Department of Physics (UG)

SYLLABUS AND REGULATIONS

Under

OUTCOME-BASED EDUCATION

2020

(Effective for the Batch of Students Admitted from 2020-2021)

AUXILIUM COLLEGE (Autonomous)

(Accredited by NAAC with A+ Grade with a CGPA of 3.55 out of 4 in the 3rd Cycle)

Gandhi Nagar, Vellore-632 006

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Department of Physics (UG)
OUTCOME BASED EDUCATION - 2020
(Effective for the Batch of Students Admitted from 2020-2021)

A) INSTITUTION LEVEL

Vision:

The vision of the college is the education of young women especially the poorest to become empowered and efficient leaders of integrity for the society.

Mission:
To impart higher education to the economically weak, socially backward and needy students of Vellore and neighbouring districts.

B) NAME OF THE PROGRAMME: B.Sc. Physics

Vision:

To prepare the students for quality physics education and equip them with skills for higher studies.

C) ELIGIBILITY CRITERIA OF THE PROGRAMME

Students who have completed their higher Secondary with Physics and Maths are eligible.

D) List of Courses

Sem	Part	Paper Code	Title of the Paper	Hours/ Week	Exam		Credits	Marks
					Th	Pr		
I	I	ULTAA20	Tamil Paper – I	6	3	-	3	40+60
	II	UENGA20	English Paper – I	6	3	-	3	40+60
	III	UCPHA20	Properties of Matter and Acoustics	6	3	-	5	40+60
	III	UCPHC20	Practical – I	3	-	-	-	-
	III	UAMAA20	Allied - I: Mathematics – I	6	3	-	5	40+60
	III	-	Skill-Based Elective – I	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**18**	**500**
II	I	ULTAB20	Tamil Paper – II	6	3	-	3	40+60
	II	UENGB20	English Paper – II	6	3	-	3	40+60
	III	UCPHB20	Thermal Physics and Statistical Mechanics	6	3	-	5	40+60
	III	UCPHC20	Practical – I	3	-	3	4	40+60
	III	UAMAB20	Allied - II: Mathematics – II	6	3	-	5	40+60
	IV	-	Skill-Based Elective –II	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**22**	**600**
III	I	ULTAC20	Tamil Paper – III	6	3	-	3	40+60
	II	UENGC20	English Paper – III	6	3	-	3	40+60
	III	UCPHD20	Mathematical Methods and Classical Mechanics	6	3	-	5	40+60
	III	UCPHF20	Practical – II	3	-	-	-	-
	III	UACHA320	Allied - III: Chemistry – I	4	3	-	4	40+60
	III	UACHC420	Allied Practical: Chemistry	2	-	-	-	-
	III	USPHB320	Skill-Based Elective : Electrical Appliances - I	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**17**	**500**
IV	I	ULTAD15	Tamil Paper – IV	6	3	-	3	40+60
	II	UENGD20	English Paper – IV	6	3	-	3	40+60
	III	UCPHE20	Optics	5	3	-	5	40+60
	III	UCPHF20	Practical – II	3	-	3	4	40+60
	III	UACHB420	Allied - IV: Chemistry – II	4	3	-	4	40+60
	III	UACHC420	Allied Practical: Chemistry	2	-	3	2	40+60
	IV	USPHC420	Skill-Based Elective- Electrical Appliances - II	2	3	-	2	40+60
	IV	UNEVS17	Environmental Studies	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**25**	**800**

Sem	Part	Paper Code	Title of the Paper	Hours/ Week	Exam		Credits	Marks
					Th	Pr		
V	III	UCPHG20	Electricity and Magnetism	5	3	-	5	40+60
	III	UCPHH20	Atomic Physics and Spectroscopy	5	3	-	5	40+60
	III	UCPHI20	Basic Electronics	4	3	-	4	40+60
	III	UCPHL20	Practical - III: General Practical	3	-	-	-	-
	III	UCPHM20	Practical - IV: Applied Electronics	2	-	-	-	-
	III	UEPHA20	Elective - I A: Digital Electronics and communication	5	3	-	5	40+60
	III	UEPHB20	Elective - I B: Astro and Plasma Physics					
	IV	-	Non Major Elective – I	3	3	-	2	40+60
	IV	USPHD520	Skill-Based Elective - Physics for competitive Examinations	2	3	-	2	40+60
	IV	UVEDA15	Value Education	1	-	-	-	-
Total							**23**	**600**
VI	III	UCPHJ20	Nuclear Physics	5	3	-	5	40+60
	III	UCPHK20	Relativity and Quantum Mechanics	5	3	-	5	40+60
	III	UCPHL20	Practical - III: General Practical	3	3	-	4	40+60
	III	UCPHM20	Practical - IV: Applied Electronics	2	-	3	4	40+60
	III	UEPHC20	Elective - II A: Solid State Physics and Material Sciance	5	3	-	5	40+60
	III	UEPHD20	Elective - II B: Materials Science					
	III	UEPHE20	Elective - III A: Microprocessor 8085	5	3	-	5	40+60
	III	UEPHF20	Elective - III B: Communication Physics					
	IV	-	Non Major Elective – II	3	3	-	2	40+60
	IV	USPHE620	Skill-Based Elective – Mobile communication	2	2	-	2	40+60
	IV	UVEDA15	Value Education	1	2	-	2	40+60
			Total				**34**	**900**
	IV		Extension Activity (90 Hours)				1	-
Total							**140**	**3900**

E) Programme Objectives (PO)

PO1: Attain knowledge and understand the principles and concepts in the respective discipline.

PO2: Acquire and apply analytical, critical and creative thinking, and problem-solving skills

PO3: Effectively communicate general and discipline-specific information, ideas and opinions.

PO4: Appreciate biodiversity and enhance eco-consciousness for sustainable development of the society.

PO5: Emulate positive social values and exercise leadership qualities and team work.

PO6: Pursue higher knowledge, qualify professionally, enhance entrepreneurial skills and contribute towards the needs of the society.

F) Programme Specific Outcomes (PSO)

PSO1: Students are expected to acquire knowledge in physics, including the major premises of Properties of matter and sound, Thermal Physics, Classical and quantum mechanics, electricity and Magnetism, electronics, optics, Relativity and modern physics.

PSO2: Students are also expected to develop skills in Physics for competitive Examinations.

PSO3: Analyze physical problems and develop correct solutions using natural laws.

PSO4: Students will develop the proficiency in the skill of data using a variety of laboratory instruments.

PSO5: Students will realize and develop an understanding of the impact of physics and science on society.

PSO6: Prepare the student to successfully compete for employment and to offer awide range of applications.

PSO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
PSO1	H	M	H	M	H	H
PSO2	H	M	H	H	M	H
PSO3	H	L	H	H	M	M
PSO4	H	M	H	M	H	L
PSO5	L	M	M	H	L	H
PSO6	H	H	L	L	H	L

(STRONGLY CORRELATED - H, MODERATELY CORRELATED - M, WEAKLY CORRELATED -L)

SEMESTER – I

UCPHA20 – Properties of Matter and Acoustics

Year: I **Sem:** I	**Course Code:** UCPHA20	**Title of the Course:** Properties of Matter and Acoustics	**Course Type:** Theory	**Course Category:** Core	**H/W** 6	**Credits** 5	**Marks** 100

Couse Objectives

1. To give introduction to different properties of matter namely elasticity, mass, viscosity and surface tension.
2. To make the students to understand the concept of bending, uniform bending and non-uniform bending of the beam.
3. To understand the concept of ultrasonics and its applications.

Course Outcomes (CO)

1. The properties of solids especially knowledge of elasticity help the students to identify the materials suitable for the construction of buildings, houses etc.

2. Learn the basics of properties of matter, how Young's modulus and rigidity modulus are defines and how they are evaluated for different shapes of practical relevance.

3. Properties of fluids especially knowledge of viscosity and surface tension help the students in their daily life and agriculture
4. Study the behaviour of the progressive wave

5. Learn the fundamentals of harmonic oscillator model, including free, damped and forced oscillators.

	PO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	L	M	M	H	H	L
CO2	M	L	L	L	M	H
CO3	H	L	H	H	M	L
CO4	M	L	H	M	M	L
CO5	M	M	H	M	H	H

	PSO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	H	M	H	M	L	H
CO2	M	H	H	M	H	L
CO3	L	M	H	M	L	H
CO4	M	M	M	H	H	M
CO5	H	H	M	L	M	H

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: Elasticity **(12 hours)**

1.1 Stress-Strain - Types- Hooke's law - Basic ideas of elastic moduli - Young's modulus-Rigidity Modulus- Bulk Modulus (K1, K2)
1.2 Behaviour of a wire under progressive tension - Work done in stretching and Twisting a wire (K3)
1.3 Twisting couple on a cylinder (K3)
1.4 Determination of Rigidity modulus and moment of inertia using torsional pendulum (with and without mass) (K3, K4)
1.5 Determination of q, n, σ by Searle's method (K3, K4)
1.6 Compound pendulum, moment of inertia - determination of radius of gyration using graph method. (K3, K4)

Unit II: Bending of Beams **(12 hours)**

2.1 Bending of beams - Expression for bending moment (K1, K3)
2.2 Cantilever- Determination of Young's Modulus by cantilever oscillations (K2, K4)
2.3 Non-uniform bending- Determination of Young's Modulus by Koenig's method (K2, K3,K4)
2.4 Uniform bending- Expression for Elevation (K2, K3, K4)
2.5 Experiment to determine young's modulus using pin and microscope (K3, K4)
2.6 Expression of Poisson's ratio- Relationship between the three moduli of elasticity (K3,K4)

Unit III: Surface Tension **(15 hours)**

3.1 Definition and dimension of surface tension, Excess of pressure, Problems and its relation between curvatures (K1, K2, K3, K4)
3.2 Jaeger's method and variation of surface tension with temperature - Drop weight method (K1, K2, K3, K4)
3.3 **Viscosity:** Viscosity definition, stream line flow, turbulent flow- Reynold's number, Searle's Viscometer, Meyer's formula for the rate of flow of a gas through a capillary tube. (K1, K2, K3, K4).
3.4 Poissuille's formula, Comparison of Viscosity using Oswald's Viscometer Stoke's formula, determination of co-efficient of viscosity (K3, K4)
3.5 **Osmosis:** Osmosis and osmotic pressure, Laws of osmotic pressure - Determination of osmotic pressure by Berkeley and Hartley method (K3, K4)
3.6 Osmosis and vapor pressure of a solution, Osmosis and boiling point of a solution (K3,K4)

Unit IV: Waves and Oscillations **(15 hours)**

4.1 Progressive wave – properties and characteristics of progressive wave (K1,K2)
4.2 Simple harmonic motion – Expression for free oscillations (K3)
4.3 Expression for Damped and Forced oscillations (K3, K4)
4.4 Expression for velocity of sound in a string - Determination of frequency of the vibratorin transverse and longitudinal mode using Melde's string (K2, K3, K4)
4.5 Determination of Specific gravity of solid and liquid by Melde's string (K3, K4)
4.6 Reverberation Time - Sabine's Formula (Derivation only) - Absorption coefficient Acoustic aspects of halls and auditorium (K2, K3)

Unit 5: Ultrasonics **(15 hours)**

5.1 Introduction - characteristic properties of ultrasonic waves (K1,K2)
5.2 Stationary waves and resonance (Half wave length and quarter wave length resonance) Attenuation and Sources of ultra sound (K2,K3)
5.3 Piezoelectric method and Magnetostriction Method (K3,K4)
5.4 Low frequency/high intensity applications (Welding, Echo Sounder, sensor for temperature and pressure) (K3,K4)
5.5 High frequency/ low intensity applications (NDT, Holography) (K3,K4)
5.6 Different types of scans and its clinical Applications (Obstetrics, Examination of heart) SONAR (K3,K4)

Books for Study:

1. Murugeshan. R.S. - Properties of Matter, 1st Edition- Chand & Co.Pvt Ltd., NewDelhi, Reprint 2005.
2. D. S. Mathur - Elements of Properties of Matter, 1st Edition - Shyamala CharitableTrust, New Delhi, 2005.
3. Brijilal & Subramaniyam N. - Properties of Matter, 1st Edition - Vikas PublicationHouse, New Delhi, 2001.
4. Brijilal & Subramaniyam N – Textbook of Sound, 1st Edition - Vikas PublicationHouse, New Delhi, 2005.
5. M. N. Srinivasan - Textbook of Sound – Himalayan Publication, 1991.
6. Brijilal & Subramaniyam N - Waves and Oscillations - Vikas Publication House, New Delhi,1994.

