B.Sc. Physics Course Structure under CBCS

(Applicable to the candidates admitted from the academic year 2017 -2018 onwards)

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	Ins.Hrs /Week	CREDIT	MARKS CIA	MARKS ESE	TOTAL
I	17U1LT1/LA1/LF1/L	I	Language – I		6	3	25	75	100
	17UCN1E1	II	English - I		6	3	25	75	100
	17UPH1C1	III	Core – I	Properties of Matter	5	5	25	75	100
	17UPH1C2P		Core – II	Properties of Matter – Practicals	3	2	20	80	100
	17UCH1A1:1		Allied –I	Inorganic, organic and Physical Chemistry -I	5	4	25	75	100
	17UCH1A2P		Allied –II	Volumetric Analysis Practical -I	3	2	20	80	100
	17UCN1VE	IV	Value Education	Value Education	2	2	-	100	100
				TOTAL	**30**	**21**			**700**
II	17U2LT2/LA2/LF2/L	I	Language – II		6	3	25	75	100
	17UCN2E2	II	English – II		6	3	25	75	100
	17UPH2C3	III	Core – III	Mechanics	6	5	25	75	100
	17UPH2C4P		Core – IV	Heat and Optical – Practicals	3	2	20	80	100
	17UCH2A3:1		Allied – III	Inorganic, organic and Physical Chemistry –III	4	3	25	75	100
	17UCH2A4P		Allied –IV	Organic Analysis Practical	3	2	20	80	100
	17UCN2ES	IV	Environmental Studies	Environmental Studies	2	2	-	100	100
				TOTAL	**30**	**20**			**700**
III	17U3LT3/LA3/LF3/L	I	Language– III		6	3	25	75	100
	17UCN3E3	II	English – III		6	3	25	75	100
	17UPH3C5		Core– V	Acoustics	4	4	25	75	100
	17UPH3C6P	III	Core– VI	Thermal and Electricity – Practicals	3	2	20	80	100
	17UMA3A5:2		Allied– V	Algebra and Trigonometry	4	3	25	75	100
	17UMA3A6:2		Allied–VI	Calculus	3	2	25	75	100
	17UPH3N1	IV	Non Major Elective I #		2	2	-	100	100
	17UCN3S1		Skill Based Elective - I @	Soft Skills Development	2	2	-	100	100
				TOTAL	**30**	**21**			**800**
IV	17U4LT4/LA4/LF4/L	I	Language–IV		6	3	25	75	100
	17UCN4E4	II	English– IV		6	3	25	75	100
	17UPH4C7		Core– VII	Thermal and Statistical Physics	5	5	25	75	100
	17UPH4C8P	III	Core - VIII	Measurement and Calibration – Practicals	3	2	20	80	100
	17UMA4A7:2		Allied– VII	Differential Equations	5	3	25	75	100
	17UMA4A8:2		Allied–VIII	Vector Calculus and Fourier series	3	2	25	75	100
	17UPH4N2	IV	Non Major Elective – II		2	2	-	100	100
	17UCN4EA	V	Extension Activities	NCC, NSS, etc.	-	1	-	-	-
				TOTAL	**30**	**21**			**700**
V	17UPH5C9P1		Core – IX	Optics and Numerical Programming- Practicals	3	3	10	40	50
	17UPH5C9P2			Analog Electronics and Microprocessor-Practicals	3	3	10	40	50
	17UPH5C10	III	Core – X	Electricity and Magnetism	5	5	25	75	100
	17UPH5C11		Core – XI	Optics	5	5	25	75	100
	17UPH5C12		Core - XII	Atomic Physics	5	4	25	75	100
	17UPH5M1A/B		Major Based Elective I **		5	4	25	75	100
	17UPH5S2A/B	IV	Skill Based Elective II @		2	2	--	100	100
	17UPH5S3A/B		Skill Based Elective – III		2	2	--	100	100
	17UPH5EC1		Extra Credit Course – I	Mobile Telephony	-	4*	--	100*	100*
				TOTAL	**30**	**28**			**700**
VI	17UPH6C13P1		Core– XIII	General Physics and Scientific Programming – Practicals	3	3	10	40	50
	17UPH6C13P2			Digital Electronics and Microprocessor–Practicals	3	3	10	40	50
	17UPH6C14	III	Core– XIV	Wave Mechanics and Relativity	5	5	25	75	100
	17UPH6C15		Core - XV	Nuclear Physics	5	5	25	75	100
	17UPH6C16		Core XVI	Laser and Spectroscopy	4	4	25	75	100
	17UPH6M2A/B		Major Based Elective II **		5	4	25	75	100
	17UPH6M3A/B		Major Based Elective III		4	4	25	75	100
	17UCN6GS	V	Gender Studies	Gender Studies	1	1	-	100	100
	17UPH6EC2		Extra Credit Course - II	Physics for Competitive Examination	-	4*	--	100*	100*
				TOTAL	**30**	**29**			**700**
			GRAND TOTAL		**180**	**140**	**-**	**-**	**4300**

* Not Considered for Grant Total and CGPA

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@ Skill Based Electives

SEMESTER	COURSE CODE	COURSE TITLE
V	17UPH5S2A	Scientific programming in C
	17UPH5S2B	Programming in C++
	17UPH5S3A	Electronic Instrumentation
	17UPH5S3B	Electrical and Electronic Appliances

** Major Based Electives

SEMESTER	COURSE CODE	COURSE TITLE
V	17UPH5M1A	Semiconductor Devices and Circuits
	17UPH5M1B	Nanoscience
VI	17UPH6M2A	Digital Electronics and Microprocessor
	17UPH6M2B	Material Science
VI	17UPH6M3A	Solar Energy
	17UPH6M3B	Astrophysics

Non Major Electives

Semester	COURSE CODE	Course Title
III	17UPH3N1	Physics of Home Appliances
IV	17UPH4N2	Medical Physics

Note: #.............**#   Self study portion**

Semester – I

SEMESTER I: CORE – I
PROPERTIES OF MATTER

Subject Code : 17UPH1C1   **Max. Marks   : 100**
Hours / Week : 5   **Internal Marks : 25**
Credit   : 5   **External Marks : 75**

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

Unit – I : Elasticity   **(15 Hours)**

Hooke's Law- Stress - Strain Diagram - Elastic modulii – 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 : **Determination of Elastic Modulli**   **(15 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 - problems

Unit – III : Surface Tension   **(15 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 - Variation of Surface tension with temperature - Jaegar's Method.

Unit – IV :Viscosity   **(15 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   **(15 Hours)**

Diffusion of liquids – Graham's laws of diffusion in liquids – Fick's 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 Books :

1. R. Murugeshan, Properties of Matter, Fifth edition S. Chand & Co Pvt. Ltd., New Delhi. 1994.
   Unit – I : 1.1-1.2, 1.6 - 1.8
   Unit – II: 1.14- 1.18, 1.20 – 1.21, 1.11
   Unit – III: 3.1 – 3.4, 3.6, 3.8 – 3.9, 3.11, 3.12
   Unit – IV: 2.1 – 2.5, 2.7 – 2.9
   Unit – V: 4.1 – 4.4, 5.1 – 5.5

Books for Reference:

1. Properties of Matter - Third edition, Brij Lal & Subramaniam. N, Eurasia Publishing Co., New Delhi, 1989.
2. Elements of Properties of Matter - Mathur D.S., Eleventh edition, Shyam lal Charitable Trust, New Delhi, 1993

SEMESTER I : CORE – II
PROPERTIES OF MATTER - PRACTICALS

Subject Code : 17UPH1C2P   **Max. Marks   : 100**
Hours / Week: 3   **Internal Marks   : 20**
Credit   : 2   **External Marks : 80**

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

List of Experiments:

1. Determination of the Young's Modulus [Y] of a material using non-uniform Bending Method (Pin & Microscope).

2. Determination of Surface Tension [T] by Capillary Rise Method.

3. Determination of the Co-efficient of viscosity [η] of a Liquid by Burette Method

4. Thermal conductivity of a bad conductor using Lee's Disc.

5. Verification of Laws of Transverse Vibrations [I & II laws] in a stretched string using a sonometer.

6. Determination of the Refractive Index [μ] of glass using a prism and a spectrometer.

7. Determination of Resistance and Specific Resistance [R &ρ] using a Meter Bridge.

8. Construct the basic logic (AND,OR, NOT) gates using discrete components.

Semester – II

Subject Code : 17UPH2C3   **Max. Marks : 100**
Hours / Week: 6   **Internal Marks : 25**
Credit : 5   **External Marks : 75**

Objective:

➢ To have knowledge in the field of dynamics

➢ To understand the concepts of hydrostatics and hydrodynamics

➢ To learn the principles of Newtonian Mechanics

Unit – I : Impact of elastic bodies and Motion of Projectile   **(18 Hours)**

Impulse of a force – Collision – Elastic and inelastic collisions - Laws of impact – Direct impact of two smooth spheres – Loss of kinetic energy due to direct impact – Oblique impact of two smooth spheres-Loss of kinetic energy due to oblique impact - Projectile Motion – #Range of an inclined plane# – Range and time of flight down an inclined plane - Two body problem – reduced mass

Unit – II : Dynamics of Rigid Bodies & Friction   **(18 Hours)**

Moment of inertia-Radius of gyration-Perpendicular axes theorem-Parallel axes theorem- of inertia of a thin circular ring - Moment of inertia of a triangular lamina– Moment of inertia of a uniform rod - Theory of compound pendulum — Period of oscillation of a Compound pendulum.

