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#### Preamble

The Department of Physics provides instructional programs in introductory Physics to a broad range of students through an understandable and effective method that enables them to integrate this knowledge into their normal thought processes. The department provides a forward-looking curriculum to undergraduate Physics majors, involving not only traditional Physics topics but also state-of-the-art instruction in experimental techniques, computational Physics and the use of computers in data acquisition and analysis, as well as active involvement in professional research.

#### Vision

To promote active learning, critical thinking coupled with ethical values and produce globally competent Physicists.

#### Mission

The Physics department is committed to impart quality education both in theoretical as well as experimental Physics with special emphasis on 'learning by doing' for socio-economic growth.

PO.No	Upon completion of B.Sc Degree programme , the graduates will be able to
PO- 1	apply the acquired knowledge of fundamental concepts in the field of science and to find
	solutions to various problems.
PO- 2	inculcate innovative skills and team – work among students to meet societal expectations.
PO- 3	perform analysis to assess, interpret, and create innovative ideas through practical experiments.
PO- 4	facilitate to enter multidisciplinary path to solve day-to-day scientific problems.
PO- 5	carry out fieldworks and projects, both independently and in collaboration with others,
	and to report in a constructive way.
PO- 6	improve communication ability and knowledge transfer through ICT aided learning
	integrated with library resources.
PO- 7	transfer the knowledge to the other stakeholders through extensive community
	development programme.
PO- 8	attain competency in job market / entrepreneurship.

#### **Programme Outcome**

# Course Structure (w.e.f. 2018) Semester –I

Part	Components	Sub. Code	Title of the Paper	Hrs/	Credits	is Max. N		Marks	
				Week		CIA	ESE	Total	
I	Tamil/ French	18ULTA11	இக்கால இலக்கியம்: செய்யுள், இலக்கணம், உரைநடை, சிறுகதை, இலக்கிய வரலாறு Preliminary French	6	4	40	60	100	
Π	General English	18UGEN11	Prose, Poetry, Extensive Reading & Language Study -I	6	4	40	60	100	
	Core I	18UPHC11	Properties of matter	4	4	40	60	100	
III	Core II	18UPHC12	Mechanics, Wave oscillations and Acoustics	4	4	40	60	100	
	Core Practical I	18UPHCRI	Practical - I	2	2	40	(0)	100	
	Allied Practical I	18UCPATT 18UCHAR1	Allied Chemistry I Allied Chemistry Practical	4	3	40	00	100	
IV	Ability Enhancement Course	18UAVE11	Value Education	2	2	20	30	50	
	1	Total		30	21				

# Semester II

Part	Components	Sub. Code         Title of the Paper         I		Hrs/	Credits		Max. N	larks
				Week		CIA	ESE	Total
Ι	Tamil / French	18ULTA21 18ULFA21	சமய இலக்கியங்களும்,நீதி இலக்கியங்களும்: செய்யுள், இலக்கணம், உரைநடை, வாழ்க்கை வரலாறு, இலக்கிய வரலாறு Basic French Course	6	4	40	60	100
II	General English	18UGEN21	Prose, Poetry, Extensive Reading & Language Study –II	6	4	40	60	100
	Core III	18UPHC21	Thermal Physics and Statistical Mechanics	4	4	40	60	100
	Core IV	18UPHC22	Optics	4	4	40	60	100
III	Core Practical I	18UPHCR1	Practical – I	2	2	40	60	100
	Allied I	18UCPA21	Allied Chemistry II	4	3	40	60	100
	Allied Practical I	18UCHAR1	Allied Chemistry Practical	2	2	40	60	100
IV	Ability	18UAEV21	Environmental	2	2	20	30	50
	Enhancement		Studies					
	Course							
		Total		30	25			

# Semester III

Part	Components	Sub. Code	Title of the Paper	Hrs/	Credits		Max. Marks	
				Week		CIA	ESE	Total
Ι	Tamil /	18ULTA31	காப்பிய இலக்கியம்: செய்யுள்,இலக்கணம், உரைநடை, சிறுகதை, இலக்கிய வரலாறு Advanced French	6	4	40	60	100
	Trenen	100217131	Course					
II	General English	18UGEN31	Prose, Poetry, Extensive Reading & Language Study - III	6	4	40	60	100
	Core V	18UPHC31	Electricity and Electromagnetism	4	4	40	60	100
III	Core Practical II	18UPHCR2	Practical II	2				
	Allied II	18UMAA31	Allied Mathematics	3	2	20	30	50
		18UMAA32	I & II	3	2	20	30	50
	Core Skill Based	18UPHS31	Instrumentation	4	4	40	60	100
	NME I	18UPHN31	Applied Physics I	2	2	20	30	50
IV	Ability Enhancement Course	18UAWS31	Women's Synergy		2	20	30	50
	Self Study /	18UPHSS1	Electrical Wiring and		+2			
	On-line Course /		Appliances /					
	Internship		Physics related					
	(Optional)		course					
		Total		30	24+2			

# Semester IV

Part	Components	Sub. Code	Title of the Paper	Hrs/	Credits	Max. Marks		
				Week		CIA	ESE	Total
I	Tamil	18ULTA41	சங்க இலக்கியம்: செய்யுள், இலக்கணம், உரைநடை,வாழ்க்கை வரலாறு, இலக்கிய வரலாறு	6	4	40	60	100
	French	18ULFA41	Language through Literature					
II	General English	18UGEN41	Prose, Poetry, Extensive Reading & Language Study - IV	6	4	40	60	100
	Core VI	18UPHC41	Electronics and communication	4	4	40	60	100
III	Core Practical II	18UPHCR2	Practical II	2	2	40	60	100
	Allied II	18UMAA41	Allied Mathematics	3	2	20	30	50
		18UMAA42	III & IV	3	2	20	30	50
	Core Skill Based	18UPHS41	Physics for Competitive Examinations	4	4	40	60	100
	NME II	18UPHN41	Applied Physics II	2	2	20	30	50
IV	Ability Enhancement Course	18UAYM41	Yoga & Meditation		2	20	30	50
	Self Study / Online Course / Internship	18UPHSS2	Sensors/Physics Related course		+2		50	50
	(Optional)							
	NCC, NSS &							
	Sports				. 1			
	Extension				+1			
	Activities CDP			20	27.1.2	200	500	000
		Total		30	27+3	300	500	800

# Semester V

Part	Components	Sub. Code	Title of the Paper	Hrs/	Credits	Max. Mar		larks
				Week		CIA	ESE	Total
	Core VII	18UPCC51	Solid State and	6	4	40	60	100
	(Common Core)		Material Science					
	Core VIII	18UPHC52	Digital Electronics	5	4	40	60	100
	Core IX	18UPHC53	Computational Physics	5	4	40	60	100
III	Core Integral I	18UPHI51	Renewable Energy Sources	4	4	40	60	100
	Core Practicals	18UPHCR3	Practical - III	3				
	III, IV & V		(Non electronics)					
		18UPHCR4	Practical - IV	3				
			(Electronics)					
		18UPHCR5	Practical – V	2				
			(Programming in C++)					
IV	Common Skill Based	18UCSB51	Computers for Digital	2	2	20	30	50
	Dased		Era and Soft Skills					
	Self Study/	18UPHSS3	Bio Physics		2		50	50
	(Compulsory)							
		Total		30	20			

# Semester VI

Part	Components	Sub. Code	Title of the Paper	Hrs/	Credits	Max. M		Aarks
				Week		CIA	ESE	Total
	Core X	18UPHC61	Modern Physics	5	4	40	60	100
	Core XI	18UPHC62	Nuclear and Particle Physics	4	4	40	60	100
	Core XII	18UPHC63	Opto Electronics And Fibre Optics Communication	4	4	40	60	100
	Core Integral II	18UPHI61	Advanced Physics	4	4	40	60	100
	Core Practicals III, IV & V	18UPHCR3	Practical - III (Non Electronics)	3	3	40	60	100
		18UPHCR4	Practical - IV (Electronics)	3	3	40	60	100
		18UPHCR5	Practical – V (Programming in C++)	2	2	40	60	100
IV	Project /	18UPHP61/	Project	5	4	40	60	100
	Core Integral III	18UPHI62						
		Total		30	28			

Semester	Hours	Credits	Extra Credits
Ι	30	21	
II	30	25	
III	30	24	2
IV	30	27	3
V	30	20	
VI	30	28	
Total	180	145	5

Courses	Number of	Total Hours/	Credits	Extra Credits
	Courses	Course		
Tamil	4	24	16	
English	4	24	16	
Core	12T+5P	53T+24P	48T+12P	
Core Skill Based	2	8	8	
Core Integral	2	8	8	
Group Project	1	5	4	
Allied	6T+2P	20T+4P	14T+2P	
NME	2	4	4	
Ability Enhancement	4	4 (4 Extra	8	
Course		Hours)		
Common Skill Based	1	2	2	
NCC, NSS & Sports			1	
Extension Activities				1
Self Study Papers	2			4
(Optional)				
Self Study Papers	1		2	
(Compulsory)				
Total		180	145	5

# Programme Specific Outcome

DSO No	Upon completion of B.Sc. Physics Degree programme, the graduates will								
PSU No.	be able to								
PSO - 1	students will demonstrate knowledge of mechanics, wave oscillations,								
	acoustics, properties of matter, optics, thermal physics, electricity,								
	electromagnetism and statistical mechanics to analyze a variety of physical								
	phenomena.								
	students will use the knowledge of electronics and communication, digital								
PSO - 2	electronics, solid state physics, optoelectronics, modern physics, Bio physics,								
	nuclear energy and fibre optics communication to analyze the contemporary								
	communication systems.								
PSO - 3	students will have knowledge about the working of medical instruments, laser,								
	superconductivity, sensors, biophysics, electrical appliances, wiring and nano								
	materials								
PSO-4	students will utilize their laboratory skills to take measurements in a physics								
	laboratory, analyze the measurements and draw valid conclusions.								
PSO-5	students will be able to compile oral and written scientific communication and								
	will prove that they can think critically and work independently.								
PSO-6	students will be able to design, set up and carryout experiments, infer data,								
	account for errors and compare with theoretical predictions in C++ language,								
	microprocessor 8085 and 8086 and microcontroller to solve problems.								
PSO-7	students will utilize their knowledge about renewable energy sources to solve								
	the present day energy crisis.								
	students will illustrate proficiency in mathematics and the mathematical								
PSO - 8	concepts needed for the proper understanding of physics and can face								
1.20 0	competitive exams with ease.								

SEMESTER - I								
Core I Properties of Matter								
Code: 18UPHC11 Hrs/Week: 4 Hrs/Semester: 60 Credits: 4								

- Vision: To enhance the knowledge of the students about the properties of matter and their relevance to day to day applications
- Mission: To provide a clear insight about gravitational force, elasticity, surface tension and viscous nature of matter

CO. Upon completion of this course, students will be able to		PSO	CL
No.	Upon completion of this course, students will be able to	addressed	
CO-1	calculate the acceleration due to gravity at a place.	1	An
CO-2	define stress, strain, Hooke's law and Poisson's ratio	1	Re
CO-3	describe the fundamental concepts of stress and strain and the relationship between both through the stress-strain equations in order to solve the problems for simple tridimensional elastic modes	1	Un
CO-4	calculate the elastic constant values of materials which is necessary for beam construction.	1, 6	An
CO-5	sketch the uses of I-form girders	1	Ар
CO-6	describe the properties of fluids such as viscosity, surface tension and capillary rise.	1	Un
CO-7	evaluate the properties and utility of lubricants	1, 6	Ev
CO-8	calculate the surface tension of a liquid	1, 6	Ap

SEMESTER - I					
Core I Properties of Matter					
Code: 18UPHC11Hrs / Week: 4Hrs/Semester: 60Credits: 4					

#### **Unit I: Gravitation**

Newton's law of gravitation – Kepler's law of planetary motion – Determination of gravitational constant: Boy's Method – Gravitational field and gravitational potential – Potential and field due to a spherical shell and a solid sphere – Variation of 'g' with altitude, latitude anddepth.

#### **Unit II: Elasticity**

Stress – Strain – Hooke's law – Poisson's ratio – Relation between the elastic moduli – Determination of Poisson's ratio for rubber – Twisting couple on a cylindrical wire – Expression for couple per unit twist – Work done in twisting – Torsional oscillation of a body – Torsion pendulum – Theory – Experimental determination of rigidity modulus and moment of inertia: Dynamic method.

#### Unit III: Bending of beams

Bending of beams – Expression for bending moment – Uniform bending: Expression for elevation – Experiment to find Young's Modulus using pin and microscope – Non-uniform bending – Cantilever: Expression for depression – Experiment to find Young's Modulus using pin and microscope – Non-uniform bending: Expression for depression – Experiment to determine Young's Modulus using scale and telescope – I section of girders.

## Unit IV: Viscosity

Newton's law of viscous flow – Streamlined and turbulent motion – Reynold's number – Poiseuille's formula for the flow of liquid through a horizontal capillary tube – Analogy between current and liquid flow – Experimental determination of co-efficient of viscosity of a liquid by Poiseuille's method – Ostwald's viscometer – Terminal velocity and Stokes' formula – Experimental determination of viscosity of a liquid by Stoke's method – Viscosity of gases – Meyer's formula – Rankine's method – Variation of viscosity with temperature and pressure –Lubrication.