Reference Books:

1. K. Halliday, R. Resnick and K.S. Krane and J. Walker - Fundamentals of Physics, 6th Edition - Wiley, N.Y., 2001.
2. R. P .Feymann, R.B., Leighton and M. Stands - The Feynmann Lectures on Physics, Vol 1,2 and 3-Narosa, New Delhi,1998,Vol.1,1st Edition, 1998, Vol 2. 2nd Edition, 1998, Vol.3.3rd Edition, 2001.

3. Arora C.L - Mechanics and Properties of Matter, 1st Edition - Chand & Co. Pvt. Ltd., New Delhi,1999.

SEMESTER – II
UCPHB20 – THERMAL PHYSICS AND STATISTICAL MECHANICS

Year: I **Sem:** II	**Course Code:** UCPHB20	**Title of the Course:** Thermal Physics and Statistical Mechanics	**Course Type:** Theory	**Course Category:** Core	**H/W** 6	**Credits** 5	**Marks** 100

Course Objectives

1. To introduce the law of thermodynamics and their applications.
2. To acquire knowledge about classical and quantum theory of radiation.
3. To understand the basic of statistical mechanics.

Course Outcomes (CO)

The learners will be able to

1. Become familiar with various thermodynamic process and work done in each of these processes.
2. Have a clear understanding about Reversible and irreversible process
3. Learn the working of a Carnot engine, and knowledge of calculating change in entropy for various processes.
4. Realize the importance of Thermo dynamical functions and applications of Maxwell's relations.
5. Learn the relation between the entropy and probability.

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	H	H	H	M	L
CO2	M	L	L	M	M	H
CO3	H	H	H	M	M	H
CO4	M	H	H	H	L	M
CO5	H	M	H	M	L	H

CO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	H	M	H	M	H
CO2	H	H	M	H	M	L
CO3	M	M	L	M	H	M
CO4	L	M	H	M	H	L
CO5	H	L	M	H	M	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: Thermal Conduction and Radiation (16 hours)

1.1 Coefficient of Thermal Conductivity - Thermal Diffusivity (K1, K2)
1.2 Rectilinear Flow of Heat along a Bar - Forbe's method - Lee's Disc Method (K3,K4)
1.3 Relation between Thermal and Electrical Conductivities - Wiedemann - Franz Law and Stefan's Law (K1,K2)
1.4 Derivation of Newton's Law of Cooling from Stefan's Law and Laboratory determination of Stefan's Constant (K3, K4)
1.5 Planck's Quantum Theory of Radiation-Deduction of Wien's Law and Raleigh-Jeans Law from Planck's Law (K1,K3,K4)
1.6 Solar Constants - Temperature of the Sun - Solar Spectrum (K2)

Unit II: Thermodynamics – I (14 hours)

2.1 Introduction – Thermodynamic system- Zeroth Law of Thermodynamics Quasistatic process (K1, K2)
2.2 Statement of First Law of Thermodynamics - Statement of Second Law (K1, K2)
2.3 Heat Engines and Ideal Heat Engine - Concept of Entropy-Entropy of an Ideal Gas Reversible and Irreversible Process and their entropy (K2,K3)
2.4 Carnot Theorem and Proof of Carnot Theorem (K2, K3,K4)
2.5 Construction and working of Internal Combustion Engine - Petrol and Diesel Engines(K3, K4)
2.6 First Latent Heat Equation – Clausis-Clapeyron equation and Second Latent Heat Equation (K4)

Unit III: Thermodynamics – II (15 hours)

3.1 Thermodynamic Scale of Temperature or Work Scale of Temperature and its Relation to Perfect Gas Scale (K4)
3.2 Entropy Temperature Diagram (K3)
3.3 Maxwell's Thermodynamic Equations and its Applications (K4)
3.4 Thermodynamic Potentials - Free Energy – Enthalpy - Internal energy – Helmholtz free energy – Significance of thermodynamic potentials (K1,K2)
3.5 Gibbs function - Gibb's Helmholtz Equation - Third Law of Thermodynamics (K1,K3)
3.6 Phase transition expression for the first orderand second order transition (K3, K4)

Unit IV: Low Temperature Physics (15 hours)

4.1 Introduction – Production of low temperature – Joule Thomson effect-Joule Kelvin Effect (Temperature of inversion) (K3)
4.2 Kammerling Onne's Method - Liquefaction of Hydrogen- Liquefaction of Helium(K3)

4.3 Helium I and II - Lambda Point, Viscosity- thermal conductivity- Rolling films (K3,K4)
4.4 Production of low temperature - adiabatic demagnetization
4.5 Practical applications of Low Temperature (K3)
4.6 Refrigerators - Air Conditioning Machines (K3, K4)

Unit V: Statistical Mechanics (15hours)

5.1 Definition of Phase-Space - Micro and Macro States (K1, K2)
5.2 Different types of Ensembles - Definition and relation between entropy and Probability (K1)
5.3 Expression for Maxwell Boltzmann Statistics (K4)
5.4 Maxwell's law of Distribution energy (K3)
5.5 Expression for Fermi Dirac Statistics (K3, K4)
5.6 Derivation for Bose Einstein Statistics - Comparison of Three Statistics (K3,K4)

Books for Study:

1. Brijilal and Subrahmanyam S. - Heat and Thermodynamics – Chand & Co., New Delhi, Reprint 1998.
2. D.S. Mathur - Heat and Thermodynamics - Sultan Chand & Sons, New Delhi, V Edition, 2005
3. Arora. C.L. – A Textbook of Heat and Thermodynamics - Chand & Co., New Delhi, Reprint 1998.
4. Dr. D. Jayaraman and Dr.K.Ilangovan – Thermal Physics and Statistical Mechanics- S. Viswanathan publishers 2016.

Books for Reference:

1. A.B.Gupta and H.Roy – Thermal Physics – Books and Allied Pvt. Ltd., Reprint 2005
2. D.Halliday, R.Resnick and J.Walker – Fundamental of Physics, 6th Edition - Wiley N.Y., 2001
3. Roy - Thermal and Statistical Physics – S Chand & Co.,2001
4. R.Murugeshan – Thermal Physics – S.Chand& Co. Publication, Reprint 2004

SEMESTER – III

UCPHD20 – Mathematical Methods and Classical Mechanics

Year: II **Sem:** III	**Course Code:** UCPHD20	**Title of the Course:** Mathematical Methods and Classical Mechanics	**Course Type:** Theory	**Course Category:** Core	**H/W** 6	**Credits** 5	**Marks** 100

Course Objectives

1. To introduce the students the basic methods of applied mathematics to solve the physical problems that arises in conventional physics such ad electricity and magnetism, classical and quantum mechanics and spectroscopy.
2. To make the students acquire the mathematical skills in solving the basic numerical problems.
3. To demonstrate knowledge and understanding of following fundamental concepts in dynamics of system of particle, motion of rigid body.
4. To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulations of classical mechanics.

Course Outcomes (CO)

The learners will be able to

1. Learn about gradients, divergence and curl in orthogonal curvilinear and their typical applications in physics
2. Learn about special type of matrices that are relevant in physics and get introduced to special functions like gamma function, beta function, delta function, dirac delta function, Bessel functions and their recurrence relations
3. Analyse statistical data using measures of central tendency, dispersion. Learn the methods of skewness like Karl-Pearson coefficient, Bowleys coefficient
4. Learn about the mechanics of moving particles and the constraints. The measure of position of moving particle and the parameters required to describe the state of system. Lagrange's equation deals with position, momentum and total energy of system in motion
5. Learn about Hamiltonian functions and differences between Lagrangian and Hamiltonian. It deals with various physical applications

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	H	H	M	H	H
CO2	M	L	H	M	H	L
CO3	L	M	L	M	M	H
CO4	M	H	H	H	L	L
CO5	L	M	M	M	H	H

CO	PSO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	L	H	M	M	H
CO2	H	M	M	H	H	L
CO3	M	H	H	L	M	H
CO4	H	M	H	M	L	H
CO5	M	H	H	M	H	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: Vector algebra and Matrices (14 hours)

1.1 Gradient of a scalar field – Physical Interpretation - Line, surface and volume integrals (K1, K2)
1.2 Divergence and curl of vector function and its physical significance (K3, K4)
1.3 Gauss divergence theorem - Application of vector to hydrodynamics- heat flow in solids- gravitation and electromagnetic field(K4)
1.4 Introduction to matrices - Review of algebraic operations of matrices - Properties of matrix multiplication (K3)
1.5 Eigen value - Eigen vectors(K4)
1.6 Characteristics equation of matrix – Cayley Hamilton's theorem - Diagonalization of matrices(K4)

Unit II: Special function (14 hours)

2.1 Beta function - Symmetry property of beta function– Evaluation of beta function (K1, K2, K3)
2.2 Gamma function - Evaluation of gamma function (K1, K2, K3)
2.3 Legendre's differential equation and Legendre's functions (K4)
2.4 Generating functions of Legendre's polynomial (K2)
2.5 Orthogonal properties of Legendre's polynomials - Recurrence formulae (K4)
2.6 Recurrence formulae - Bessel's differential equation(K4)

Unit III: Statistics (14 hours)

3.1 Introduction to statistics - Measures of central tendency (K1, K2)
3.2 Measure of arithmetic mean, median, mode (K1, K3)
3.3 Measure of dispersion, Range, Quartile deviation, mean deviation and standarddeviation (K2, K3, K4)
3.4 Measure of skewness - Karl Pearson's coefficient of skewness (K4)
3.5 Bowley's coefficient of skewness (K4)
3.6 Distribution models - binomial, Poisson and normal distribution (K4)

Unit IV: Classical Mechanics I (14 hours)

4.1 Mechanics for a system of particles - constraints – Holonomic and non-Holonomic constraints(K1)
4.2 Degrees of freedom - Generalized coordinates (K2)
4.3 Principle of virtual work(K1, K2)
4.4 D'Alembertz principle - Lagrange's equation from D'Alembertz principle- Lagrange's equation for system containing dissipative forces (K3, K4)
4.5 Applications of Lagrange's equation –Spherical pendulum - simple pendulum, - compound pendulum (K4)
4.6 Central force - Equation of motion and first integrals (K4)

Unit V: Classical Mechanics II (14 hours)

5.1 Phase –Space (K1)
5.2 Hamiltonian function – Hamilton's equation – Physical significance of Hamiltonian function (K2, K3)
5.3 Applications of Hamiltonian equations – Simple pendulum, compound Pendulum (K4)
5.4 Poisson's bracket - Properties of Poisson's bracket (K3,K4)
5.5 Relation between Lagrange and Poisson bracket (K4)
5.6 Application of Lagrangian and Hamiltonian for a charged particle (K4)

Books for Study:

1. Sathya Prakash - Mathematical Physics – S.Chand & Sons, Reprint 2006.
2. P.N. Arora, Sumeet Arora – Comprehensive Statistical Methods – S. Chand Publication, 2012.
3. Guptha Kumar - Classical Mechanics – Pragathi Prakashan, 2008.
4. J Medhi - Statistical Methods: An Introductory Text - New age International Publications, 2013.
5. N G Das – Statistical Methods- McGraw-Hill Companies, 2018.

