100
	14UCH1A1:1	III	Allied – I	Inorganic, Organic and Physical Chemistry – I	5	2	20	30	50
	14UCH1A1P	III	Allied – I	Volumetric Analysis - Practical	3	2	20	30	50
	14UPH1C1	III	Core I	Properties of Matter	4	4	40	60	100
	14UPH1M1P	III	Major Based Elective –I	Properties of Matter: Practical	3	3	40	60	100
	14UCN1VE	IV	Value Education	Value Education	3	3	40	60	100
TOTAL					30	20	240	360	600
II	14U2LT2 / LA2 / LF2/LH2/LU2	I	Language – II		6	3	40	60	100
	14UCN2E2	II	English – II		6	3	40	60	100
	14UCH2A2:1	III	Allied – II	Inorganic, Organic and Physical Chemistry – II	4	2	20	30	50
	14UCH2A2P	III	Allied – II	Organic Analysis - Practical	3	2	20	30	50
	14UPH2C2	III	Core – II	Mechanics	4	4	40	60	100
	14UPH2M2P	III	Major Based Elective-II	Heat and Optical Practical	3	3	40	60	100
	14UPH2N1	IV	Non Major Elective – I #		2	2	40	60	100
	14UCN2ES	IV	Environmental Studies	Environmental Studies	2	2	40	60	100
TOTAL					30	21	280	420	700
III	14U3LT3 / LA3 / LF3/LH3/LU3	I	Language-III		6	3	40	60	100
	14UCN3E3	II	English-III		6	3	40	60	100
	14UMA3A3:2	III	Allied – III	Classical Algebra	7	4	40	60	100
	14UPH3C3	III	Core – III	Acoustics	4	4	40	60	100
	14UPH3M3P	III	Major Based Elective-III	Thermal and Electricity - Practical	3	3	40	60	100
	14UPH3N2	IV	Non Major Elective – II #		2	2	40	60	100
	14UCN3S1	IV	Skill Based Elective-I	Soft Skills	2	2	40	60	100
TOTAL					30	21	280	420	700
IV	14U4LT4 / LA4 / LF4/LH4/LU4	I	Language-IV		6	3	40	60	100
	14UCN4E4	II	English-IV		6	3	40	60	100
	14UMA4A4:2	III	Allied – IV	Calculus and Trigonometry	8	4	40	60	100
	14UPH4C4	III	Core – IV	Thermal and Statistical Physics	4	4	40	60	100
	14UPH4C5P	III	Core – V	Measurement and Calibration - Practical	4	4	40	60	100
	14UPH4S2	IV	Skill Based Elective – II	Nano science	2	2	40	60	100
	14UCN4EA	V	Extension	NCC, NSS, etc.,	-	2	-	-	-
	14UPH4EC1		Extra Credit – I	History of Science	-	4*	-	100*	100*
	14UPH4EC2		Extra Credit – II	Astrophysics	-	4*	-	100*	100*
TOTAL					30	22	240	360	600
V	14UPH5C6	III	Core – VI	Electricity, Magnetism & ElectroMagnetism	5	4	40	60	100
	14UPH5C7	III	Core – VII	Atomic Physics	4	4	40	60	100
	14UPH5C8	III	Core – VIII	Optics	4	4	40	60	100
	14UPH5C9	III	Core – IX	Semiconductor Electronics	4	4	40	60	100
	14UPH5C10	III	Core – X	Solar Energy	4	4	40	60	100
	14UPH5C11P	III	Core – XI	Optics and Numerical Programming - Practical	4	4	40	60	100
	14UPH5M4P	III	Major Based Elective –IV	Electronics and Microprocessor Practical	3	3	40	60	100
	14UPH5S3	IV	Skill Based Elective – III	Scientific Programming in C	2	2	40	60	100
	14UPH5EC3		Extra Credit - III	Mobile Telephony	-	4*	-	100*	100*
TOTAL					30	29	320	480	800
VI	14UPH6C12	III	Core – XII	Wave Mechanics and Relativity	5	4	40	60	100
	14UPH6C13	III	Core – XIII	Digital Electronics & Microprocessor	5	4	40	60	100
	14UPH6C14	III	Core – XIV	Nuclear Physics	5	4	40	60	100
	14UPH6C15	III	Core – XV	Laser and Spectroscopy	4	4	40	60	100
	14UPH6C16P	III	Core – XVI	General Physics and Scientific Programming -Practical	4	4	40	60	100
	14UPH6C17P	III	Core – XVII	Advanced Electronics and Microprocessor - Practical	4	4	40	60	100
	14UPH6S4	IV	Skill Based Elective – IV	Advanced Scientific Programming in C	2	2	40	60	100
	14UCN6GS	V	Gender Studies	Gender Studies	1	1	40	60	100
	14UPH6EC4		Extra Credit – IV	Physics for Competitive Examination	-	4*	-	100*	100*
TOTAL					30	27	320	480	800
GRAND TOTAL					180	140	1680	2520	4200

Non Major Elective Courses offered to the other Departments:

SEM	COURSE TITLE
II	Physics of Home Appliances
III	Medical Physics

* Not considered for Grand Total and CGPA

SEMESTER-I: ALLIED -I
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - I

Course Code : 14UCH1A1:1
Hours/Week : 5
Credit : 2

Max. Marks : 50
Internal Marks: 20
External Marks: 30

Objectives:

- To understand the concept of periodic properties and molecular orbital theory.
- To know the chemistry of biomolecules.
- To study the concept of stereochemistry electrochemistry and photochemistry.
- To learn the principles of separation techniques.

UNIT – I

15 hours

- 1.1 **Periodic properties-** Ionization potential, electron affinity and electro negativity-variation in the periodic table
- 1.2 **Molecular Orbital Theory:** Some important basic concepts of molecular orbital theory - LCAO. Bonding , anti-bonding orbital and bond order – application of MO theory to H₂, He₂, O₂ and F₂ molecules
- 1.3 **Industrial Chemistry:**
Fuel gases – Water gas, Producer gas, L.P.G., Gobar gas and Natural gas. Fertilizers – N.P.K and mixed fertilizers.
#Soap and detergents – An elementary idea of soap and detergent. Cleansing action of soap and detergents#.

UNIT – II

15 hours

- 2.1 **Carbohydrates:**
Classification – Glucose and fructose – Preparation and properties – Sucrose – Manufacture and properties – Starch and cellulose – Properties and uses.
- 2.2 **Amino Acids and Proteins:**
Amino acids – Classification, preparation and properties. Peptides (Elementary treatment) – Proteins – Classification based on physical properties and biological functions.
- 2.3 **Nucleic acid:** DNA and RNA – functions - #Structure of DNA and RNA#.

UNIT – III

15 hours

- 3.1. **Synthetic polymers** – Teflon, Alkyl and Epoxy resins, Polyesters – definitions and uses
Types of polymerization – Thermosetting and thermoplastics.
- 3.2. **Heterocyclic compounds** – Furan, thiophene, and pyridine – Preparation and properties.
- 3.3. **Stereoisomerism:** Optical isomerism – lactic and tartaric acid – Racemic mixture and resolution – Geometrical isomerism –#maleic and fumaric acid#.

UNIT – IV**15 hours**

- 4.1 **Chromatography** – principles of column, paper and thin layer chromatography.
- 4.2 **Photochemistry:** Photochemical reaction – Lambert’s law , Beer’s law – Absorbtion, Extinction Coefficient – The law of Photochemical equivalence, Quantum efficiency, **#Some of Photochemical and their quantum yield#**.
- 4.3 **Phase Rule:**
Phase, Component, Degree of freedom, Phase Rule – Definition. One component system –Water system.

UNIT – V**15 hours**

- 5.1. **Electrochemistry:**
Specific and equivalent conductance – their determination – Effect of dilution on conductivities – An elementary idea about ionic theory – Ostwald’s Dilution Law, Kohlrausch Law, Conductometric titrations.
- 5.2. **pH and Buffer:**
Importance of pH and buffers in the living systems. pH determination by colorimetric and electrometric methods.
- 5.3 **Corrosion:** Types of corrosion, **#Prevention#**.

#_____# Self study

Text books:

1. R.D. Madan, J.S. Tiwari and G.L. Mudhara – A Textbook of First Year B.Sc. Chemistry, S.Chand and Co.
2. P.L. Soni – “Text book of Inorganic Chemistry. S. Chand & Co., New Delhi (1999).
3. P.L. Soni and H.M. Chawla – “Text Book of Organic Chemistry” – 28th Edition, (1999) - Sulthan and Chand company, New Delhi.
4. B.R. Puri, L.R. Sharma and M.S. Pathania, “Principles of Physical Chemistry”, Vishal Publications, Jalandhar, 2002.

UNIT I : Text Book 1,2

UNIT II : Text Book 3

UNIT III : Text Book 3

UNIT IV : Text Book 4

UNIT V : Text Book 4

Books for reference:

1. Bahl and Arun Bahl – “Advanced Organic Chemistry” – 19th Edition., (2005) – Sulthan and Chand company, New Delhi.
2. M.K. Jain – “Organic Chemistry” – 12th Ed., (2003) Sulthan and Chand Company, New Delhi.
3. R.L. Madan, G.D. Tuli, “Simplified Course in Physical Chemistry”, 5th revised and enlarged edition, S.Chand & Co., New Delhi, 2009.

SEMESTER I : ALLIED - I

VOLUMETRIC ANALYSIS - PRACTICAL

Course Code : 14UCH1A1P
Hours / Week : 3
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objectives:

- ❖ To know the basic principles of volumetric analysis
- ❖ To understand the concepts of indicators and equivalent weight

1. Estimation of Sodium Hydroxide

(Na_2CO_3 X HCl X NaOH)

2. Estimation of Hydrochloric Acid

($\text{H}_2\text{C}_2\text{O}_4$ X NaOH X HCl)

3. Estimation of Oxalic Acid

(FeSO_4 X KMnO_4 X $\text{H}_2\text{C}_2\text{O}_4$)

4. Estimation of Ferrous Sulphate

($\text{H}_2\text{C}_2\text{O}_4$ X KMnO_4 X FeSO_4)

5. Estimation of KMnO_4

($\text{K}_2\text{Cr}_2\text{O}_7$ X FAS X KMnO_4)

6. Estimation of Zn by EDTA

(MgSO_4 X EDTA X ZnSO_4)

7. Estimation of Mg by EDTA

8. Estimation of Cu by iodometry

($\text{K}_2\text{Cr}_2\text{O}_7$ X thio X CuSO_4)

9. Estimation of Iodine

($\text{K}_2\text{Cr}_2\text{O}_7$ X thio X I_2)

Book for reference:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons(1997).

SEMESTER I: CORE – I
PROPERTIES OF MATTER

Course Code : 14UPH1C1
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To understand elastic properties and modulus of the materials.
- To study the principles of hydrostatics and hydrodynamics.