### **Unit V: Surface Tension**

Definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy – Work done on increasing the area of a surface – Angle of contact – Neumann's triangle – Excess pressure inside a liquid drop and soap bubble – Excess pressure inside a curved liquid surface – Experimental determination of surface tension: Jaegar's method, Drop-weight method and capillary rise method – Variation of surface tension with temperature.

### **Text Books:**

- 1. R. Murugeshan, Properties of matter, S. Chand & Company Ltd., revised edition 2008.
- 2. A. Ubald Raj and G. Jose Robin, Properties of matter and optics, Indira publication, Marthandam, First edition 2003.
- 3. A. Ubald Raj and G. Jose Robin, Allied Physics, Indira publication, Marthandam, First edition 2008.
- 4. D. S. Mathur, Elements of Properties of matter, Shyam Lal Charitable Trust, New Delhi, Reprint 2013.

## **Book for Reference:**

David Halliday, Robert Resnik and Jearl Walker, Fundamentals of Physics, John Wiley & Sons Inc.

SEMESTER – I					
Core II Mechanics, Wave Oscillations and Acoustics					
Code: 18UPHC12 Hrs/Week: 4 Hrs / Semester: 60 Credits: 4					

- Vision: To impart knowledge in the mechanics of objects, wave oscillations and acoustics of buildings
- **Mission:** To enhance the understanding of students in the mechanics of objects, wave oscillations and acoustics through a detailed study of projectile motion, translational and rotational motion, centre of gravity of objects and the nature of sound.

CO.	CO. Upon completion of this course, students will be able to		CL
No.	Opon completion of this course, students will be able to	addressed	
CO-1	discuss impulse and linear momentum, calculate the change in momentum of an object for the net force acting on the object	1	Un
СО-2	analyze the motion of the projectile that is projected with an initial velocity	1	An
CO-3	calculate the torque and angular momentum for a moving particle	1,6	An, Ev
CO-4	locate the center of gravity, the line of gravity and the center of pressure of the objects	1,6	Un, Ev
CO-5	understand the factors affecting atmospheric pressure , variation of atmospheric pressure with temperature, principle of barometer and working of different kinds of barometer	1	Un
CO-6	define simple harmonic motion and discuss the principle of simple harmonic motion and their types	1	Re, Un
CO-7	understand how sound is transmitted through building components	1	Un
CO-8	identity, discuss and resolve acoustical problems related to architectural acoustics and acoustic comfort	1, 6	Un, An

SEMESTER – I				
Core II Mechanics, Wave Oscillations and Acoustics				
Code: 18UPHC12	Hrs / Week: 4	Hrs / Semester: 60	Credits: 4	

#### Unit I: Projectile, Impulse and Impact

Projectile – Expression for time of flight on a horizontal range of a projectile – Path of a projectile is a parabola – Range of a projectile on plane inclined to the horizontal – Impulse of a force – Fundamental principles of impact – Oblique impact of a smooth sphere on a smooth fixed horizontal plane – Direct impact of two smooth spheres – Loss of KE due to direct impact – Oblique impact of two smooth spheres – Loss of KE due to oblique impact.

#### Unit II: Dynamics of rigid bodies

Translational and rotational motion – Angular momentum and angular impulse – moment of inertia and radius of gyration – Moment of inertia of a thin circular ring, solid sphere, solid cylinder – Parallel axis and perpendicular axis theorem – Compound pendulum – theory – Equivalent simple pendulum – Reversibility of centres of oscillation and suspension – Determination of g and k.

#### Unit III: Centre of gravity, Centre of Pressure, Floating bodies, Atmospheric pressure

Centre of gravity of a body – C.G. of a solid hemisphere – C.G. of a solid tetrahedron – C.G. of a solid cone – Centre of pressure – Rectangular lamina – Triangular lamina – Laws of floatation – Stability of floating bodies – Metacentre – Experimental determination of a metacentric height of a ship – The barometer – Fortin's barometer – Correction for a barometer – Faulty barometer – Variation of atmospheric pressure with altitude.

#### **Unit IV: Sound**

Sound – Simple harmonic motion – free, damped, forced vibrations and resonance – Helmholtz resonator – laws of transverse vibration of strings – Sonometer – Determination of AC frequency using sonometer – Determination of frequency using Melde's apparatus. Decibels – Intensity levels – Musical sound and noise – Musical scale.

#### **Unit V: Acoustics**

Reverberation – Sabine's reverberation formula – Factors affecting the acoustics of buildings – Sound distribution in an auditorium – Requisites for good acoustics.

Ultrasonics: Production (Magenetostriction oscillator) and detection – Applications of ultrasonic waves.

## **Text Books:**

- 1. M. Narayanamurthi and N. Nagarathinam, Statics, Hydrostatics and Hydrodynamics, The National Publishing Company, Chennai, 2005.
- 2. D.S. Mathur, Mechanics, S. Chand & Co., Reprint, 2013.
- 3. R. Murugeshan, Mechanics and Mathematical Physics, S. Chand & Co. Pvt. Ltd., New Delhi.
- 4. Brij Lal & Subramaniam, Text book of sound, N. Vikas Publishing House, New Delhi, 1982.
- 5. R. Murugeshan, Properties of matter, S. Chand & Company Ltd., revised edition 2008.
- 6. A. Ubald Raj and G. Jose Robin, Mechanics and Thermal Physics, Indira Publications, Marthandam, First Edition, 2003

### **Books for Reference:**

- 1. M. Narayanamurthi and N. Nagarathinam, Dynamics, The National Publishing Company, Chennai, 2005.
- 2. R. Murugesan, Mechanics and Mathematical Physics, S. Chand & Company Ltd., New Delhi, 2008.
- 3. N. Subrahmanyam and Brij Lal, Waves & Oscillations, Vikas Publishing House Pvt. Ltd., New Delhi, 1994.
- 4. D. R. Khanna and R. S. Bedi, A Textbook of Sound, Atma Ram & Sons, New Delhi 1985.
- 5. D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics, Wiley NY. 6<sup>th</sup> Edition, 2001.

SEMESTER I				
Allied	Allied Ch	iemistry I		
Code :18UCPA11	Hrs/Week: 4	Hrs/ Sem : 60	Credits : 3	

### Vision:

Educate future leaders about how to Chemistry underlies living systems and physical processes.

### Mission:

Graduate students so that they have a broad insight into atomic structure ,purification of organic compounds , elemental analysis, chemical bonding, colloids , emulsions ,gaseous state and nuclear chemistry.

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO 1	list the rules for filling of electron in orbitals, Recognize conductors, insulators and semiconductors, write the electronic configuration of elements	1, 4	Re, Ap
CO 2	identify methods to purify organic compounds Estimate the amount of Carbon, Hydrogen and sulphur in a sample	1,4,3,7	Un
CO 3	evaluate molecular weight of a chemical compound	1, 2	Cr
CO 4	correlate the importance of colloids in day to day life, develop a basic understanding of emulsions	1,2,3	An , Ev
CO 5	explain different types of molecular velocities and its significance	1,4	Un
CO 6	know basic terms associated with gaseous state and an insight into degrees of freedom and law of equipartition of energies	1.2, 3	Re
CO 7	identify fundamental particles of nuclear isotopes	1, 3, 4	Re
CO 8	learn the basic principles behind nuclear fusion and fission and enumerate its application	1, 2	An

SEMESTER I					
Allied Allied Chemistry I					
Code :18UCPA11Hrs/Week : 4Hrs/ Sem : 60Credits : 3					

#### Unit I Atomic Structure and Chemical Bonding

Quantum numbers and their significance- Pauli's exclusion principle – Aufbau principle – Hund's rule – Electronic configuration of elements (atomic number 1 to 36)

Lattice energy – Born-Harber cycle–Factors affecting the dissolution of ionic compounds – M.O. Theory of covalent bond – Bonding, antibonding and non bonding orbital – M.O. Configuration of  $H_2$ , $N_2$ , $O_2$ -Bond order – Band theory of metallic bond- Conductors, insulators, semi conductors- Hydrogen bonding – types and effects – Vander Wall's London forces.

#### Unit II Introduction to Organic Chemistry

Definition and importance-Sources of organic compounds-purification of organic compounds-Crystallisation- Fractional crystallisation-Sublimation-Solvent extraction-Soxhlet extraction

Elemental analysis-qualitative analysis of Carbon, Hydrogen, nitrogen, Sulphur and halogen- estimation of Carbon, Hydrogen, Nitrogen-Calculation of empirical formula-Determination of molecular weight by Victor Mayer's method, silver salt, Chloroplatinic salt method- Calculation of molecular formula

#### **Unit III Colloids and Emulsions**

Definition- Classification of Colloids –comparison of lyophilic and lyophobic colloids Preparation of sols-Dispersion method(Bredig's Arc method ) –Aggregation method (oxidation, reduction, double decomposition) - Properties – Optical (Tyndall effect) – kinetic (Brownian movement) Electrical (electrical double layer) – Coagulation of colloids – Hardy Schulze law-Hoff meister series – protective colloids – gold number – Gels – classification, preparation , properties (imbibition, synerisis and thixotropy). Emulsion – types and their distinction. Emulsifiers – surfactants– applications of colloids-food, medicine, thixotropic paints, clarification of municipal water, formation of delta.

#### Unit IV Gaseous State

Maxwell's law of distribution of velocities (no derivation) –types of molecular velocities – graphical representation and its significance - Collision diameter – collision number – collision frequency – mean free path – viscosity of gases-calculation mean free path and collision diameter from Chapman equation-law of equipartition of energies - Degrees of freedom-molecular basis of heat capacities.

#### Unit V Nuclear Chemistry

Fundamental particles of nuclear isotopes, isobars, isotones and isomers-Differences between chemical reactions and nuclear reactions-fusion and fission and its applications —radioactive series, group displacement law- mass defect- Applications of radio isotopes-carbon dating-rock and medicinal applications.

## **Text Books:**

- 1. Arun Bahl and B.S.Bahl, Advanced Organic Chemistry, S.Chand and Company Ltd., Reprint 2005.
- 2. B.R.Puri, L.R.Sharma, K.C.Kalia, Principles of Inorganic Chemistry, Milestone publishers and distributers, Delhi, 2010.
- 3. Arun Bahl, B.S.Bahl, G.D.Tuli, Essentials of Physical Chemistry, S.Chand & Company Ltd., New Delhi,2008.

## **Books for Reference:**

- 1. K.S.Tewari, N.K.Vishnoi, S.N.Mehrotra, A Text Book of Organic Chemistry, 2<sup>nd</sup> Revised Edition, 1998.
- 2. B.R. Puri. L.R. Sharma, Madan S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2008.
- 3. M.K.Jain and S.C.Sharma, Modern Organic chemistry, Vishal Publishing Co., 2012.

SEMESTER - II					
Core III T	Core III Thermal Physics and Statistical Mechanics				
Code: 18UPHC21     Hrs / Week: 4     Hrs / Semester: 60     Credits: 4					

Vision: To impart knowledge in thermal physics and statistical mechanics

**Mission:** To provide a solid understanding of the fundamental laws of thermodynamics, kinetic theory and statistical physics

CON	Upon completion of this course, students will be able to	PSO	CL
CO.NO.	opon completion of this course, students will be able to	addressed	
CO-1	define temperature, pressure, closed system, reversible	1	Re
	and irreversible process		
CO-2	understand the basic concepts of thermodynamics such as	1	Un
	temperature, pressure, properties, closed system,		
	reversible and irreversible process		
CO-3	understand the transfer of energy	1	Un
CO-4	demonstrate the experiment regarding the measurement	1, 2	An
	of thermal conductivity and specific capacity		
CO-5	calculate the thermal conductivity of a bad conductor	1,6	An
CO-6	understand the low temperature physics, concerned with	1	Un
	the behavior of matter in the temperature regime where		
	quantum effects are dominated		
CO-7	create an interest in field of research in low temperature	1	Cr
	physics		
CO-8	employ Fermi-Dirac and Bose-Einstein statistics	1	An, Ev
	according to the spin of the particle and compare the three		
	statistics		

SEMESTER - II				
Core III Thermal Physics and Statistical Mechanics				
Code: 18UPHC21Hrs / Week: 4Hrs / Semester: 60Credits: 4				

### Unit I: Laws of thermodynamics

Zeroth law of Thermodynamics – First law of thermodynamics – Isothermal Change – Adiabatic Change – Heat engine – Expression for the efficiency of a Carnot's engine – Carnot's cycle as refrigerator – Carnot's theorem - Reversible and irreversible process – Second law of thermodynamics – Thermodynamic scale of temperature – Entropy – Change in entropy in reversible and irreversible process – Temperature-entropy diagram – Third law of thermodynamics.

### Unit II: Kinetic theory of gases

Ideal gas equation – Degrees of freedom – Equipartition of energy – Atomicity of gas – Mean free path of a molecule – Expression for the mean free path – Transport phenomena – Expression for the viscosity of a gas – Thermal conductivity of a gases – Expression for the coefficient of diffusion – Vander Waal's equation of the state: Real or imperfect gas Vander Waal's equation – Critical constant in terms of Vander Waal's constants – Demerits of Vander Waal's equation – Reduced equation of state .

#### Unit III: Transmission of heat

Transference of heat : Conduction, Convection and Radiation – Conduction: Coefficient of thermal conductivity – Thermal conductivity of good conductor: Forbe's method – Thermal conductivity of bad conductor: Lee's disc method – Widemann Franz law – Convection: Illustrative examples – Verification of Newton's law of cooling and determination of specific heat capacity of liquid – Convective equilibrium – Radiation : Black body – Stefan-Boltzman's law – Boltzman's proof – Distribution of energy in the spectrum of a black body – Wien's displacement law – Rayleigh-Jean's law – Planck's radiation law.