Reference Books:

1. B.D.Gupta – Mathematical Physics, 3rd Edition – Vikas Publishing House Pvt. Ltd., 2007.
2. B.S.Rajput – Mathematical Physics – Pragati Prakashan Publication, 2005.
3. H.K.Dass – Mathematical Physics - S.Chand and Co. Ltd., 2007.
4. Herbert Goldstein – Classical mechanics – Narosa Publications, 2001.
5. H.K.Dass -Statistical mechanics - S.Chand and Co. Ltd., 2014.

SEMESTER – IV
UCPHE20 – Optics

Year: II Sem: IV	Course Code: UCPHE20	Title of the Course: OPTICS	Course Type: Theory	Course Category: Core	H/W 5	Credits 5	Marks 100

Course Objectives

1. Students understand the dual nature of light through the different branches of optics like Geometrical optics and Physical optics.
2. To teach them the aberration in lenses in optical instruments.
3. To teach the basic concepts and working of interference, diffraction and polarization.
4. To explain the students about important application of interference, diffraction and polarization.

Course Outcomes (CO)

1. To make the students understand different types of lenses and the aberrations in it
2. Learn about dispersion by thin prism and dispersion without deviation; deviation without dispersion of prism
3. Study about interference and various interferometers used for the applications like wavelength and resolution determination and refractive index of gases
4. Learn about the concept of diffraction. Its types Fresnel's and Fraunhofer diffraction experiments and applications
5. Study about polarization, its experiments Laurent's half shade polarimetry and applications

	PO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	M	H	H	L	H	H
CO2	M	M	H	M	H	L
CO3	L	M	M	M	H	H
CO4	M	H	H	H	M	L
CO5	L	M	H	M	H	H

	PSO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	H	M	H	L	H	H
CO2	M	H	H	M	L	H
CO3	H	L	H	H	M	L
CO4	M	H	H	L	M	H
CO5	H	M	L	M	H	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: Geometrical Optics (14 hours)

1.1 Lens and its types (K1)
1.2 Optic center of the lens - Principal foci and Principal points - Thick lens formula(K1,K2)
1.3 Power of thick lens - Defects in lenses - various defects and its minimizing method (K2, K3)
1.4 Method of minimizing spherical aberration - contact method and out of contact method – Chromatic aberration in lenses (K3)
1.5 Conditions for achromatic aberration of two thin lenses in contact and out of contact(K3 , K4)
1.6 Basic ideas of eyepiece - Ramsden's and Huygen's eyepiece and comparison(K4)

Unit II: Dispersion (14 hours)

2.1 Dispersion - Prism - Explanation of VIBGYOR- application (K1)
2.2 Dispersion produced by a thin prism - angular dispersion (K1, K2)
2.3 Dispersive power of a prism - resolving power of a prism (K2, K3)
2.4 Combination of prisms to produce - dispersion without deviation and deviation without dispersion (K3)
2.5 Achromatic prism - Direct vision spectroscope-constant deviation spectrometer (K3,K4)
2.6 Determination of refractive index of the material of small angled prism (K4)

Unit III: Interference (14 hours)

3.1 Interference - condition for interference - theory of interference in reflected system (K1, K2)
3.2 Interference in thin films- Thin films - air wedge - Determination of diameter of a thin wire by air wedge method - test for optical flatness (K2, K3)
3.3 Newton's rings- Determination of refractive index of a liquid (K4)
3.4 Michelson's interferometer - theory - application - determination of wavelength and resolution of spectral lines (K4)
3.5 Refractive index of gases - Jamin's and Rayleigh's interferometer - Fabry - Perot interferometer (K3, K4)
3.6 Holography – Principle - construction and reconstruction –application(K1, K3, K4)

Unit IV: Diffraction **(14 hours)**

4.1 **Diffraction:** Fresnel's Diffraction (K1)

4.2 Fresnel's ideas of wave fronts - Fresnel's explanation of rectilinear propagation of light - half period zones (K1, K2, K3)

4.3 Comparison of half period one and convex lens - Diffraction at a circular aperture, straight edge (K2, K3)

4.4 **Fraunhofer diffraction:** Fraunhofer diffraction at single slits and double slits - theory of plane diffraction grating - determination of wavelength using grating (K3, K4)

4.5 Dispersive power of a grating - absent spectra - overlapping spectra - resolving power of a grating (K2, K3)

4.6 Difference between prism and grating - difference between Fresnel and Fraunhofer diffraction(K3, K4)

Unit V: Polarization **(14 hours)**

5.1 Polarisation - Double refraction by Huygens explanation of double refraction in uniaxial crystals (K1, K2)

5.2 Nicol prism as a polarizer and analyser (K3, K4)

5.3 Quarter and half wave plates - production and detection of a plane- circularly and elliptically polarized light (K4)

5.4 Optical activity - Fresnel's explanation - experimental verification(K3)

5.5 Specific rotatory power - determination of specific rotatory power by Laurent's half shade polarimeter (K3)

5.6 Kerr effect and Faraday Effect -LCDs (K3, K4)

Books for Study:

1. Subramanyam, Brijlal – A Text of Optics – S.Chand & Co. Ltd., 2006.
2. Murugesan R – Optics and Spectroscopy - S.Chand & Co. Ltd., 2005.

Reference Books:

1. Khanna D.R, Gulati H.R. - Optics - S.Chand and Co. Ltd., Reprint 2002.
2. Raj M.G. - Fundamentals of Optics – Anmol Publications Ltd., New Delhi, 1996.
3. C.L.Arora – Optics, 1st Edition - S.Chand and Co. Ltd., New Delhi, 1999.
4. Eugene Hecht - Optics, 4th Reprint – Pearson Education Publication, 2004.

SEMESTER – V

UCPHG20 – Electricity and Magnetism

Year: III **Sem:** V	**Course Code:** UCPHG20	**Title of the Course:** Electricity and Magnetism	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To make the students understand the principles and theory of electrostatics, current electricity, thermo electricity, electromagnetism and alternating current.
2. To familiarize the students with different kinds of magnetism such as para, dia, Ferro and anti-ferro magnetism and the various theories of magnetism.

Course Outcomes (CO)

The learners will be able to

1. Solve mathematical problems involving electric and magnetic forces, fields, and various electro-magnetic devices and electric circuits.
2. Develop explicit problem-solving strategies that emphasize qualitative analysis steps to describe and clarify the problem.
3. Import knowledge of Transient current, Alternate current
4. To present a clear & consistent picture of the Ballistic galvanometer, Figure of merit, Capacitances, Emf of cells
5. Gain confidence in their ability to apply mathematical methods to understand electromagnetic problems to real-life situations

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	H	H	L	H	H
CO2	L	M	H	M	M	L
CO3	L	M	M	M	H	H
CO4	M	H	L	H	M	L
CO5	L	M	H	M	H	H

CO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	M	L	H	M	L
CO2	M	H	M	H	L	M
CO3	M	L	M	H	M	H
CO4	L	M	H	H	M	L
CO5	M	H	H	L	H	H

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: Electrostatics (16 hours)

1.1 Coulomb's law – Permittivity of free space – Relative permittivity (K1,K2)
1.2 Gauss Law – statement – proof of Gauss' law – differential form of Gausslaw (K1,K2,K3)

1.3 Applications of Gauss Law – Electric field due to a uniformly charged sphere (K3,K4)
1.4 Electric Potential – electric potential as line integral of electric field – Relationbetween electric potential and electric field (K1,K2,K3)
1.5 Potential due to a uniformly charged conducting sphere (K1,K2,K3)
1.6 Electric dipole – dipole moment – Electric Potential and Electric field due to a dipolePoisson's and Laplace's equations. (K1,K2,K3,K4)

Unit II: Capacitors & Thermoelectricity (15 hours)

2.1 Capacitance – Definition - Principle – Energy of a charged capacitor (K1,K2)
2.2 Loss of energy on sharing of charges – Force of attraction between the plates of a charged capacitor(K3,K4)
2.3 Electrometers - construction and working of Quadrant electrometer - Theory of quadrant electrometer – Heterostatic and Idiostatic uses (K1,K2,K3,K4)
2.4 Thermoelectricity – Seeback effect - Peltier Effect – Thomson effect - Expression for Peltier and Thomson co- efficients (K1,K2,K3,K4)
2.5 Thermodynamics of thermocouple - Thermo-electric diagrams and its uses (K1,K2,K3,K4)
2.6 Potentiometer – principle - Emf of thermocouple using Potentiometer. (K1,K2,K3,K4)

Unit III: DC and AC circuits (15 hours)

3.1 Transient current (DC) – Growth and decay of current in a circuit containing inductance and resistance (LR) – time constant (K2,K3,K4)
3.2 Growth and decay of charge in a circuit containing capacitance and resistance (CR) – time constant - Determination of high resistance by leakage (K3,K4)
3.3 Growth and decay of charge in LCR circuit – Conditions for oscillations (K3,K4)
3.4 Alternating current – Peak, average and RMS values of AC voltage (K1,K2,K3,K4)
3.5 AC circuit containing Resistance, inductance and Capacitance (series resonant circuit) resonant frequency (K2,K3,K4)
3.6 Power in AC circuit. (K1,K2)

Unit IV: Electromagnetism (14 hours)

4.1 Biot and Savart's law (Vector treatment) (K3)
4.2 Magnetic induction due to a circular coil carrying current – Force on a current carrying conductor placed in a uniform magnetic field (K3,K4)
4.3 Moving coil Ballistic Galvanometer – Construction and theory – Damping correction

Conditions for dead beat – conditions for ballistic (K1,K2,K3,K4)

4.4 Current and voltage sensitivities of moving coil galvanometer - Experimental method for figure of merit (K1,K2,K3,K4)

4.5 Absolute capacity of a capacitor – Comparison of capacitances - Comparison of EMFs of cells (K1,K2,K3,K4)

4.6 Self-inductance and Mutual inductance - self inductance of a long solenoid – mutual inductance of co-axial solenoids – Eddy current and its uses. (K1,K2,K3,K4)

Unit V: Magnetism **(15 hours)**

5.1 Magnetic Induction (B) – Magnetization (M) – Magnetic susceptibility - Permeability (K1,K2)

5.2 Relation between B, H and M (K3)

5.3 Hysteresis – Hysteresis curve - Experiment to draw M-H curve (hysteresis – horizontal model) (K3,K4)

5.4 Importance of hysterisis curves – choice of magnetic materials - Ferrites- Properties of dia, para and ferro magnetic materials (K1,K2,K3,K4)

5.5 Langevin's theory of dia and para magnetism (K4)

5.6 Weiss theory of ferro magnetism. (K3,K4)

Books for Study:

1. R.Murugeshan – Electricity and Magnetism – S.Chand & Co. Ltd., New Delhi, 2009.
2. D.N. Vasudeva – Electricity and Magnetism – S.Chand & Co. Ltd., New Delhi, 2009.