Friction : Definition - Static, dynamic, rolling and limiting friction- Laws of friction

Unit – III : Gravitation & Centre of gravity   **(18 Hours)**

Gravitation: Newton's laws of gravitation- Kepler's Laws of Planetary motion — Deduction of Newton's law of gravitation from Kepler's law- Determination of G using Boy's method.

Centre of Gravity: Definition - C.G of solid cone - Solid hemisphere – Hollow hemisphere - # Solid tetrahedron#

Unit – IV : Hydrodynamics   **(18 Hours)**

Centre of Pressure: Definition- Centre of Pressure of Vertical rectangular lamina – Centre of Pressure of Vertical triangular lamina

Laws of floatation - Meta centre - Meta centric height of a ship- atmospheric pressure - Equation of continuity of flow – Energy of the liquid - Euler's equation for unidirectional flow - Bernoulli's theorem – Venturimeter – Pitot tube – **#**wings of an aeroplane**#**

Unit – V : Newtonian Mechanics   **(18 Hours)**

Centre of mass – Definition – Centre of mass of two particle system - Conservation of linear and angular momentum of a particle--Basic ideas of degrees of freedom, generalised co-ordinates and generalised momentum

Rocket motion – principle – theory – velocity– propulsion system – multistage rocket - shape of the rocket

#....................# self study portion

Books for Study

1. Mechanics and Mathematical Physics- R.Murugesan, Third edition, S.Chand Publications.
2. Properties of matter - .Murugesan, Revised edition, S.Chand Publications. (2010**)**

Units	Chapters	Book
Unit –I	1.1 – 2.4	T.B 1
Unit – II	7.1 – 7.4, 10.1, 10.2, 6.10, 22.1-22.3	T.B 2
Unit – III	3.1 – 3.6	T.B 1
Unit – IV	4.3 – 4.8 , 5.1 – 5.4	T.B 1
Unit – V	19.1, 23.1 – 23.3, 23.11 13.8 – 13.13	T.B 2 T.B 1

Books for Reference:

1. Mechanics and Relativity – Brijlal Subramaniam, S.Chand Publications.
2. Mechanics – Part – I & II Naryanamoorthy. S.Chand Publications
3. Mechanics – D.S.Mathur. S.Chand Publications

SEMESTER II: CORE -IV
HEAT AND OPTICS - PRACTICALS

Subject Code : 17UPH2C4P   **Max. Marks : 100**
Hours / Week: 3   **Internal Marks   :   20**
Credit   : 2   **External Marks :   80**

Objective:

➢ To have knowledge with practical experience for determining the physical constants
➢ To study the measurements of some physical quantities through Heat and optical experiments
➢ To study the characteristics of the semiconductor diodes.

List of Experiments:

1. Determination of the Young's modulus [Y] of a material using Non-uniform bending (Scale & Telescope).

2. Static Torsion: Determination of the Rigidity Modulus [N] of a material.

3. Compound Pendulum: Determination of the Acceleration due to Gravity and Radius of Gyration [g & K].

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.

Semester – III

SEMESTER III: CORE – V

ACOUSTICS

Subject Code : 17UPH3C5   **Max. Marks   : 100**
Hours / Week : 4   **Internal Marks : 25**
Credit   : 4   **External Marks : 75**
Objectives:

  ➢ To learn the properties of the sound waves

  ➢ To understand the concepts of acoustics,

  ➢ To learn the production of ultrasonics waves and its applications

UNIT – I   Sound and Harmonic Oscillators   (12 hours)

Wave motion— **#**characteristics of wave motion**#** – Transverse wave motion – Longitudinal wave motion – Definitions- Relation between frequency and wavelength - Properties of Longitudinal Progressive Waves – Simple harmonic motion – differential equation of SHM – Energy of vibration – Linearity and superposition principle – Simple pendulum – Compound Pendulum- Bar pendulum.

UNIT – II   Lissajou's Figures   (12 hours)

Lissajou's figures – composition of two SHM in a straight line – composition of two simple harmonic vibrations of equal time periods acting at right angles – composition of two SHM at right angles to each other and having time periods in the ratio 1:2 – Experimental methods for obtaining Lissajou's figures – Uses of Lissajou's figures.

UNIT – III   Velocity of Sound   (12 hours)

 Origin of sound - Velocity of longitudinal waves in gases – Newton's formula for velocity of sound in an effect of temperature – experiment - velocity of sound in water – effect of pressure – effect of density of the medium,humidity,wind – wave velocity and molecular velocity – Doppler effect – observer at rest and source in motion – **#**Source at rest and observer in motion**#** – when both the source and the observer are in motion.

UNIT – IV   Vibrations in strings and Air Columns   (12 hours)

Laws of transverse vibration of strings – verification of laws of transverse vibration of strings Melde's experiment – Vibration of air column- resonance – velocity of sound in Air by Resonance

method – Velocity of sound in solids - Kundt's tube – Characteristics of musical sound- Intensity of sound-Decibel and Phone – Bell – musical scale.

UNIT – V   Acoustic Applications   (12 hours)

Acoustics – Reverberation – Reverberation time   - Sabine's reverberation formula –– Factors affecting the acoustics of the buildings- Conditions for good acoustics – Ultrasonics- Properties- Production of ultrasonic waves – magnetostriction oscillator – Piezo electric oscillator – #Applications of ultrasonic waves#.

<p align="center">#..............# Self study portion</p>

Text book

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

Revised edition, 1994.

UNIT I	Chapter 1	Sections 4.1 – 4.8,4.11,4.12,4.15,1.9- 1.11
UNIT II	Chapter 2	Sections 2.1 - 2.2,2.5-2.6,2.8,2.9
UNIT III	Chapter 3	Sections 7.1 –7.8,7.20-7.24
UNIT V	Chapter 6	Sections 11.14 – 11.16, 11.20 – 11.24,11.27

Book for reference:

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

edition, 2011.

SEMESTER III: CORE-VI

THERMAL AND ELECTRICITY PRACTICALS

Subject Code : 17UPH3C6P　　　　　　　　　　**Max. Marks : 100**
Hours / Week : 3　　　　　　　　　　　　　　**Internal Marks : 20**
Credit　　 : 2　　　　　　　　　　　　　　　**External Marks : 80**

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

List of Experiments:

1. Determination of the Young's modulus [Y] of a material using Uniform bending (Single Optic Lever).

2. Determination of the Co-efficient of viscosity [η] of a highly viscous liquid using Stoke's Method.

3. Joule's Calorimeter: Determination of the Specific heat capacity of a liquid (with Barton's correction).

4. Carey Foster's Bridge: Determination of Resistance and Specific Resistance [R &ρ] of a material.

5. Deflection Magnetometer – M & H.

6. Figure of merit of a Sensitive Galvanometer.

7. Potentiometer: Calibration of a Low Range Voltmeter.

8. Bridge rectifier with π-section filter and Zener diodes.

SEMESTER III: NON MAJOR ELECTIVE – I
PHYSICS OF HOME APPLIANCES

Subject Code: 17UPH3N1   Max. Marks   : 100
Hours / Week: 2   Internal Marks   : 25
Credit   : 2   External Marks : 75

Objectives:
- ➢ To learn the Physical principles and working mechanism of Home appliances
- ➢ To study the electrical circuit, Fault finding and Precautions

UNIT- I : Electrical Cooking Appliances & Egg beaters   **(6 Hours)**
Introduction – Types – Construction – Electric Toaster – Types – Automatic and Non-Automatic - Coffee maker – types – construction and working of per colator type.
Egg beaters – Hand operated crank type – Electric type – Construction.