## **Unit IV: Low temperature Physics**

Joule-Thomson effect – Porous-plug experiment – Theory – Expression for the Joule – Thomson cooling produced in a Vander Waal's gas – Liquefaction of gases: Regenerative cooling – Liquefaction of air (Linde's process) – Liquefaction of Helium – Adiabatic demagnetisation – Expression for the fall in temperature due to adiabatic demagnetisation – Practical applications of low temperature – Refrigeration – Air conditioning – Air conditioner – Window air-conditioner – Central heating system – Effects of  $CF_2Cl_2$  on ozone layer.

## **Unit V: Statistical Mechanics**

Probability – Probability theorems – Phase space – Chemical potential – Quantum states – Microscopic and macroscopic systems – Microstates, macrostates and thermodynamic

probability – Fundamental postulates of statistical mechanics – Probability and disorder (Entropy) – Derivation of Boltzmann's relation – Maxwell-Boltzman distribution law (M.B statistics) – Quantum statistics – Fermi-Dirac statistics – Bose-Einstein statistics – Comparison of three statistics.

#### **Text Books:**

- 1. R. Murugeshan, Er. Kiruthiga Sivaprasath, Thermal Physics, S. Chand & Co. pvt. Ltd., New Delhi, Reprint 2014.
- 2. G. Jose Robin and A. Ubald Raj, Thermal Physics and Statistical Mechanics, Indira Publications, Marthandam, 2001.
- 3. J.B. Rajan and C.L. Arora, A textbook of Heat and thermodynamics, S. Chand & Co. Pvt. Ltd., New Delhi, Reprint 1983.

#### **Books for Reference:**

- 1. A.B. Gupta, H.P. Roy, Thermal physics, Books and Allied (P) Ltd., Kolkata, Reprinted 2011.
- 2. Halliday and Resnik, Fundamentals of Physics, John Wiley publication, 6<sup>th</sup> edition extended, 2006.
- 3. M.N. Bapat, D.S. Mathur's Heat and Thermodynamics, Sultan Chand & sons, Educational publishers, New Delhi, Reprint 2001.
- 4. Brijlal and N. Subrahmanyam, Heat and thermodynamics, S. Chand & Co, Ltd., 7<sup>th</sup> edition, 1981.

SEMESTER – II					
Core IV	Core IV Optics				
Code: 18UPHC22     Hrs / Week: 4     Hrs / Semester: 60     Credits: 4					

- **Vision:** To appreciate the spectacular nature of light and harness it for constructive day to day applications.
- **Mission:** To deepen the conceptual knowledge in optical phenomena and apply it in real life situations through the systematic study of theory, validating experiments and relevant applications.

CON	Upon completion of this course, students will be able to	PSO	CL
CO.NO.	Opon completion of this course, students will be able to	addressed	
CO-1	understand the theory behind the important properties of	1	Un
	light such as reflection, refraction, dispersion,		
	interference, diffraction and polarisation.		
CO-2	calculate the focal length of lenses in contact and out of	1,6	An
	contact with each other		
CO-3	determine the refractive index and dispersive power of the	1, 2, 6	Ev
	material of the prism		
CO-4	define the different types of aberrations in lenses and	1	Re, Un
	discuss the methods to reduce them		
CO-5	describe the phenomenon of interference in reflected	1, 2, 6	Un, Ev
	systems and calculate the refractive index of liquids by		
	forming Newton's rings		
CO-6	calculate the thickness of a thin wire by forming	1, 2, 6	Ev
	interference fringes		
CO-7	evaluate the dispersive power and resolving power of a	1, 2, 6	Ev, An
	grating and demonstrate experiments with a grating and		
	find the wavelengths of the light used		
CO-8	acquire knowledge of the polarisation of light and its	1	Un
	changes upon reflection and transmission		

SEMESTER – II					
Core IV	Core IV Optics				
Code: 18UPHC22     Hrs / Week: 4     Hrs / Semester: 60     Credits:					

#### **Unit I: Refraction in lenses**

Introduction – Refractive index and optical path – Fermat's principle – Laws of reflection and refraction – Refraction through a thin lens (Lens maker's formula) – Deviation produced by thin lens – Equivalent focal length of two thin lenses in contact and separated by a distance – Definition of Cardinal points and respective planes.

### **Unit II: Dispersion and Aberrations**

Dispersion by a prism – Refraction through a prism – Angular dispersion – Dispersive power – Deviation without dispersion – Dispersion without deviation – Direct vision spectroscope – Constant deviation prism – Constant deviation spectroscope – Aberrations – Spherical aberration in lenses – Methods of minimizing spherical aberration – Coma – Aplanatic points – Chromatic aberration in lenses – Achromatic lenses – Condition for achromatism of two thin lenses in contact and separated by a finite distance.

### Unit III: Interference

Introduction – Conditions for interference – Interference due to reflected light – Production of colours in thin films – Air wedge – Determination of diameter of a thin wire by air wedge – Test for optical flatness-Newton's rings – Determination of wavelength of Sodium light by Newton's rings – Determination of refractive index of a liquid by Newton's rings – Michelson's interferometer – Determination of  $\lambda$  and  $d\lambda$ .

#### **Unit IV: Diffraction**

Introduction – Fresnel's explanation of rectilinear propagation of light – Half period zones – Zone plate – Multiple foci in a zone plate – Comparison of a zone plate with a convex lens – Fraunhofer diffraction at a single slit – Plane diffraction grating – Theory – Determination of wavelength of light using transmission grating (Normal incidence) – Grating at oblique incidence – Dispersive power of grating – Rayleigh's criterion for resolution – Resolving power of a plane transmission grating.

#### **Unit V: Polarisation**

Introduction – Polarisation by reflection – Pile of plates – Law of Malus – Double refraction – Nicol prism – Polarizer and Analyzer – Quarter wave plate and half wave plate – Production and detection of plane, circularly and elliptically polarized light – Optical activity – Fresnel's theory of optical rotation – Specific rotation – Laurent's half-shade polarimeter. **Text Books:** 

- 1. N. Subramanyam and Brijlal, A textbook of Optics, S. Chand & Co., Revised by M. N. Avadhanulu 23<sup>rd</sup> revised and enlarged edition, 2006.
- 2. R. Murughesan, Optics and Spectroscopy, S. Chand & Co, 6<sup>th</sup> revised edition 2006.

### **Books for Reference:**

- 1. David Halliday, Robert Resnik & Jearl Walker, Fundamentals of Physics, John Wiley & Sons Inc.
- 2. Ajay Ghatak, Optics, McGraw Hill Education (India) Private Limited, New Delhi, Fourth reprint 2014.

SEMESTER – I & II				
Practical I				
Code: 18UPHCR1	Hrs / Week: 2	Hrs / Semester: 30	Credits: 2	

#### List of Experiments (Any fourteen)

- 1. Measurements of diameter using vernier caliper, screw gauge and travelling microscope
- 2. Young's modulus Uniform bending (pin and microscope)
- 3. Young's modulus Non uniform bending (scale and telescope)
- 4. Young's modulus Cantilever depression (pin and microscope)
- 5. Surface Tension Drop weight method
- 6. Surface Tension Capillary rise
- 7. Comparison of viscosities Oswald's viscometer / Hare's apparatus
- 8. Coefficient of viscosity Stoke's method
- 9. Coefficient of viscosity Burette method
- 10. Compound pendulum 'g' and moment of inertia
- 11. Rigidity modulus Torsion pendulum
- 12. Sonometer A.C frequency
- 13. Melde's String
- 14. Specific heat capacity of liquid Newton's law of cooling
- 15. Thermal conductivity of a bad conductor Lee's disc
- 16. Air wedge Thickness of wire
- 17. Spectrometer refractive index of a solid prism
- 18. Spectrometer Prism Dispersive power
- 19. Newton's ring
- 20. Long focus convex lens f, R and  $\mu$  determination
- 21. Determination of the specific heat capacity of different liquids.
- 22. Determination of the thermal conductivity of good conductor using Forbe's Method.

SEMESTER II					
Allied	Allied Allied Chemistry II				
Code : 18UCPA21Hrs/Week : 4Hrs/ Sem : 60Credits : 3					

## Vision:

To provide a broad foundation in the fundamental principles of chemistry that stresses scientific reasoning.

## Mission:

Student will be able to integrate knowledge of physics to a wide variety of chemical problems and thereby understand the interdisciplinary nature of chemistry involved in metallurgy, preparation of some organic compound, industrial chemistry, analytical chemistry photochemistry and electrochemistry.

CO No.	Upon completion of this course, students will be able to	PSO	CL
		addressed	
CO 1	Differentiate ores and minerals Explain the methods of	1	An,Un,
	purification of ores Know the extracting methods, properties and		Re
	uses of titanium, vanadium ,thorium. Titanium tetrachloride,		
	Vanadiumpentoxide, Thorium nitrate.		
CO 2	Synthesise some industrially important organic compounds such	1, 5	Ev
	as Freon, rayon, polyester, nylon, thiokol Dacron		
CO 3	Classify fuels and know its industrial uses	1, 4	Ар
CO 4	Identify the techniques for sterilising water for domestic use	1, 4	An
CO 5	Know the basics of abrasives	1,4	Re
CO 6	Know the principles of volumetric analysis	1,3 , 4	Re
CO 7	Assess error analysis	1	Cr
CO 8	Know the basic concepts of photochemistry and electrochemistry	1,3	Re

SEMESTER II				
Allied Allied Chemistry II				
Code: 18UCPA21	Hrs/Week: 4	Hrs/ Sem : 60	Credits : 3	

## Unit I Metallurgy

Ores and Minerals- types of ores – methods of ore dressing- roasting –calcinationreduction(aluminothermic)-smelting-purification by electrolysis and ion exchange methodoxidative refining- zone refining- Kroll process- types of furnaces.

Extraction, properties and uses of titanium-vanadium-thorium.

Preparation of Titanium tetrachloride, Vanadium pentoxide and Thorium nitrate

### Unit II Preparation and Uses of Some Important Organic Compounds

Preparation and uses of Formalin , choloroform , Freon , rayon , polyester , nylon , thiokol Dacron , silicone, Bakelite , polythene , urethane , Teflon , PVC , BHC

## Unit III Industrial Chemistry

**Fuels**-classification-gaseous fuels -water gas ,producer gas, liquefied petroleum gas, gobar gas, compressed natural gas.

Water-Hardness of water-temporary and permanent hardness, disadvantages of hard watersoftening of hard water-zeolite process, demineralization process and reverse osmosissterilisation of water for domestic use by chlorine, ozone and UV light.

Abrasives-Manufacture and uses of carborundum, calcium carbide, alundum-Industrial uses of lamp black, carbon black, activated charcoal, wood charcoal, animal charcoal, coke, artificial diamond

## **Unit IV Analytical Chemistry**

Introduction to Qualitative and Quantitative analysis Principles of volumetric analysis – Error analysis –types of errors minimizing errors – accuracy and precision – Methods of expressing precision, mean, median, mean deviation, standard deviation and confidence limit.

## Unit V Photochemistry and Electrochemistry

Photochemistry-Introduction to photochemistry-Statement of Grothus —Draper law, Beer-Lambert law -Stark Einstein's law, Quantum yield-Photosynthesis — Phosphorescence-Fluorescence- Chemiluminescence-Bioluminescence- Definition with examples.

Electrochemistry-Specific conductance-ionic conductance-molar conductance — equivalent conductance-Definition of pH and its determination by colorimetric method- Buffer solution-Henderson's Equation-Applications of pH and buffer in biological systems.

## **Text Books**

- 1. Arun Bahl and B.S.Bahl, Advanced Organic Chemistry, S.Chand and Company Ltd., Reprint 2005.
- 2. B.R.Puri, L.R.Sharma, K.C.Kalia, Principles of Inorganic Chemistry, Milestone publishers and distributers, Delhi, 2010.
- 3. Arun Bahl,B.S.Bahl,G.D.Tuli, Essentials of Physical Chemistry, S.Chand & Company Ltd., New Delhi, 2008.

## **Books for Reference**

- 1. K.S.Tewari,N.K.Vishnoi,S.N.Mehrotra, A Text Book of Organic Chemistry, 2<sup>nd</sup> Revised Edition, 1998.
- 2. B.R. Puri. L.R. Sharma, Madan S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2008.
- 3. M.K.Jain and S.C.Sharma, Modern Organic chemistry, Vishal Publishing Co., 2012.

SEMESTER II					
A	Allied Chemistry Practicals				
Code:18UCHAR1	Hrs/Week : 2	Hrs/ Sem : 30	Credits : 2		

## **Organic Analysis**

Analysis of simple organic compounds

- a) Nature of the compound- Aromatic / Aliphatic
- b) Test for Saturation/ unsaturation.
- c) Element present/absent
- d) Characterization of functional groups (Acid, phenol (solid), aldehyde, ester,

amide, primary amine, carbohydrates).

### **Volumetric Analysis**

## I. Acidimetry — Alkalimetry

- 1. Estimation of  $H_2SO_4$  /HCl using standard oxalic acid .
- 2. Estimation of sodium hydroxide using standard sodium hydroxide.
- 3. Estimation of sodium carbonate using standard sodium carbonate.
- 4. Estimation of oxalic acid using standard oxalic acid

#### **II.** Permanganometry

- 5. Estimation of ferrous ion using standard ferrous ammonium sulphate.
- 6. Estimation of sodium oxalate /oxalic acid using standard oxalic acid.