Books for Reference:

1. David J.Criffittts – Introduction to Electro Dynamics – Prentice Hall of India Pvt. Ltd., New Delhi 2002.
2. Duggal B.D. and Chabra C.L – Fundamentals of Electricity and Magnetism Shoban Lal Nagin. Chand & Co. Jallundui, Delhi, 1997.
3. Halliday D., R.Resnich and J.Walker – Fundamentals of Physics, 6th Edition – WileyNew York, 2001.
4. Tayal D.C. - Electricity and Magnetism – Himalayan Publishing House, Bangalore, 1999.
5. Tewari K.K. – Electricity and Magnetism – S.Chand& Co. Ltd., New Delhi, 2001.

SEMESTER – V

UCPHH20 – Atomic Physics and Spectroscopy

Year: III **Sem:** V	**Course Code:** UCPHH20	**Title of the Course:** Atomic Physics And Spectroscopy	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To provide the students with basic ideas of properties of atoms and ions when subjected to Electric and magnetic fields.
2. To make the students to acquire the knowledge about the salient features of vector atom model and to explain the fine structure of spectral lines.
3. To provide a brief understanding of the principles of Spectroscopy.

Course Outcomes (CO)

The learners will be able to

1. Understand the observed dependence of atomic spectral lines on externally applied electric and magnetic fields.
2. Analyse the types of photo electric cells.
3. Realize the theories explaining the structure of atoms and the origin of the observed spectra.
4. Identify the atomic effect such as Zeeman Effect and its types
5. List the different types of atomic spectra

	PO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	M	H	H	M	H	H
CO2	M	M	H	M	M	L
CO3	H	M	M	M	H	H
CO4	M	H	L	H	M	L
CO5	H	M	H	M	H	H

	PSO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	H	M	H	M	L	H
CO2	M	H	H	L	H	M
CO3	H	M	H	H	L	M
CO4	H	M	M	M	L	H
CO5	M	H	H	M	H	L

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: Positive Ray Analysis (14 hours)

1.1 Overview of Positive Ray Analysis and its properties (K1,K2)
1.2 Determine the value of e/m using Thomson's parabola method (K3,K4)
1.3 Aston's mass spectrograph(K4)
1.4 Dempster's mass spectrograph(K3)
1.5 Critical potentials (ionization and excitation potential) (K1,K2)
1.6 Experimental determination of critical potentials-Frank and Hertz experiment-Davis and Goucher's experiment. (K1,K2,K3,K4)

Unit II: Photo Electric Effect (14 hours)

2.1 Photo electric emission and laws (K1,K2)
2.2 Determination of e/m using Lenard's experiment(K3,K4)
2.3 Richardson and Compton experiment(K3,K4)
2.4 Einstein's photoelectric equation – Experimental Verification of Einstein's photoelectric equation by Millikan's experiment (K3,K4)
2.5 Photoelectric cells-photo-emissive cell - photo-voltaic cell - photoconductive cell-(K3,K4)
2.6 Applications of photo electric cell – Photo multiplier tube (K2,K3)

Unit III: Vector Atom Model (15 hours)

3.1 Vector Atom Model-Spatial Quantization – Electron spin (K1,K2,K3)
3.2 Quantum numbers of electrons (K1,K2,K3)
3.3 Coupling scheme -L-S and j-j Couplings (K2,K3)
3.4 Pauli's Exclusion Principle and Electronic configuration of elements and periodic classification (K4)
3.5 Magnetic dipole moment of electron due to orbital and spin motion- Bohr magneton (K2,K4)
3.6 Stern and Gerlach experiment - Spin Orbit Coupling (K2,K4)

Unit IV: Fine Structure of Spectral Lines (16 hours)

4.1 Overview of Spectral terms and notations, Selection rules, Intensity rule and interval rule ((K1,K2,K3)
4.2 Fine structure of Sodium D lines (K3)
4.3 Spectrum of Helium (K3)
4.4 Zeeman effect (experimental arrangement for the normal Zeeman effect (K2,K3)
4.5 Larmor's theorem(K2,K3)
4.6 Debye's explanation of normal Zeeman effect-Anamalous Zeeman effect- Theoretical explanation-Lande's g factor and explanation of splitting of D1 and D2 lines of sodium – Coalescence of spectral lines. (K1,K2,K3,K4)

Unit V: Spectroscopy (K1 to K4) **(16 hours)**

5.1 Electromagnetic spectrum - Laws of Absorption Spectrum (K1,K2,K3)
5.2 UV rays -Sources of UV –detection –IR rays- Sources – Detection (K1,K2,K3)
5.3 Double Beam Spectrophotometer (K3)
5.4 Scattering of light - Rayleigh's scattering(K2)
5.5 Raman effect-Experimental study of Raman effect-Quantum theory of Raman effect (K2,K3,K4)
5.6 Comparison of Raman and IR Spectra (K2)

Books for Study:

1. N.Brijial & N.Subrahmanyam-Atomic and nuclear physics-S. Chand & Co. Publication, New Delhi, 2005.
2. R.Murugeshan Kiruthiga sivaprasanth-Modern Physics-S.Chand-First edition 2007.
3. S.N.Ghoshal-Atomic Physics-S.Chand&Co.Publication New Delhi,2006.
4. B.K.Sharma-Spectroscopy-GOEL publishing House-20th Edition,2007.
5. O.D.Tyagi and M.Yadav-A Text book of Spectroscopy-Anmol Publications,1996.

Books for Reference:

1. Atomic and molecular physics - C.L.Arora- S.Chand & Co.Publication, New Delhi.
2. Atomic and molecular physics-Raj Kumar-Campus Books International First edition 2003.
3. Text book of Atomic Physics-D.K.Jha-Discovery Publishing house, New Delhi,2004.
4. Gurdeep Chatwal and Sham Anand-Spectroscopy-Himalaya Publishing House, 2009.

SEMESTER – V
UCPHH20 – Basic Electronics

Year: III Sem: V	Course Code:	Title of the Course:	Course Type:	Course Category:	H/W	Credits	Marks
	UCPHI20	BASIC ELECTRONICS	Theory	Core	4	5	100

Course Objectives

1. To give knowledge of some basic electronic components and circuits.
2. To acquire the knowledge about the characteristics and working principles of semiconductor diodes, transistors, FET, UJT and SCR.
3. Analysis the working of semiconductor circuits such as rectifiers, Amplifiers, oscillators, and multivibrators.

Course Outcomes (CO)

1. Learn the basic role of semiconductor and its working principle.
2. Identify and explain the various current components in a transistor.

3. Have a clear understanding about different types of oscillators and its working functions.
4. Analysis the I-V characteristic of semiconductor diodes, transistors, FET, UJT and SCR.
5. Realize the importance of special device and its applications.

CO	PO					
	1	2	3	4	5	6
CO1	L	M	M	L	H	H
CO2	M	H	H	H	L	L
CO3	H	L	M	H	H	M
CO4	M	H	M	H	H	L
CO5	L	M	H	M	H	L

	PSO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	M	H	M	L	H	H
CO2	H	H	M	M	L	M
CO3	H	M	M	H	L	H
CO4	H	H	L	M	H	M
CO5	H	M	M	H	M	L

(Low - L, Medium – M, High - H)

Course SyllabuS

Unit I: Semiconductor Devices and Rectifiers (14 hours)

1.1 Semiconductors -P-type and N-type- PN junction diode (K1,K2,K3)
1.2 V-I characteristics -PN junction diode (K4)
1.3 Zener diode -Zener diode as a voltage regulator (K1, K2,K4)

1.4 Half wave and full wave rectifiers -theory of full wave rectifier- Bridge rectifiers- expression for efficiency and ripple factor for half wave and full wave rectifiers (K1, K2, K3, K4)
1.5 Filters-Types of filter circuits -Action of filter circuits -π section filter (K1,K2,K3, K4)
1.6 Diode voltage doubler- Diode voltage multiplier -Clipping and Clamping (K1,K2,K3, K4)

Unit II: Transistors and Amplifiers (14 hours)

2.1 Junction transistors- CB, CE modes configuration (K1, K3)
2.2 Relationship betweenα, β of a transistor (K4)
2.3 Transistor amplifier- Methods of transistor biasing -voltage divider Method (K1,K2,K3, K4)
2.4 Two-port representation of a transistor -h-parameters -AC equivalent circuit of a transistor amplifier (common emitter only), expressions for current gain, voltage gain, input, impedance, output admittance and power gain (K1, K2,K3,K4)

2.5 RC coupled amplifier -Frequency response curve (K3,K4).
2.6 Power amplifiers- Classification of amplifiers-class A power amplifier- Push -pull amplifiers, class B power amplifier-Emitter follower (K3,K4).

Unit III : Oscillators (14 hours)

3.1 Feedback in amplifier-Positive and negative Feedback-Advantages of negative feedback (K2, K3)
3.2 Oscillators -Oscillations in tank circuit (K1, K2)
3.3 Barkhausen Criterion (K3, K4)
3.4 Hartley and Colpitts oscillators(K3, K4)
3.5 Phase shift and Wien Bridge oscillators (K3,K4)
3.6 Expressions for the frequency of oscillation and conditions for oscillations in hparameters(K4)

Unit IV: Special devices (14 hours)

4.1 Field effect transistor –JFET– construction and working – Output characteristics
(K1, K3, K4)
4.2 Difference between FET and bipolar transistor(K2)
4.3 Parameters of JFET (K3)
4.4 Description and working of MOSFET- Depletion and Enhancement type MOSFETS
(K3, K4)
4.5 Construction, working and V-I-characteristics UJT (K3, K4)
4.6 Construction, working and V-I characteristics of Silicon controlled rectifier (K3,K4).

Unit V: OP-AMP and Multivibrators (12 hours)

5.1 Differential amplifier - differential gain (K3,K4)
5.2 Common mode rejection ratio (CMRR) (K3,K4).
5.3 Operational amplifiers- characteristics of an ideal OP-AMP (K3,K4)
5.4 Expression for voltage gain, inverting and non-inverting amplifier (K3,K4)
5.5 Voltage follower, Summer, Differentiator, Integrator (K2,K3,K4)
5.6 Multivibrators, astable, monostable and Bistable multivibrator using transistors and op-amp (K3,K4)

Books for Study:

1. Mehta V.K. – Principles of Electronics, 6th Edition – S.Chand& Co. Ltd., 2003.
2. Badge M.K. Singh S.P. – Elements of Electronics - S.Chand& Co. Ltd., 2002.
3. Subramanyam .A - Applied Electronics – The National Publishing Company, 2006.

Books for Reference:

1. Theraja B.L. Basic Electronics – S.Chand and Co. Pvt. Ltd., 2000.
2. Chattopadhaya – Foundation of Electronics – New Age International Pvt. Ltd., Publishers, New Delhi, 1999.

3. Gupta and Kumar – Hand Books of Electronics, 24th Revised Edition – Pragathi Prakasham, 1998.
4. Theodre F.Bogart – Electric Circuit, 2nd Edition – Glenco Pvt.Ltd., 1996.
5. Puri & Chand – Handbook of Electronics – Anmol Publication, Reprint, 1996.
6. Albert Paul Nalvino – Principles of Electronics, 6th Edition - Tata McGraw Hill Publications Co., 1999.
7. Sedha R.S. – Applied Electronics - S.Chand and Co. Pvt. Ltd., 2019.