UNIT- II : Electric Iron Box & Electric Fan   **(6 Hours)**
Types – Non-Automatic – Automatic – Construction and Working – Comparision – Trouble Shooting – Steam Iron Box.
Electric Fan – Function – **#**Terminology **#**– Construction and Working of Ceiling & table fans – Exhaust Fan – General Fault and Remedy.

UNIT- III : Water Heaters   **(6 Hours)**
Water Heater – Function – Types – Electric Kettle – Immersion water heater – Construction and working – storage water heaters – Non pressure type – pressure type – construction and working – repairs & remedies – **#**Solar water heater**#**

UNIT- IV : Electric Mixer & Centrifugal Pump   **(6 Hours)**
Electric Maker – Function – Construction – General Operating Instruction – Caution – Cleaning– Repairs and Remedies
Introduction – Constructional features – working – friction lead – static suction head – static delivery lead –automatic operation of pump – Trouble shooting.

UNIT- V : Vacuum Cleaner and washing machine   **(6 Hours)**
Vacuum Cleaner – Function – Principle – Main components – features – types - working – accessories - Filters – Repairing.
Washing Machine – Function – Types – Semi and Fully Automatic – Top and Front loading – washing technique – working cycle – construction and working of washing machine – **#**comparison of Top and front loading machines **#** – Problems and Remedies.

Books for study:
1. Service Manual-Electrical Home Appliances-GT Publications

Units	Topic / Page No.
Unit - I	16-20
Unit - II	8-12,21-22
Unit - III	44-46
Unit – IV	12-15,77-82
Unit- V	59-72

Semester – IV

THERMAL AND STATISTICAL PHYSICS

Subject Code : 17UPH4C7	**Max. Marks : 100**
Hours / Week: 5	**Internal Marks : 25**
Credit : 5	**External Marks : 75**

Objectives:

> ➢ To study about the nature of Heat
>
> ➢ To understand the concepts of thermodynamics and statistical Physics

Unit-I : Kinetic theory of Heat   **(15 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 : Radiation and Transmission of Heat   **(15 Hours)**

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

Unit-III : Specific Heat   **(15 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- Einstein's and Debye's theory of Specific heat capacity of solids.

Unit-IV :Thermodynamics   **(15 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# - Change of entropy problems #

Unit-V :Statistical Physics   **(15 Hours)**

Phase Space-Micro and Macro States- Fundamental postulates of statistical mechanics-Ensembles (Concept only) - #Boltzman-entropy relation# – law of equipartition energy - Maxwell Boltzmann statistics - Bose Einstein Statistics - Fermi-Dirac Statistics.

Books for study:

Units	Title of the Book	Topic / Page No.
Unit – I	Heat Thermodynamics and Statistical Physics -Satya Prakash & J.P. Agarwal and S.S. Singhal, Pragati Prakasan, Meerut.	311 – 315
	Heat and Thermodynamics - Brijlal and N. Subramaniam, S. Chand & Co, New Delhi 2002	29, 83, 114, 62–66
Unit – II	Heat and Thermodynamics - Brijlal and N. Subramaniam, S. Chand & Co, New Delhi 2002	563, 564–565, 574–577, 298, 314–316
Unit – III	Heat and Thermodynamics - Brijlal and N. Subramaniam, S. Chand & Co, New Delhi 2002	527–528, 543–544, 544–548, 531–533
Unit – IV	Heat and Thermodynamics - Brijlal and N. Subramaniam, S. Chand & Co, New Delhi 2002	109–110,112–113, 139–140, 118–120, 120–121, 121–123, 133–137, 140–141, 174–177, 178–179.
Unit – V	Heat and Thermodynamics - Brijlal and N. Subramaniam, S. Chand & Co, New Delhi 2002	380, 356–357, 385–398, 417–425, 458–462, 465–469

Books for Reference:

1. Heat and Thermodynamics - J.B. Rajam and C. L. Arora, S. Chand & Co, New Delhi.

   Thermodynamics and Statistical Physics - Sharma and Sarkar, Himalaya publishers, Mumbai.

2. Thermal Physics - R. Murugeshan, Kiruthiga Sivaprasath, I Edition, S.Chand& Co. (relevant chapters for all the units)

SEMESTER IV: CORE – VIII
MEASUREMENT AND CALIBRATION PRACTICALS

Subject Code : 17UPH4C8P	**Max. Marks : 100**
Hours / Week: 3	**Internal Marks : 20**
Credit : 2	**External Marks : 80**

Objectives:

> ➢ To learn the measurements and calibration techniques through properties of matter, heat, optics and electricity experiments

List of 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. Study the frequency response of the LCR series resonance circuit.

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 [Eg] of a thermistor using a Post Office Box.

MEDICAL PHYSICS

Subject Code: 17UPH4N2	**Max. Marks** **: 100**
Hours / Week: 2	**Internal Marks** **: 25**
Credit **: 2**	**External Marks** **: 75**

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 – Schiotz Tonometer – Goldmann Tonometer – Comparison between Schiotz 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#.

Books for Study:

Units	Title of the Book	Topic / Page No.
Unit – I	Medical Physics, John R. Cameron, University of Wisconsin, Madison & James G. Skofronick, Florida State university, Tallahassee, A wiley-Interscience Publication, John Wiley & sons, Singapore	108 – 116
Unit – II, III, IV & V	Biomedical Instrumentation, Dr. M . Arumugam, Second Edition, 10th Reprint, Anuradha Publications PVT, Kumbakonam, 2010	299 – 367 164 – 167 186 – 190 274 – 352 224 – 382

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

Semester – V

SEMESTER V: CORE – IX

OPTICS AND NUMERICAL PROGRAMMING - PRACTICALS

Subject Code : 17UPH5C9P1   **Max. Marks   : 50**
Hours / Week : 3   **Internal Marks   : 10**
Credit   : 3   **External Marks : 40**

Objectives:
- To learn the measurement techniques of optical experiments
- To develop the skills in numerical programming

List of Experiments:

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. To find the band gap and Fermi level of a semioconductor

6. Programming Exercises using Control statements [*if, if-else, switch*]

   - Finding the solution of a quadratic equation using switch statement.
   - Conversion of temperature from Celcius to Fahrenheit scale.

7. Programming Exercises using Loops and Nested Loops [*while, do-while, For*]

   - To find the factorial of a 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

SEMESTER V: CORE – IX

ELECTRONICS AND MICROPROCESSOR-PRACTICALS

Subject Code : 17UPH5C9P2 **Max. Marks   : 50**
Hours / Week : 3 **Internal Marks : 10**
Credit   : 3 **External Marks : 40**

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

List of Experiments:

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. Hartley Oscillator

5. Block Transfer of Data using µp 8085.

6. Eight bit Addition and Subtraction using µp 8085.

7. Sorting of Data in Ascending order and Descending order using µp 8085.

8. Conversion of Binary Numbers to BCD coded form.

SEMESTER V: CORE – X

ELECTRICITY AND MAGNETISM

Subject Code : 17UPH5C10   **Max. Marks   : 100**
Hours / Week : 5   **Internal Marks : 25**
Credit   : 5   **External Marks : 75**

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

Unit – I: Electrostatics   **(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 – Coulomb's theorem - **#**mechanical force on unit area of a charged surface**#**.

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

Unit – II: Magnetism   **(15 Hours)**

Magnetic field – Magnetic induction – Intensity of Magnetisation – Magnetic permeability – susceptibility – properties of para, dia, and ferromagnetic materials –Anti-ferro and ferrimagnetism - hysteresis – Retentivity – Coercivity – Experiment to draw B-H curve by magnetometer method – **#**loss of due to hysteresis**#** – magnetic circuit –magnetic circuit of an electromagnet.

Unit–III:Current Electricity   **(15 Hours)**

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

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.

Unit – IV: Electromagnetic Induction   **(15 Hours)**

Faraday's Laws of electromagnetic induction – Lenz law – 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 – Eddy currents and its applications

Unit – V: DC & AC Currents   **(15 Hours)**

Growth and decay of current in a circuit containing a resistance and inductance - charging of a condenser - discharging of a condenser through a resistance.

Peak value, Mean value and RMS value of an alternating current– **#**Form factor**#** - AC circuits with single components (inductance, resistance and capacitance) - LC series and Parallel – LCR in series and parallel – The Q factor.