UNIT – I Elasticity

12 hours

Hooke's Law- Stress - Strain Diagram - Elastic moduli – Types of elastic constants – Young's modulus- Rigidity Modulus –Bulk Modulus- Relation between elastic constants - Poisson's Ratio -Expression for Poisson's Ratio in terms of elastic constants - Experimental determination of Poisson's Ratio for Rubber.

UNIT -II Bending of beams

12 hours

Bending of beams: Cantilever - Expression for bending moment - Expression for depression - Expression for time period - Experiment to find Young's modulus - #Non uniform bending (Pin and microscope)# - Experimental determination of Rigidity Modulus –Static torsion method.

UNIT – III Surface Tension

12 hours

Definition and dimensions of surface tension – Molecular explanation of surface tension – Angle of contact- Excess pressure inside a liquid drop and soap bubble –Excess pressure inside a curved liquid surface - Capillary rise method-Variation of Surface tension with temperature - Jaegar's Method.

UNIT – IV Viscosity

12 hours

Streamline flow – Turbulent flow –Critical velocity-Reynold's number-Co-efficient of viscosity and its dimension - Rate of flow of liquid in a capillary tube - Poiseuilles' formula - Experimental determination of co-efficient of viscosity of a liquid by Poiseuille's method-Stoke's method.

UNIT –V Diffusion & Osmosis**12 hours**

Diffusion of liquids – Graham’s laws of diffusion in liquids – **#Ficks law of diffusion#** – Analogy between liquid diffusion and heat conduction – Experimental determination of coefficient of diffusion.

Osmosis and osmotic pressure – Laws of osmotic pressure -Experimental determination of osmotic pressure (Berkeley and Hartley method) — elevation of the boiling point – depression of freezing point.

#.....# Self study portion**Text Book :**

R. Murugesan, Properties of Matter, Fifth edition S. Chand & Co Pvt. Ltd., New Delhi, Fifth edition, 1994.

Unit I	Chapter 1	Sections 1.1 - 1.8.
Unit II	Chapter 1	Sections 1.10 - 1.21.
Unit III	Chapter 3	Sections 3.1 - 3.12.
Unit IV	Chapter 2	Sections 2.1 - 2.9.
Unit V	Chapter 4 & 5	Sections 4.1 - 5.6.

Books for Reference:

1. Brij Lal & Subramaniam, Properties of Matter, S. Chand & Co Pvt.Ltd.,New Delhi, Third edition, 1989.
2. Mathur D.S, Elements of Properties of Matter ,Eleventh edition, Shyamlal Charitable Trust, New Delhi, Eleventh edition, 1993.

**SEMESTER I: MAJOR BASED ELECTIVE – I
PROPERTIES OF MATTER - PRACTICAL**

Course Code : 14UPH1M1P
Hours / Week : 3
Credit : 3

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

To develop the experimental skills and determination of the physical coefficients of matters.

1. Determination of the Young's Modulus [Y] of a material using Uniform Bending Method (Scale & Telescope).
2. Compound Pendulum: Determination of the Acceleration due to Gravity and Radius of Gyration [g & K].
3. Determination of Surface Tension [T] by Capillary Rise Method.
4. Determination of the Co-efficient of viscosity [η] of a Liquid by Burette Method
5. Thermal conductivity of a bad conductor using Lee's Disc.
6. Verification of Laws of Transverse Vibrations [I & II laws] in a stretched string using a sonometer.
7. Determination of the Refractive Index [μ] of glass using a prism and a spectrometer.
8. Determination of Resistance and Specific Resistance [R & ρ] using a Meter Bridge.

Books for reference:

1. M.N. Srinivasan, S. Balasubramanian, R. Ranganathan, A text book of practical physics, S.Chand & Sons , reprint 2010.
2. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition, 2007.

SEMESTER-II : ALLIED -II
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY – II
(For B.Sc., Physics)

Course Code : 14UCH2A2:1
Hours/Week : 4
Credit : 2

Max. Marks : 50
Internal Marks: 20
External Marks: 30

Objectives:

- To understand the types of chemical bonding and the importance of coordination compound.
- To have knowledge of types for organic reaction and chemotherapy.
- To study the importance of energetics and colloids.
- To know the concept of chemical equilibrium and catalysis.

UNIT – I

12 hours

1.1. Coordination Chemistry:

Nomenclature of mononuclear complexes – Werner, Sidgwick and Pauling's Theory. Biological role of Haemoglobin and Chlorophyll. Application of complexes in qualitative and quantitative analysis.

1.2. Metallic Bond:

Electron gas, Pauling and Band Theories. Semiconductors – Intrinsic, n and p-type.

1.3. #Compounds of Sulphur: Peracids of sulphur and sodium thiosulphate#.

UNIT – II

12 hours

2.1. Electron Displacement Effects- Inductive effect – Relative strength of aliphatic acid and alkyl amines. Resonance – Condition for resonance - Consequences of resonance - Hyper conjugation – definition and examples- steric effect.

2.2. Aromaticity – Conditions – Huckel's rule - aromaticity of benzene.

2.3. Substitution reactions- Nitration, halogenation, sulfonation and #alkylation of benzene#.

UNIT –III

12 hours

3.1 Halogen containing compounds: Preparation and uses of Dichloromethane, Chloroform, Carbon tetrachloride, DDT, and BHC.

3.2. Chemotherapy: Structure and uses of Sulpha drugs – Sulpha pyridine, Sulpha – thiazole and sulpha diazine –Antibiotics - Structure and uses of penicillin –G and #Chloromycetin#.

3.3. Name reactions: Benzoin, Perkin, Cannizaro, Claisen, Haloform, Carbylamine reactions – Biuret reaction.

UNIT – IV**12 hours****4.1 Solid State:**

Typical crystal lattice – Unit cell. Elements of symmetry. Bragg's equation, Weiss indices, Miller indices, Simple, Body centered and face centered cubes.

4.2 Energetics:

Second Law of thermodynamics - Carnot's Theorem – Carnot Cycle.

4.3 Colloids:

Types of colloidal systems — Classification of colloidal systems, Lyophilic and Lyophobic Sols — properties of colloidal system – Dialysis – Electro-dialysis, Ultrafiltration. #Emulsion –types- preparation- emulsifier- Deemulsification- Gels-types-thixotrophy- synerisis, imbibition#.

UNIT – V**12 hours****5.1 Chemical Equilibrium:**

Criteria of homogeneous and heterogeneous equilibria. Decomposition of HI and PCl_5 .

5.2 Chemical Kinetics:

Order, Rate, Molecularity of the reaction and rate constant, Determination of order of the reaction – Activation energy, Effect of temperature on reaction rate.

5.3 Catalysis:

Catalysis – Types-Importance of catalysis, types of catalysis - Homogeneous and heterogeneous catalysis (Industrial catalyst – catalyst carrier, catalyst promoter, catalyst inhibitor, catalytic poison, activity of catalyst). Theory of catalysis - Intermediate complex theory –#concept of acid-base and enzyme catalysis#.

#_____# Self study

Text books:

1. P.L. Soni – “Text book of Inorganic Chemistry. S. Chand & Co., New Delhi (1999).
2. P.L. Soni and H.M. Chawla – “Text Book of Organic Chemistry” – 28th Ed., (1999) - Sulthan and Chand company, New Delhi.
3. B.R. Puri, L.R. Sharma and S. Pathania – Principles of Physical Chemistry: Shoban Lal Nagin Chand and Co., New Delhi
4. A.K. Srivastava – “Organic Chemistry” – 1st Ed.,(2002) – New Age International Publishers, New Delhi.

UNIT I : Text Book 1

UNIT II : Text Book 2

UNIT III : Text Book 4

UNIT IV : Text Book 3

UNIT V : Text Book 3

Books for reference:

1. R.D Madan – “Modern Inorganic Chemistry” (1987), S. Chand & Co Pvt Ltd.
2. B.R. Puri and L.R. Sharma – Principles of Inorganic Chemistry: Shoban Lal Nagin
Chand and Co., New Delhi (2000).
3. R.L. Madan, G.D. Tuli, “Simplified Course in Physical Chemistry”, 5th revised and enlarged edition,
S.Chand & Co., New Delhi, 2009.

SEMESTER II: ALLIED – II

ORGANIC ANALYSIS - PRACTICAL

Course Code : 14UCH2A2P
Hours / Week : 3
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objectives:

- ❖ To learn the techniques of organic qualitative analysis
- ❖ To learn the Nitrogen containing compounds.

A study of reactions of the following organic compounds:

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Monocarboxylic acid
6. Dicarboxylic acid
7. Amine
8. Monohydric phenol
9. Ester
10. Nitro

The students may be trained to perform the specific reaction like test for element (Nitrogen only), Aliphatic or aromatic, saturated or unsaturated and functional group present and record their observation.

Book for Reference:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons(1997).

UNIT – V Newtonian Mechanics**12 hours**

Frame of reference-Inertial frame-Reduced mass -Conservation of linear and angular momentum of a particle-Conservation of energy of a particle-Centre of mass- Conservation of linear and angular momentum of a system-Conservation of energy of a system-#Basic ideas of degrees of freedom, generalised co-ordinates and generalised momentum#.

#.....# Self study portion

Text Books :

T.B 1 R.Murugesan, Mechanics and Mathematical Physics, S.Chand Publications, Third edition, 2010 .

T.B 2 R. Murugesan, Properties of Matter, S. Chand & Co Pvt. Ltd., New Delhi, Fifth edition, 1994.

Unit I	Chapter 1 & 2	Sections 1.1 - 2.1	T.B 1
Unit II	Chapter 6 & 7	Section 6.10 - 7.5	T.B 2
Unit III	Chapter 6	Sections 6.1 - 6.3	T.B 2
Unit IV	Chapter 4 & 5	Sections 4.1 - 5.4	T.B 1
Unit V	Chapter 6 & 13	Sections 6.1, 13.1 - 13.7	T.B 1

Books for reference:

1. Brijlal Subramaniam, Mechanics and Relativity, S.Chand Publications, Fifth edition, 2010
2. Naryanamorthy, Mechanics- Part – I & II, S.Chand Publications, Sixth edition, 2008
3. D.S.Mathur, Mechanics, S.Chand Publications, Sixth edition, 2013.
4. J.C.Upadhyaya, Classical Mechanics, Himalalaya Publishing House, second edition, 2010

SEMESTER II: MAJOR BASED ELECTIVE – II
HEAT AND OPTICAL PRACTICAL

Course Code : 14UPH2M2P
Hours / Week : 3
Credit : 3

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To have a knowledge and practical experience in determining physical constants
- To learn the measurements in Heat and optical experiments
- To study the characteristics of the semiconductor diodes.

1. Determination of the Young's modulus [Y] of a material using Non-uniform bending (Pin & Microscope).
2. Static Torsion: Determination of the Rigidity Modulus [N] of a material.
3. Melde's String - Determination of the frequency of a vibrator
4. Comparison of the co-efficient of viscosities of two liquids using the Burette method.
5. Determination of the Specific heat capacity [S] of a liquid using Newton's Law of Cooling.
6. Determination of the specific gravity of a solid and liquid using a sonometer.
7. Air wedge: Determination of the thickness of a material by forming interference fringes.
8. Characteristics of a PN Junction Diode and a Zener Diode.