SEMESTER – V

UEPHA20 – Elective IA: Digital Electronics and Communication

Year: III Sem: V	Course Code: UEPHA20	Title of the Course: Elective IA: Digital Electronics and Communication	Course Type: Theory	Course Category: Core	H/W 5	Credits 5	Marks 100

Course Objectives

1. To analyze logic processes and implement logical operations using logic circuits.
2. To understand the design and operation of arithmetic circuits, logic families, flip flop and counters.
3. To analyze different parameters of analog communication techniques.
4. To introduce students the concept and theory of signals and systems needed in electronics and telecommunication fields

Course Outcomes (CO)

The learners will be able to

1. Learn the fundamental operation of logic circuit.
2. Express the basic design and operation of arithmetic circuits.
3. Convert different type of codes and number systems which are used in digital communication system.
4. To introduce students to the basic idea of signal, modulation and demodulation techniques of analog communication.
5. To understand the concept, working principle, block diagram and key applications of AM and FM transmitting & receiving system.

CO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	H	M	H	L	M
CO2	M	L	H	M	M	L
CO3	L	M	H	M	M	H
CO4	L	M	H	M	L	L
CO5	H	M	H	M	L	H

CO	PSO					
	1	2	3	4	5	6
CO1	M	H	M	H	M	L
CO2	H	M	H	M	M	H
CO3	M	L	M	H	M	M
CO4	H	M	H	H	L	M
CO5	H	M	H	L	H	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: Boolean algebra and Logic gates (12 hours)

1.1 Decimal and binary systems -Decimal to binary and binary to decimal conversion (K1,K2)
1.2 Boolean operations, logic expressions, rules and laws of Boolean algebra (K4)
1.3 DeMorgan's theorems -Simplification ofBoolean expressions using Boolean algebra Techniques (K1, K2,K4)
1.4 Fundamental products-Sum of products - Karnaugh map- pair, quads and octet (K3)
1.5 AND gate - OR gate - NOT gate - NAND gate - NOR gate (K2, K4)
1.6 EX – OR and EX – NOR gates – NAND and NOR as universal gates (K2, K4)

Unit II: Arithmetic Circuits and Logic Families (12 hours)

2.1 Introduction of Arithmetic circuits (K1)
2.2 Adders- Half Adder - Full Adder (K2,K3)
2.3 Subtractor - Half Subtractor (K2,K3)
2.4 Parallel binary adders- BCD adder (K3,K4)
2.5 Multiplexers and De-Multiplexers with suitable example (K3, K4)
2.6 Digital logic family- RTL NOR gate-DTL NAND gate- TTL NAND gate - Characteristics of TTL family(K3, K4)

Unit III: Flip Flop and Counters, D/A Conversion & A/D Conversion (13 hours)

3.1 RS flip flop -clock pulses- clocked RS flip flop- Preset and clear, JK flip flop- Race around condition- JK Master slave flip flop- D flip flop- T flip flop(K2,K3)
3.2 Asynchronous counter-3 bit binary counter - Mod 7 counter (K2, K3)
3.3 Operation of synchronous counters- mod8 parallel counter (K3, K4)
3.4 Combination counter-Decade counter (K3, K4)
3.5 Binary weight- Resistance divider method – Binary ladder method (K3,K4).
3.6 Simultaneous equation (K4)

Unit IV: Modulation and Demodulation (12 hours)

4.1 Modulation- Amplitude modulation- Mathematical analysis of AM wave (K1,K3,K4)
4.2 Modulation index (modulation factor) - Power in AM wave (K1, K2)
4.3 Frequency modulation - expression for frequency modulated wave(K1, K3)

4.4 Demodulation -Ratio Detector (K1, K2, K4)
4.5 Block diagram of AM transmitting system- AM receiver: Principle of Superhetrodyne receiver (K3,K4)
4.6 Block diagram of FM transmitting & receiving system (K3, K4)

Unit V: Propagation of Radio Waves and Radar (13 hours)

5.1 Antenna- Dipole and Folded type Antennas-array of antennas (K1,K2)
5.2 Propagation of Radio waves -Propagation of ground waves- Space wave propagation- Skywave propagation (K3,K4).
5.3 Skip distance and maximum usable frequency and Fading (K1,K2)
5.4 The ionosphere- Effect of ionosphere on propagation of radio waves - Eccles Larmor theory (K3,K4)
5.5 Principle, working and applications of Radar (K1,K2,K3,K4)
5.6 Range equation for radar and Duplexer (K3, K4)

Book for Sudy:

1. Malvino and Leech – Digital Principles and Applications, 5th Edition – Tata McGraw Hill, 2002.
2. A.Subramanyam - Applied Electronics –National Publishing Company, 2006.
3. R.Murugeshan Kiruthiga Sivaprasath - Modern Physics – S.Chand, 2007.

Books for Reference:

1. Mano Morris – Digital Logic and Computer Designs, 23rd Edition – Prentice Hall Publication, 2000.
2. R.S. Sedha – A Textbook of Electronics – S.Chand Publication, 2001.
3. Gupta & Kumar - Handbook of Electronics – PragatiPrakasan Publication, 2002..
4. T.L.Floyd – Digital Fundamentals, 3rd Edition – Universal Book Stall, New Delhi, 2002.
5. V.K.Puri – Digital Electronics, 5th Reprint – Tata McGraw Hill Publication, 2003.

SEMESTER – V
UEPHB20 – Elective – IB: Astro and Plasma Physics

Year: III **Sem:** V	**Course Code:** UCPHB20	**Title of the Course:** Elective – IB: Astro and Plasma Physics	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To understand various astrophysical phenomena by applying the knowledge obtained in Plasma Physics

2. To study and help to understand a solid grounding in fundamental plasma physics.

3. To acquire the knowledge about variety of structures we can see in the universe from stars and planetary systems, to galaxies and clusters of galaxies.

Course Outcomes (CO)

The learners will be able to

1. Learn the basic theories about the sun and solar system.
2. Learn the most fascinating and important astrophysical phenomena.
3. Have a clear understanding about visible matter in the universe
4. Study the various phases of the interstellar medium inside galaxies
5. Study in detail about Cosmic Rays, Galaxy and Instrumentation

	PO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	L	H	M	M	H	H
CO2	L	H	M	H	L	M
CO3	M	L	H	M	H	H
CO4	H	L	M	L	H	M
CO5	L	H	M	H	H	L

	PSO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	M	H	M	M	H	L
CO2	M	H	M	H	H	M
CO3	H	M	H	M	L	H
CO4	M	L	L	L	M	H
CO5	H	M	L	H	L	M

(Low- L, Medium - M, High - H)

Course Syllabus

Unit I: Theories about solar system and the sun (12 hours)

1.1 Theories on solar system like Geo-centric theory and Helio-centric theory (K1,K2,K3)

1.2 Kepler's laws of gravitation and Newton's law of gravitation- Basic ideas of the solar system (K1,K2).

1.3 The Sunandtemperature distribution near the photosphere (K3,K4).

1.4 Chromosphere boundary and solar granulation (K3,K4).

1.5 Study the basic concepts chromospheres, Spicules, plages and filaments, solar

corona and Solar flares (K2,K3)

1.6 Radio emission from the sun, solar wind and syroheliometer (K1,K2,K3,K4).

Unit II: Stars (12 Hours)

2.1 Colour Index of stars, stellar evolution and birth of a star (K1, K2,K3)
2.2 Maturity, ageing of stars and death of a star (K1,K3,K4)
2.3 Types of stars such as binary, multiple, variable, erupting and exploding stars (K1, K2,K3, K4)
2.4 Nebulae, Novae and Super Novae (K1, K2,K3,K4).
2.5 White dwarfs and electrons in white dwarfs(K3,K4).
2.6 Study of neutron stars, pulsars, quasars and black holes (K1,K3,K4).

Unit III: Cosmic Rays, The Galaxy and Instrumentation (12 hours)

3.1 Cosmic rays and discovery of cosmic rays (K2, K3).
3.2 Latitude effect, azimuth effect, altitude effect and longitude effect (K3,K4).
3.3 Primary cosmic rays and secondary rays (K1,K2)
3.4 Cosmic ray showers and vanallen belts (K3, K4).
3.5 The Galaxy, hubble's law and general structure of galaxy(K1,K2,K3,K4).
3.6 Astronomical Instruments: Reflecting and refracting telescopes, radio telescopes and hubble space telescope (HST) (K1, K3,K4).

Unit IV: Basic concepts of Plasma (12 hours)

4.1 Introduction to plasma and composition and characteristics of plasma (K1,K3)
4.2 Collisions, elastic collisions, Inelastic collisions and space plasma (K2,K3)
4.3 Interstellar space plasma and earth's atmospheric plasma (K3)
4.4 Atmosphere of other planets (K3, K4)
4.5 Nuclear reactions in steller plasma (K3,K4)
4.6 Proton-Proton cycle (K3, K4)

Unit V: Characteristics and Applications of Plasma (12 hours)

5.1 Properties of plasma in a magnetic field (K3,K4)
5.2 Force on plasma in a magnetic field (K3)
5.3 Current in magnetized plasma (K3)
5.4 Collisions in fully ionized magneto-plasmas and pinch effect. (K3,K4)
5.5 Applications of plasma (K4)
5.6 Controlled thermonuclear reactions, Heating and confinement of plasma Stellarator and tokamak (K3, K4)

Books for Study:

1. K.S.Krishnaswamy – Astro Physics: A Modern Perspective – New Age International Pvt. Ltd., New Delhi, 2002.
2. G.K.Sasidharan – The Great Universe – S.Chand& Company Ltd., New Delhi, 2008.
3. R.Murugeshan Kiruthiga Sivaprasath – Modern Physics–S.Chand &Co.Publication, 2007.

Books for Reference:

1. BaidyananthBasu – An Introduction to Astro Physics – Prentice Hall of India, 2004.
2. V.B.Bhatia – Textbook of Astronomy and Astro Physics with Elements of Cosmology – Narosa Publishing House, New Delhi, 1998.
3. R.R.Danial – Concepts of Space Science – University Press, Reprint 2002.
4. K.CosmicKapoor – Space Book – Lotus Press, 2005.
5. Goswami – Elements of Plasma Physics – New Central Book Agency, Reprint 2000.

SEMESTER – VI

UCPHJ20 – NUCLEAR PHYSICS

Year: III **Sem:** VI	**Course Code:** UCPHJ20	**Title of the Course:** NUCLEAR PHYSICS	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To understand the basic properties of nucleus.
2. To expose to the students the processes of Radioactivity, nuclear fission, nuclear fusion and their applications in various fields.
3. To introduce a brief account of the elementary particles and cosmic rays.

Course Outcomes (CO)

The learners will be able to

1. Demonstrate a knowledge of fundamental aspects of the structure of the nucleus, radioactive decay, nuclear reactions and the interaction of radiation and matter.
2. Discuss nuclear and radiation physics connection with other physics disciplines – solid state, elementary particle physics, radiochemistry.
3. Describe experimental techniques used (or developed) for nuclear physics purposes semiconductor detectors and discuss their influence on development of new technologies.
4. Students learn about nuclear models, nuclear reactions, and radioactivity. Students might also examine nuclear imaging, dosimetry, and isotopic dating in a course focusing on nuclear science's applications.
5. Explore an application of nuclear and radiation physics and communicate their understanding to a group of their peers in a short presentation.