Books for Study:

1. Electricity and Magnetism – R.Murugeshan, S.Chand & company, Seventh Revised Edition 2008

Units	Chapter
Unit – I	1.1 – 1.5, 2.1, 2.2, 2.5, 2.8, 2.11,2.12, 4.1 – 4.3, 4.5, 4.6, 4.9, 4.11
Unit – II	15.1, 15.2, 15.4 – 15.9, 15.14, 15.16-15.17, 15.19
Unit – III	10.2-10.4, 10.6-10.8, 10.11, 10.17, 7.2-7.2
Unit – IV	11.1 – 11.4, 11.6 – 11.10, 14.1, 14.2
Unit – V	18.16 – 18.19, 13.1 – 13.2

Books for Reference:

1. Electricity and Magnetism- Brijlal and N.Subramaniam, Ratan Prakash Mandir, S.Chand & company ,New Delhi 1995.

Course Code   : 17UPH5C11   **Max. Marks   : 100**
Hours / Week : 5   **Internal Marks : 25**
Credit   : 5   **External Marks : 75**

Objectives:

➢ To study about the principles of geometrical and physical optics.

➢ To understand the wave properties of light.

Unit – I: Geometrical Optics   (15 Hours)

Aberration - Spherical aberration in lenses – Defects in lenses - Methods of minimizing spherical aberration - Condition for minimum spherical aberration of two thin lenses separated by a distance - Chromatic aberration in lenses - Condition for achromatism of two thin lenses (in contact and out of contact) - coma - astigmatism - Ramsden and Huygen's eyepieces- Comparison of Eyepieces.

Unit – II: Dispersion   (15 Hours)

Dispersion produced by a prism- Angular dispersion - Dispersive power-Cauchy's formula-Achromatism in prisms-Deviation without dispersion-Dispersion without deviation-Direct vision spectroscope-Constant deviation spectroscope-Rainbow - Theory of primary Rainbow and #secondary Rainbow#.

Unit – III: Interference   (15Hours)

Theory of Interference fringes- Fresnel's Biprism: Experiment to determine the Wavelength of light-Air wedge- Determination of the diameter of a thin wire- Newton's Rings – Determination of wavelength of sodium light-Determination of refractive index of a liquid - Interferometer-Michelson's Interferometers- Construction-Working- Measurement of Wavelength of monochromatic light- Jamin's Interferometer.

Unit – IV: Diffraction   (15 Hours)

Fresnel diffraction-Diffraction at circular aperture, straight edge and Narrow slit- Fraunhoffer diffraction-single slit-Double slit-Plane diffraction grating-theory and experiment to determine wavelength - #Absent spectra with a diffraction grating# - Dispersive power of a grating-Overlapping of spectral lines Determination of wavelength of light using grating (Normal Incidence)-Rayleigh's criterion for Resolution-Resolving power of a prism.

Unit – V: Polarization   **(15 Hours)**

Double refraction - Nicol prism-Polarizer and analyzer - Huygen's theory of double refraction in uniaxial crystals – Fresnel's theory of double refraction - Theory of Plane, Circularly and Elliptically polarized light- Quarter wave plate-Half wave plate- Production and detection of plane, circularly and elliptically polarized light-**#**Optical activity**#**-Specific rotation-Laurent's half-shade polarimeter.

#............**#** **Self study portion**

Text books:

1. R. Murugeshan and Kiruthiga Sivaprasath, Optics and Spectroscopy, S. Chand & Company Ltd, New Delhi , 7th Revised Edition, 2010.

UNIT I	Chapter 1	Sections 1.16 – 1.28
UNIT II	Chapter 1	Sections 1.7– 1.13 & 24.1-24.3
UNIT III	Chapter 2	Sections 2.2 – 2.13
UNIT IV	Chapter 3	Sections 3.6 – 3.23
UNIT V	Chapter 4	Sections 4.5 – 4.20

Books for reference:

1. Ajoy Ghatak, Optics, Tata Mc Graw Hill, New Delhi , 4th Edition, 2009.
2. Subrahmanyam, Brij Lal and M. N. Avadhanulu, A Text Book of Optics, S. Chand, New Delhi, 23rd Edition, 2006

SEMESTER V: CORE – XII
ATOMIC PHYSICS

Subject Code : 17UPH5C12	**Max. Marks : 100**
Hours / Week : 5	**Internal Marks : 25**
Credit : 4	**External Marks : 75**

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 **(15 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 – Dempster's mass spectrograph

Unit –II: Photo Electricity **(15 Hours)**
        Photoelectric emission – laws – Lenard's method to determine e/m for photoelectrons - 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 **(15 Hours)**
        Introduction – spatial quantization – spinning electrons - Various quantum numbers - L-S and j-j couplings – Pauli's exclusion principle – applications - magnetic dipole moment of electron due to orbital and spin motions – Bohr magneton – Stern and Gerlach experiment – spin orbit coupling

Unit – IV: Fine Structure of Spectral Lines **(15 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 of Anamolous Zeeman effect – Paschen-Back effect – Stark effect

Unit – V: X- Rays **(15 Hours)**
        X-Rays - Bragg's Law – Bragg's X-ray spectrometer – determination of crystal structure – the powder crystal method - 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.

Book for Study:
  1. Modern Physics (13ᵗʰ revised multi colour edition) by R.Murugeshan, S.Chand & Co publication.

Units	Topic / Page No.
Unit – I	52 – 57, 85
Unit – II	152 – 160
Unit – III	93 – 103
Unit – IV	107 – 115
Unit – V	123 – 137

Books for Reference:
1. Atomic and Nuclear Physics – N. Subramaniam and Brijlal, Sultan Chand, NewDelhi.
2. Concepts of Modern Physics, Arthus Beiser, McGraw Hill Ed. V, (1999).

SEMESTER V: MAJOR BASED ELECTIVE - I
SEMICONDUCTOR DEVICES AND CIRCUITS

Subject Code : 17UPH5M1A   **Max. Marks   : 100**
Hours / Week : 5   **Internal Marks : 25**
Credit   : 4   **External Marks : 75**

Objectives:
- To understand the operation, characteristics and applications of semiconductor devices.
- To study about the functions semiconductor device circuits.
- To know the basics of electronic communication.

Unit – I : Semiconductor Diodes   **(15 Hours)**

PN junction – properties of PN junction - V-I characteristics – half wave rectifier– #efficiency of half wave rectifier# – full-wave bridge rectifier – efficiency of full-wave bridge rectifier - Zener diode – V-I characteristics – Zener diode as voltage stabiliser - Light-Emitting Diode (LED) – Photo-diode – operation and characteristics

Unit – II : Transistors and FET   **(15 Hours)**

Transistor – Transistor action – Voltage divider biasing - Transistor configurations – Common Base (CB) and Common Emitter (CE) connections – #Common collector (CC) characteristics#

Junction Field Effect Transistor (JFET) – construction - principle and working – characteristics – Diffences between JFET and Bipolar Transistor – output characteristics of JFET – Parameters – relation among JFET parameters.

Unit – III : Amplifiers and Oscillators   **(15 Hours)**

Transistor as an amplifier in CE transistor configuration – single stage RC coupled amplifier – Class B push pull amplifier – feedback – principles of negative voltage feedback in amplifiers – gain of negative voltage feedback amplifier

Barkhausen Oscillatory condition – Colpitt's oscillator - Hartley oscillator – Phase Shift oscillator

Unit – IV : Modulation and Demodulation

Amplitude modulation – modulation factor - Analysis of AM - sideband frequencies in AM wave – power in AM wave – limitations of AM – frequency modulation(FM) - Theory of frequency modulation(FM) - #Comparision of AM and FM #– Demodulation – AM diode detector – stages of superheterodyne radio receiver – FM receiver – Phase Modulation (basic idea only)

Unit – V : Operational amplifier **(15 Hours)**

op-amp characteristics and parameters - inverting amplifier – inverting summing amplifier (adder) - Non-inverting amplifier – difference amplifier (subtractor) – differentiator – integrator – Weinbridge oscillator – astable multivibrator

Book for Study:
1. Principle of Electronics, V.K.Mehtha, S.Chand Publictions, NewDelhi (2012)

   Unit – I: 5.14,5.15,5.18,6.8,6.10,6.13,6.15,6.25,6.27,7.2,7.7,7.8,7.9

   Unit – II: 8.1,8.4,8.8,8.9,8.10,8.12,19.2,19.3,19.6,19.8,19.13,19.14

   Unit – III: 8.16,10.4,12.17,13.1,13.2,13.3,14.3,14.5,14.10,14.11,14.13

   Unit – IV: 16.4,16.5,16.6,16.7,16.9,16.10,16.11,16.12,16.3,16.14,16.16,16.19,16.21

2. Introduction to Integrated Electronics Digital & Analog, V.Vijayenran, S.Viswanathan printers & Publishers (Pvt Ltd.) 2007

   Unit – V: 13.4, 14.2, 14.3,14.4,14.5,14.8,14.9, 14.10, 15.2,15.3

Book for reference:
1. Basic Electronics, B.L. Theraja.
2. Applied Electronics, R.S. Sedha, S.Chand Publictions, NewDelhi (2012)

NANO-SCIENCE

Course Code : 17UPH5M1B   **Max. Marks : 100**
Hours / Week : 2   **Internal Marks : 25**
Credit : 2   **External Marks : 75**

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 Nanotechnology
- 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:
1. KK. Chattobpadhyay, Introduction to Nano Science and Technology, PHI, New Delhi, 2011.