Books for reference:

1. M.N. Srinivasan, S. Balasubramanian, R. Ranganathan, A text book of practical physics, S.Chand & Sons , reprint 2010.
2. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition, 2007.

Text book

S.K. Guptha, Service Manual-Electrical Home Appliances, GT Publications.

Unit I	Chapter 2
Unit II	Chapter 3
Unit III	Chapter 7
Unit IV	Chapter 1 & Chapter 9
Unit V	Chapter 8

SEMESTER III: ALLIED - III
CLASSICAL ALGEBRA
(For Physics and Chemistry Major)

Course Code : 14UMA3A3:2

Hours/Week : 7

Credit : 4

Max. Marks : 100

Internal Marks: 40

External Marks: 60

Objective:

To enhance the power of ideas for solving the problems in Algebra, Theory of equation, Matrices and Differentiation.

UNIT I

21 hours

Algebra: Binomial Series - Exponential series.

UNIT II

21 hours

Theory of equations: Relation between the coefficients and the roots of an algebraic equation - Reciprocal equations.

UNIT III

21 hours

Matrices: #Various types of Matrices# - Rank of a Matrix - Verification of Cayley-Hamilton theorem - Eigen values and Eigen vectors.

UNIT IV

21 hours

Finite differences: #Interpolation# - Linear interpolation - Newton's (Forward and Backward) Interpolation formula - Lagrange's Interpolation formula.

UNIT V

21 hours

Higher Derivatives: The n^{th} derivatives of standard functions - Formation of equations involving derivatives - Problems using Leibnitz theorem.

#..... # Self study portion.

Text Book:

S.Narayanan, R.Hanumantha Rao and T.K. Manicachagom Pillay, P. Kandasamy, Ancillary Mathematics, Volume I, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2007).

UNIT I	Chapter 1	Sections 1.2, 1.3
UNIT II	Chapter 2	Sections 2.2, 2.4
UNIT III	Chapter 3	Sections 3.1 - 3.2
UNIT IV	Chapter 4	Sections 4.1 - 4.3
UNIT V	Chapter 6	Section 6.1

Books for reference:

1. Abdul Rashid, Allied Mathematics, Vijay Nicole Publishing Company (2008).
2. S. Arumugam and A. Thangapandi Isaac, Ancillary Mathematics, New Gamma Publishing house (2002).

UNIT – V Practical Applications**12 hours**

Acoustics – Reverberation – Sabine’s reverberation formula – Reverberation time – requisites for good acoustics – Ultrasonics production of ultrasonic waves – magnetostriction oscillator – Piezo electric oscillator – **#Applications of ultrasonic waves#**.

#.....# Self study portion

Text book

N.Subrahmanyam, Brijlal, Waves and Oscillations , Vikas Publishing House Pvt, Ltd. Second Revised edition, 2011.

UNIT I	Chapter 1	Sections 1.2 - 1.3
UNIT II	Chapter 2	Sections 2.2 - 2.4
UNIT III	Chapter 3	Sections 3.1 - 3.2
UNIT IV	Chapter 4	Sections 4.1 - 4.3
UNIT V	Chapter 6	Sections 6.1 - 6.3

Book for reference:

N.Subrahmanyam, Brijlal, A Textbook of Sound, Vikas Publishing House, Pvt, Ltd, Second Revised edition, 2011.

**SEMESTER III: MAJOR BASED ELECTIVE – III
THERMAL AND ELECTRICITY PRACTICAL**

Course Code : 14UPH3M3P
Hours / Week : 3
Credit : 3

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To develop the skills in thermal and electricity experiments
- To have a knowledge in measurements and determining the physical coefficients
- To learn the circuit construction in the electricity and electronics experiments

Determination of the Young's modulus [Y] of a material using Uniform bending

(Single Optic Lever).

1. Determination of the Co-efficient of viscosity [η] of a highly viscous liquid using Stoke's Method.
2. Joule's Calorimeter: Determination of the Specific heat capacity of a liquid (with Barton's correction).
3. Carey Foster's Bridge: Determination of Resistance and Specific Resistance [R & ρ] of a material.
4. Deflection Magnetometer – M & H.
5. Figure of merit of a Sensitive Galvanometer.
6. Potentiometer: Calibration of a Low Range Voltmeter.
7. Bridge rectifier with π -section filter and Zener diodes.

Books for reference:

1. M.N. Srinivasan, S. Balasubramaniyan, R. Ranganathan, A text book of practical physics, S.Chand & Sons , reprint 2010.
2. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition, 2007.

**SEMESTER III: NON MAJOR ELECTIVE – II
MEDICAL PHYSICS**

Course Code : 14UPH3N2
Hours / Week : 2
Credit : 2

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To acquire knowledge in biomedical instrumentation
- To learn the principles, properties and applications of Laser and Ultrasonics in Medicine

UNIT – I Pressure measurement

6 hours

Eye pressure measurement – Schiötz Tonometer – Goldmann Tonometer – Comparison between Schiötz and Goldmann Tonometers – Urinary bladder pressure – Direct measurement – Cathetar method.

UNIT – II Diagnostic Devices

6 hours

X-ray machine – Comparison between Radiography and Fluoroscopy – Angiography (Basic concept) – #Thermography# – Comparison between normal and cancer cells.

UNIT – III Therapeutic Devices

6 hours

External and internal defibrillators – ac defibrillator – DC defibrillator – Pace maker – Comparison between External and internal pace makers.

UNIT – IV Laser in Medicine

6 hours

Laser – Principle – Properties – General applications – Laser based blood cell counting – Laser surgery – #Advantages#.

UNIT – V Ultrasonics in Medicine

6 hours

Ultrasonics – Properties – Ultrasonic propagation through tissues – Ultrasonic diathermy – B mode Ultrascan – applications of diagnostic ultrasound.

#.....# Self study portion

Text books

T.B 1 John R. Cameron, Medical Physics, University of Wisconsin, Madison & James G. Skofronick, Florida State university, Tallahassee, A wiley-Interscience Publication, John Wiley & sons, Singapore, 2005.

T.B 2 Dr. M . Arumugam, Biomedical Instrumentation, Second Edition, Anuradha Publications PVT, Kumbakonam, 10th Reprint, 2010.

T.B 1 UNIT I	Chapter 6 & 15	Sections 6.3 - 6.6 & 15.10 - 15.13
T.B 2 UNIT II	Chapter 7 & 10	Sections 7.9 - 7.12 & 10.8 - 10.14
T.B 2 UNIT III	Chapter 5	Sections 5.5 - 5.7
T.B 2 UNIT IV	Chapter 7 & 10	Sections 7.2 - 7.4 & 10.9.3 – 10.9.8
T.B 2 UNIT V	Chapter 6	Section 6.5 - 6.8

Book for reference:

Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, Prentice Hall of India, PVT, New Delhi, Second Edition, 2005.

SEMESTER IV: ALLIED - IV
CALCULUS AND TRIGONOMETRY

Course Code : 14UMA4A4:2
Hours/week : 8
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To enhance the power of ideas for solving the problems in Calculus, ODE &PDE, Laplace transforms, Vector analysis and Trigonometry.

UNIT I **24 hours**

Properties of definite Integrals – Integration by parts - Reduction Formulae for $\int x^n e^{ax} dx$, $\int \sin^n x dx$, $\int \cos^n x dx$.

UNIT II **24 hours**

Differential equations of the first order with higher degree - Equations solvable for p - Equations Solvable for y – Equations Solvable for x - Clairaut's form. Laplace transforms of the function e^{at} , e^{-at} , $f(t)$, $f'(t)$, $\cos at$, $\sin at$, $\cosh at$, $\sinh at$, t^n , $e^{-at} f(t)$, where n is a positive integer – Inverse transforms relating to the above standard functions.

UNIT III **24 hours**

Solving ODE of order two with constant coefficients using Laplace transforms - Partial Differential Equations of the first order – Formation of PDE by eliminating arbitrary constants - Standard type of first order equations I, II, III and IV (Clairaut's form) - Lagrange's equations.

UNIT IV **24 hours**

Vector differential operator - Gradient – Direction and magnitude of gradient-Divergence and Curl – Laplacian Operator. Line Integral – Surface integral - Volume integral - Simple Problems.

UNIT V **24 hours**

Trigonometry: Hyperbolic functions – Inverse hyperbolic functions – Separation into real and imaginary parts, Logarithm of complex numbers. Fourier series – Even and Odd function and Half range series.

Text Books:

T.B-1. S. Narayanan, R. Hanumantha Rao and T.K. Manicavachagom Pillay, P. Kandasamy, Ancillary Mathematics, Volume II, S. Viswanathan Publishers Pvt. Ltd., Revised Edition (2007).

T.B-2. S. Narayanan, R. Hanumantha Rao and T.K. Manicavachagom Pillay, P. Kandasamy, Ancillary Mathematics, Volume I, S. Viswanathan Publishers Pvt. Ltd., Revised Edition (2007).

UNIT I	Chapter 1	Sections 11 – 13	T.B-1
UNIT II	Chapter 4	Sections 6.5 and Chapter 6 Sections 1 – 6	T.B-1
UNIT III	Chapter 7	Sections 1 – 6	T.B-1
UNIT IV	Chapter 8	Sections 1.15 – 1.22, 2 – 6 and 9	T.B-1
UNIT V	Chapter 5	Sections 5.4, 5.5 T.B-2 and Chapter 2 Sections 1 – 3	T.B-1

Books for reference:

1. Abdul Rashid, Allied Mathematics, Vijay Nicole publishing Company (2008).
2. T.K. Manicavachagom Pillai, Calculus Volume-I, S. Viswanathan Publishers, Pvt., Ltd. (2004).

SEMESTER IV: CORE – IV
THERMAL AND STATISTICAL PHYSICS

Course Code : 14UPH4C4
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To study about the nature of Heat
- To learn the concepts of thermodynamics and statistical Physics

UNIT-I Kinetic theory of Heat 12 hours

Fundamental assumptions of Kinetic theory of heat-Pressure of a gas-Relation between pressure and Kinetic energy-Kinetic interpretation of temperature-Mean free path- #Two specific heat capacities of gases# - Mayer's relation-Determination of specific heat capacity at constant volume by Joule's method.

UNIT-II Transmission of Heat 12 hours

Conduction process-Thermal conductivity-Measurement of thermal conductivity by Forbe's method and Lee's disc method for bad conductors-Thermal radiation- #Stefan's law# - Newton's law from Stefan's law- Experimental determination of Stefan's constant.

UNIT-III Specific Heat 12 hours

Specific heat capacity of liquids- #Dulong and Pettit's law# - Variation of specific heat and atomic heat with temperature - Newton's law of cooling-Specific heat capacity of liquids-Barton's correction.

UNIT-IV Thermodynamics 12 hours

Statements of Zeroth, first, second and third laws of thermo dynamics- Isothermal and adiabatic processes-Work done during isothermal and adiabatic changes-Carnot's Engine-Carnot's theorem-Entropy-Change of entropy in reversible and irreversible processes.