	PO					
CO	1	2	3	4	5	6
CO1	L	H	M	M	H	H
CO2	L	H	M	H	L	M
CO3	M	L	H	M	H	H
CO4	H	L	M	L	H	M
CO5	L	H	M	H	H	L

CO	PSO					
	1	2	3	4	5	6
CO1	M	H	M	H	H	L
CO2	M	L	M	H	H	M
CO3	H	M	H	M	L	H
CO4	M	L	H	L	M	H
CO5	H	M	H	H	L	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: Properties of Nuclei and Nuclear Structure (15 hours)

1.1. Introduction and overview – Classification of nuclei (K1, K2)
1.2. General properties of Nucleus and Binding energy – Mass defect - Packing fraction – Nuclear Stability (K1,K2,K3)
1.3. Nuclear forces – Meson theory of Nuclear forces (K3,K4)
1.4. Nuclear models – Liquid drop model – Weizacker's semi empirical mass formula (K3,K4)
1.5. Shell model – Evidences for magic numbers (K2,K3)
1.6. Collective Model (K3)

Unit II: Radioactivity (15 hours)

2.1 Fundamental laws of radio activity – Laws of radioactive disintegration – Mean life – Half life (K1,K2,K3)
2.2 Measurement of decay constants – Law of successive disintegration – Age of the earth (K3,K4)
2.3 Biological effects of nuclear radiations (K2,K3)
2.4 Discovery of natural radioactivity – Gamow's Theory of alpha decay - Alpha ray spectra (K2,K3,K4)
2.5 Beta decay – Beta decay spectra – Origin of the line and continuous spectrum (K3,K4)
2.6 Neutrino theory of beta decay – Gamma ray spectra – Origin of gamma rays – Nuclear isomerism (K3,K4)

Unit III : Particle Detectors and Particle Accelerators (15 hours)

3.1 **Particle Detectors:** Geiger Muller Counter (K4)
3.2 Wilson Cloud Chamber (K3)
3.3 Bubble Chamber (K3)
3.4 Scintillation counter -ionization chamber (K2,K3)
3.5 **Particle Accelarators:** Linear Accelerator – Betatron (K2,K3,K4)
3.6 Synchrocyclotron – Protonsynchrocychrotron (K3,K4)

Unit IV: Artificial Transmutation of Elements (15 hours)

4.1 Artificial transmutation of elements (K1,K2)
4.2 Nuclear reactions - Q value for a nuclear reaction (K3,K4)
4.3 Types of nuclear reactions – Conservation laws of nuclear reaction – Threshold energy of an endoergic reaction (K2,K3,K4)
4.4 Discovery of neutron – Detection and properties of neutron (K3)
4.5 Thermal neutrons - Induced radioactivity (K3)
4.6 Applications of radio isotopes in medicine, agriculture, industry – Carbon dating (K3,K4)

Unit V: Nuclear Fission and Fusion (15 hours)

5.1 Discovery – Nuclear fission – Calculation of energy in amu - Energy released in fission - Bohr wheeler's theory of nuclear fission (K2,K3,K4)
5.2 Chain reaction – atom bomb – nuclear reactors (K2)
5.3 Power reactor – Breeder reactor (K3,K4)
5.4 Nuclear fusion – source of stellar energy - thermo nuclear reaction (K3,K4)
5.5 Carbon – nitrogen cycle, proton – proton cycle –- Hydrogen bomb (K2,K3)
5.6 Elementary particles – Baryons – Hyperons – leptons – mesons – the quark model. (K1,K2,K3,K4)

Books for Study:

1. R.Murugeshan Kiruthiga Sivaprasath - Modern Physics – S.Chand, 2007.
2. M L Pandya & R P S Yadav - Elements of Nuclear physics – Ramnath Meerut Publication, 7th reprint, 2006.
3. D.C.Tayal- Nuclear Physics – Himalaya Publishing House, 2006.
4. B.N. Srivatsav - Basic Nuclear Physics, 17th Edition – Pragathi Prakasham, 2001.

Reference Books

1. J.B .Rajam - Nuclear Physics – S.Chand and Co. Pvt. Ltd., Reprint 2000.
2. S.B.Patel – Introduction to Nuclear Physics – New Age International Publication, Reprint 2003.
3. Beiser - Concept of Modern Physics - McGraw Hill Publications Co. Ltd., 2005.
4. C.L.Arora -B.Sc physics: Nuclear Physics – S. Chand & Co.Pvt. Ltd., 1999.
5. G.Chatwal - Nuclear Physics, Vol. I and II – Dominant Publication, 2007.

SEMESTER – VI

UCPHK20 – Relativity and Quantum Mechanics

Year: III **Sem:** VI	**Course Code:** UCPHK20	**Title of the Course:** Relativity and Quantum Mechanics	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. Understand the concept of constant relative motion of different bodies in different frames of references
2. To introduce students to the concept of special relativity and its applications to Physical Sciences
3. To make the students understand the inadequacy of classical mechanics and the birth of quantum mechanics.
4. To study role of uncertainty in quantum physics.
5. To impart the knowledge about the postulates and the basic principles of quantum mechanics and operator formulation.
6. Students learn the concept of wave function and Schrodinger equation and their applications using spherically symmetric potentials.

Course Outcomes (CO)

The learners will be able to

1. Understand the concept of constant relative motion of different bodies in different frames of references
2. To introduce students to the concept of special relativity and its applications to Physical Sciences
3. To make the students understand the inadequacy of classical mechanics and the birth of quantum mechanics.
4. To study role of uncertainty in quantum physics.
5. To impart the knowledge about the postulates and the basic principles of quantum mechanics and operator formulation.

CO	**PO**					
	1	2	3	4	5	6
CO1	M	H	M	H	M	M
CO2	M	H	H	M	M	L
CO3	L	M	H	M	M	H
CO4	L	M	H	M	L	L
CO5	H	M	H	M	L	H

CO	PSO					
	1	2	3	4	5	6
CO1	H	H	M	L	H	M
CO2	L	H	M	L	H	M
CO3	H	H	M	L	H	M
CO4	M	L	H	M	H	M
CO5	H	H	M	L	H	M

(Low - L, Medium – M, High - H)

Course Syllabus

Unit I: Relativity **(15 hours)**

1.1 Postulates of special theory of relativity-Galilean transformation equation-Michelson-Morley Experiment (K1,K2,K3,K4)
1.2 Lorentz transformation equations(K3,K4)
1.3 Length contraction and Time dilation (K1,K2,K3)
1.4 Relativity of simultaneity and Addition of velocities (K1,K2,K3)
1.5 Variation of mass with velocity and Mass energy relation (K1,K2,K3,K4)
1.6 Minkowski's four dimensional space and Elementary ideas of general theory of relativity and its significance - Red Shift.(K3,K4)

Unit II: Wave Nature of Matter **(15 hours)**

2.1 De Broglie wavelength - Phase velocity and group velocity of de Broglie waves – relationship between phase velocity and group velocity (K3,K4)
2.2 Experimental study of matter waves – Davisson and Germer's experiment – G. P. Thomson's experiment (K1,K2,K3,K4)
2.3 Wavelength of motion of particles like electron – Electron microscope (K1,K2,K3,K4)
2.4 Heisenberg's uncertainty principle –γ- ray microscope (K2,K3)
2.5 Application – Diffraction of electron beam by single slit and Non- existence of electrons inside the nucleus (K1,K2,K3,K4)
2.6 Explanation of Bohr radius - Minimum energy of Simple Harmonic Oscillator. (K3,K4)

Unit III: Schrodinger Equation **(15 hours)**

3.1 Failures of Classical mechanics - Wave function - Physical interpretation of wave function - Postulates of quantum mechanics (K1,K3,K4)
3.2 Operators for physical quantities (K2,K3,K4)
3.3 Eigen value equation - Eigen values and Eigen functions (K2,K3)
3.4 Schrodinger's equation -Time dependent and time independent equation (K1,K3,K4)
3.5 Expectation values – Expectation values of observables (K2,K3)
3.6 Ehrenfest's theorem (K4)

Unit IV: One dimensional Problem (15 hours)

4.1 Free particle solution of Schrodinger's equation (K3,K4)
4.2 Bound state problems: Particle in a box (K3,K4)
4.3 Wave equation and solution for the particle - Eigen values of energy (K2,K3,K4)
4.4 Normalization of the wave functions (K1, K3)
4.5 Simple harmonic oscillator– Square well potential of finite depth (K3,K4)
4.6 Rectangular potential barrier - Tunneling effect. (K4)

Unit V: Spherically Symmetric Potential Problems: (15 Hours)

5.1 Schroedinger equation in Spherical polar coordinates (K1,K3)
5.2 Reduction of two body problems in to one body problem (K3)
5.3 Hydrogen atom – Wave equations for the hydrogen atom - Separation of variables- Azimuthal, polar and Radial wave equations (K1,K2,K3,K4)
5.3 Solution for Azimuthal and polar wave equation (K1,K2,K3,K4)
5.5 Rigid Rotator- Moment of inertia of a rigid rotator (K1,K3,K4)
5.6 Wave equation for rigid rotator and its energy levels- wave functions for the rigid rotator. (K3,K4)

Books for Study:

1. R.Murugeshan – Modern Physics – S.Chand Publication – Reprint 2007 (Units I, III, V – Rigid Rotator)
2. Arthur Beiser – Concepts of Modern Physics – McGraw Hill Publication, 2003.
3. S.P.Singh, M.K.Badge& Kamal Singh – Quantum Mechanics – S.Chand & Co. Ltd., Reprint 2001(Unit – IV)
4. G.Aruldass – Introduction to quantum mechanics – Prentice Hall of India, Reprint 2005 (Unit – IV)
5. D.Devanathan, - Introduction to Quantum Mechanics – Narosa Publications, 2019.
6. Kamal Singh, S.P.Singh – Elements of Quantum Mechanics – S.Chand publications – Edition 2005 (Unit V)

Books for Reference:

1. Gupta Kumar Sharma – quantum Mechanics - Jai Prakash Nath Publications, 2017.
2. B.K.Agarwal – quantum Mechanics – Lokbharathi Publications, 2003
3. Sathyaprakash - Mathematical physics – S.Chand & Sons, Reprint 2006.
4. Sathyaprakash – Advanced quantum mechanics - S.Chand & Sons, Reprint 2006.

SEMESTER – VI

UEPHC20 – Elective – II A: Solid State Physics and Material Science

Year: III **Sem:** VI	**Course Code:** UEPHC20	**Title of the Course:** Elective - II A: Solid State Physics and Material Science	**Course Type:** Theory	**Course Category:** Core	**H/W** 5	**Credits** 5	**Marks** 100

Course Objectives

1. To have background about solid materials and crystal structure.
2. To understand the fundamentals of polarization mechanisms in dielectric materials.
3. To characterize the properties of solids and dynamic lattice vibrations arrangements of atoms
4. To study electrons in solids and key features distinguishing metals, insulators and semiconductors and defects in crystals.
5. To learn superconductivity and magnetism.