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

Subject Code : 17UPH5S2A	**Max. Marks : 100**
Hours / Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

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.

Books for Study and Reference:

Units	References	Topics / Page Nos
Unit - I	Programming in ANSI C-E. Balagurusamy, Tata Mc_Graw Hill, New Delhi,Sixth Edition,2013	Topics: 1.2,1.8,1.9, 2.2,2.4,2.5,2.6,2.7, 2.8,2.10
	Mastering C-K.R. Venugopal and S.R. Prasad,Tata Mc-Graw Hill,New Delhi,2007	Topics: 1.6,1.8 Algorithm Examples: 1.1,1.3,1.4,1.7,1.2
Unit - II	Programming in ANSI C-E. Balagurusamy, Tata Mc_Graw Hill, New Delhi,Sixth Edition,2013	Topics: 3.2,3.3,3.4,3.5,3.6,3.7,3.10,
	Mastering C-K.R. Venugopal and S.R. Prasad,Tata Mc-Graw Hill,New Delhi,2007	Topics: 2.15 *Programming exercises:* Example 2.10,2.11,2.12
	Projects Using C-PVN. Varalakshmi, Scitech Publications, Chennai,2001	*Programming exercises:* Example 2
Unit- III	Mastering C-K.R. Venugopal and S.R. Prasad,Tata Mc-Graw Hill,New Delhi,2007	Topics: 3.4,3.5,4.2,4.3,4.10,4.11,4.12,4.13 *Programming exercises in pages* 105,130,136
Unit-IV	Mastering C-K.R. Venugopal and S.R. Prasad,Tata Mc-Graw Hill,New Delhi,2007	Topics: 4.6,4.8,4.9,4.7 *Programming exercises in pages* 134
	Projects Using C-PVN. Varalakshmi, Scitech Publications, Chennai,2001	*Programming exercises:* Example 22,23,35,4,29
Unit-V	Mastering C-K.R. Venugopal and S.R. Prasad,Tata Mc-Graw Hill,New Delhi,2007	Topics: 7.2 *Programming exercises in pages* 222,225,226
	Projects Using C-PVN. Varalakshmi, Scitech Publications, Chennai,2001	*Programming exercises:* Example 44,52

PROGRAMMING IN C++

Subject Code : 17UPH5S2B	**Max. Marks : 100**
Hours / Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objectives:
- ➢ To understand the concept of object oriented programming
- ➢ To know the operations of C++ commands
- ➢ To develop programming skills

Unit – I: Oops and beginning with C++   **(6 Hours)**
Basic concept of object oriented programming – structure of C++ program – tokens – identifier and constant – basic data types –user –defined data types – derived data types – symbolic constant – type compatibility – declaration of variables – dynamic initialization of variables

Unit – II: Functions in C++   **(6 Hours)**
The main function – function prototype – call by reference – return by reference – inline functions – default argument – constant argument – function overloading – friend and virtual function – math library function

Unit – III: Classes and Objects   **(6 Hours)**
C structure revisited – specifying a class – defining member function – A C++ program with classes – making an outside function inline – nesting of member function – private member function – array within a class – memory allocation for object – static data members - static members function – array of objects – objects as functions arguments – friendly functions – returning objects constant member functions – pointers to members

Unit – IV: Constructors and destructors   **(6 Hours)**
Constructor – parameterized constructors – multiple constructors in a classes – constructors with default arguments – dynamic initializations of objects – copy constructors – dynamic constructors – constructing two –dimensional array – constant object - destructors

Unit – V: Operator overloading and type conversions   **(6 Hours)**
Defining Operator overloading – overloading unary operators – overloading binary operators – overloading binary operators using friend – manipulation of string using operators – rules for overloading operators – type conversions

Book for study
1. Object oriented programming C++, E.Balagurusamy, third edition, Tata McGraw-Hill

    Unit I: 1.5, 2.6, 3.2, 3.4 – 3.13

    Unit II: 4.2 – 4.11

    Unit III: 5.2 – 5.18

    Unit IV: 6.2 – 6.11

    Unit V: 7.2 – 7.8

ELECTRONIC INSTRUMENTATION

Course Code : 17UPH5S3A	**Max. Marks :100**
Hours / Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objectives:

- To understand the principles and operations of analog and digital instruments
- To study Signal Generators and Waveform analysis
- To learn the principle of transducers and their classifications

UNIT – I: Analog Instruments (6 hours)
DC Instruments: PMMC Movement – DC ammeter – Multi range ammeters – **#**DC voltmeter**#** – Multi range DC voltmeter – Sensitivity of Voltmeter.
AC Instruments: AC Voltmeter using half-wave rectifier – Multi range AC voltmeter – Transistor voltmeter (TVM)

UNIT – II: Digital Instruments (6 hours)
Digital Voltmeters: Ramp type digital voltmeter –Dual slop type digital voltmeter –Digital voltmeter –digital multimeter.
Digital measurements:#Digital frequency meter**#**– Digital measurement of time – Universal counter (Timer).

UNIT – III: Signal Generators (6 hours)
Basic Signal generators: Standard signal generator – Modern laboratory signal generator – AF sine and square wave generators.
Special signal generators: Function generator – Pulse and square generator – sweep generators – **#**pattern generator**#**.

UNIT – IV: Waveform analysis (6 hours)
Basic wave analyser – Frequency selective wave analysers – Heterodyne wave analysers – Spectrum analysers – Harmonic distortion analysers – Harmonic distortion analysers using a resonance bridge,

UNIT – V: Transducers (6 hours)
Classification of transducers – Potentiometer – unbounded strain gage – Bonded strain gage foil type strain gage – Linear variable differential transducer (LVDT) – Rotational variable differential transducer (RVDT)

Text book:

1. H.S.Kalsi, Electronic Instrumentation , Learning Materials centre, New Delhi, 2nd edition, 2002.

UNIT I	Chapter 2	Sections 2.4 – 2.41
UNIT II	Chapter 3	Sections 3.3 – 3.27
UNIT III	Chapter 5	Sections 5.3 – 5.22
UNIT IV	Chapter 6	Sections 6.3 – 6.18
UNIT V	Chapter 8	Sections 8.42 – 8.51

Book for reference:

1. P.S.Manoharan, Microprocessors & Microcontrollers, Charulatha Publications, 2nd edition,2011

ELECTRICAL AND ELECTRONIC APPLIANCES

Course Code : 17UPH5S3B	**Max. Marks :100**
Hours / Week : 2	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objectives:

- ➢ To understand the principles and operations of analog and digital instruments
- ➢ To study Signal Generators and Waveform analysis
- ➢ To learn the principle of transducers and their classifications

Unit I : Audio and Video Equipments   (6 Hours)
Introduction – Gramaphone – Recording techniques - Magnetic tape – Tape recorder – Mono – Stereo – Spool type - Compact Disc – VCD, MP3, DVD, MP4, Blue Ray - Memory Card USB
Home Theatre – Dolpy – **#DTS#**

Unit II : Tranceivers   (6 Hours)
Introduction – Cell Phone – PCS, GSM, CDMA, TDMA Transmission - Infra red – Blue tooth, GPRS, Camera, VGA, Pixel type - Half Duplex – Full duplex – Channel range – Cell phone frequency – Radio frequency – Radio Telephony - WLL – Satellite Phone

Unit III : Medical Electronic Equipments   (6 Hours)
Introduction – Electronic blood testing equipment - ECG - CT Scan and ultrasound - Electronic BP apparatus - Digital Thermometers – EEG - Digital X-Ray - **#Nano technology and its applications#**

Unit IV: Winding of AC & DC machines   (6 Hours)
Single phase windings – Lap winding – wave winding – concentric winding – Three phase winding – single layer winding – double layer winding.