#### **III.** Complexometry

7. Estimation of Zinc using standard Zinc sulphate.

### **Books for reference:**

- 1. Vogel's Textbook of Quantitative Chemical Analysis, 2004 sixth Edition
- Advanced Practical Chemistry Raghupati Mukhopadhyay, Pratul Chatterjee Books and Allied (P) Ltd. Third Edition-2007

SEMESTER III					
Core V	Core V Electricity and Electromagnetism				
Code: 18UPHC31	Hrs./Week : 4	Hrs./Sem : 60	Credits : 4		

Vision: To transform our students to become competent in the field of electrical and magnetic Physics

Mission: To make our students understand the basic concept of electricity, laws of electromagnetic induction and also Maxwell's equations for the propagation of electromagnetic waves

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	recall Coulomb's law	1	Re
CO–2	discuss potential due to point charge	1	Un
CO–3	apply the principle of potentiometer to measure current and resistance	1,4,6	Ар
CO-4	compare self inductance and mutual inductance	1,4,6	Ev
CO–5	describe eddy current	1	Un
CO-6	construct LCR series and parallel resonance circuit	1,4,6	Cr
CO–7	study the uses of transformer	1,4,6	Ap
CO–8	formulate Maxwell's equations for the propagation of electromagnetic waves	1	Cr

SEMESTER III				
Core V	Core V Electricity and Electromagnetism			
Code: 18UPHC31Hrs/Week : 4Hrs./Sem : 60Credits : 4				

### Unit I: Steady currents and Thermo electricity

Current and current density – Equation of continuity – Ohm's law – Kirchoff's laws – Applications to Wheatstone's network – Carey Foster bridge – Determination of coefficient of resistance – Potentiometer – Seebeck effect – Law of successive temperature – Law of intermediate metals – Thermocouple – Laws of thermo emf – Peltier effect – Thomson effect – Thermodynamics of thermocouple – Measurement of thermo emf using a Potentiometer.

### Unit II: Magnetic properties and Magnetic effect of Electric current

Magnetic induction (B) – Magnetization (M) – Relation between B, H and M – Magnetic susceptibility – Magnetic permeability – Relation connecting them.

Moving coil B.G – Construction and theory – Correction for damping in B.G. – Measurement of charge sensitiveness – Absolute capacity of a condenser – Desauty's bridge to compare two capacitances.

### **Unit III: Electromagnetic Induction**

Faraday's laws of induction – Lenz law – Expression for induced current – Self induction – Self inductance of a long solenoid and a torroidal solenoid – Determination of self inductance by Rayleigh's method using B.G – Mutual induction – Determination of mutual inductance – Eddy currents.

### Unit IV: AC circuits

Alternating currents – Average and r.m.s value – a.c through L and R in series – a.c through C and R in series – a.c through L and R in parallel – Vector diagram method – LCR series resonance circuit – Sharpness of resonance – Q factor – Parallel resonance circuit – Q– factor – Power in a.c circuits – Power factor – Wattless current – Choke – Transformer.

#### Unit V: Maxwell's equations and Electromagnetic waves

Fundamental laws of electromagnetism – Ampere's law – Need for modifying Ampere's law – Maxwell's modification of Ampere's law – Displacement current – Maxwell's equations– Energy in electromagnetic waves – Poynting vector.

## **Text Books:**

- 1. R. Murugeshan, Electricity and Magnetism, S. Chand & company Ltd. 2<sup>nd</sup> revised edition, 1998.
- 2. G. Jose Robin and A. Ubald Raj, Electricity, Electromagnetism and Practicals., First Edition May 2004.

### **Books for Reference:**

- 1. Brijlal and Subramanium, Electricity and Magnetism, Ratan Prakash mandir, 7<sup>th</sup> edition, 1994.
- 2. D.C. Tayal, Electricity and Magnetism, Himalaya Publishing House, 3<sup>rd</sup> revised edition, 1998.
- 3. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, Wiley & Sons Inc. 6<sup>th</sup> edition, 2006.

Semester –III				
Allied	Allied Mathe	matics – I		
Code : 18UMAA31	Hrs/week :3	Hrs/Sem :45	Credits :2	

# Vision

Aims to help physical science students to achieve their goals and to develop their mathematical skills

## Mission

To help students to appreciate the uses of derivatives and integrals in day to day life and solve real life problems

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	form the equations from the given roots.	1	Cr
CO-2	Approximate solutions of equations by applying	1	Un ,Ev
	Horner's method and Newton's method		
CO-3	transform equations by increasing, decreasing and	3	An
	multiplying the roots of the equation.		
CO-4	develop and apply concepts of expressions and equations	7	An
	to investigate and describe relationships		
CO-5	demonstrate problem solving skills	3, 8	Cr
CO-6	evaluate eigen values and eigen vectors of square	1	Un, Ev
	matrices and make use of the properties of determinants		
	in their calculation.		
CO-7	calculate the radius of curvature by differentiation	1,3	Un, Ev
CO-8	calculate centre and circle of curvature.	1,3	Ev

Semester –III					
Allied Allied Mathematics – I					
Code : 18UMAA31Hrs/week :3Hrs/Sem :45Credits :2					

#### Unit I

Theory of equations - Formation of equations

### Unit II

Approximate solutions of equations - Horner's method and Newton's method

### Unit III

Matrices - Cayley - Hamilton theorem-Eigen values and Eigen vectors

#### Unit IV

Curvature and Radius of Curvature -Cartesian and polar co - ordination

#### Unit V

Centre of Curvature – Evolutes

#### **Text Book**

1. S.Arumugam & A.Thangapandi Isaac, Allied Mathematics, New Gamma Publishing House, Palayamkottai

#### **Books for Reference**

- Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume – I, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010
- Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume – II, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

SEMESTER – III				
Allied Mathematics – II				
Code : 18UMAA32Hrs / Week: 3Hrs / Semester: 45Credits: 2				

## Vision

Aims to help physical science students to achieve their goals and to develop their mathematical skills

### Mission

To help students to appreciate the uses of derivatives and integrals in day to day life and solve real life problems

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	compute the curl and the divergence of vector fields	1,3	Cr
CO-2	compute the gradient of a scalar valued function	1,3	Cr
CO-3	solve Differential Equations	1	Ev
CO-4	interpret basic definitions and terminology associated with differential equations and their solutions	3	Un
CO-5	classify the differential equations with respect to their order and linearity	1	An
CO-6	solve linear differential equations	1	Ev
CO-7	find complementary functions	1	Re
CO-8	evaluate particular integrals of the form $e^{ax}$ , sin $ax$ , cos $ax$ , $x^m$ and $e^{ax}f(x)$	1,3	An,Ev

Semester –III					
Allied Allied Mathematics – II					
Code: 18UMAA32Hrs/week :3Hrs/Sem :45Credits :2					

#### Unit I

Vector Differentiation - Gradient-unit normal

#### Unit II

Divergence and Curl

### Unit III

First order differential equations of higher degree - Equations solvable for p,x,y and Clairauts form

#### Unit IV

Linear equations of second and higher order with constant co –efficients-Complementary function - particular integrals of the form  $e^{ax}$ 

#### Unit V

Linear equations of second and higher order with constant co –efficients-Complementary function - particular integrals of the form  $\sin ax$ ,  $\cos ax$ ,  $x^m$  and  $e^{ax}f(x)$ 

#### **Text Book**

1. S.Arumugam & A.Thangapandi Isaac, Allied Mathematics, New Gamma Publishing House,

Palayamkottai

#### **Books for Reference**

- Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume – I, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010
- Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume – II, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

SEMESTER III				
Core Skill Based Instrumentation				
Code : 18UPHS31Hrs/Week : 4Hrs./Sem : 60Credits : 4				

Vision: To enrich our students with the knowledge of instrumentation physics

Mission: To make our students to understand the basic principles of instrumentation physics

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	identify the errors of instruments.	3.4	Un
CO–2	find out the arithmetic mean, deviation from the mean, average deviation, standard deviation.	3,8	Cr
CO–3	list out the characteristics of resting potential	3	Re
CO-4	compare active and passive transducers	3	Ev
CO–5	understand the working of bio medical equipments such as electron microscope.	3	Un
CO–6	read and interpret the output of bio potential recorders such as ECG and EEG.	3,6	Ev
CO–7	recall the functional elements of measuring instruments	3,6	Re
CO8	describe the applications of Physics in the field of medicine	3	Un

SEMESTER III				
Core Skill Based Instrumentation				
Code : 18UPHS31Hrs/Week : 4Hrs/Sem : 60Credits : 4				

### Unit I: Measurement and error

Definition – Accuracy and precision – Significant figures – Types of error (Gross error, Systematic error, Random error) – Statistical analysis (Arithmetic mean, Deviation from the mean, Average deviation, Standard deviation) – Probability of errors (Normal distribution of errors, Probable error) – Limiting errors.

### **Unit II: Electrodes**

Electrode potential – Purpose of the electrode paste – Electrode material – Types of electrodes – Microelectrodes (metal microelectrode) – Depth and needle electrodes – Surface electrodes – Chemical electrodes (Hydrogen electrode, pH electrode, pCO<sub>2</sub> electrode).

### Unit III: Transducers and Microscope

Active transducers: Piezoelectric type transducers and Photovoltaic type transducer – Passive transducer – Photoelectric type resistive transducers – Inductive transducers – Optical and Electron microscope – Comparison between optical and electron microscope – Resolving power – Magnification power – Depth of focus – Types of electron microscope – TEM – SEM – Comparison between TEM and SEM.

#### Unit IV: Specialized and advances in medical instruments

Angiography – Digital thermometer – Endoscopes – EEG – ECG – Computed Tomography (CT scan) – X-ray machine – Comparison of Fluoroscopy and Radiography – Computers in medicine – Lasers in medicine – Cryogenic surgery – MRI (basics and instrumentation).

#### **Unit V: Displays and Oscilloscope**

Classification of displays – Display devices – Liquid crystal diode – Incandescent display –Liquid vapour display – Oscilloscope – Basic principle – CRT features – Block diagram of oscilloscope –Simple cathode ray oscilloscope.

#### **Text Books:**

- 1. Albert D. Helfrick and William D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice- Hall of India Pvt. Limited, Reprint 2002.
- 2. M. Arumugam, Biomedical Instrumentation, Anuradha Agencies, Reprint 2002.
- 3. H.S.Kalsi, Electronic Instrumentation, Tata McGraw Hill Education Pvt. Limited, Reprint 2012.

#### **Books for Reference:**

- 1. P. Mani, A text book of Engineering Physics- I, Dhanam Publications, Reprint 2013.
- 2. G. Jose Robin and A. Ubald Raj, Applied Physics, Indira Publications, Marthandam, 1998
| SEMESTER III    |                                 |              |             |  |  |
|-----------------|---------------------------------|--------------|-------------|--|--|
| NME I           | NME I         Applied Physics I |              |             |  |  |
| Code : 18UPHN31 | Hrs/Week : 2                    | Hrs/Sem : 30 | Credits : 2 |  |  |

Vision: To transform our students in the field of applied physics

Mission:	To train	our students	in domestic	wiring, ai	r conditioning	and fibre and	d laser optics
Course (	Dutcome	:					

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	recall the tools used in the home	3	Re
CO –2	discuss the systems of domestic wiring	3	Un
CO –3	explain the principle of Air Conditioning	3	Un
CO -4	sketch the refrigerating cycle	3	Ap
CO –5	describe the function of a compressor	3	Un
CO -6	understand the theory behind the important properties of light such as reflection, refraction, interference and total internal reflection	1,3	Un
CO –7	discuss the types of optical fibers	2,3	Ev
CO -8	list out the applications of lasers	3	Re

SEMESTER III				
NME I         Applied Physics I				
Code : 18UPHN31	Hrs/Week : 2	Hrs/Sem : 30	Credits : 2	

#### **Unit I: Domestic Wiring**

Introduction – Tools – Precautions in handling tools – Wires – Cables – Systems of domestic wiring (CTS wiring, conduit wiring) – Fuses.

## **Unit II: Electrical Appliances**

Electric bell – Electric iron – Electric kettle – Hot plate – Fan – Washing machine.

#### **Unit III: Air Conditioning**

Air conditioning – Principle – Refrigerating cycle – Refrigerants – Evaporators – Function of a compressor – Freezers – Ice plant – Water coolers.

## **Unit IV: Fibre optics**

Introduction – Principles of optical fibre – Total internal reflection – Acceptance angle – Numerical aperture – Types of optical fibres – Fibre optic communication system – Advantages.

#### Unit V: Laser

Basic principle – Concept of laser – Population inversion – Pumping action – Characteristics of laser – Determination of the wavelength of the given laser source of light using grating – Determination of particle size – Application of lasers.

#### **Text Books:**

- 1. G. Jose Robin and A. Ubald Raj, Applied Physics, Indira Publications, Marthandam, 1998
- 2. P.Mani, A text book of Engineering Physics-I, Dhanam Publications, 2007 Edition.