Course Outcomes (CO)

The learners will be able to

1. Building blocks of crystals, Bravais lattices, crystal structure, reciprocal lattice
2. To learn lattice dynamics, phonons, density of states, specific heat, thermal conductivity
3. To study electron theory, free model theory, band theory of metals, semiconductors and electrical conductivity
4. Learn the basic properties of superconductors in the frame of BCS theory
5. To study the dielectric property of various materials

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	H	H	M	H	M
CO2	M	H	H	M	H	M
CO3	H	M	L	M	H	H
CO4	H	H	M	H	H	M
CO5	M	M	H	M	H	H

CO	**PSO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	H	M	L	H	M
CO2	L	H	M	L	H	M
CO3	H	H	M	L	H	M
CO4	M	L	H	M	H	M
CO5	H	H	M	L	H	M

(Low- L, Medium - M, High – H)

Course Syllabus

Unit I: Crystal Structure (14 hours)

1.1 Crystal lattice – Primitive and unit cell – seven classes of crystals – Bravais lattice – Miller indices (K1, K2)
1.2 Structure of crystals - simple cubic - face centered cubic structure - body centered cubic structure - hexagonal close packed structure(K4, K5)
1.3 Reciprocal lattices - properties of reciprocal lattice(K3, K4)
1.4 Bragg's law - Determination of crystal structure (K4, K5)
1.5 The Laue method of X – ray diffraction (K4, K5)
1.6 Powder crystal method (Debye- Scherrer method) (K4, K5)

Unit II: Band Theory of Solids and Defects (14 hours)

2.1 Energy band in solids (K1)
2.3 Electron in a periodic potential (K3, K4)
2.3 Brillouin zones (K1, K2)
2.4 Brillouin zones construction(K3, K4)
2.4 Crystal imperfections (K3)
2.5 Point defects - line defects - surface defects(K4)
2.6 Effects of crystal imperfections(K3)

Unit III: Dielectric properties (14 hours)

3.1 Dielectrics - Dielectric polarizability - Dielectric constant (K1, K2)
3.2 Different types of electric polarization (Ionic, electronic and orientational polarization) (K3, K4)
3.3 Frequency and temperature effects on polarization (K3, K4)
3.4 Dielectric loss - Local field or internal field - Clausius – Mosotti Relation -determination of dielectric constant (K2, K3, K4)
3.5 Dielectric breakdown (K2)
3.6 Properties of different types of insulating materials (K3, K4)

Unit IV: Bonding in Crystals and Lattice Vibrations (14 hours)

4.1 Types of bond in crystals- Ionic, covalent, metallic, Vanderwaal's and Hydrogen bonding (K1, K2, K3)
4.2 Phonons of mono atomic one dimensional lattice (K3, K4)
4.3 Specific heat of solids – Atomic heat - Dulong and Petit's (K3, K4)
4.4 Einstein's theory of specific heat (K4)
4.5 Debye's theory of specific heat (K4)
4.6 Cohesive energy of ionic crystals (K2, K3)

Unit V: Superconductivity **(14 hours)**

5.1 Introduction - Properties of superconductors(K1, K2)
5.2 Type I and Type II superconductors (K2, K3)
5.3 BCS theory of super conductors - Cooper pair - Electron – Lattice – electron interaction(K3, K4)
5.4 Meissner effect - Ac Josepson effect of superconductors(K4)
5.5 Dc Josepson effect of superconductors(K4)
5.6 High temperature superconductors - Application of superconductors (K3)

Books for Study:

1. R.Murugesan, Kiruthiga Sivaprasath - Modern Physics, First Edition - Ltd, NewDelhi, 2007.
2. Guptha Kumar – Solid State Physics, 9th Edition - K.Nath & Co. Education, 2006.
3. S.O.Pillai - Solid State Physics, 6th Edition - S.Chand& Co., 2005.
4. D Velmurugan – Elements of Crystallography – M J P Publishers, 2008.

Books for Reference:

1. H.C.Guptha - Solid State Physics - Vikas Publishing House, 2013.
2. S.L.Kakani - Solid State Physics: Theory, Application and Problems – 2005.
3. P.K.Palaniswamy - Solid State Physics - SciTech Publication, 2003.
4. J.P.Srinivastva - Elements of Solid State Physics - Prentice Hall of India, 2004.
5. Wahab - Solid State Physics: Structure and Properties of Materials, 2nd Edition – Narosa Publishing Huse, 2008.
6. V Rajendran, A Marikani - Material Science – Tata McGraw Hill Publishing Company, 2005.

SEMESTER – VI

UEPHD20 – Elective – II B: Materials Science

Year: III Sem: VI	Course Code: UEPHD20	Title of the Course: Elective - II B: Materials Science	Course Type: Theory	Course Category: Core	H/W 5	Credits 5	Marks 100

Course Objectives

1. To brief the theory of the electrical, thermal, mechanical and magnetic properties of materials.
2. To understand the different types of materials and their characterization with respect to their applications
3. To understand the various properties of materials and its measure
4. To expose the students the different NDT available in industry

Course Learning Outcomes (CO)

The learners will be able to

1. To learn about the materials properties and corrosion-oxidation of material
2. Study about the thermal properties of material and its effect
3. Learn about the testing of material quality
4. To study the synthesis of nanoparticles and characterization of nanoparticles
5. To make the students to understand the future application of nano materials

	PO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	M	H	H	L	H	H
CO2	M	M	H	M	H	L
CO3	L	M	M	M	H	H
CO4	M	H	H	H	M	L
CO5	L	M	H	M	H	H

	PSO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	H	H	M	L	H	L
CO2	L	H	M	L	H	M
CO3	H	L	M	L	M	L
CO4	M	L	H	M	H	M
CO5	H	H	M	L	M	M

(Low- L, Medium - M, High - H)

Course Syllabus

Unit I: Material Classification – Corrosion and Oxidation (14 hours)

1.1 Materials - Material classification - Properties of Engineering material - Mechanical properties (K1, K2)
1.2 Effect of heat treatment - Effect of atmospheric exposure (K2)
1.3 Creep - Creep resisting materials (K2, K3)
1.4 Factors influencing corrosion - Types of corrosion (K2, K3)
1.5 Basic mechanisms of corrosion - Corrosion testing (K4)
1.6 Oxidation - Corrosion control (K3, K4)

Unit II: Properties of Materials (14 hours)

2.1 Heat capacity - Specific heat - Thermal expansion - Melting Point (K1, K2)
2.2 Thermal conductivity -Thermal shock resistance – Thermal stability –Magnetic properties (K2)
2.3 Permeability –Superconductivity – Coercive force – Hysteresis (K2, K3)
2.4 Electrical property – Resistivity - Conductivity - Temperature coefficient of resistance(K2, K3)
2.5 Dielectric strength -Thermoelectricity - Optical properties (K3, K4)
2.6 Refractive index – Absorptive – Reflectivity (K3)

Unit III: Non – destructive Testing (14 hours)

3.1 NDT – Advantages of NDT - Defects in materials (K1, K2, K3)
3.2 Selection of the NDT method - Visual inspection (K3, K4)
3.3 Basic principle - Liquid penetration testing - Physical principle (K3)
3.4 Magnetic Particle Testing (MPT) - Principle of MPT – Sensitivity – Limitation (K3, K4)
3.5 Eddy Current Testing (ECT) – Principle - Instrument for ECT (K3, K4)
3.6 Eddy Current Testing (ECT) - Application –Limitations (K3, K4)

Unit IV: Nano Technology (14 hours)

4.1 Introduction to Nano technology – Position control – Self assembly (K1, K2, K3)
4.2 Positional devices – stiffness – Top- down method – Bottom-up method (K3, K4)
4.3 Enabling Technologies – Characteristics of Self assembly – Zeolitic materials (K2, K3, K4)
4.4 Application of Nano Technology – Scanning electron microscope (SEM) (K3, K4)
4.5 Transmission electron microscope (TEM) (K3, K4)
4.6 The Scanning tunneling microscope (K3, K4)

Unit V: Nano Particles (14 hours)

5.1 Fabrication of nano particles – Grinding with Iron balls – Gas condensation (K3, K4)
5.2 Laser ablation – Thermal and ultrasonic decomposition (K3, K4)
5.3 Atom optics - Sol Gels – precipitation of quantum dots (K3, K4)
5.4 Characterization of nanoparticles (K3)
5.5 Optical measurement – Electrical measurement (K3, K4)
5.6 Application of nanoparticles (K3)

Books for Study:

1. O.P. Khanna – Material Science and Metallurgy – Dhanpat Raj Publication – Reprint 1998.
2. W.R.Fahrner (Ed) – Nanotechnology and Nano electronics – Springer Private Limited, 2006.
3. Richard Booker and Earl Boysen – Nano Technology – Wiley Publication, 2005.

Books for Reference:

1. K.G. Aswani – Material Science, 2nd Edition – S.Chand & Company, Ltd., 2001.
2. M.Arumugam – Physics II – Anuradha Agencies, Reprint 2005.
3. K.Goser, P.Glosekotter, J.Dienstuhl – Nanoelectronics and Nano Systems – Springer Publication, 2008.

SEMESTER – VI

UEPHE20 – Elective III A: MICROPROCESSOR 8085

Year:	Course Code:	Title of the Course:	Course Type:	Course Category:	H/W	Credits	Marks
III Sem: VI	UEPHE20	Elective III A: Microprocessor 8085	Theory	Core	4	5	100

Course Objectives

1. To provide a basic knowledge about computer language in binary system
2. To understand the fundamental concepts of conversion of binary into decimal and hexa decimal systemS
3. To have a knowledge about basics logic gates and Flip flops
4. To familiarize with the concepts of Registers and multiplexers
5. To give a knowledge about the basics of ROM and RAM
6. To understand the concept of microprocessor bus structure and architecture of 8085.

Course Outcomes (CO)

The learners will be able to

1 Develop an ability to convert from binary into decimal and hexa decimal system
2 Provide a clear internal behavior of a basic logic gates
3 Explain the principles of registers and the block diagram of multiplexers
4 Provide a comprehensive understanding about the usage of ROM and RAM and make the students to differentiate the working process of ROM and RAM.
5 Enable the learners to get an in-depth knowledge in microprocessor and how to execute an instruction using processor.

	PO

CO	1	2	3	4	5	6
CO1	M	H	H	L	H	H
CO2	M	M	H	M	H	L
CO3	L	M	M	M	H	H
CO4	M	H	H	H	M	L
CO5	L	M	H	M	H	H

	PSO					
CO	1	2	3	4	5	6
CO1	M	H	L	M	H	L
CO2	H	M	L	L	M	H
CO3	M	H	L	M	H	M
CO4	H	M	M	H	L	H
CO5	H	L	M	M	H	L

(Low- L, Medium - M, High - H)

Course Syllabus

Unit I: Digital Fundamentals and Architecture of 8085 (14 hours)

1.1 Binary and Hexa decimal system – Representation of negative numbers (K1,K3)
1.2 Binary coded decimal and basic logic gates – High impedance state (K2,K3)
1.3 D flip flop and D latches – Registers– Multiplexers and Demultiplexers (K2,K3,K4)
1.4 ROM and RAM – Microprocessor as CPU –Input and output unit (K2,K3,K4)
1.5 System and Bus structure – Execution of an instruction (K2,K3,K4)
1.6 Block diagram of Architecture of 8085 – Internal Registe – Flag -ALU.(K3,K4)

Unit II: Instruction Sets of 8085 (14 hours)

2.1 Machine language and assembly language (K3,K4)
2.2 Programmer's model of 8085 (K4)
2.3 Data transfer instructions I – Arithmetic, logic and special instructions (K2,K3,K4)
2.4 Assembly language to Hex code – Data transfer instruction II (K2,K3,K4)
2.5 Branch instructions – Stack and stack related instructions (K3,K4)
2.6 I/O and Machine control instructions - 8085 Addressing modes (K2,K4)

Unit III: 8085 Instruction Timings (14 hours)

3.1 Introduction on 8085 instruction timings (K2,K3,K4)
3.2 Memory read cycle (K3,K4)
3.3 Memory Write cycle (K3,K4)
3.4 Wait states – Halt state (K2)
3.5 Timing diagrams for some instructions (MOV, MVI, LXI, STA, DCX)
3.6 Delay calculations. (K3,K4)

Unit IV: Memory and I/O Interface (14 hours)

4.1 Memory interface basics (K1,K2)
4.2 Demultiplexing address/data bus (K1,K3)
4.3 Generating control signals – ROM / EPROM interface (2K X 8 EPROM, 4K X 8 ROM) (K1, K3)
4.4 RAM interface (2K X 8 RAM interface, 2K X 8 RAM interface using Decoders) (K1, K4)
4.5 IN instruction and its timing diagram – Out instruction and its timing diagram (K2,K3)
4.6 Memory mapped I/O –difference between Memory Mapped I/O and I/O Mapped I/O (K3,K4)

Unit V: Interrupts (14 hours)

5.1 Introduction – INTR and INTA – RST 5.5, RST 6.5, RST 7.5 AND TRAP (K1,K3,K4)
5.2 Triggering levels – Priority levels (K2,K3,K4)
5.3 Programmable Peripheral Interface 8255(K4)
5.4 Simple programs- code conversion- 8 bit addition, subtraction (K3,K4)
5.5 Multiplication and division (K3,K4)
5.6 Arranging number in ascending and descending orders. (K3,K4)

Book for Study:

1. V.Vijayendran – Fundamentals of Microprocessor 8085 – Edition 2006

Books for Reference:

1. Ramesh Gaonkar – Microprocessor Architecture, Programming and Applications with 8085 – Penram International Publishing Private Limited.
2. Malvino – An Introduction to Microprocessor – Tata McGraw Hill Publication, 3rd Edition.
3. B. Ram – Fundamentals of Microprocessor and Microcomputer – Dhanpat Raj Publisher.
4. Ajit Pal – Microprocessor Principle and Applications – Tata McGraw Hill Publication.