General procedure – Double Layer simplex Lap winding – Double layer duplex Lap winding – Double Layer simplex wave winding.

Unit V : Rewinding and Testing of electric motors   (6 Hours)
Methods of Rewinding – Testing the new winding – Testing of Armature – Insulation resistance test - Growler test - **#Drop test#**.

Introduction – Voltage tester screwdriver – Continuing Test – Insulation test – Measurement of Power for DC & AC Circuits.

Book for Study:

1. Basic Elctrical and Electronics engineering, S.K.Battacharya, Praeson Publications (2006).

2. Electrical Machinery, P.S.Bimphra, Krishna Publishers (2011).

MOBILE TELEPHONY

Subject Code : 17UPH5EC1   Max. Marks   : 100
Hours / Week : --   Internal Marks : --
Credit   : 4   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.

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

Books for study:

1. Mobile Communication –Jochen Schiller, Pearson, New Delhi, Second Edition, 2004

Units	Topics
I	1,1.1,1.1.7,1.2,2,2.1,2.1.1
II	2.5,2.5.1,2.5.2,2.5.3,2.5.4,2.6,2.6.1,2.6.2,2.6.3,2.6.6
III	2.7,2.7.1,2.7.2,2.8,3,3.1,3.2,3.3,3.4,3.4.1,3.5,3.6
IV	4,4.1,4.1.1,4.1.2,4.1.4,4.1.5,4.1.6,4.1.7
V	4.1.8,4.1.8.1,4.1.8.2,7,7.5,7.5.1,7.5.2,7.5.2.1,7.5.2.2

Semester – VI

Subject Code : 17UPH6C13P1   **Max. Marks   : 50**
Hours / Week : 3   **Internal Marks : 10**
Credit   : 3   **External Marks : 40**

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

List of Experiments:

1. *i-i' curve*: Determination of Refractive Index of Glass using a prism and a Spectrometer.

2. Self Inductance of a coil by Anderson's method.

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 × 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.

SEMESTER VI: CORE – XIII
DIGITAL ELECTRONICS AND MICROPROCESSOR–PRACTICALS

Subject Code : 17UPH6C13P2   **Max. Marks   : 50**
Hours / Week : 3   **Internal Marks : 10**
Credit   : 3   **External Marks : 40**

Objectives:
 ➢ To practice circuit constructions of analog and digital experiments
 ➢ To practice Intel 8085 microprocessor programming

List of Experiments:

1. Verification of Logic Gates (AND,OR, NOT, NAND, NOR & EX-OR) and De Morgan's

    Theorems using ICs.

2. Half adder , full adder using basic logic gates and simplification of Boolean expression using

    Karnaugh Map.

3. Construction of Astable and Monostable Mulitivibrators using Op-Amp.

4. Verification of NAND and NOR as Universal Gates.

5. Verification of the Truth Tables of R-S, Clocked R-S and J-K Flip-Flops.

6. Eight Bit Multiplication and Division using μp 8085.

7. Searching for the Biggest and Smallest Numbers of an Array using μp 8085.

8. Conversion of a Decimal Number to Hexadecimal form and vice versa using μp 8085.

SEMESTER VI: CORE – XIV
WAVE MECHANICS AND RELATIVITY

Course Code : 17UPH6C14   **Max. Marks   : 100**
Hours / Week : 5   **Internal Marks : 25**
Credit   : 5   **External Marks : 75**

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-Sommerfield: Quantization rule for the harmonic oscillator and its limitation.

UNIT – II: Foundations of Wave Mechanics   yyyy(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 – **#**Postulates of special theory of relativity**#** – Lorentz transformation - velocity transformation – length contraction – time dilation – simultaneity – Mass in relativity – mass and energy.

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. Aruldhas and P. Rajagopal, Modern Physics, Second edition,
Prentice Hall of India, 2005.

T.B 3 G. Aruldhas, 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

NUCLEAR PHYSICS

Subject Code : 17UPH6C15 **Max. Marks   : 100**
Hours / Week : 5 **Internal Marks : 25**
Credit   : 5 **External Marks : 75**

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 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)

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

Range of α particles (Definition) – 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)

Cockcroft Walton voltage multiplier – Vande Graff generator - Linear accelerator – cyclotron – synchrocyclotron – Betatron – Proton synchrotron.

Ionisation chamber – G.M. Counter – Scintillation counter – 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.

Book for Study:
1. Nuclear Physics, K. Ilangovan, MJP Publishers, Chennai, 2012.
   Unit – I: 1.3.1, 1.3.2, 1.6, 1.7.1 – 1.7.7, 1.8, 1.8.3, 1.9, 1.9.1, 1.10 – 1.10.2.
   Unit – II: 2.2, 2.2.2, 2.3, 2.6, 2.6.1 – 2.6.3, 2.7, 2.7.1, 2.8.1, 2.8.3, 3.1.4 – 3.1.7, 3.2.2, 3.2.3, 3.2.5, 3.3.2, 3.3.4, 3.3.5, 3.3.6
   Unit – III: 8.2 – 8.7, 8.9, 4.3.1 – 4.3.3, 4.4,4.5.1,5.1,5.2, 5.3, 5.4, 5.5, 5.6, 5.7,5.8, 5.10, 5.13.
   Unit – IV: 10.2, 10.2.1, 10.3, 10.4, 10.4.2, 10.5, 10.5.1, 10.5.2, 10.5.4
   Unit – V: 9.3, 9.3.1 – 9.3.3, 12.2 – 12.6

Book for reference:
1. Nuclear Physics, D.C.Thayal, Himalaya Publisher house (2011).
2. Nuclear Physics, Sathyaprakash, S.Chand Publisher (2005).

SEMESTER VI: CORE-XVI
LASERS AND SPECTROSCOPY

Subject Code : 17UPH6C16   Max. Marks   : 100
Hours / Week: 4   **Internal Marks : 25**
Credit   : 4   **External Marks : 75**

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

Unit – I: Fundamentals of Lasers   (12 Hours)

Laser principle – **#Characteristics#** – Process of Absorption, Spontaneous and stimulated emission – Metastable states – Population inversion – Pumping methods: Optical, Electrical pumping and Direct conversion – pumping schemes: Two level and three level.

Unit – II: Types of Lasers and Applications   (12 Hours)

Types of Lasers: Ruby Laser – Helium-Neon Laser - CO_2 Laser – Semiconductor Laser – Industrial Applications: Drilling – Cutting – **#Welding #**– Industrial application - Holography

Unit – III: Ultraviolet (UV) - Visible, Infra– Red (IR) spectroscopy   (12 Hours)

Electromagnetic spectrum, theory of ultraviolet spectra, Lambert-Beer's Law – UV-Visible Spectrophotometer – Range of I.R. Radiation – Theory of IR absorption spectroscopy –Diatomic molecule as harmonic oscillator – linear and symmetric top molecules.

Unit – IV: Microwave Spectroscopy   (12 Hours)

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

Unit – V   Raman Spectroscopy   (12 Hours)

Raman Effect - Characteristic properties of Raman lines – Mechanism of Raman effect – Classical and quantum theory of Raman scattering– Differences between Raman and IR spectra — Raman spectrometer – **#Applications#**.

Books for Study & References:
1. An introduction to Lasers theory and Applications., M.N.Avadhanulu.,S.Chand Publication.
   Unit – I: Page No: 11 – 31.
   Unit – II: Page No: 65 – 89, 161& 156.
2. Spectroscopy (Atomic and Molecular) – Gurdeep R. Chatwal & Sham K.Anand., Himalaya Publishing House.
   Unit – III: Page No: 2.30 – 2.52
   Unit – IV: Page No: 2.7 – 2. 24
   Unit – V : Page No: 2.83 – 2.99

SEMESTER VI: MAJOR BASED ELECTIVE - II
DIGITAL ELECTRONICS AND MICROPROCESSOR

Subject Code : 17UPH6M2A   **Max. Marks   : 100**
Hours / Week: 5   **Internal Marks : 25**
Credit   : 4   **External Marks : 75**

Objectives:
- To understand the digital principles and its applications
- To study about the architecture of Intel 8085 Microprocessor and its programming instructions.

Unit – I   **Number Systems and logic gates**   **(15 Hours)**

Introduction to decimal, binary, octal & hexadecimal number systems – Interconversions – Simple binary arithmetic operations – Addition, Subtraction, Multiplication and Division – 1's & 2's complements - BCD code - Gray code – ASCII code - Basic logic gates – symbols and truth tables – AND, OR, NOT, NAND, NOR, EX-OR, and EX-NOR – **#Universality of NAND and NOR gates#**.