UNIT-V**Statistical Physics****12 hours**

Phase Space-Micro and Macro States- Fundamental postulates of statistical mechanics- Ensembles (Concept only)- Maxwell Boltzmann statistics - Bose Einstein Statistics-Fermi-Deric Statistics.

#.....# Self study portion**Text books**

T.B 1 Satya Prakash & J.P. Agarwal and S.S. Singhal, Heat Thermodynamics and Statistical Physics, Pragati Prakasan, Second edition, 2010.

T.B 2 Brijlal and N. Subramaniam, Heat and Thermodynamics, S. Chand & Co, New Delhi, First edition, 2002

UNIT I	Chapter 6	Sections 6.1 - 6.11	T.B 1
UNIT I	Chapter 1 - 4	Sections 1.25 - 4.10	T.B 2
UNIT II	Chapter 8 & 15	Sections 8.1 - 8.22 & 15.1 -15.12	T.B 2
UNIT III	Chapter 14	Sections 14.1 -14.5	T.B 2
UNIT IV	Chapter 4 & 5	Sections 4.2 - 4.29 & 5.2 -5.6	T.B 2
UNIT V	Chapter 9 -12	Sections 9.7 - 12.8	T.B 2

Books for reference:

1. J.B. Rajam and C. L. Arora, Heat and Thermodynamics, S. Chand & Co, New Delhi, First edition, 2000.
2. Sharma and Sarkar, Thermodynamics and Statistical Physics, Himalaya publishers, Mumbai, First edition, 2002 .
3. R. Murugesan, Kiruthiga Sivaprasath, Thermal Physics, S.Chand & Co, First edition, 2002

SEMESTER IV: CORE – V
MEASUREMENT AND CALIBRATION PRACTICAL

Course Code : 14UPH4C5P
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To learn the measurements and calibration techniques through properties of matter, heat, optics and electricity experiments
1. Determination of the Young's modulus [Y] of a material: Cantilever Depression (Scale and Telescope).
 2. Determination of Static Torsion using Searle's Apparatus.
 3. Determination of the Co-efficient of viscosity [η] of a highly viscous liquid using Searle's Viscometer.
 4. Finding the emissivity of a surface using Newton's Method of Cooling.
 5. Determination of the EMF of Thermocouple – Direct Deflection Method.
 6. Calibration of an Ammeter using a Potentiometer.
 7. Determination of wavelengths of White Light using a Grating and a Spectrometer (Normal Incidence Method).
 8. Determination of the Band Gap Energy [E_g] of a thermistor using a Post Office Box.

Books for reference:

1. M.N. Srinivasan, S. Balasubramaniyan, R. Ranganathan, A text book of practical physics, S.Chand & Sons , reprint 2010.
2. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition, 2007.

**SEMESTER IV: SKILLED BASED ELECTIVE – II
NANO-SCIENCE**

Course Code : 14UPH4S2
Hours / Week : 2
Credit : 2

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To acquire knowledge about the Properties and structure of nano materials
- To study about fabrications and characterization of nano materials
- To learn the evaluation techniques of nano materials through microscopy

UNIT-I Nano Technology 6 hours

Nanomaterials - #basis of nanomaterials# - Nanotechnology - four generations of Nano-technology - thermal, optical, electrical and magnetic properties of nanomaterials- Elementary ideas of Nano structures.

UNIT-II Methods of Nano Materials 6 hours

Classification of Nano materials - technique of preparation - bottom up methodology (Sol-Gel preparation technique) - Top down methodology - fullerenes - Properties of fullerenes.

UNIT-III Carbon Nano Tubes 6 hours

Types of carbon Nanotubes -single walled (SWNT) Nanotubes - multi walled (MWNT) Nanotubes - properties - kinetic property - electrical property - Chemical, mechanical applications – current applications.

UNIT-IV Quantum dots, wire and well 6 hours

Quantum dot – fabrication –optical properties – quantum dot for tumor targeting –quantum wire –quantum well – fabrication – #applications#.

UNIT-V**Evaluation Techniques****6 hours**

Scanning Probe Microscope - Types -Tunnelling Electron Microscope (TEM) -Atomic Force Microscopy(AFM) - Scanning Tunneling Microscopy (STM).

#.....# Self study portion**Text book:**

S. Shanmugam, Nano Technology, MJP Publishers, Second edition, 2010.

UNIT I	Chapter 1 & 2	Sections 1.2 - 1.3 & 2.2 -2.6
UNIT II - IV	Chapter 2 & 3	Sections 2.8 - 2.10 & 3.1 -3.5
UNIT V	Chapter 8 & 9	Sections 8.2 - 8.3 & 9.1 -9.3

Books for References:

KK. Chattobpadhyay, Introduction to Nano Science and Technology, PHI, New Delhi, 2011.

SEMESTER IV: EXTRA CREDIT - I
HISTORY OF SCIENCE

Course Code : 14UPH4EC1
Hours / Week : --
Credit : 4

Max. Marks : 100
Internal Marks : --
External Marks : 100

Objective:

- To provide a more conventional history, with the emphasis on the character and philosophy of the period, the new ideas or methods that emerged during the period, and the major advances in each branch of science or technology.

UNIT – I Science in the seventeenth century

Heat as a fluid – Dr. Black & James Watt – Count Rumford and Heat as motion Benjamin Franklin – Coulomb’s law.

UNIT – II Electricity Magnetism & light

Mystery of electricity magnetism – Faraday – the great experimenter – Thomas Alva Edison – James Clark Maxwell – Hertz waves – Young, Fresnel and light waves.

UNIT – III Atoms & Elements

Dalton’s atoms – Avogadro’s Hypothesis – Volta & birth of the battery – Davy’s electrochemistry – Mendeleev’s periodic table – Joule’s measurement.

UNIT – IV Life Science

Charles Darwin – Voyage of Beagle – Pre Darwinians evolution – Descent of man – the Neanderthal mystery – Pavlov & the Brain – Birth of cell theory – Pasteur’s germ theory – Robert coche – finding causes of Disecus.

UNIT – V Microbiology

The Double Helix model of DNA – RNA story – Genetic code – cloning – viruses – Birth of genetic engineering.

Text book:

Ray Spangenburg and Diane K. Moser, The History of Science from 1946 to the 1990's, Universities Press, 2010.

UNIT I	Chapter 1	Sections 1.1 - 1.9
UNIT II	Chapter 3	Sections 3.8 - 3.10
UNIT III	Chapter 5	Sections 5.2 - 5.9
UNIT IV	Chapter 6	Sections 6.2 - 6.9
UNIT V	Chapter 8	Sections 8.1 - 8.10

Book for reference:

Ray Spangenburg and Diane K. Moser, The History of Science in the Eighteenth Century, The History of Science in the Nineteenth Century, Universities Press, 2009.

SEMESTER IV: EXTRA CREDIT – II ASTROPHYSICS

Course Code : 14UPH4EC2
Hours / Week : --
Credit : 4

Max. Marks : 100
Internal Marks : ---
External Marks : 100

Objective:

- To study about origin of universe and its expansion, star and solar system, earth and moon and components of telescopes.

UNIT – I Universe

Contribution of Chinese, Indian and Islamic civilization to astronomy- Nobel Prize to astronomers- difference among astrology, astronomy and astrophysics.

Origin of universe –age of universe –expansion of universe –cosmic background radiation - cosmic inflation –formation of first galaxies and stars –string theory –size of universe –Black holes –dark energy – different types of galaxies –Milky way –nebula –fate of the universe.

UNIT – II Stars

Why do stars shine? – composition of stars –why are stars round –number of stars in the galaxy – measurement of stars luminosities –measurement of star distance –light years –determination of mass of the stars – size of the stars – age of the stars –age of the oldest star –different kind of stars –evolution of stars –supernova –binary stars (double stars) – constellation.

UNIT – III Solar system

Formation of solar system – age of Sun –Sun’s future – future of earth when the sun dies – sun spots – mass of the sun – solar wind – flight time of light from Sun to Earth – brown dwarf – Pluto no longer a planet – comets

UNIT – IV Earth and Moon:

Size of the earth – measurement of mass of earth – age of earth –Origin of water on the earth – Origin of Oxygen in our atmosphere – Reasoning of Seasons – Green house effect

Origin of moon – dark areas on the moon – lack of atmosphere in moon – waning / waxing of moon

UNIT – V Telescope

Difference between reflecting and refracting telescopes – common optical telescope configuration – measurement of the performance of a telescope – shape and construction of telescope mirrors – Schmidt telescope – resolving power of telescope – atmosphere degradation of telescope image – advantages of observation from space – working of radio telescope – working of gamma ray telescope.

Text book:

Pierre-Yves Bely, Carol Christian and Jean-Rene Roy, A Question and Answer Guide to Astronomy, Cambridge University Press, First South Indian Edition, 2011.

UNIT I & IV Chapter 2

UNIT II & III Chapter 1

UNIT V Chapter 3

Books for reference:

1. N. Subrahmanyam, Brij Lal and M. N. Avadhanulu, A Text Book of Optics, S. Chand, New Delhi, 23rd Edition, 2006
2. G.D. Rai, Solar Energy Utilization, Khanna Publishers, 8th edition, 2005

SEMESTER V: CORE – VI
ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM

Course Code : 14UPH5C6
Hours / Week : 5
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To study the static characteristics of electric charges, electromagnetic effect, AC circuits and magnetic properties of materials

UNIT – I Electrostatics and Condensers

15 hours

Fundamentals of Electrostatics – **#Electric field#** – Electric Potential - Coulomb's law - lines of forces - Properties – Gauss theorem - electric intensity due to a charged sphere and cylinder – mechanical force on unit area of a charged surface.

Principle of a capacitor – capacity of a spherical capacitor – Energy stored in a charged conductor– loss of energy due to sharing of charges between two charged conductors.

UNIT – II Magnetic Properties of Materials

15 hours

Magnetic field – Magnetic induction – Intensity of Magnetisation – Magnetic permeability – susceptibility – **#properties of para, dia, and ferromagnetic materials#** –curie point- curie temperature-hysteresis – Retentivity – Coercivity – Experiment to draw B-H curve by magnetometer method –loss of energy per cycle.

UNIT–III Magnetic Effect of Electric Current and Electrical Measurements 15 hours

Biot-Savart's law – Magnetic intensity at a point due to a current carrying straight conductor, axis of a circular coil and solenoid – Moving coil ballistic galvanometer – damping correction- **#Ampere's circuital law#.**

Carey Foster's bridge – specific resistance – Potentiometer – Principle – Ammeter calibration. – Calibration of low range and high range voltmeter using potentiometer.