SEMESTER III		
Self Study Paper Electrical Wiring and Appliances		
Code : 18UPHSS1 (Optional)		Credits : +2

- Vision: To produce competent students to handle electrical appliances and wiring in their home
- Mission: To equip the students with adequate knowledge and skills in the field of electrical wiring and appliances

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	recall the tools used in the home	3	Re
CO –2	discuss the systems of domestic wiring	3	Un
CO –3	explain the principle of AC	1,3	Un
CO -4	sketch the refrigerating cycle	1,3	Ap
CO –5	describe the function of a compressor	3	Un
CO –6	list out the types of motor	1,3	Re
CO -7	describe a single phase a.c.motor	1,3	Un
CO -8	sketch electric kettle	3	Ap

SEMESTER III		
Self Study Paper Electrical Wiring and Appliances		
Code : 18UPHSS1 (Optional)	Credits : +2	

## **Unit I: Domestic Wiring I**

Introduction – Tools – Precautions in handling tools – Wires – Cables – General rules for wiring – Systems of domestic wiring.

## **Unit II: Domestic Wiring II**

Tests to be carried out on wiring installation before commissioning – Good grounding and its need – Fuses – Switch wiring.

## **Unit III: Air Conditioning**

Air conditioning – Principle – Refrigerating cycle – Refrigerants – Evaporators – Function of a compressor – Freezer.

## Unit IV: Electric motors and coil winding

Electric motor – Motor classification – Motor Rating – Squirrel cage induction motor – A single phase a.c. motor – Motor winding – Coil winding.

# **Unit V: Electrical Appliances**

Electric bell – Electric iron – Electric kettle – Hot plate – Fan – Washing machine.

## **Text Books:**

1. G. Jose Robin and A. Ubald Raj, Applied Physics, Indira Publications, Marthandam, 1998.

SEMESTER IV					
Core VI Ele	Core VI Electronics and Communication				
Code : 18UPHC41	Hrs/Week : 4	Hrs/Sem : 60	Credits : 4		

Vision: To develop competent technocrats who can strive continuously in pursuit of professional excellence in the field of Electronics and Communication

**Mission:** Establish a unique learning environment to enable the students to face the challenges in Electronics and Communication Engineering field

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	recall semiconductors	2	Re
CO –2	design a voltage regulator using Zener diode.	2,4,6	Cr
CO –3	construct Colpitt's oscillator, Hartley oscillator.	2,4,6	Cr
CO4	design a single stage transistor amplifier and an oscillator	2,4,6	Cr
CO –5	list out the types of networks	2	Re
CO –6	differentiate monostable and bistable multivibrator	2,4,6	An
CO –7	describe Satellite Communication	2	Un
CO -8	apply the principle of Doppler effect to Radar	2,3	Ap

SEMESTER IV				
Core VI	Core VI Electronics and Communication			
Code : 18UPHC41	Hrs/Week : 4	Hrs/Sem : 60	Credits : 4	

#### **Unit I: Linear Circuit Analysis**

Linear and non – linear circuit elements – Active and Passive elements – Ideal voltage source and current source – Superposition theorem – Thevenin's theorem – Norton's theorem – Maximum power transfer theorem – h-parameters.

#### **Unit II: Semiconductor Devices**

**Diodes:** Semiconductors – P and N type semiconductors – PN junction diode under forward bias, reverse bias – Silicon and Germanium diodes – Energy band diagram of PN diode – V-I characteristics of a PN diode – Experimental determination of knee voltage, ac forward resistance and reverse saturation current of a PN diode – Diode rectifier – Half wave rectifier – Expression for  $I_{dc}$ ,  $I_{rms}$ , efficiency and ripple factor – Bridge rectifier – Zener diode – V-I characteristics – Voltage regulator.

**Transistor:** Junction transistor – Three modes of transistor connection – Relation between alpha and beta of transistor – Transistor parameter calculation for CE mode – Single stage transistor amplifier.

#### **Unit III: Oscillators**

Feedback – Negative voltage feedback amplifier – Principle – Gain – Advantages – Feedback circuit. Negative current feedback – Principle – Current gain – Effects – Emitter follower – D.C. analysis – Voltage gain – Input impedance – Output impedance – Applications – Sinusoidal oscillator – Types – Oscillatory circuit. Positive feedback amplifier – Barkhausen criterion. Colpitt's oscillator, Hartley oscillator.

## **Unit IV: Operational Amplifier**

Operational amplifier basic ideas – Inverting amplifier – Summing amplifier – Differential amplifier – Integrator & Differentiator using Op amp – Instrumentation amplifier using Op amp – Differential Instrumentation amplifier using transducer bridge – Application to measurement of temperature and as analog weight scale – Multivibrator (Astable, Monostable and Bistable using Op amp).

## **Unit V: Modulation and Demodulation**

Radio Amplitude modulation – Modulated power output – Single side band transmission: A.M – Frequency Modulation – FM transmitter – Demodulation – Transmission of radio waves – Reception of radio waves – Superhetrodyne Receiver – Characteristics of a receiver.

# **Text Books:**

- 1. V. K. Mehta and Rohit Mehta, Principles of Electronics, S. Chand & Co. Ltd. 2006.
- 2. G. Jose Robin and A. Ubald Raj, Electronics (I Edition), Indira Publication, Marthandam, 2000.

# **Books for Reference:**

- 1. R. S. Sedha, A text book of applied electronics, S. Chand & Co. Ltd. 2006.
- 2. B. L. Theraja, Basic Electronics (solid state), S. Chand & Co. Ltd. 2003.
- 3. N. N. Bargava, D. C. Kulshreshtha, S. C. Gupta, Basic Electronics and linear circuits, Tata McGraw Hill Publishing company Ltd, Reprint 2012.

SEMESTER - IV			
Allied Allied Mathematics – III			
Code: 18UMAA41	Hrs / Week: 3	Hrs / Semester: 45	Credits: 2

# Vision

Aims to help physical science students to achieve their goals and to develop their mathematical skills

# Mission

To help students to appreciate the uses of derivatives and integrals in day to day life and solve real life problems

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	identify the difference between partial differential	1	An
	equation and ordinary differential equation		
CO-2	form the partial differential equation	1	Cr
CO-3	classify various types of partial differential equations	3	Un
CO-4	apply Laplace transform on functions	1	An
CO-5	understand inverse Laplace transform	1	Un
CO-6	solve differential equation using Laplace transform	1	An
CO-7	identify Beta integrals and Gamma integrals	3	An
CO-8	understand the concept of Beta and Gamma functions.	1	Un

Semester –IV			
Allied Allied Mathematics – III			
Code: 18UMAA41	Hrs/week :3	Hrs/Sem :45	Credits :2

## Unit I

Partial differential equation -first order -formation - types of solutions -Lagrange's form

## Unit II

Laplace transforms - inverse Laplace transform

## Unit III

Application to solution of differential equations (except simultaneous equations)

## Unit IV

Beta and Gamma functions - Definitions, Properties and results

## Unit V

Beta and Gamma functions - Problems

## **Text Book**

1. S.Arumugam & A.Thangapandi Isaac, Allied Mathematics, New Gamma Publishing House, Palayamkottai

## **Books for Reference**

- Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume – I, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010
- Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume – II, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

SEMESTER – IV			
Allied Allied - Mathematics – IV			
Code : 18UMAA42	Hrs / Week: 3	Hrs / Semester: 45	Credits: 2

# Vision

Aims to help physical science students to achieve their goals and to develop their mathematical skills

# Mission

To help students to appreciate the uses of derivatives and integrals in day to day life and solve real life problems

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	use the Jacobian to change variables to ease integration	1,3	Un
CO-2	evaluate line integrals	3	Ev
CO-3	set up the regions and integrate double integrals in	3	Re, Ev
	rectangular and polar coordinates		
CO-4	set up and evaluate triple integrals	3	R,E
CO-5	use Green's theorem to evaluate line integrals along	1	Cr
	simple closed contours on the plane.		
CO-6	apply Stokes' theorem to compute line integrals along the	1	An
	boundary of a surface.		
CO-7	use Stokes' theorem to give a physical interpretation of	1,3	An
	the curl of a vector field.		
CO-8	use the divergence theorem to give a physical	1,3	An
	interpretation of the divergence of a vector field.		

Semester –IV			
Allied Allied Mathematics – IV			
Code : 18UMAA42Hrs/week :3Hrs/Sem :45Credits :2			

## Unit I

Jacobian – Results and Problems

#### Unit II

Vector Integration -Line Integral

#### Unit III

Vector Integration -Surface Integral- Stoke's theorems

#### Unit IV

Vector integration - Volume integrals-Verification of Green's, and Divergent theorems (simple problems only).

#### Unit V

Introduction of Forward Difference operator and Backward Difference operator(only) -Newton's Interpolation formulae

## **Text Book**

1. S.Arumugam & A.Thangapandi Isaac, Allied Mathematics, New Gamma Publishing House,

Palayamkottai

# **Books for Reference**

- Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume – I, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010
- Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume – II, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

SEMESTER IV		
Core Skill Based Physics for Competitive Examinations		
Code : 18UPHS41Hrs./Week : 4Hrs./Sem : 60Credits : 4		

- Vision: To motivate students to face and pursue higher education through competitive examinations
- Mission: To equip our students with the basic principles of physics and apply the same in solving problems

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	recall units and dimensions	8	Re
CO –2	solve problems in gravitation and escape velocity	1,8	An
CO –3	solve problems in magnetic effect of current	1,8	An
CO4	solve problems in Surface Tension and Viscosity	1,8	An
CO -5	solve problems related to Kirchhoff's laws & Steady current	1,8	An
CO –6	solve problems in Electrostatics & Electric potential	1,8	An
CO -7	solve problems in Electromagnetic Induction	1,8	An
CO –8	solve problems in Zener diode & Transistor	2,8	An

SEMESTER IV		
Core Skill Based Physics for Competitive Examinations		
Code : 18UPHS41Hrs/Week : 4Hrs/Sem : 60Credits : 4		

#### **Unit I: Fundamentals of Physics**

Units – Trignometric – Numerical constants – Derivative and Integrals – Unit conversion factors – Some fundamental physical constants – Units and dimensions.

## **Unit II: Properties of matter**

Gravitation, Escape velocity and artificial satellite – Surface Tension and Viscosity – Elasticity.

# Unit III: Heat and Optics

Calorimetry – Kinetic theory of gases - Laws of thermodynamics - Conduction and radiation.

Interference – Diffraction, Resolving power (Prism & Grating) and Polarisation.

## **Unit IV: Electricity and Electromagnetism**

Kirchhoff's laws and Steady current – Alternating Current – Electrostatics and Electric Potential.

Magnetic Properties of matter – Magnetic Effects of Current – Electromagnetic Induction.

## **Unit V: Electronics**

Semiconductors – PN junction diode – Zener diode – Transistor: Transistor as an amplifier, Transistor as an oscillator.

# **Text Books:**

1. Dr. S.L. Kakani, Objective Physics, Sultan Chand and sons Ltd.,10<sup>th</sup> revised edition, 2001.

## **Books for Reference:**

 Satya Prakash, Er. Vibhav Saluja, Objective Physics, A.S.Prakashan publications, Meerut 27 revised edition 2010.

SEMESTER – III & IV			
Practical II			
Code : 18UPHCR2Hrs/Week : 2Hrs/Sem : 30Credits : 2			

## List of Experiments (any 14)

- 1. Potentiometer Calibration of low range voltmeter.
- 2. Potentiometer R1/R2 and specific resistance
- 3. Potentiometer Ammeter calibration
- 4. LCR series resonance circuit
- 5. LCR parallel resonance circuit
- 6. Absolute capacity of a capacitor B.G
- 7. Desauty's Bridge –Determination of C in series & parallel
- 8. Comparison of E1/E2 & C1 /C2 B.G
- 9. Bridge rectifier
- 10. Zener Characteristics
- 11. RC and LC filters
- 12. Amplifier CE mode Without feedback
- 13. Spectrometer –Normal incidence Grating
- 14. Spectrometer i –d curve Prism
- 15. Owen's bridge
- 16. Field along the axis of the coil m & BH
- 17. Measurement of inductance, capacitance and resistance using LCR meter

SEMESTER IV			
NME II     Applied Physics II			
Code : 18UPHN41Hrs/Week : 2Hrs/Sem : 30Credits : 2			

Vision: To enlighten our students to be aware of digital, energy and nano physics

Mission: To make our students knowledgeable on digital electronics, renewable energy sources and communication physics

CON	CO No. Upon completion of this course students will be able to		CL
CO.NO.	Opon completion of this course, students will be able to	addressed	
CO -1	explain number system	2	Un
CO –2	construct logic gates	2	Cr
CO –3	construct solar ponds for water desalination, solar cookers and solar green houses	7	Cr
CO -4	assess the working of windmills used for power generation	7	Ev
CO –5	explain the applications of ultrasonics	1	Un
CO –6	define nanomaterials	3	Re
CO -7	list out Special features of nanophase materials	3	Re
CO -8	describe Pulsed laser deposition	3	Un

SEMESTER IV			
NME II     Applied Physics II			
Code : 18UPHN41Hrs/Week : 2Hrs/Sem : 30Credits : 2			

#### Unit I: Number System

Number system – Conversion of decimal number to binary number – Binary – Decimal conversion – Binary addition, subtraction – 1's and 2's complement – Hexa decimal numbers – Octal numbers.

## **Unit II: Logic Gates**

Introduction – AND, OR, NOT, NOR, NAND, exclusive OR gate- LED – LCD – Seven segment display.

## **Unit III: Energy Physics**

Conventional and non conventional energy sources – Solar energy – Photovoltaic effect – Solar cooker (box type) – Solar ponds – Wind energy – Power of wind – Construction and working of wind mill – Ocean energy.

#### **Unit IV: Ultrasonics**

Introduction – Properties of ultrasonics – Ultrasonics production (magnetostriction method) – Acoustic grating – SONAR – Applications of ultrasonics.