Unit – II   **Boolean algebra and Simplification of logic expressions**   **(15 Hours)**

Laws of Boolean algebra – De-Morgan's theorems - Reducing Boolean expressions using Boolean laws – Sum of Products (SOP) - Product of Sum (POS)

Karnaugh map: Minterms – 2, 3 & 4 variables – Don't care conditions.

Unit – III : Combinational circuits   **(15 Hours)**

Half adder and Full adder – Half subtrator and Full subtractor – Multiplexer(2-input) – Demultiplexer - Decoder – 2 to 4 Decoder – **#Encoder#** –Binary Weighted Resistor D/A converter with Op-amp - A/D conversion – Successive approximation method.

Unit – IV: **Sequential Circuits**   **(15 Hours)**

RS Flip-Flop – Clocked RS Flip-Flop – D Flip Flop – JK Flip-Flop - J-K Master Slave Flip-Flop –Registers Right Shift Register – Left Shift Register – **#Ring Counter#** – Johnson's counter – Asynchronous counter (Mod – 2 counter) – Synchronous counter.

Unit – V   **Intel 8085 Microprocessor and 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.

Books for Study:

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

   Unit-I : Page no: 1.1 – 4.20.   Unit-II : Page no: 5.1 – 6.23.

   Unit-III: Page no: 7.1 – 8.18, 16.1 – 16.13.   Unit-IV: Page no: 9.1 – 10.19.

2. Microprocessors & Microcontrollers –P.S.Manoharan, Charulatha Publications, 2011

   Unit-V : Page no: 1.68 – 1.82.

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

   Unit-V : Page no: 6.22 – 6.38.

Books for References:

1. Digital Fundamentals, V.Vijayendran, S.Viswanathan, Printers & Publishers Private Ltd.
2. Fundamentals of Microprocessor – 8085, V.Vijayendran, S.Viswanathan, Printers & Publishers Private Ltd.

SEMESTER VI: MAJOR BASED ELECTIVE - II
MATERIAL SCIENCE

Subject Code : 17UPH6M2B   **Max. Marks   : 100**
Hours / Week: 5   **Internal Marks : 25**
Credit   : 4   **External Marks : 75**

Objectives:
- To understand the properties, basic structure of various materials and its applications
- To study about the characterization techniques of materials

Unit – I: Crystallography   (15 Hours)

Classification of solids, crystals and non-crystalline materials – lattice points – space lattice – unit cell – Bravais lattices – Miller Indices – characteristics of unit cell – symmetry elements of a crystalline solid – crystal structures of simple cubic and body centered cubic – diamond cubic – sodium chloride

Unit – II: Simple crystal structures and imperfections   (15 Hours)

X-ray diffraction and Bragg's law – simple crystal structures – Laue method – powder method – crystal imperfections – points defects – line defects – edge dislocation – screw dislocation – surface defects

Unit – III : Electron theory of solids   (15 Hours)

The classical free electron theory – the quantum free electron theory – Brillouin Zones – distinction between metals, insulators and semi conductors – Hall effect – Hall coefficients – electrical conductivity of a metal – variation of electrical resistivity due to mechanical stress

Unit – IV: Dielectric and Magnetic materials   (15 Hours)

Fundamental definitions in dielectrics – different types of electric polarization – local field – Clausius – Mosatti relation – Classical theory of dia, para and ferro-magnetism

Unit – V: Material Characterization Techniques   (15 Hours)

Optical Microscope – Atomic absorption Spectrometer – UV – Visible spectroscope – X-ray diffraction – Scanning electron microscope

Books for Study:

1. Material Science – M.Arumugam, 3rd edition, 2002, ANEH editiom
2. Materials science engineering – V. Raghavan, PHI

Books for References:

1. Elements of Materials Science and Engineering – Van Valck (3rd edition), Addision- Wesley

publishers.

SEMESTER VI: MAJOR BASED ELECTIVE-III
SOLAR ENERGY

Subject Code : 17UPH6M3A   Max. Marks   : 100
Hours / Week: 4   Internal Marks : 25
Credit   : 4   External Marks : 75

Objectives:
 ➢ To understand the concepts of conventional and non conventional energies.
 ➢ To learn the utilization of solar energy.

Unit - I 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-Pyrheliometer – Pyranometers.

Unit - II Solar Collectors   **(12 Hours)**
Liquid flat plate collectors – General Characteristics - Focusing type solar collectors -- Flat-plate Air Heating Collector - Evacuated Tube collector Solar Concentrators - Compound parabolic concentrator - Cylindrical parabolic concentrator - Fixed mirror solar concentrator - Hemispherical bowl mirror concentrator - Central tower receiver .

Unit - III Solar Energy Storage   **(12 Hours)**
Chemical energy storage - Hydrogen storage - Reversible chemical reactions storage - Electromagnetic energy storage - Electrostatic energy storage - Thermal energy storage - sensible heat storage - #Biological storage#.

Unit – IV Solar Thermal Systems and Refrigeration   **(12 Hours)**
Solar water heater - Box type solar Cooker - Solar Furnace - 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)**
Photoconduction - Solar cell - I-V Characteristics - Energy Losses and Efficiency - Cell Size - Solar cell classification on the basis of Junction structure and active materials -Solar PV Module - Solar PV Array - Solar Photovoltaic Systems - #Applications#.

Books for study:
1.Non-Conventional Energy Resources – B.H.Khan, Tata McGraw Hill Education Private Limited, Second Edition.
(Unit –II: Page no 118-120,123-129 ,Unit-III: Page no 62,66-79,Unit-IV: 130-154,Unit-V: 170-178)

2.Solar Energy Utilization -- G.D.Rai, Khanna Publishers
(Unit I: Page no 33-69,Unit V: Page no 317-322)

Books for Reference:
    1.Solar energy – S.P.Sukhatme and J.K. Nayak , Tata McGraw Hill   Education Private
    Limited, Third Edition.
    2.Solar Energy - M.P. Agarwal S.Chand Company Ltd

SEMESTER VI: MAJOR BASED ELECTIVE – III
ASTROPHYSICS

Subject Code : 17UPH6M3B   Max. Marks   : 100
Hours / Week : 4   Internal Marks : 25
Credit   : 4   External Marks : 75

Objective
  ➢ To impart an understanding of the great number of diverse phenomena in the Universe through Physics
  ➢ To understand the solar system
  ➢ To understand the life in universe.

UNIT - I: ELEMENTS OF SPACE DYNAMICS   **(12 Hours)**
        Man's quest for space - the energy requirements - Rocket propulsion -suborbital flights - #Artificial earth satellites# - Lunar and planetary probes.

UNIT- II: THE HEART OF THE SOLAR SYSTEM   **(12 Hours)**
        Vital statistics of the Sun - the solar photosphere - the Fraunhoffer lines - structure of solar atmosphere - the solar interior - Sunspots and solar activity - #other features of the solar activity# - Radio studies of the quiet Sun – Radio radiation of the disturbed Sun.

UNIT - III : SMALL BODIES IN THE SOLAR SYSTEM   **(12 Hours)**
        Asteroids - Meteorites - Comets as members of the Solar system – Physical properties of comets - Origin and evolution of comets - Space studies of comets - Meteors - an inventory of satellites - the large satellites - Medium, small and tiny satellites - Planetary rings.

UNIT - IV : OUR HOME AND THE NEAREST NEIGHBOUR   **(12 Hours)**
        EARTH: Gross properties - internal structure - the terrestrial atmosphere - the Earth's magnetic field - motions - Solar terrestrial relations - the Earth in space - atmospheric circulation in the troposphere. MOON: Some basic facts - telescopic studies - internal structure - surface features - Origin of the Moon - the lunar environment - Solar and Lunar eclipses.

UNIT - V: LIFE IN THE UNIVERSE   **(12 Hours)**
        Nature of life on Earth - A survey of objects in the Solar System - Pre Mariner search for life on Mars - Post-Mariner search for life on Mars - Life outside the Solar system - #the search for life in the Universe#.

Book for Study
1. Astrophysics of the Solar System - KD Abhyankar, Universities Press India Pvt. Ltd. Hyderabad, 1999.