UNIT – IV Electromagnetic Induction**15 hours**

Laws of electromagnetic induction – Lenz law – Flemings right hand rule– self inductance - self inductance of a long solenoid – Determination of self inductance – Anderson’s method - Mutual inductance – Experimental determination of mutual inductance- Coefficient of coupling –Three Phase AC generator

UNIT – V Alternating Currents**15 hours**

Peak value, Mean value and RMS value of an alternating current– form factor - AC circuit containing inductance ,resistance and capacitance LC series and Parallel – LCR in series – Parallel – Comparison between series and parallel resonance circuits– The Q factor- Power in AC circuit containing resistance ,inductance and capacitance– choke coil.

#.....# Self study portion**Text book:**

R.Murugesan, Electricity and Magnetism, S.Chand & company, Seventh Revised Edition, 2008

UNIT I	Chapter 1 - 4	Sections 1.1, 2.12, 3.1, & 4.1 - 4.11
UNIT II	Chapter 15	Sections 15.1 - 15.19
UNIT III	Chapter 7 & 10	Sections 7.1 - 7.2 & 10.1 -10.17
UNIT IV	Chapter 11 & 14	Sections 11.1 - 11.10 & 14.1 -14.3
UNIT V	Chapter 13	Sections 13.1 - 13.6

Book for reference:

Brijlal and N.Subramaniam, Electricity and Magnetism, S.Chand & company,New Delhi 1995.

**SEMESTER V: CORE – VII
ATOMIC PHYSICS**

Course Code : 14UPH5C7
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To study about the properties of positive rays, photo electric effect and atom model.
- To study about Fine Structure of Spectral Lines and X-rays.

Unit – I Positive ray analysis 12 hours

Production and #properties of positive rays# – Positive Rays Analysis - Thomson's Parabola method – Aston and Bainbridge Mass spectrographs – Critical Potentials: Franck and Hertz's experiment.

UNIT –II Photo Electricity 12 hours

Photoelectric emission – laws – Richardson & Compton experiment -Einstein's Photoelectric equation and its verification by Millikan's experiment – Photoelectric cells and applications: Photomultiplier – exposure meter in photography –Sound reproduction in films – Automatic operation of street light.

UNIT – III Vector atom model 12 hours

Distinct features of Vector atom model - Various quantum numbers - L-S and j-j couplings – #Pauli's exclusion principle# – magnetic dipole moment of electron due to orbital and spin motions – Bohr magneton – Paschen-Back effect – Stern and Gerlach experiment.

UNIT – IV Fine Structure of Spectral Lines 12 hours

Selection rules – intensity rule and interval rule – Fine Structure of sodium D lines – hyperfine structure – Zeeman effect – Larmour's theorem – Debye's quantum mechanical explanation of the normal Zeeman effect – Quantum mechanical explanations – Anamolous Zeeman effect.

UNIT – V X- Rays 12 hours

X-Rays - Bragg's Law – Bragg's X-ray spectrometer – Origin and analysis of Continuous and #Characteristic X-ray spectra# –Mosley's law and its importance – Compton effect - Expression for change in wavelength – Experimental verification.

#.....# Self study portion

Text book:

R.Murugesan, Modern Physics, S.Chand & company, 13th revised edition, 2012

UNIT I	Chapter 5 & 6	Sections 5.1 - 5.5 & 6.8 – 6.10
UNIT II	Chapter 8	Sections 8.1 - 8.6
UNIT III	Chapter 6	Sections 6.12 - 6.20
UNIT IV	Chapter 6	Sections 6.22 - 6.26
UNIT V	Chapter 7	Sections 7.1 - 7.14

Books for references:

1. N. Subramaniam and Brijlal, Atomic and Nuclear Physics, Sultan Chand, NewDelhi, 5th edition, 2010.
2. Arther Beiser, Concepts of Modern Physics,x McGraw Hill Ed , 5th edition,1999.

SEMESTER V: CORE – VIII
OPTICS

Course Code : 14UPH5C8
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To study about the principles of geometrical and physical optics.
- To understand the wave properties of light.

UNIT – I Huygen’s Principle and its Applications

12 hours

Huygen’s Theory – Rectilinear Propagation – Refraction of a Plane Wave at a Plane Interface- Total Internal Reflection - Reflection of a Plane Wave by a Plane Surface - Refraction of a Spherical Wave by a Spherical Surface: -Convex surface- Concave surface-Lens Maker’s Formula

UNIT – II Interference

12 hours

Interference of Light Waves – **#Theory of Interference (Analytical Method Only)#** - Fresnel Biprism: Experiment to determine the Wave length of light.
Thin Films-Interference due to films of variable thickness (Air Wedge)-Determination of the thickness of the spacer used to form an Air Wedge - Newton’s Rings – Determination of wavelength.

UNIT – III Interferometry and Holography

12 hours

Michelson’s Interferometer: Construction–Working–Measurement of Wavelength of monochromatic light -Measurement of the thickness of a thin film.
Holography: Principle-Recording of a Hologram- Reconstruction of the Image – Properties of a Hologram - **#Applications of Holography#.**

UNIT – IV Diffraction

12 hours

Diffraction – **#Distinction between Interference and Diffraction#** - Fresnel and Fraunhofer types of Diffraction –Fresnel Diffraction due to a straight Edge.
Fraunhofer Diffraction at a Double slit: Interference –Theory of Plane Diffraction Grating-Determination of the Wavelength of a Spectral Line using a Plane Transmission Grating – Dispersive Power of a Grating

UNIT – V Polarization**12 hours**

Polarization of Light – Production of Polarized Light by Reflection – Brewster’s Law – Application of Brewster’s Law-Polarizer and Analyzer – Malus Law.

Polarization by Double Refraction – Huygen’s Explanation of double Refraction – Optical Activity-Specific Rotation –Laurent’s Half-shade Polarimeter

#.....# Self study portion**Text books:**

T.B 1 Ajoy Ghatak, Optics, Tata Mc Graw Hill, New Delhi , 4th Edition, 2009.

T.B 2 Subrahmanyam, Brij Lal and M. N. Avadhanulu, A Text Book of Optics,
S. Chand, New Delhi, 23rd Edition, 2006

UNIT I	Chapter 12	Sections 12.2 - 12.4.6	T.B 1
UNIT II	Chapter 14 & 15	Sections 14.4 - 14.9.2 & 15.1 - 15.6.3	T.B 2
UNIT III	Chapter 15 & 23	Sections 15.7.1 - 15.8.3 & 23.1 - 23.6	T.B 2
UNIT IV	Chapter 17 & 18	Sections 17.1 - 17.10 & 18.4 - 18.7.7	T.B 2
UNIT V	Chapter 20	Sections 20.1 - 20.26	T.B 2

Books for reference:

R. Murugesan, Optics and Spectroscopy, S.Chand & company Ltd, 5th edition, 2005.

SEMESTER V: CORE – IX
SEMICONDUCTOR ELECTRONICS

Course Code : 14UPH5C9
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To learn about the characteristics of semiconductor devices under forward and reverse biasing
- To study about the functions and different types of amplifiers and oscillators.

UNIT – I Semiconductors and Diodes 12 hours

Intrinsic and Extrinsic semiconductors – n-type and p-type semiconductors – #formulation of p-n junction# – V-I characteristics – Zener diode – V-I characteristics – Zener diode voltage regulator – Half wave rectifier – Bridge rectifier.

UNIT – II Transistors and FET 12 hours

Introduction – npn - pnp transistors – transistor action– Transistor configurations – common base configuration – CB characteristics – CE characteristics – Relation between α and β – Voltage divider biasing.
Field effect transistors – JFET – Principle, construction and working – characteristics of FET – Parameters.

UNIT – III Amplifiers 12 hours

Transistors as an amplifier – CE transistor amplifier – RC coupled single stage amplifier – Power amplifier – Push-Pull amplifier – FET – CS amplifier.

UNIT – IV Oscillators 12 hours

Oscillatory circuit – frequency of oscillator circuit – Barkhausen criterion – Hartley oscillator – Colpitt's oscillator – Phase shift oscillator – Wien's Bridge Oscillator – #Comparison between amplifier and oscillator# – classification of oscillator.

UNIT – V Operational amplifier 12 hours

Ideal characteristics of op-amp – #op-amp parameters# – inverting amplifier – Non-inverting amplifier – integrator – differentiator – Adder – Subtractor – Sign changer – Scale changer.

#.....# Self study portion

Text books:

- T.B 1** V.K.Mehtha, Principle of Electronics, S.Chand Publications, NewDelhi, 3rd edition , 2012
T.B 2 R.S. Sedha, Applied Electronics, S.Chand Publications, NewDelhi, 3rd edition, 2012

UNIT I	Chapter 5 & 6	Sections 5.1 - 5.20 & 6.1 - 6.15	T.B 1
UNIT II	Chapter 8 & 19	Sections 8.1 – 8.12 & 19.1 – 19.10	T.B 1
UNIT III	Chapter 24,26,27 &30	Sections 24.3, 26.4, 27.1 - 27.16 & 30.17	T.B 2
UNIT IV	Chapter 31	Sections 31.1 - 31.28	T.B 2
UNIT V	Chapter 35	Sections 35.1 - 35.13	T.B 2

Book for Reference:

B.L. Theraja, Basic Electronics, S.Chand & company Ltd, 5th edition, 2005

SEMESTER V: CORE – X
SOLAR ENERGY

Course Code : 14UPH5C10
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To understand the concepts of conventional and non conventional energies.
- To learn the utilization of solar energy.

UNIT - I Conventional & Non-Conventional Energy Resources 12 hours

Conventional Energy Resources: Fossil Fuels – Hydro resources – Nuclear resources.

Non-Conventional Energy Resources -Solar Energy - Wind Energy Conversion Systems –

Bio Mass Conversion Technology (Physical method) – Geo thermal Energy – Applications – Ocean Tidal Energy Conversion Schemes – Ocean thermal Energy Conversion.

UNIT –II Solar Radiation Analysis 12 hours

The characteristics of the sun – The solar constant –The electromagnetic energy spectrum-

#Spectral distribution of solar radiation# - Determination of Solar time – Solar radiation data –

Estimation of direct and diffused radiation –Pyrheliometers – Pyranometers.

UNIT- III Solar Collectors & Solar Energy Storage 12 hours

Liquid flat plate Collectors - General Characteristics - Focusing type Solar Collectors - Solar Concentrators and Receiver geometries - General Characteristics of focusing Collectors Solar Energy Storage: Types of Energy Storage – Thermal Storage – Electrical Storage – Chemical Storage.

UNIT-IV Solar Thermal Systems and Refrigeration 12 hours

Solar water heater – Box type Solar Cooker - Solar Furnaces - **#Solar green house#** - Solar Dryer - Solar Distillation- Solar Refrigeration and Air conditioning system-Solar thermo mechanical Systems-Solar thermal water pump-Solar Vapour Compression Refrigeration- Solar Chimney Plant.

UNIT-V Solar Photovoltaic Systems 12 hours

Photovoltaic Principles - Solar Cell Characteristics – Types of Solar Cells - Energy Losses & Efficiency - Solar Photovoltaic Systems- Applications.

#.....# Self study portion

Text books:

T.B 1 B. H. Khan, Non-Conventional Energy Resources, Tata McGraw Hill Education Private Limited, Second Edition, 2012.