## **Unit V: Nanomaterials**

Introduction – Definition – Special features of nanophase materials – Different forms of nanomaterials – Synthesis of nanomaterials (basics) – Preparation of nanomaterials: Pulsed laser deposition – Applications of nanophase materials.

#### **Text Books:**

- 1. G. Jose Robin, A. Ubald Raj, Applied Electronics, Indira Publication, First Edition 2008.
- 2. G. Jose Robin, A. Ubald Raj, Applied Physics
- 3. P.Mani, A text book of Engineering Physics –I, Dhanam Publication, First Edition 2007.
- 4. P.Mani, A text book of Engineering Physics –II, Dhanam Publication, Tenth Edition 2016.

SEMESTER IV		
Self Study Course Sensors		
Code : 18UPHSS2 (Optional)Credits : +2		

**Vision:** To enlighten our students about sensors

Mission: To make students understand the construction, principle, working and application of different types of sensors

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	recall the Sensor Characteristics and the fundamental principles of Sensing.	3,5	Re
CO –2	classify the types of Transducer	3,5	Re
CO –3	recognise selected chemical sensors	3,5	Un
CO -4	understand the optical sensors	3,5	Un
CO –5	acquire the knowledge of selected humidity sensors and other sensors	3,5	Un
CO –6	explain working principle of various sensors	3,5	Un
CO –7	identify sensors for humidity and liquid level measurements	3,5	Un
CO -8	explain the terminologies for different sensors and their applications	3,5	Un

SEMESTER IV			
Self Study Course S	Sensors		
Code : 18UPHSS2 (Optional)	Credits : +2		

# **Unit I: Principles of Sensing**

Sensor – Physical principles – Capacitance – Inductance – Mutual inductance – Resistance – Piezoelectric effect – Pyroelectric effect – Hall Effect –Seebeck effect.

#### **Unit II: Transducers**

Transducers – Electric transducers – Advantages of electric transducers – Classification of transducers.

## **Unit III: Chemical Sensors**

Probe analyser – Differential refractometer – Spectrophotometer – Chromatography – Electrochemical sensor.

#### **Unit IV: Optical Sensors**

Optical transducers: Vacuum type photocell – Gas filled photo – Emissive tube – Semiconductor photoelectric transducer: Photo conductive cell – Photo voltaic cell.

#### Unit V: Measurement of Liquid Level, Thickness and Humidity

Liquid level: Sensitive method, Inductive method, Ultrasonic method – Thickness: Ultrasonic vibration and Nuclear radiation methods – Humidity: Resistive Hygrometer.

#### **Text Book:**

1. A.K Sawhney, A course in electrical and electronic measurements and instrumentation, Dhanpat Rai & Co.(P) LTD, Reprint 2010.

SEMESTER V				
Common Core Core VII – Solid state and Material Science				
Code : 18UPCC51Hrs/Week : 6Hrs/Sem :90Credits : 4				

Vision: To understand the usage of the appropriate materials while designing electronic systemMission: To enrich the students with the knowledge of theory and properties of different materials

CON		PSO	CL
CO.No.	Upon completion of this course, students will be able to	addressed	
CO-1	understand the basic symmetry elements and operations of	1, 2	Un
	crystals		
CO-2	distinguish the types of crystals and enumerate the various	3,4	An
	crystal imperfections		
CO–3	get a clear knowledge about metallic glasses, ceramics and	1, 3, 5,7, 8	Re
	biomaterials.		
CO -4	justify the wave nature of matter and its experimental study	1,3	Ev
CO –5	apply Bragg's law for x –ray study	2	Ар
CO –6	distinguish magnetic materials based on susceptibility	1,2	An
CO –7	use magnetic materials in various field	1,2	Ар
CO –8	discuss the synthesis methods of nano materials	2,3	Un

SEMESTER V				
Common Core VII – Solid state and Material Science				
Code : 18UPCC51Hrs/Week : 6Hrs/Sem :90Credits : 4				

## Unit I: Crystal Structure and Crystal imperfections

Crystal lattice – Primitive and unit cell – Basic symmetry elements and operations – Plane of Symmetry, centre of symmetry & axis of symmetry – Types of Crystals – Bravais lattices – Simple cubic, body centered, FCC structures with an example – Miller indices, Inter planar spacing – Crystal imperfections – Point defects – Schotty and Frenkel defects – Line Defects –Edge & screw dislocations – Surface defects – Volume defects( imperfection).

## **Unit II: New Materials**

New materials – Metallic glasses – Fibre reinforced plastics – Fibre reinforced metals – Bio materials – Ceramics – Cements – High temperature materials – Intermetallic compounds – Alloys – Smart materials.

#### Unit III: Wave Nature of Matter and X-ray Diffraction

Wave nature – Introduction – De Broglie Hypothesis – Experimental study of matter waves – Davision –Germer's experiment – Heisenberg's Uncertainity Principle.

Bragg's law – Derivation of Bragg's equation – Experimental methods of X –ray study – Laue rotating crystal and powder methods.

#### **Unit IV: Magnetic and Dielectric materials**

Classification of magnetic materials – Langvein theory of diamagnetism – Theory of Paramagnetism – Domain theory of Ferromagnetism – Antiferro magnetic materials – Application of Different magnetic materials.

Dielectric materials – Types of dielectric materials – Different types of electric polarization – Internal field – Clausius –Mossotti equation – Frequency and temperature dependence of dielectric constant.

#### **Unit V: Nanomaterials**

Nanomaterials – Synthesis – Plasma Arcing – Chemical vapour Deposition – Sol gels – Electro deposition – Ball milling – Properties of nano particles and applications. Carbon nanotubes fabrication – Arc method – Pulsed laser deposition – Chemical vapour deposition – Structure –properties – applications.

# Text books:

1. M.Arumugam Material Science, Anuradha Publications, 2008.

- 2. C M Sri Vasta & C Srinivasan, Science of Engineering materials, New Age International (P) Ltd, Second Edition, 1999.
- 3. P. K. Palanisamy, Solid state Physics Copyright (2003), Scitech Publication (India) Pvt Ltd, Chennai, 3<sup>rd</sup> reprint, 2008.

- R.Murughesan, Modern Physics, Kiruthiga Sivaprasath, S.Chand & Co Ltd, 17<sup>th</sup> Edition 2013.
- 5. Dr. P. Mani, A Text book of Engineering Physics, Dhanam Publications Chennai, Revised Edition, 2008.

# **Book for Reference:**

- 1. Charles Kittel, Introduction to solid State Physics, John Willey and sons, 2010.
- 2. P. K. Palanisamy, Material Science, Scitech Publication (India) Pvt Ltd ., Chennai, 2005.
- 3. M.H Fulekar, Nano Technology: Importance and Application, I K International Publishing House Pvt Ltd, 2010.

SEMESTER V				
Core VIII Digital Electronics				
Code : 18UPHC52Hrs/Week : 5Hrs/Sem : 75Credits : 4				

Vision: To enlighten our students on the concepts of digital electronics

Mission: To make our students understand number systems, logic gates and semiconductor

devices and memories

Re
Un
Cr
Re
An
Cr
Cr
An

SEMESTER V					
Core VIII Digital Electronics					
Code : 18UPHC52	Code : 18UPHC52Hrs/Week : 5Hrs/Sem : 75Credits : 4				

#### **Unit I: Arithmetic Circuits**

Binary to decimal system – Decimal system to binary system – Octal system – Hexadecimal System – Excess 3 Code – Gray Code – Binary addition – Subtraction – Unsigned Binary numbers 2's complement – Half adder – Full adder –Half subtractor – Full subtractor.

## **Unit II: Logic circuits**

Boolean algebra – OR, AND and NOT operation – Boolean equation – Logic circuits – Boolean theorems and Basic laws – De Morgan's theorem – Duality theorem – Sum of products – Product of sums – Karnaugh map – Pairs, Quads and Octets – Karnaugh map simplification.

#### Unit III: Data processing circuits

Flip –Flops: R –S flip flop – Clocked RS flip flop – JK flip flop – JK master slave flip flop – Schmitt trigger.

Multiplexer – Demultiplexer – 1-16 decoder – BCD to decimal decoders – Seven segment decoder – Encoder – Parity checker and generator.

## Unit IV: Shift registers and counters

Serial in register – Serial out register – Serial in–parallel out register – Parallel in-serial out register – Parallel in–parallel out register.

Ring counter – Binary counter – Decade counter UP/DOWN counter – Mod 3 counter – Mod 5 counter.

#### Unit V: Semiconductor memories:

ROM- RAMS – SRAMS – Dynamic RAMS. A/D and D/A conversion:Variable resistor network – Binary ladder – A/D conversion – D/A conversion – Simultaneous conversion – Continuous AD conversion.

#### **Text Books:**

- 1. G. Jose Robin, A. Ubald Raj, Integrated Electronics, Indira Publications, Marthandam, second edition, 2002.
- 2. Albert Paul Malvino and Donald P. Leach, Digital principles and applications, 7<sup>th</sup> edition 2013.

#### **Books for Reference:**

- 1. Millman and Taub, Integrated Electronics, International student edition, (TMH)
- R. P. Jain, Modern digital Electronics, Tata Mc Graw Hill Pvt. Ltd., 4<sup>th</sup> Reprint 1988.

SEMESTER V				
Core IX Computational Physics				
Code : 18UPHC53Hrs/Week : 5Hrs/Sem : 75Credits : 4				

**Vision:** To achieve programming logic by using all C++ features and to become a good programmer in C++

**Mission:** To apply the knowledge of computing fundamentals and mathematics to write programs in C++

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	utilize their knowledge of C++ programming language and write programs for solving various problems in physics	6,8	Ар
CO –2	design a program for operator overloading	6	Cr
CO –3	distinguish between one dimensional and two dimensional arrays	6	An
CO4	define various types of constructors	6	Re
CO –5	design a simple C++ program for function	6	Cr
CO –6	define a class	6	Re
CO -7	differentiate constructors and destructors	6	An
CO –8	solve the problem in Bisection method	6, 8	An

SEMESTER V				
Core IX Computational Physics				
Code : 18UPHC53Hrs/Week : 5Hrs/Sem : 75Credits : 4				

#### **Unit I: Tokens and Expressions**

Tokens– Keywords – Identifiers and Constants – Basic data types – User defined data types – Derived data types – Symbolic constants – Declaration of variables – Dynamic initialization of variables – Reference variables – Operators in C++ – Scope resolution operator – Member dereferencing operators – Memory management operators – Manipulators – Expressions and their types – Control structures.

#### **Unit II: Functions, Classes and Objects**

Functions in C++ – The main function – Function prototyping – Call by reference – Return by reference – Inline functions – Default arguments.

Specifying class – A simple class example – Creating objects – Accessing class members – Defining member functions – Nesting of member functions – Private member functions – Arrays within a class – Arrays of objects – Objects as function arguments – Returning object.

#### **Unit III: Constructors and Operator Overloading**

Constructors – Parameterized constructors – Multiple constructors in a class Dynamic constructor – Copy constructors – Destructors.

Defining operator over loading – Overloading unary operators – Overloading binary operators – Manipulation of strings using operators – Rules for overloading operators.

#### Unit IV: Inheritance and Managing Console I/O Operations

Defining derived class – Single inheritance – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance.

C++ streams - C++ stream classes - Unformatted I/O operations - Formatted console I/O operations - Managing output with manipulators - Designing our own manipulators.

#### **Unit V: Numerical Methods (No derivations)**

Iterative methods: Bisection method, Newton – Raphson method – Solution of linear simultaneous equations: Gauss elimination method – Method of least squares: Straight line – Interpolation: Newton's forward and Lagrange's interpolation – Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule – Solution of differential equation: Taylor's series method.

#### **Text Book:**

1. E. Balagurusamy, Object oriented programming with C++, Tata McGraw – Hill publishing company Ltd. New Delhi, 4<sup>th</sup> Reprint 2015. 2. J.N.Sharma, Numerical Methods for Engineers and Scientists, Narosa Publishing House, New Delhi, Reprint 2008.

# **Book for Reference:**

- 1. D. Ravichandran, Programming in C++, Tata Mc. Graw Hill Publishing company Ltd. New Delhi.
- 2. T.Veerarajan, T. Ramachandran, Numerical Methods with Programs in C, Tata McGraw Hill publishing company Ltd. New Delhi, Fifth reprint 2010.

SEMESTER V				
Core Integral I Renewable Energy Sources				
Code :18UPHI51Hrs/Week : 4Hrs/Sem : 60Credits : 4				

Vision: To enhance the students to understand about renewable energy sources and their utilisations

Mission: To create awareness among the students about sustainable utilisation and conservation of natural resources

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	construct solar ponds for water desalination, solar cookers and solar green houses	7, 5	Cr
CO –2	assess the working of windmills used for power generation	7	Ev
CO –3	list the renewable energy sources available in surplus	7	Re
CO -4	explain different types of solar water heaters	7,5	Un
CO –5	sketch out the classifications of WEC system	7	Ар
CO –6	recall Green house effect	7	Re
CO -7	discuss Energy audit	7	Un
CO -8	design KVIC plants for bio gas generation	7	Cr

SEMESTER V			
Core Integral I Renewable Energy Sources			
Code :18UPHI51Hrs/Week : 4Hrs/Sem : 60Credits : 4			

#### **Unit I: Solar Energy**

Introduction – Solar Constant – Solar Radiation at the Earth's Surface : Beam and Diffuse Solar Radiation, Attenuation of Beam Radiation – Solar Radiation Measurements: Pyrheliometers, Pyranometers, Sunshine Recorder – Solar Radiation Data – Solar Energy Collectors: Introduction – Conversion of Solar Radiation into Heat – Green House Effect – Flat –Plate Collectors: Introduction – Typical Liquid Collector – Advantages of Flat Plate Collectors.