Unit I : 3.1 –3.6
Unit II: 4.1 – 4.10
Unit III: 9.1 – 9.11
Unit IV: 5.1 –5.9, 6.1–6.6
Unit V: 11.1 – 11.7

SEMESTER VI: EXTRA CREDIT-II
PHYSICS FOR COMPETITIVE EXAMINATION

Subject Code : 17UPH6EC2   **Max. Marks   : 100**
Hours / Week : ---   **Internal Marks : ---**
Credit   : 4   **External Marks : 100**

Objectives:
➢ 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 H_2 atom – thermionic emission – diode as rectifier – X-rays: their production and properties – radioactivity – Atomic nucleus – Proton and neutron – photoelectric effect – wave particle duality.

Book for Study:

1. The treaties on Physics for IIT-JEE, 1999 Edition – K.V. Ramakrishna sastry, Vikas publishing house PVT Ltd – NewDelhi.

SEMESTER I: ALLIED – I
FUNDAMENTALS OF PHYSICS

Course Code : 17UPH1A1   **Max. Marks**   : 100

Hours / Week : 5   **Internal Marks** : 25

Credit   : 4   **External Marks** : 75

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   **(15 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   **(15 hours)**

Mechanics: Newton's law of gravitation – - #Kepler's laws of Planetary motion#–Gravitation contstant 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   **(15hour)**

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   **(15 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   **(15 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)

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 - PRACTICALS

Course Code : 17UPH1A2P	**Max. Marks : 100**
Hours / Week: 3	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

Objective:

➢ To develop the experimental skills and determination of the Physical coefficients of matters.

List of Experiments:

1. Young's Modulus – Non Uniform bending (Scale & Telesscope)

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. Air wedge – Thickness of a thin wire.

6. Co-efficient of viscosity – Burette method.

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.

SEMESTER II: ALLIED –II
ESSENTIALS OF PHYSICS

Course Code : 17UPH2A3 Max. Marks : 100
Hours / Week: 4 **Internal Marks : 25**
Credit   : 3 **External Marks : 75**

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

SEMESTER II: ALLIED–II
OPTICAL, THERMAL AND ELECTRICITY - PRACTICALS

Course Code : 17UPH2A4P   **Max. Marks   : 100**
Hours / Week: 3   **Internal Marks : 25**
Credit   : 2   **External Marks : 75**

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

List of Experiments:

1. Young's modulus - Non Uniform bending.(Pin & Microscope)

2. Potentiometer – Ammeter calibration.

3. Comparison of viscosities – by capillary Burette method.

4. Meter Bridge – R & ρ.

5. Sonometer – Verification of transverse laws of vibration (I & II Law)

6. Newton's rings – Radius of curvature.

7. Spectrometer – Grating by normal incidence method

8. Zener Controlled bridge 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 III: APPLIED PHYSICS-I
ELECTRICITY AND MAGNETISM

Course Code : 17UPH 3A5   **Max. Marks   : 100**
Hours / Week: 4   **Internal Marks : 25**
Credit   : 3   **External Marks : 75**

Objective:

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

Unit – I   Electrostatics   (12 Hours)

Definitions: Electric field, electric potential – Coulomb's law –Gauss theorem – Electric intensity due to a charged sphere - Principle of capacitor –Capacitors in series and #parallel# – Energy stored in a charged capacitor – Loss of energy due to sharing of charges.

Unit – II   Magnetism   (12 Hours)

Magnetic field- Intensity of Magnetization-Magnetic dipole – Field due to Magnetic dipole in end on position and side on position - Properties of Para, dia, and ferromagnetic materials – #Ferri and anti-ferimagnetism# - Hysteresis – Retentivity –Coercivity (Qualitative analysis only).

Unit – III   Current Electricity   (12 Hours)

Biot Savart's law - Magnetic intensity at a point due to a straight conductor carrying current- Kirchhoff's laws – Wheatstone bridge - Carey Foster's bridge – Determination of Specific Resistance – Potentiometer – Calibration of low range voltmeter - Ammeter calibration.

Unit – IV   Electromagnetic Induction   (12 Hours)

Laws of electromagnetic induction – Faraday's law – Lenz law - Self induction-Determination of self inductance by Anderson's method – Mutual inductance – Experimental determination using Ballistic Galvanomater.

Unit – V   A.C. Circuits   **(12 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 – The Q factor - Power in AC circuit containing resistance ,inductance and capacitance – **#**choke coil**#**.

#----------# Self study portion

Books for Study & Reference :

1. Electricity and Magnetism – R.Murugeshan, S.Chand & company, Seventh Revised Edition 2008.

   Unit- I : Page no.1-24,34,56-58,67,71

   Unit- II : Page no.251-255,263-265,269,270,273 & 274

   Unit- III : Page no.97-101,132-136,145-148,155,

   Unit- IV : Page no.163-176,241 &244

   Unit- V: Page no.190-195,198-201,209-216,224-229.

2. Electricity and Magnetism- Brijlal and N.Subramaniam, Ratan Prakash Mandir, S.Chand & company, New Delhi 1995.

SEMESTER III:

APPLIED PHYSICS PRACTICALS – I

Course Code : 17UPH3A6P	**Max. Marks : 100**
Hours / Week: 3	**Internal Marks : 25**
Credit : 2	**External Marks : 75**

List of Experiments:

1. LCR – Series

2. Meter bridge – R & ρ

3. PN Junction and Zener diode characteristics

4. Potentiometer – Low range voltmeter calibration

5. Wave shaping Circuits (Positive & Negative Clippers & Clampers)

6. Op-Amp – Adder and Subtractor

7. Field Coil – Determination of M

8. Figure of Merit – Table Galvanometer

SEMESTER IV: APPLIED PHYSICS-II
ELECTRONICS

Course Code : 17UPH 4A7	**Max. Marks : 100**
Hours / Week: 5	**Internal Marks : 25**
Credit : 3	**External Marks : 75**

Objectives:

➢ To learn about the characteristics of semiconductor devices under forward and reverse biasing

➢ To study about the different types lasers, special devices and function of op-amp.

Unit – I   Semiconductor Physics   (15 Hours)

Intrinsic & Extrinsic Semiconductors – n-Type and p-Type semiconductors-Formation of PN Junction Diode -V-I characteristics –Zener diode –V-I characteristics – Zener diode voltage regulator -Rectifiers – Half wave & bridge rectifier.

Unit – II   Transistors   (15 Hours)

Transistor action: npn & pnp–Transistor characteristics CE and CB configuration –α and β relationship-Amplifier – Single Stage RC Coupled Amplifier –Principle of feedback –**#**Types of feedback **#**–Barkhausen criterion – Oscillator – Hartley oscillator.

Unit – III   Special Devices   (15 Hours)

FET – Construction – n channel and p channel – FET Characteristics – FET parameters – FET amplifier (CS configuration) –Photo diode –Construction- Characteristics- LED – Construction-Characteristics- LCD- Construction - Seven segment display.

Unit – IV   Laser and Optical Fiber   (15 Hours)

Laser Principle – Stimulated Emission –Spontaneous emission-Population Inversion –Optical Pumping – Properties of Laser – Ruby laser – He-Ne laser -— **#**Applications of laser**#** - Types of fibers- Semiconductor laser source for optical communication-Block diagram of fiber optic communication system.

Unit – V   Operational Amplifier   (15 Hours)

Introduction to Ideal Op-amp – characteristics Parameters – Inverting and Non-Inverting Operational Amplifiers – Adder – Subtractor – Sign changer – **#Scale changer#** – Op-amp Differentiator -Op-amp Integrator.

Book for Study & Reference:

1. Principle of Electronics –V.K. Mehta & Rohit Metha - S. Chand & Co
2. Modern Physics – R.Murugesan ,Kiruththiga SivaPrasath ,S. Chand & Co Thirteenth Edition.
3. Semiconductor Physics And Opto-Electronics –P.K.Palanisamy, Scitech Publications (India).Pvt.Ltd
4. Applied Physics – Dr. M. Arumugam – Anuradha Agencies
5. Laser and Optics – B.B.Laud, New Age International Publications

SEMESTER IV:

APPLIED PHYSICS PRACTICALS – II

Course Code : 17UPH4A8P   **Max. Marks   : 100**
Hours / Week: 3   **Internal Marks : 25**
Credit   : 2   **External Marks : 75**

List of Experiments:

1. Transistor characteristics – CE configuration

2. Carey Foster's Bridge – R & ρ

3. Zener controlled rectifier

4. Potentiometer – Ammeter calibration

5. Band gap energy – Thermistor

6. Op-Amp – Differentiator and Integrator

7. Op-Amp Astable Multivibrator

8. Basic Logic gates – Discrete Components