T.B 2 G.D. Rai, Solar Energy Utilization, Khanna Publishers, 5th edition 2010.

UNIT I	Chapter 1 & 7-10	Sections 1.13.2, 7.8, 8.4, 9.1&10.1.3	T.B 1
UNIT II	Chapter 3 & 4	Sections 3.1 - 3.7 & 4.1 - 4.4	T.B 2
UNIT III	Chapter 5, 7 & 9	Sections 5.3 -5.5, 7.1 – 7.5 & 9.1 – 9.2	T.B 2
UNIT IV	Chapter 5	Sections 5.2 - 5.11.7	T.B 1
UNIT V	Chapter 6	Sections 6.1 - 6.2.4	T.B 1

Books for reference:

1. S.P. Sukhatme & J.K. Nayak ,Solar Energy, Tata McGraw Hill Education Private Limited, Third Edition, 2011
2. M.P. Agarwal, Solar Energy, S.Chand & Company Ltd, Third edition, 2012.

SEMESTER V: CORE – XI
OPTICS AND NUMERICAL PROGRAMMING: PRACTICAL

Course Code : 14UPH5C11P
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To learn the measurement techniques of optical experiments
 - To develop the skills in numerical programming
1. Determination of the Young's modulus [Y] of a material: Koenig's Method.
 2. Determination of the Cauchy's Constants and the Dispersive power of a glass prism using a Spectrometer.
 3. *i-d curve*: Determination of Refractive Index of Glass using a prism and a Spectrometer.
 4. Determination of Refractive Index of Glass by forming Newton's Rings.
 5. Programming Exercises to Evaluate Simple Mathematical Expressions
 - Conversion of temperature from Celcius to Fahrenheit scal.
 - Computation of area of a triangle given its three sides
 - Computation of area of a triangle given its base and height.
 - Computation of the value of π from the expression $\pi = 4 \tan^{-1}(1)$
 6. Programming Exercises using Control statements [*if, if-else, switch*]
 - To find the biggest of three numbers.
 - To check whether a given number is a floating point input.
 - Finding the solution of a quadratic equation using if-else construct.
 - Finding the solution of a quadratic equation using switch statement.
 7. Programming Exercises using Loops and Nested Loops [*while, do-while, for*]
 - To find the prime numbers in a given range.
 - To find the factorial of a number.
 - Conversion of decimal number into a binary number.
 - To construct the multiplication table from 1 to 20.
 8. Programming Exercises using One-Dimensional Arrays
 - To print the elements of an array.
 - To sort the elements of an array in ascending order.
 - To find the biggest and smallest elements of an array.
 - To construct the Fibonacci series using arrays

Books for reference:

1. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition, 2007.
2. E. Balagurusamy, Programming in ANSI C, Tata Mc_Graw Hill, New Delhi, Sixth Edition, 2013

SEMESTER V: MAJOR BASED ELECTIVE – IV
ELECTRONICS AND MICROPROCESSOR PRACTICAL

Course Code : 14UPH5M4P
Hours / Week : 3
Credit : 3

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To develop the skills in analog and digital experiments
- To practice the assembly language programs of 8085 microprocessor using trainer kit.

1. Frequency Characteristics of a Single Stage R-C Coupled Amplifier.
2. Adder (Inverting and Non-inverting Modes), Subtractor using Op-amp IC741
3. Integrator and Differentiator Circuits using IC741 Op-Amps.
4. Verification of De Morgan's Theorems and the Truth Tables for the Logic Gates (AND,OR, NOT, NAND, NOR & EX-OR) using ICs.
5. Block Transfer of Data using μ p 8085.
6. Eight bit Addition and Subtraction using μ p 8085.
7. Sorting of Data in Ascending order and Descending order using μ p 8085.
8. Conversion of Binary Numbers to BCD coded form.

Books for reference:

1. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition, 2007.
2. B.Ram, Fundamentals of Microprocessors and Microcontrollers, Dhanpat Rai Publications, Reprint 2011.

SEMESTER V: SKILLED BASED ELECTIVE-III
SCIENTIFIC PROGRAMMING IN C

Course Code : 14UPH5S3
Hours / Week : 2
Credit : 2

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To understand the basic concepts of C structure.
- To learn the keywords and functions of C
- To practice the programming exercises

UNIT – I C Basics

6 hours

Importance of C – Basic structure of C Programs – Programming Style – #Basic concepts of flowcharts and algorithms# –conventions used in writing algorithms -Character set, Keywords and Identifiers – Constants – Variables – Data Types – Declarations of Variables –Assigning values of variables

Programming Exercises:

Algorithm and flowcharts for

1. To compute the largest of three numbers.
2. To find the average of n numbers.
3. To generate prime numbers between 1 to n.
4. To find the factorial of a given number n.
5. To find the roots of the quadratic equation.

UNIT – II Operators and Expressions

6 hours

Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional- Arithmetic expressions – Operator Precedence and Associativity

Programming exercises:

1. Conversion of temperature from Celcius to Fahrenheit scale and vice versa.
2. Computation of area of a triangle given its three sides
3. Computation of area of a triangle given its base and height.
4. Computation of the value of π from the expression $\pi = 4 \tan^{-1}(1)$
5. Area and perimeter of a square given its sides.

UNIT – III Input, Output and Control Statements

6 hours

General I/P and O/P functions: scanf & printf functions - format specifiers-Conversion type characters for numeric and qualified data types-Decision making statements: if, if-else, switch, go-to, break and continue statements

Programming exercise:

1. To find the biggest of three numbers.
2. To check whether a given number is a floating point input.
3. Finding the solution of a quadratic equation using if-else construct.
4. Finding the solution of a quadratic equation using switch statement.
5. Finding the area of a triangle using switch statement-given (a) its three sides (b) its base and height.

UNIT – IV Loops and Nested Loops**6 hours**

Loop Constructs – #explanation of these constructs using flow charts# – while loop – syntax of while loop – do-while loop – syntax of do-while loop –for loop –syntax of for loop –initialization, testing and incrementation

Programming exercise:

1. To find the prime numbers in a given range.
2. To find the factorial of a number.
3. Conversion of decimal number into a binary number.
4. To construct the multiplication table from 1 to 20.
5. To check for leap years for the period 1901-2100.

UNIT – V Arrays**6 hours**

One-dimensional array declaration- initializing arrays- storing arrays in memory - accessing elements of an array

Programming exercise:

1. To print the elements of an array.
2. To sort the elements of an array in ascending order.
3. To find the biggest and smallest elements of an array.
4. To find the average of a given set of elements using arrays.
5. To construct the Fibonacci series using arrays.

#.....# Self study portion**Text books:**

T.B 1 E. Balagurusamy, Programming in ANSI C, Tata Mc_Graw Hill, New Delhi , Sixth Edition, 2013

T.B 2 K.R. Venugopal and S.R. Prasad, Mastering C, Third edition, Tata Mc-Graw Hill, New Delhi, 2007

UNIT I	Chapter 1 & 2	Sections 1.2 - 1.9 & 2.2 - 2.10	T.B 1
UNIT II	Chapter 3	Sections 3.2 - 3.10	T.B 1
UNIT III	Chapter 3 & 4	Sections 3.4 -3.5 & 4.2 - 4.13	T.B 2
UNIT IV	Chapter 4	Sections 4.6 - 4.9	T.B 2
UNIT V	Chapter 7	Sections 7.2 - 7.2.4	T.B 2

Book for reference:

PVN. Varalakshmi , Projects Using C, Scitech Publications, Chennai, First edition, 2001

SEMESTER V: EXTRA CREDIT – III
MOBILE TELEPHONY

Course Code : 14UPH5EC3
Hours / Week : --
Credit : 4

Max. Marks : 100
Internal Marks : --
External Marks : 100

Objectives:

- To learn about electronic communication principles
- To learn about the concepts of wireless communication and cellular systems.

UNIT – I Wireless Communication

Wireless communication –applications-mobile and wireless devices-history of wireless Communication -wireless transmission-frequencies for radio transmission and their regulation

UNIT – II Concepts of Wireless Transmission

Multiplexing: space division multiplexing-frequency division multiplexing-time division multiplexing-code division multiplexing-modulation: amplitude shift keying-frequency shift keying-phase shift keying-multicarrier modulation

UNIT – III Spread Spectrum Communication and Cellular System

Spread Spectrum and its advantages-Direct sequence Spread Spectrum – Frequency Hopping Spread Spectrum – Cellular Systems-Medium Access Control-Motivation for MAC-SDMA-FDMA-TDMA-Fixed TDM-CDMA- Comparison of these

UNIT – IV Telecommunication Systems

Different Types of Telecommunication Systems– GSM –Mobile Services–System Architecture – Protocols – Localization and Calling –Handover-Security

UNIT – V GPRS and Bluetooth Services

Data Services – HSCSD – GPRS –Wireless LAN and its advantages and disadvantages - Bluetooth – User Scenarios – Architecture: Networking and Protocol Stack

Text book:

Jochen Schiller, Mobile Communication, Pearson, New Delhi, Second Edition, 2004

SEMESTER VI: CORE – XII
WAVE MECHANICS AND RELATIVITY

Course Code : 14UPH6C12
Hours / Week : 5
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To study about the fundamentals of wave mechanics
- To learn the theories of relativistic mechanics

UNIT – I Inadequacy of Classical theory 15 hours

Black body radiation – difficulties with classical theory of black body radiation – Planck's hypothesis – Planck's radiation formula- difficulties with classical theory of specific heat of solids – Einstein's theory of specific heat – the Frank-Hertz experiment – application of Wilson-Sommerfeld: Quantization rule for the harmonic oscillator and its limitation.

UNIT – II Foundations of Wave Mechanics 15 hours

Dual nature of matter – #evidences of the existence of matter waves# – Davison and Germer's experiment – G.P. Thomson's experiment – velocity of DE-Broglie wave – Wave packet – Group velocity – Phase velocity – Uncertainty principle – non-existence of the electrons in the nucleus.

UNIT – III Formulation of Wave Mechanics 15 hours

Operators – Basic definitions – orthonormal functions – Eigen functions and Eigen values – Hermitian operator – Postulates of Quantum mechanics – Measurability of observables – Superposition state and probability – Expansion theorem – Ehrenfest's theorem.

UNIT – IV Schrödinger's Wave Equation 15 hours

Equation of motion of matter wave – time independent Schrodinger equation – Schrödinger equation for a free particle – time dependent Schrödinger equation – physical interpretation of wave function – solution of Schrödinger equation – stationary states – expectation values of dynamical quantities – Probability current density.

Unit – V Relativity 15 hours

Galilean transformation – Michelson-Morley experiment – #the Postulates of special theory of relativity# – Lorentz transformation - velocity transformation – length contraction – time dilation – simultaneity – Mass in relativity – mass and energy.

#.....# Self study portion

Text books:

T.B 1 Sathya Prakash and G.K. Singh, Quantum Mechanics, First edition,
Kedar Nath Ram Nath & Co,1991

T.B 2 G. Aruldas and P. Rajagopal, Modern Physics, Second edition,
Prentice Hall of India, 2005.