## **Unit II: Solar Energy Storage and applications**

Introduction – Solar Energy Storage Systems: Thermal Storage – Chemical Storage – Solar Pond: Introduction – Principle of Operation and Description of Non-convective Solar Pond –Extraction of Thermal Energy –Applications of Solar Ponds – Applications of Solar energy: Agriculture and Industrial Process heat – Solar Distillation – Solar Cooking: Box type Solar Cooker – Green House effect – Solar Green Houses (Introduction, Types, advantages, parameters for plant growth and Green house environment and control) – Global Warming.

#### **Unit III: Wind Energy**

Introduction – Basic Principles of Wind Energy Conversion: The nature of the wind – The power in the wind (only theory) – Wind energy conversion – Wind data and energy estimation – Site selection considerations – Basic components of a WECS (Wind Energy Conversion System) – Classification of WEC systems – Advantages and disadvantages of WECS – Applications of wind energy – Safety systems – Environmental aspects.

#### **Unit IV: Energy Conservation**

An Economic Concept of Energy – Principles of Energy Conservation and Energy Audit – Types of Energy Audit – Energy Conservation Approach: Energy saving devices eligible for higher depreciation – Renewable energy devices eligible for higher depreciation – Waste Heat Utilization – Heat Recuperators (Definition and Uses) – Heat Regenerators– Instrumentation and control.

#### **Unit V: Other Conventional Energy Sources**

Biomass energy – Classification – Biomass conversion Technologies: Wet and Dry Processes – Photosynthesis – Biogas generation – Advantages of Anaerobic Digestion – Factors Affecting Biodigestion – Types of biogas plant (KVIC Digester) – Geothermal energy (Introduction, Applications and advantages) – Ocean Thermal Electric Conversion (OTEC – Basics principle ) – Method and Working Principle of Closed OTEC.

#### **Text Book:**

1. G. D. Rai, Non conventional Energy Sources, Khanna Publishers, Reprint 2014.

SEMESTER V			
Self Study Bio P	hysics		
Code :18UPHSS3 (Compulsory)	Credits : 2		

Vision: To enhance the students to apply the principles and techniques of Physics to BiologyMission: To make the students to know about the physiology of respiration and resolving power of eye which uses the principle of Physics

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	define Poiseueille 's formula	1,2	Re
CO –2	recall polarization	1,2	Re
CO –3	compare transverse and longitudinal waves	1,2	An
CO4	use of Doppler effect	1,2	Ap
CO –5	diagrammatically show retina and photo receptor	2	An
CO –6	understand the Physiological characteristics of sound	1,2	Un
CO –7	define the terms thermodynamics	1,2	Re
CO -8	identify the non –linearity of human ear response	2	Un

SEMESTER V			
Self Study Bio Physics			
Code :18UPHSS3 (Compulsory)	Credits : 2		

# **Unit I: Bio Mechanics**

Bio Statics: Forces and Torques – Bio Physics of Muscle – Strength of Bones – Bio Dynamics: Newton's Laws – Frictional Forces and Stoke's Law.

# **Unit II: Biophysics and Fluid Flow**

Steady Laminar Flow: Coefficient of viscosity – Poiseuille's Formula: Velocity Profile – Continuity Equation – Flow network and equivalent resistance – Energetics of Fluid Flow – Turbulence – Reynolds Number – Hemodynamics.

# **Unit III: Biophysics and Gas Transport**

The Ideal Gas – Dalton's Law of Partial Pressure – Vapour Pressure – Convective Transport of Gases – Transport of  $O_2$  in Blood – Transport of  $CO_2$  in Blood – Diffusion of Gases: Fick's Law – Gas exchange in lungs – Physiology of Respiration (Definitions associated with the operation of lungs)

# **Unit IV: Biophysics and Audition**

Transverse and Longitudinal Waves – Wave Velocity – Intensity of a Wave – Physiological Characteristics of Sound – Human ear: Phase sensitivity and determination of direction – Non-linearity of ear response.

## **Unit V: Physics of Vision**

Wave Nature of Light – Polarization – Particle Nature of Light – Geometrical Optics – Refraction – Gradient Index Lens –Spherical Aberration – Refractive Power –Refractive Power of Eye – Retina and photoreceptors – Resolving power of eye – Polarization and vision.

## **Text Book:**

1. K Srivastava, Elementary Biophysics , Narosha Publishing House Pvt. Ltd., Reprint 2006

SEMESTER VI				
Core X Modern Physics				
Code :18UPHC61Hrs/Week : 5Hrs/Sem : 75Credits : 4				

Vision: To enlighten our students on the Atomic, molecular, optical and quantum physicsMission: To understand the theory and applications of emission, absorption and scattering of electromagnetic radiation.

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	describe Michelson – Morley experiment	2	Un
CO –2	list the Postulates of special theory of relativity	2	Re
CO –3	apply Pauli's exclusion principle to periodic table	2	Ap
CO -4	illustrate L –S coupling	2	Ap
CO –5	differentiate the Characteristic and continuous X – ray spectrum	2,5	An
CO –6	define Bragg's law	2,5	Re
CO –7	evaluate Davisson and Germer's experiment	2	Ev
CO –8	apply Bohr's quantization of angular momentum to the hydrogen atom	2	Ap

SEMESTER VI				
Core X Modern Physics				
Code :18UPHC61Hrs/Week : 5Hrs/Sem : 75Credits : 4				

#### Unit I: Relativity

General theory – Michelson – Morley experiment – Postulates of special theory of relativity – Lorentz transformation – Length contraction – Time dilation – Relativistic condition of velocities – Simultaneity – Relativistic mass – Relativistic momentum – Mass and energy equivalence – Relation between total energy and rest mass, rest mass energy and momentum.

#### Unit II: Atomic Structure and Spectra

The vector atom model – Quantum numbers associated with vector atom model – coupling schemes – L-S coupling – j-j coupling – Pauli's exclusion principle – Application to periodic table – Magnetic dipole moment due to orbital and spin motion of the electron – Stern and Gerlach experiment – Zeeman effect – Experimental study of Zeeman effect – Larmor's theorem – quantum mechanical explanation of normal Zeeman effect.

#### Unit III: X – Rays

Production of X – rays – Coolidge tube – Properties of X –rays – Bragg's law – Bragg spectrometer – X-ray spectra – Characteristic and continuous X- ray spectrum – Moseley's law and its significance – Compton Effect – Compton Effect and its experimental verification.

#### **Unit IV: Wave Properties of Matter**

Wave velocity and group velocity – Relation connecting them – Basic postulates of quantum mechanics – Derivation of time dependent and time independent Schrodinger's equation – Physical interpretation of the wave function – Properties of wave function – Operators in quantum mechanics – Eigen functions, Eigen values and Eigen value equations – Expectation values – Transition probability.

#### **Unit V: Development of Quantum Mechanics**

Introduction – Black body radiation – Theoretical laws of black body radiation – Plank's quantum theory – Photo-electric effect – Einstein explanation of photo electric effect – The Ritz combination principle in spectra – Stability of an atom, Bohr's quantization of angular momentum and its application to the hydrogen atom – Particle in one dimension and three dimensional box.

## **Text Books:**

- 1. R. Murugeshan, Kiruthiga Sivaprasath, Modern Physics, S. Chand & Co. Ltd. 12<sup>th</sup>revised edition 2006.
- 2. Kamal Singh, S.P. Singh, Quantum Mechanics, S. Chand & Co Ltd., 1998.

#### **Books for Reference:**

- 1. Brijlal and Subramanyam, Modern Physics, 8<sup>th</sup> edition, 2007
- 2. J.B. Rajam, Atomic Physics, 8<sup>th</sup> edition, S. Chand & Co.1981.

SEMESTER VI			
Core XI Nuclear and Particle Physics			
Code :18UPHC62Hrs/Week : 4Hrs/Sem : 60Credits : 4			

Vision: To enrich our students with the knowledge of nuclear and particle physics

**Mission:** To study the properties of  $\alpha$ ,  $\beta$ ,  $\gamma$  rays, process of radioactivity and its applications and various detectors

CON	Upon completion of this course, students will be able to	PSO	CL
CO.NO.	Upon completion of this course, students will be able to	addressed	
CO -1	recall the structure of nuclei	2	Re
CO –2	understand simple nuclear models	2	Un
CO –3	explain properties of $\alpha$ , $\beta$ , $\gamma$ rays and their decay	2	Un
CO -4	analyze the key features of nuclear fission and its applications	2	An
CO –5	analyze the key features of nuclear fusion and its applications	2	An
CO –6	understand the principle and working of particle accelerators	2	Un
CO –7	understand the principle and working of particle detectors	2	Un
CO -8	describe the constituent particles in the electron, proton and neutron	2	Un

SEMESTER VI				
Core XI	Core XI Nuclear and Particle Physics			
Code :18UPHC62	Code :18UPHC62Hrs/Week : 4Hrs/Sem : 60Credits : 4			

## **Unit I: Introduction to nucleus**

Introduction – Classification of nuclei – General properties of nucleus: Nuclear density, Nuclear charge, Spin angular momentum, Resultant angular momentum, Nuclear magnetic dipole moment – Binding energy– Nuclear stability– Theories of nuclear composition– Non -existence of electron within the nucleus – Nuclear forces – Meson theory of nuclear forces – Liquid drop model – The shell model – Neutrons: The discovery of the Neutron – Basic properties of the Neutron – Classification of Neutrons – Neutron Sources – Neutron Detectors.

## **Unit II: Radioactivity**

Discovery of radioactivity – Natural radioactivity – Alpha, Beta and Gamma Rays – Properties of  $\alpha$ ,  $\beta$ ,  $\gamma$  rays – Determination of e/m of  $\alpha$  particles – Determination of charge of alpha particles –Range of alpha particles, Geiger Law, Geiger –Nuttal Law(definition only) –Theory of  $\alpha$  decay – The nature of Beta Particles – Origin of  $\gamma$ rays – Soddy Fajan's Displacement law – Law of Radioactive disintegration – The mean life – Unit of Radioactivity – Law of successive disintegration – Biological Effects of Nuclear Radiations.

## **Unit III: Nuclear Reactions**

The discovery of artificial transmutation -Bohr's theory of nuclear disintegration -The Q -value equation for a nuclear reaction - Nuclear reactions - Energy Balance in Nuclear Reactions and the Q - Value - Threshold energy of an Endoergic Reaction -Nuclear Transmutation.

Nuclear Fission and Fusion: Discovery – Nuclear Fission – Energy Released in Fission– Chain Reaction – Nuclear reactor – Uses of nuclear reactor – Nuclear fusion – Sources of stellar energy – Thermonuclear reactions.

# **Unit IV: Particle Accelerators and Detectors**

Linear Accelerator – Cyclotron – Synchro-cyclotron– Betatron– Ionization chamber – Geiger Mullar counter– Scintillation counter – Wilson cloud chamber.

# **Unit V : Elementary Particles**

Introduction– Particles and Anti-particles – Antimatter – The fundamental interactions – Elementary – Particle quantum numbers – Conservation laws and symmetry – The Quark model.

# **Text Book:**

1. R.Murughesan, Kiruthiga Sivaprasath, Modern Physics, S.Chand & Co Ltd. 12<sup>th</sup> revised edition, 2006.

# **Book for Reference:**

- 1. A. Gupta, Modern Physics, 1<sup>st</sup> edition, Book and Allied Pvt. Ltd , 2006.
- 2. D.C Tayal, Atomic and Nuclear Physics, 3<sup>rd</sup> revised edition, Himalaya Publishing House, 1998.

SEMESTER VI				
Core XII Opto Electronics & Fibre Optic Communication				
Code :18UPHC63Hrs/Week : 4Hrs/Sem : 60Credits : 4				

Vision: To make our students at ease with optoelectronics and communication physics

**Mission:** To make our students knowledgeable in the field of optoelectronics and fibre optic communication

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL	
CO -1	recall the basic principles of semiconductors	2	Re	
CO –2	understand the formation of energy bands of semiconductors	2	Un	
CO –3	list out the optical characteristics of semiconductors	2	Re	
CO -4	explain the principle and working of optical sources	2	Un	
CO –5	categorise the optical detectors and their principles	2	An	
СО –6	analyze and classify the structure of optical fibres, its types and various optical losses	2	An	
CO –7	understand the basics of signal propagation through optical fibres	2	Un	
CO8	understand the types and various optical losses	2	Un	
SEMESTER VI				
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Core XII Opto Electronics & Fibre Optic Communication				
Code :18UPHC63Hrs/Week : 4Hrs/Sem : 60Credits : 4				

## **Unit I: Optical Characteristics of Semiconductors**

Introduction – Light units – Formation of energy bands in semiconductors – Energy band diagram – Direct band gap and indirect band gap semiconductors – Mobility, current density and electrical conductivity – Optical absorption – Optical absorption coefficient – luminescence – Photoluminescence – Electroluminescence – Excess carrier recombination and minority carrier life time – Photoconductivity – photoconductive decay – Experiment to study photoconductive decay – Haynes and Shockley experiment for determination of minority carrier mobility

#### **Unit II: Optical Sources for Optical Fibres**

LED – Laser – Fundamentals – Types: Ruby Laser – He-Ne Laser – Heterojunction Laser – CO<sub>2</sub> Laser – Opto electronic couplers – Parameters of opto electronic coupler.