T.B 3 G. Aruldas, Classical Mechanics, Second edition, Prentice Hall of India,2008

UNIT I	Chapter 1	Sections 1.3 - 1.14	T.B 1
UNIT II	Chapter 2 & 4	Sections 2.2 - 2.10 & 4.1 - 4.4	T.B 1
UNIT III	Chapter 5	Sections 5.1 - 5.9	T.B 2
UNIT IV	Chapter 2	Sections 2.12 - 2.18	T.B 1
UNIT V	Chapter 10	Sections 10.1 - 10.11	T.B 3

Book for Reference:

R. Murugesan, Modern physics, S.Chand & Company Ltd, 4th edition, 2005

UNIT – V Intel 8085 Microprocessor & Programs**15 hours**

Introduction to microprocessor –Architecture of 8085 – Pin diagram - Addressing modes - Instruction format – Instruction set.

8- bit addition, subtraction, multiplication & division - Ascending and Descending orders – Largest number in an array – Sum of a series of 8- bit numbers, 16 bit addition.

#.....# Self study portion**Text books:**

T.B 1 V.Vijayendran, Introduction to Integrated electronics(Digital & Analog), S.Viswanathan, Printers & Publishers Private Ltd, Reprint 2008.

T.B 2 P.S.Manoharan, Microprocessors & Microcontrollers, Charulatha Publications, 1st edition, 2011.

T.B 3 B.Ram, Fundamentals of Microprocessors and Microcontrollers, Dhanpat Rai Publications, Reprint 2011.

UNIT I	Chapter 1 - 4	Sections 1.1 - 4.20	T.B 1
UNIT II	Chapter 5 & 6	Sections 5.1 - 6.23	T.B 1
UNIT III	Chapter 7, 8 & 16	Sections 7.1 – 8.18 & 16.1 -16.13	T.B 1
UNIT IV	Chapter 9 &10	Sections 9.1 - 10.19	T.B 1
UNIT V	Chapter 1	Sections 1.10 - 1.11	T.B 2
UNIT V	Chapter 6	Sections 6.21 - 6.27	T.B 3

Books for References:

1. V.Vijayendran, Digital Fundamentals, S.Viswanathan, Printers & Publishers Private Ltd, 4th edition, 2011.
2. V.Vijayendran, Fundamentals of Microprocessor 8085, S.Viswanathan, Printers & Publishers Private Ltd, 3rd edition,2010 .

**SEMESTER V: CORE – XIV
NUCLEAR PHYSICS**

Course Code : 14UPH6C14
Hours / Week : 5
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To understand nuclear structure and its radiations.
- To study nuclear reactions and elementary particles.
- To learn the concepts of particle accelerators and Detectors

UNIT – I Nuclear Structure

15 hours

Discovery of nucleus – Rutherford α – scattering experiment – classification of nuclei – properties of nucleus: nuclear size – nuclear size mass – nuclear density – charge – spin – dipole moment.

Binding energy – nuclear stability – #mass defect and packing fraction# – nuclear forces – Meson theory of nuclear forces – liquid drop model.

UNIT – II Radioactivity and Radiations

15 hours

#Properties of α , β and γ rays# – Soddy Fajan's law – Radioactive law of disintegration – decay constant – half life period – mean life period – law of successive disintegration – radioactive dating – age of the earth – Radiocarbon dating.

Range of α particles – Bragg's experiment to determine range of α -particle – Geiger Nuttal law – Beta ray spectra – violation in β -decay – K-electron capture – Origin of γ ray – interaction of γ rays with matter - Nuclear isomerism – Internal conversion.

UNIT – III Particle accelerators and Detectors

15 hours

Linear accelerator – cyclotron – synchrocyclotron – Betatron – Proton synchrotron.

Ionisation chamber – proportional counter – G.M. Counter – Scintillation counters – Wilson cloud chamber.

UNIT – IV Nuclear fission, Fusion and transmutation**15 hours**

Nuclear Fission – energy released in fission – chain reaction – nuclear reactor – power reactor –
Nuclear Fusion – sources of stellar energy – thermonuclear reaction – controlled thermonuclear
reactions.

Nuclear transmutations – transmutations by α – particle – protons – neutrons and electrons.

UNIT – V Nuclear Reactions and elementary particles**15 hours**

Nuclear reactions – types of nuclear reactions – conservation laws – energy balance in nuclear
reactions and Q value.

Classification of elementary particles – particles and antiparticles – fundamental interactions –
quantum numbers – conservation laws.

#.....# Self study portion

Text book:

K. Ilangoan, Nuclear Physics, MJP Publishers, Chennai, 1st edition, 2012.

UNIT I	Chapter 1	Sections 1.3.1 - 1.10.2
UNIT II	Chapter 2 & 3	Sections 2.2 - 3.3.6
UNIT III	Chapter 4, 5 & 8	Sections 4.3.1 - 5.13 & 8.4 - 8.9
UNIT IV	Chapter 10	Sections 9.1 - 10.19
UNIT V	Chapter 1	Sections 10.2 - 10.5.4
UNIT V	Chapter 9 & 12	Sections 9.3 - 9.3.3 & 1.2 -12.6

Books for reference:

1. D.C.Thayal, Nuclear Physics, Himalaya Publisher house, 2nd edition, 2011.
2. Sathyaprakash, Nuclear Physics, S.Chand Publisher, 2nd edition, 2005.
3. S.B.Patel, Nuclear Physics, Wiley Eastern Publications, 1st edition, 1992.

SEMESTER VI: CORE – XV
LASER AND SPECTROSCOPY

Course Code : 14UPH6C15
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To understand the principles, production and applications of Laser.
- To understand the concepts of Infra red, Microwave, Raman Spectroscopy

UNIT – I LASER FUNDAMENTALS 12 hours

Spontaneous and stimulated emission – Einstein's Coefficients – Population inversion – Metastable states - Pumping methods: Optical, Electrical pumping and Direct conversion – pumping schemes: Two level and three level pumping scheme.

UNIT – II TYPES AND APPLICATIONS OF LASER 12 hours

Types of Lasers: Ruby Laser – Helium-Neon Laser - CO₂ Laser – Semiconductor Laser – Applications: Scanners – Compact discs – Holography.

UNIT – III INFRA – RED SPECTROSCOPY 12 hours

Range of I.R. – Theory of IR absorption spectroscopy – Diatomic molecule as harmonic oscillator - anharmonic oscillator – linear & symmetric top molecules – Double beam I.R.Spectrometer – #Limitation of I.R.Spectroscopy#.

UNIT – IV MICROWAVE SPECTROSCOPY 12 hours

Theory of microwave spectroscopy – Diatomic molecule as a Rigid Rotator – Microwave spectrometer – Application: Carbon monoxide and HCl molecules – structure determination of Carbon Oxysulphide (OCS) molecule.

UNIT – V RAMAN SPECTROSCOPY 12 hours

Raman Effect - Characteristic properties of Raman lines – Mechanism of Raman spectra – Classical and quantum theory – Difference between IR and Raman spectra — Raman spectrometer – #Applications of Raman spectroscopy#.

#.....# Self study portion

Text books:

T.B 1 M.N.Avadhanulu, An introduction to Lasers theory and Applications, S.Chand Publication, 1st edition, 2011.

T.B 2 Gurdeep R. Chatwal & Sham K.Anand, Spectroscopy (Atomic and Molecular), Himalaya Publishing House, 5th edition, 2011.

UNIT I	Chapter 1	Sections 1.1 - 1.2	T.B 1
UNIT II	Chapter 2 & 5	Sections 2.1 - 2.5 & 5.9 -5.11	T.B 1
UNIT III - V	Chapter 2	Sections 2.30 -2.99	T.B 2

Books for reference:

1. Dr. Kaur, Spectroscopy, Pragathi prakashan, 9th edition, 2014.
2. B.B. Laud, Laser and non-linear optics, New age International Publishers, 2nd edition 2008.

SEMESTER VI: CORE – XVI
GENERAL PHYSICS AND SCIENTIFIC PROGRAMMING: PRACTICAL

Course Code : 14UPH6C16P
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To practice the determination of coefficient and measurement of physical quantities in optical, electricity and magnetic experiments
 - To practice the programming concepts in C
1. *i-i'* curve: Determination of Refractive Index of Glass using a prism and a Spectrometer.
 2. Determination of Refractive Index of a Liquid by forming Newton's Rings.
 3. Potentiometer: Calibration of a High Range Voltmeter.
 4. Vibration magnetometer: Determination of M & H.
 5. Programming Exercises using Two-Dimensional Arrays
 - To accept the elements and print a two dimensional array.
 - Trace of a square matrix.
 - Transposing a square matrix.
 - Addition of two square matrices ($n \times n$ matrices)
 6. Programming Exercises using Functions
 - To evaluate the factorial of a given number.
 - To find the sum of two numbers
 - To construct the Fibonacci series
 7. Programming Exercises for Curve Fitting using Regression Analysis
 - To fit a given set of data to a straight line using linear least square fit.
 - To fit a given set of data to an exponential equation of the form $p = p_0 e^{kt}$
 8. Programming Exercises for Evaluation of some Statistical Parameters
 - Calculation of median of a given data set.
 - Calculation of mode of a given data set.

Books for reference:

1. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical physics and electronics, First edition, S. Viswanathan, Pvt,Ltd, 2007.
2. E. Balagurusamy, Programming in ANSI C, Sixth Edition, Tata Mc_Graw Hill, New Delhi,2013

SEMESTER VI: CORE – XVII
ADVANCED ELECTRONICS AND MICROPROCESSOR PRACTICAL

Course Code : 14UPH6C17P
Hours / Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To practice circuit constructions of analog and digital experiments
 - To practice Intel 8085 microprocessor programming
1. Study of Series and Parallel Resonance Circuits
 2. Hartley Oscillator.
 3. Construction of Astable and Monostable Multivibrators using Op-Amp.
 4. Verification of NAND and NOR as Universal Gates.
 5. Verification of the Truth Tables of R-S, J-K and Master-Slave Flip-Flops.
 6. Eight Bit Multiplication and Division using μ p 8085.
 7. Searching for the Biggest and Smallest Numbers of an Array
 8. Conversion of a Decimal Number to Hexadecimal form and vice versa

Books for reference:

1. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical physics and electronics, First edition, S. Viswanathan, Pvt,Ltd, 2007.
2. B.Ram, Fundamentals of Microprocessors and Microcontrollers, Dhanpat Rai Publications, Reprint 2011.

UNIT –IV Numerical Integration**6 hours**

Need and scope for numerical integration –numerical integration using trapezoidal rule (two point formula), Simpson’s 1/3 rule (three point formula)

Programming exercise:

1. To find the integral of a given function using trapezoidal rule.
2. To find the integral of a given function using Simpson’s 1/3 rule.

UNIT –V Evaluation of statistical parameters**6 hours**

Classification and tabulation of data –finding the limits of intervals – inclusive and exclusive methods –calculation of arithmetic mean, median and mode

Programming exercise:

1. Calculation of median of a given data set.
2. Calculation of mode of a given data set.

#.....# Self study portion**Text books:**

T.B 1 K.R. Venugopal and S.R. Prasad, Mastering C, Tata Mc-Graw Hill, New Delhi, 1st edition, 2007

T.B 2 Balagurusamy, Numerical Methods , Tata McGraw Hill, New Delhi, 1st edition, 1999

UNIT I	Chapter 7	Sections 7.3 - 7.6	T.B 1
UNIT II	Chapter 5	Sections 5.1 - 5.9	T.B 1
UNIT III	Chapter 10	Sections 10.1 -10.3.	T.B 2
UNIT IV	Chapter 12	Sections 12.1 -12.4	T.B 2
UNIT V	Chapter 11	Sections 11.1 -11.3	T.B 2

Book for reference:

Suresh Chandra, Computer Applications in C, Narosa Publishing House, New Delhi, Second Edition,2006

**SEMESTER VI: EXTRA CREDIT- IV
PHYSICS FOR COMPETITIVE EXAMINATION**

Course Code : 14UPH6EC4
Hours / Week : ---
Credit : 4

Max. Marks : 100
Internal Marks : ---
External Marks : 100

Objective:

- To develop the skills and quantitative knowledge in physics concepts to face competitive examinations.

UNIT – I Mechanics and sound

Motion of particles under various type of forces – simple Harmonic motion – Rotational motion – motion of fluids – elastic constants – waves (Progressive and stationary) – Superposition of waves – Transverse and longitudinal waves – Intensity of sound – velocity of sound.

UNIT – II Heat and Thermodynamics

Mechanical equivalent of energy of thermodynamics – equation of state for ideal gases – graphical representation of reversible and irreversible process – thermodynamic scale of temperature – Entropy – Black body.

UNIT – III Electromagnetism

Magnetic lines of force – magnetic induction – earth as a magnet – horizontal intensity – declination – deflection and vibration magnetometer.

Electrostatics

Electric lines of forces – Electric intensity – Electric potential – capacity of condenser – energy of condenser – Ohm's law – specific resistance – Measurement of resistance: Wheatstone bridge, Potentiometer – primary of secondary coils – heating effect of electric current – magnetic effect electric current – Fleming rule – self and mutual induction.

UNIT – IV Optics

Reflection and refraction from plane and spherical surfaces critical angle – total reflection: Lenses and prism – image formation – dispersion – simple optical instruments: Telescope, Microscope – Spectrometer, photometry – velocity of light – interference of light – young's double slit experiments.

UNIT – V Modern Physics

Discharge of electricity through gases – Bohr's theory of H₂ atom – thermionic emission – diode as rectifier – X-rays: their production and properties – radioactivity – Atomic nucleus – Proton and neutron – photoelectric effect – wave particle duality.

Text book:

K.V. Ramakrishna sastry, The treaties on Physics for IIT- JEE, Vikas Publishing house PVT Ltd, New Delhi, 1999.

UNIT I	Chapter 1
UNIT II	Chapter 2 & 3
UNIT III	Chapter 4, 5 & 8
UNIT IV	Chapter 10
UNIT V	Chapter 9 & 12

Book for reference:

Arther Beiser, Concepts of Modern Physics, McGraw Hill Ed , 3rd edition,1999.

SEMESTER I: ALLIED – I
PROPERTIES OF MATTER AND SOUND

Course Code : 14UPH1A1
Hours / Week : 5
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objectives:

- To understand the Properties of solid and liquid particles and its applications
- To study the concepts of heat, gravitation and their implications
- To learn the basic concepts of osmosis and diffusion

UNIT – I

12 hours

Elasticity: Stress and strain – Hooke's law –Types of elastic constants – Young's modulus, Rigidity modulus & Bulk modulus –Poisson's ratio –Determination of Young's modulus by non-uniform bending (Pin and Microscope) - **#Surface tension:- Definition#** –Molecular theory- Determination of surface tension by Jaeger's method.

Viscosity: Co-efficient of viscosity –Determination of co-efficient of viscosity by Burette method – comparison of viscosities.

UNIT – II

12 hours

Mechanics: Newton's law of gravitation – - **#Kepler's laws of Planetary motion#**–Gravitation constant G- Determination of G by Boy's method- Friction- Laws of friction – Centre of gravity - centre of gravity of a solid hemisphere – Meta center – Meta centric height – Determination of the metacentric height of a ship.

UNIT – III

12 hours

Sound: Simple harmonic motion –Equation of simple harmonic motion – composition of two SHM's in a straight line – composition of two SHM's at right angles to each other –Lissajou's Figures(Basic concept only) –Ultrasonic – Properties – Production by Piezo-electric method-Application of Ultrasonics– Reverberation and reverberation time--Conditions for a good auditorium.

UNIT – IV

12 hours

Heat: Newton's law of cooling -Determination of specific heat capacity of a liquid by cooling – Thermal conductivity – co-efficient of thermal conductivity – Determination of thermal conductivity of a bad conductor by Lee's disc method – - **#solar constant#** – Determination of solar constant by Angstrom's Pyrheliometer-Temperature of the sun-Joule-Kelvin effect- Porus Plug experiment.

UNIT – V

12 hours

Diffusion: Diffusion of liquids – Graham's laws of diffusion in liquids –Ficks' law of diffusion – Analogy between liquid diffusion and heat conduction – Experimental determination of coefficient of diffusion.

Osmosis: Osmosis and osmotic pressure – Laws of osmotic pressure -Experimental determination of osmotic pressure (Berkeley and Hartley method)

#.....# Self study portions

Text books:

T.B 1 R. Murugesan, Properties of matter, S.Chand & Co, 5th edition, 2007

T.B 2 R. Murugesan, Properties of matter, S.Chand & Co, 4th edition, 2005

T.B 3 Brij lal & Subramaniam, Heat & thermodynamics, S.Chand Publications, 7th edition, 2008.

Unit – I: Chapter 1 & 2 Section: 1.1 - 2.11 T.B 1

Unit – II: Chapter 6,18,20& 22 Section: 6.1-6.3,18.1-18.4,20.1-20.3&22.1-22 T.B 2

Unit – III: Chapter 11 Section: 11.1 - 11.17 T.B 1

Unit – IV: Chapter 4 & 5 Section: 4.1- 5.5 T.B 3

Unit – V: Chapter 2 & 8 Section: 2.21, 8.1- 8.28 T.B 2

Books for reference:

1. BrijLal&Subramaniam,Properties of Matter, S.Chand Publications, 4th edition, 2008.
2. Mathur D.S,Elements of Properties of Matter ,Eleventh edition, Shyamlal Charitable Trust, New Delhi, 1993.

SEMESTER I: ALLIED-I
PROPERTIES OF MATTER - PRACTICAL

Course Code : 14UPH1A1P
Hours / Week : 3
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objective:

- To develop the experimental skills and determination of the Physical coefficients of matters.
1. Young's Modulus – Non Uniform bending (Pin & Microscope)
 2. Surface Tension – Capillary Rise Method.
 3. Potentiometer – Low range Voltmeter calibration
 4. Specific heat capacity of a liquid – Newton's law of cooling.
 5. Newton's rings – Radius of curvature.
 6. Co-efficient of viscosity – Burette method.
 7. Sonometer verification of I and II laws.
 8. Zener Controlled rectifier.

Books for reference:

1. M.N. Srinivasan, S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , reprint 2010.
2. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition, 2007.

SEMESTER II: ALLIED –II

MODERN PHYSICS

Course Code : 14UPH2A2

Hours / Week: 4

Credit : 2

Max. Marks : 50

Internal Marks : 20

External Marks : 30

Objectives:

- To study the fundamental concepts of light, electricity and atomic models
- To learn the spectral studies of IR, UV and Raman and understand the basics of semiconductors

UNIT – I

12 hours

Optics: Velocity of light – Michelson's method – Interference – #Types of interference# - Thickness of a thin wire using by air wedge— Measurement radius of curvature with Newton's rings – optical activity – Specific rotatory Power- Laurent's half shade Polari meter.

UNIT – II

12 hours

Electricity: #Coulomb's law #–Principle of capacitor –Energy stored in a charged capacitor – Loss of energy due to sharing of charges.
Kirchoff's law – Carey foster's bridge – Determination of specific resistance –Calibration of an ammeter using Potentiometer.

UNIT – III

12 hours

Atomic & Nuclear properties: Vector atom model – Quantum numbers – Pauli's Exclusion Principle-L-S coupling – J-J coupling – Zeeman Effect.
Nuclear fission and fusion – Radioactivity – Construction and working of an Ionization chamber- Construction and working of G.M Counter.

UNIT – IV

12 hours

Spectroscopy: UV Spectrum- Range- UV Spectroscopy-Instrumentation-Applications-IR Spectrum-Range- IR Spectroscopy-Instrumentation-Applications- Raman effect-Stokes and anti-stokes lines-Experimental set up of Raman Spectroscopy.

UNIT – V

12 hours

Electronics : Semiconductors-Types of Semiconductors – P-N Junction Diode and Zener diode - V-I Characteristics of PN Junction and Zener diodes- Conversion between Binary, Decimal and Hexadecimal systems-Truth table of AND, OR, NOT gates–Laws of Boolean algebra (Associative, Commutative and Distributive only) – De-Morgan's theorems.

#.....# self study portion

Text Books :

T.B 1 R. Murugesan, Allied Physics , S.Chand & Co, Second Edition, New Delhi, 2010

T.B 2 R. Murugesan, Optics & Spectroscopy, S.Chand & Co, Second Edition,
New Delhi, 2010

Unit I	Chapter 6	Sections 6.1 - 6.20	T.B 2
Unit II	Chapter 4	Sections 4.1 - 4.6	T.B 1
Unit III	Chapter 7 & 8	Sections 7.1 - 8.15	T.B 1
Unit IV	Chapter 5	Sections 5.1 - 5.8	T.B 2
Unit V	Chapter 10	Sections 10.1 -10.27	T.B 1

Book for reference:

R.Murugesan, Modern Physics, S.Chand& company, 13th edition, 2012

SEMESTER II: ALLIED-II
OPTICAL, THERMAL AND ELECTRICITY - PRACTICAL

Course Code : 14UPH2A2P
Hours / Week : 3
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objectives:

- To learn the measurements in Heat and optical experiments
- To study the characteristics of the semiconductor diodes.
- To learn the circuit construction in the electricity and electronics experiments

1. Young's modulus (Scale and telescope method) Non Uniform bending.
2. Potentiometer – Ammeter calibration.
3. Comparison of viscosities – by capillary Burette method.
4. Meter Bridge – R & ρ .
5. Thermal conductivity of a bad conductor – Lee's disc method.
6. Air wedge – Thickness of a thin wire.
7. Spectrometer Solid Prism - μ
8. Basic logic gates using discrete components.

Books for reference:

1. M.N. Srinivasan, S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , reprint 2010.
2. C.C. Ouseph, U.J. Rao & V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition, 2007.