## **Unit III: Optical detectors**

The need for optical detectors – Photo diode – Performance parameters of photodiode – Silicon p–i–n photodiode – Heterojunction Photodiode – Phototransistor – Photo multiplier – Photo thyristor - Photothermistor.

## **Unit IV: Fibre Optics**

Introduction – Different types of fibres – Light propagation through step index fibre: Acceptance angle – Numerical aperture – Numerical aperture of Graded index fibre – Losses in Fibre: Absorption Losses –Scattering Losses: Rayleigh scattering loss and Mie scattering loss –Dispersion in fibres: Types of dispersion – Theory of material dispersion.

### **Unit V: Fibre optic communication**

Analog optical communication system– Digital optical communication – Different generation in optical fibre communication – Advantages – Modulation: Different types of modulation methods –Modulation formats – External modulators: Electro optic modulators (Pockels Effect) – Acousto optic modulators – Demodulation Scheme: Homodyne and Heterodyne detection schemes.

# **Text Books:**

- 1. Dr. M. Arumugam, Semiconductor physics & optoelectronics, Anuradha Publications, First edition, Reprint 2009.
- 2. A. Ubald Raj, G. Jose Robin, Optoelectronics, Indira Publication, Reprint 2012.

# **Book for Reference:**

- 1. Pallab Battacharya, Semiconductor optoelectronic devices, Pearson Education, New Delhi, Second edition, 2000.
- 2. Ajoy Ghatak, Optics, McGraw Hill Education(India) Private Limited, Fourth reprint 2014.
- 3. Ajoy Ghatak and K.Thyagarajan, Introduction to Fibre optics, Cambridge University Press India Pvt. Ltd., Reprint 2011
- 4. Subir Kumar Sarkar, Optical fibre and fibre optic communication system, S.Chand & company, First edition, Reprint 2008.

SEMESTER VI				
Core Integral II Advanced Physics				
Code :18UPHI61Hrs/Week : 4Hrs/Sem : 60Credits : 4				

Vision: To make our students experts in areas of advanced Physics

Mission: To train our students in the areas of laser, microprossor, nanotechnology and nuclear spaced materials

# **Course Outcome:**

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO –1	recall laser and its applications in medicine industry	3	Re
CO –2	list out the applications of Holography	3	Re
CO –3	solve arithmetic operations using 8085	5,6	An
CO -4	draw 8085 MPU	5,6	An
CO –5	formulate a program to write two hexadecimal numbers using 8085	5,6	Cr
CO –6	discuss BCS theory	2	Un
CO –7	assess the usage of Superconductors	3	Ev
CO8	list the materials and its properties for nuclear and space applications	2	Re

SEMESTER VI				
Core Integral II Advanced Physics				
Code :18UPHI61Hrs/Week : 4Hrs/Sem : 60Credits : 4				

## **Unit I: Applications of Laser**

Application of laser in material processing – Laser drilling – laser cutting – Laser welding – Experimental welding – Air pollution monitoring – Water pollution monitoring – Propagation of laser radiation through atmosphere – Laser remote sensing – LIDAR – Raman LIDAR – Sensing wind velocity using laser – Holography – Applications.

## Unit II: Microprocessor architecture

Microprocessor – Microprocessor instruction set and computer language – Microprocessor architect and its operations – Input and output devices – Microcomputer system – Logic devices for interfacing – 8085 MPU.

## **Unit III: Programming the 8085**

8085 programming model – Instruction classification – Instruction and data format – How to write, assemble and execute simple programs – Instruction set – Data transfer operations – Addressing modes – Arithmetic operations – Logical operations – Branching operations.

# **Unit IV: Superconductors**

Superconductivity – Effect of magnetic field– The Meissner effect – Effect of current – Type I and Type II superconductors – Thermal properties – Isotope effect – London equations – BCS theory– flux quantisation – Josephson's effect – Application of superconductors – High Tc superconductor – Application of superconductor.

### **Unit V: Materials For Nuclear and Space Applications**

Nuclear fuels – Fuel cladding – Moderators, control materials – Coolants – Shielding materials – Space programme – Structural material and their properties – System requirements – Extreme high temperature materials for thermal protection – Pressure vessels – Lubrication.

## **Text Books:**

- 1. R. Murugeshan, Optics and spectroscopy, S. Chand & Co. (1995).
- 2. Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing (India) Private Limited, Fifth edition, (2011).
- P.K. Palanisamy, Solid state Physics, Scitech publication (India) Pvt Ltd., Chennai. 3<sup>rd</sup> Reprint (2008).
- 4. CM Sri Vastava, C & C. Srinivasan, Science of Engineering materials and Carbon Nanotubes, New Age International Publishers, Third Edition.

# **Books for Reference:**

- 1. Physics education, volume 19, No.1, April June 2002
- 2. Dr. Arumugham, Bio medical instrumentation, Anuradha Agencies, Reprint 2014.
- 3. M.H Fulekar, Nano Technology: Importance and Application, I K International Publishing House Pvt Ltd, 2010.

SEMESTER VI				
Core Integral III Microprocessor 8086 and Microcontroller				
Code :18UPHI62Hrs/Week : 5Hrs/Sem : 75Credits : 4				

Vision: To develop background knowledge and core expertise in 8086 microprocessor and 8051 microcontroller

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	explain the architecture of 8086 Microprocessor	5,6	Un
CO –2	categorise addressing modes of the 8086 Microprocessor	5,6	An
CO –3	understand instruction set of the 8086 Microprocessor	5,6	Un
CO -4	recall the basic introduction to 8051microcontroller	5,6	Re
CO –5	understand instruction Set and Programming of the 8051 microcontroller	5,6	Un
CO –6	design the assembly level programs using instruction set	5,6	Cr
CO –7	sketch the architecture of 8051 microcontroller	5,6	Ар
CO –8	compare timers and counters	5,6	An

# **Course Outcome:**

Mission: To expose the students to the architecture and instruction set of 8086 microprocessor and 8051 microcontroller

SEMESTER VI				
Core Integral III Microprocessor 8086 and Microcontroller				
Code :18UPHI62Hrs/Week : 5Hrs/Sem : 75Credits : 4				

### Unit I: Architecture of 8086 Microprocessor

Introduction – Architecture of 8086 – Bus Interface Unit - Execution Unit – Fetch and Execute – Process of Fetching and Decoding of instructions – Registers – Data registers –Segment Registers –Pointer and Index Registers – Flag Register.

### Unit II: Addressing modes of the 8086 Microprocessor

Logical and physical address – Address bus, Data bus, Control Bus – Memory Segmentation – 8086 memory addressing-8-bit data from Even – Address bank-8-bit data from odd Address bank – 16-bit data starting from Even Address bank – 16-bit data starting from odd Address bank.

#### Unit III: Instruction set of the 8086 Microprocessor

Pin description of 8086 - memory read and write bus cycle of <math>8086 - 8086 instruction set.

### **Unit IV: Introduction to microcontroller**

Introduction – Architecture of 8051 microcontroller – Memory organization – Pin diagram of 8051 microcontroller – Timers/ Counters – Serial communication

#### Unit V: Instruction Set and Programming of the 8051 microcontroller

Introduction – Addressing modes- 8051 instruction set – logical instructions – Datatransfer instruction - Boolean variable manipulation – Simple examples in assembly – Language programs of 8051 microcontroller – Assembly – Language programs.

## **Text Book:**

1. Microprocessors and Microcontrollers, Soumitra Kumar mandal, Tata McGraw Hill Education Private Limited, New Delhi.

SEMESTER VI				
Project				
Code :18UPHP61Hrs/Week : 5Hrs/Sem : 75Credits : 4				

# Vision :

To develop scientific and research temper in the students.

# Mission:

To attain awareness about the importance of scientific research in one's career.

# **Course Outcome:**

CO.	Upon completion of this course, students will be able to:	PSO	CL
No.		addressed	
CO = 1	Design, build and assess the working of scientific models		
0 -1	individually as well as in groups	5, 6	Cr, Ev
CO –2	Plan research works related to crystal growth	5, 6	Cr
CO –3	Synthesize Nano materials and compile the characteristics	3,5,6	Cr
CO – 4	Assess the output of electronic projects	2,5,6	Ev
CO – 5	Interpret the physical phenomena in theoretical projects	5,6	Ap
CO 6	Analyse the various properties of atmosphere using available	5,6	An
	software		All
CO –7	Design solar appliances	5,6,7	Cr
CO 8	Calculate the thickness of different hairs using air wedge	1,5,6	۸n
0-0	apparatus		All

SEMESTER VI				
Project				
Code :18UPHP61Hrs/Week : 5Hrs/Sem : 75Credits : 4				

#### **GUIDE LINES:**

The objective of the course is to train the students to gain confidence to carry out independent work, group work and get experience in handling of various equipments.

A maximum of five students combine together to do a project. Students are given freedom to choose the topic of the project. It may be theoretical or practical and may be from any one of the following areas

- a) Physics –Theoretical
- b) Physics Experimental
- c) Electronics
- d) Computational Physics
- e) Micro Processor
- f) Interdisciplinary projects involving concepts of physics

Students carry out the project in about 30 hours in a laboratory. The students present the first oral report at the end of the first month, the second oral report at the end of the second month and final report at the end of approximately the third month. Students submit a group project report (dissertation) with a minimum of 25 pages.

Students are encouraged to take it as a challenge so that the result of the project shall be approved for publication in a leading journal.

SEMESTER VI				
Practical III – Non Electronics				
Code : 18UPHCR3	Hrs/Week : 3	Hrs/Sem : 45	Credits : 3	

### Any 14 experiments:

- 1. Spectrometer Cauchy's constants
- 2. Spectrometer Hartmann's formula
- 3. Spectrometer i-i'-curve
- 4. B. G Comparison of mutual inductance.
- 5. B. G Absolute determination of mutual inductance
- 6. B. G High resistance by leakage
- 7. M. G Thermo e.m.f.
- 8. Potentiometer Temperature coefficient
- 9. Potentiometer Calibration of high range voltmeter
- 10. Conversion of a galvanometer into ammeter and voltmeter
- 11. Spectrometer Biprism
- 12. Anderson's Bridge Self Inductance
- 13. Verification of Network's theorem Thevenin's and Norton's theorem
- 14. Thermistor
- 15. Calcite Prism Refractive Index
- 16. Find compressibility, free length, free volume, enthalpy, relaxation time and molar volume for different (binary or ternary) liquid mixtures.
- 17. Measurement of CO<sub>2</sub> concentration, humidity, temperature at various places and seasons
- 18. Measurement of intensity of light at different times and seasons
- 19. Determination of size of the particle using He –Ne Laser
- 20. Determination of wavelength of He Ne laser source using grating

SEMESTER VI				
<b>Practical IV – Electronics</b>				
Code : 18UPHCR4Hrs/Week : 3Hrs/Sem : 45Credits : 3				

# List of Experiments (any 14)

- 1. Dual power supply using IC
- 2. Logic circuits (OR, AND, NOT, NAND and NOR) using discrete components
- 3. Single stage amplifier with and without feedback
- 4. Hartley oscillator
- 5. Colpitt's oscillator
- 6. Astable multivibrator using 555 Timer
- 7. OP AMP Adder and Subtractor
- 8. OP AMP Differentiator and Integrator
- 9. OP AMP Low pass and high pass filters
- 10. Verification of De Morgan's laws
- 11. Half and Full Adder
- 12. NAND and NOR as Universal building blocks
- 13. Solving Boolean expression
- 14. Monostable multivibrator using 555 Timer
- 15. OP AMP characteristics
- 16. Half and Full subtractor
- 17. Determination of V-I Characteristics of a solar cell

SEMESTER VI			
Practical IV – Computer Programming – C++			
Code : 18UPHCR5	Hrs/Week : 2	Hrs/Sem : 30	Credits : 2

# List of Experiments (any 14)

- 1. Simple arithmetic operations (i.e. addition, subtraction, multiplication and division) using do-while loop.
- 2. Name of the day in a week using Switch–case statement.
- 3. Validity of any entered character (whether it belongs to the alphabetical set or a number or a special character) using if else.
- 4. Quadratic equation.
- 5. Sum of the series using for loop.
  - a. Sum=1+3+5+.....n.
  - b. Sum= $x-x^3/3!+x^5/5!-x^7/7!+\dots x^n/n!$
  - c. Sum= $1^2+2^2+4^2+\dots+n^2$
- 6. Matrix addition and its transpose.
- 7. Multiplication of two matrices.
- 8. The largest number in the given array and sort them in ascending or descending order using function declaration.
- 9. Factorial of a number using function declaration (with /without using the return statement)
- 10. (a) Displaying the content of an array using pointer arithmetic
  - (b) Displaying the current date (such as day, month and year) using member function
- 11. Fibonacci numbers using constructor
- 12. Student details using inheritance concept.
- 13. Period of a pendulum of given length L.
- 14. Young's modulus from the data obtained from uniform bending method.
- 15. Bank account (Data members: Name of the depositor, Account Name, Type of account, Balance amount in the account and Member functions are to assign initial values, deposit an amount, withdraw an amount, display name and balance)
- 16. Addition and subtraction of two hexa decimal numbers using 8085 microprocessor
- 17. Perform ORA B, XRA B and CMA functions using 8085 microprocessor