SEMESTER – VI

UEPHF20 – Elective III B: Communication Physics

Year:	Course Code:	Title of the Course:	Course Type:	Course Category:	H/W	Credits	Marks
III Sem: VI	UEPHF20	ELECTIVE III B: Communication Physics	Theory	Core	6	5	100

Course Objectives

1. To learn about the radio communication system and propagation of waves
2. To study about the microwave communications and generation of microwaves
3. Students understand the satellite communication system
4. To provide a basic idea of fiber optic communication
5. To help of the students understand the light sources of fiberoptics
6. To learn about the transmission lines and facsimile transmission

Course Outcomes (CO)

The learners will be able to

1. Students understand the direct waves and ground waves
2. Students understand the working of television and RADAR
3. Analyse the types of Kepler's law
4. Students understand the principles of fiber optics
5. Realize the LED, diodes, detectors

CO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	M	L	L	L	H
CO2	M	H	L	H	L	L
CO3	M	M	L	H	L	L
CO4	L	M	M	L	L	L
CO5	M	L	M	L	L	M

CO	PSO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	L	H	H	L	H	M
CO2	H	M	H	H	M	L
CO3	L	H	L	L	M	H
CO4	H	M	L	H	H	M
CO5	M	H	L	M	L	H

(Low- L, Medium - M, High - H)

Course Syllabus

Unit I: Radio Communication System (14 hours)

1.1 Propagation (K1,K2)
1.2 Direct waves and ground waves (K3)
1.3 Modulation amplitude modulation Generation of SSB Signal (K2,K3)
1.4 Detectors and its types (K3,K4)
1.5 Receivers, simple receiver (K3,K4)
1.6 Super heterodyne receiver (K4)

Unit: II Microwave Communication (14 hours)

2.1 Generation of microwaves, klystron oscillator, reflex oscillator (K2)
2.2 Television picture tube ,iconoscope, image orthicon, scanning synchronization (K2,K3)
2.3 TV transmission, TV reception (K1,K2)
2.4 Fundamentals of colouring TV and RADAR (K2,K3)
2.5 RADAR equations, TYPES and PPI displace (K2,K3)
2.6 Automatic tracking RADAR ,applications of RADAR (K1,K2,K3)

Unit III: Satellite Communication (14 hours)

3.1 Kepler's laws ,station keeping (K1,K2)
3.2 Satellite attitude, power system (K1,K2,K3)
3.3 Transmission path loss (K4)
3.4 Satellite earth station (K3,K4)
3.5 Satellite station (K2)
3.6 Introduction to Indian satellite (K3)

Unit IV: Fiber Optics Communication (14 hours)

4.1 Principles of light transmission in a fiber (K2,K3,)
4.2 Propagation with in a fiber, effect of index profile on propagation (K1,K4)
4.3 Modes of propagation, listing of losses in fiber (K1,K2,K3)
4.4 Light sources of fiber optics (K2,K3,)
4.5 LED ,laser diodes, detectors (K2,K3,)
4.6 Photo diode, avalanche photo diode (K2,K3,)

Unit V: Transmission Line Facsimile Transmission (14 hours)

5.1 Transmission lines, herts experiment (K1,K2)
5.2 Fundamentals of aerial (K2)
5.3 Radiation field, radiation resistance power radiated for a dipole antenna(K1,K2,K3)
5.4 Facsimile transmitter, cylindrical scanning (K2,K3)
5.5 Facsimile receiver, photographic reception (K2,K3)
5.6 Direct recording reception (K4)

Book for Study:

1. A.Subramanyam - Applied Electronics –National Publishing Company, 2006.
2. R.Murugeshan Kiruthiga Sivaprasath - Modern Physics – S.Chand, 2007.

Books for Reference

1. Gupta and Kumar- Hand book of electronics, 24th revised edition- pragathi pragasham,1998
2. Puri & Chand - hand book of electronics - Anmol publications, Reprint 1996.
3. Albert Paul Nalvino – Principles of electronics, 6thEdition,Tata McGraw Hill publications co., 1999.
4. Sedha.R.S., Applied electronics -S.Chand and Co. Pvt.Ltd., 2009.
5. Dennis Reddy and John Coleman- Electronic communication – Tata McGraw Hill publications Co.,2000.

SEMESTER – I / III

UAPHA20 – Allied I: Physics I

Year: I/II **Sem: I / III**	**Course Code:**	**Title of the Course:**	**Course Type:**	**Course Category:**	**H/W**	**Credits**	**Marks**
	UAPHA20	ALLIED I: PHYSICS I	Theory	Allied	4	4	100

Course Objectives

1. To impart knowledge about Physics to the students of Mathematics and Chemistry
2. To apply the concepts of Physics to their core subject.

Course Outcomes (CO)

The learners will be able to

1. Gains the knowledge of the properties of materials and its applications.
2. Understands the properties of liquids.
3. Able to understand the concepts of heat, superconductors and its application
4. Perceives the clear knowledge of the characteristic behaviour of sound with its applications.
5. Understand the properties of light

	PO					
CO	1	2	3	4	5	6
CO1	L	M	L	L	L	H
CO2	M	H	L	H	L	L
CO3	M	M	L	H	L	L
CO4	L	M	M	L	L	L
CO5	M	L	M	L	L	M

CO	PSO					
	1	2	3	4	5	6
CO1	M	H	L	H	L	L
CO2	H	M	M	M	M	M
CO3	M	L	L	L	M	H
CO4	L	M	H	M	H	M
CO5	H	H	M	H	H	M

(Low- L, Medium - M, High - H)

Unit I: Elasticity **(14 hours)**

1.1 Stress – Strain - Hooke's law – Definitions of Young's Modulus, rigidity and bulk modulus modulus–Definition of Poisson's ratio (K1, K2)

1.2 Energy stored in a stretched wire - problems (K2)

1.3 Bending of beams –Neutral axis - Expression for internal bending moment - Cantilever –Depression at the loaded end of a cantilever (K3, K4)

1.4 Experimental determination of Young modulus by non-uniform bending using pin and microscope– I form girders –Problems (K4)

1.5 Torsional couple – Potential energy stored in a twisted wire – Expression for couple per unit twist(K3, K4)

1.6 Torsional Pendulum - Experimental determination of rigidity modulus by Torsional oscillation (without masses) - Experimental determination of rigidity modulus by static torsion method. (K3, K4).

Unit II: Properties of liquids **(14 hours)**

2.1 **Viscosity:** Stream line and turbulent flow– critical velocity - Viscous force – Coefficient of viscosity of a liquid (K2)

2.2 Poiseuille's formula –Determination of coefficient of viscosity of liquid by Poiseuille's method - Problems (K2, K3)

2.3 Comparison of coefficient viscosities of two liquids using graduated burette - Ostwald's viscometer method. (K3)

2.4 Terminal velocity – Stokes law- Experimental determination of coefficient of viscosity of highly viscous liquid. (K2, K4)

2.5 **Surface Tension**: Definition – Excess of Pressure inside curved surface (curvilinear co-ordinates) – Spherical and cylindrical drops and bubbles - Problems (K3)

2.6 Determination of surface tension by the method of drops - Interfacial tension between two immiscible liquids – Determination of interfacial tension by the method of drops (K3, K4)

Unit III : **Heat** **(14 hours)**

3.1 Specific Heat of Capacity – Definition – Determination of specific heat of capacity of a liquid by method of mixtures – Half time radiation correction (K1, K2, K3, K4)

3.2 Specific heat capacity by Callender and Barne's method –Merits and demerits (K3,K4)

3.3 Newton's law of cooling –Statement - Determination of specific heat of a liquid using Newton's law of cooling. (K2,K3,K4)

3.4 Joule Kelvin effect –Definition - Temperature of inversion –Porous plug experiment – Results – Theory of Joule Kelvin effect (K2,K3,K4)

3.5 Liquefaction of air by Linde's Process - Liquefaction of Helium –Properties of Helium I and II - Lambda point. (K2,K3,K4)

3.6 Superconductors – Definition of type I and II Superconductors – Meissner effect - Applications – Magnetic levitation. (K1,K2,K3)

Unit IV: Sound **(14 hours)**

4.1 Properties of sound – Longitudinal and transverse waves - Expression for Velocity of transverse vibrations along a stretched string - frequency of transverse vibrations along a stretched string (K1,K2,K4)

4.2 Laws of transverse vibrations of strings -Determination of A.C. frequency using Sonometer- Problems (K2,K3)

4.3 Ultrasonics–Piezo-electric effect – Inverse piezo-electric effect - Production of ultrasonic waves by Piezo electric oscillator (K2,K3,K4)

4.4 Definition of Magnetostriction- Production of ultrasonic waves by Magnetostriction oscillator (K2,K3,K4)

4.5 Applications of Ultrasonics– Scientific, industrial and medical applications. (K2,K3)

4.6 Acoustics of buildings – Definition of Reverberation – Reverberation time - Sabine's formula (Without derivation) – Absorption coefficient– Factors affecting the acoustics of buildings (K2,K4)

Unit V: Optics **(14 hours)**

5.1 **Physical Optics:** Interference **–** Definition **–** Conditions for interference **–** interference in thin films (reflected light) (K1, K2, k4)

5.2 Newton's ring - Determination of radius of curvature of lens by forming Newton's rings(K2,K3,K4)

5.3 Air wedge – Expression for fringe width – Experiment to measure the diameter of a thin wire by air wedge method **–** Test for optical flatness. (K2,K3,K4)

5.4 Diffraction**–**Definition **–** Plane transmission Grating **–**construction - Theory of plane transmission grating**–** Experimental determination of wavelength using transmission grating – Problems (K1,K2,K4)

5.5 **Polarization:** Definition of polarization –Polarization by reflection (Brewster's law)**–** Double refraction - Optical activity – specific rotatory power (K1,K2,K4)

5.6 Function of a half shade **–** Determination Specific rotatory power of sugar solution using Laurent's half shade polarimeter**–** Uses of polarised light. (K3,K4)

Books for Study:

1. R.Murgeshan**–** Allied Physics **–**S.Chand & Co. Ltd., New Delhi, First Edition 2008.
2. Dr.Dhanalakshmi and Dr.R.Sabesan **–** Allied Physics **–** Popular Book Dept, 2005.

3. N.Brijilal and N.Subramaniam– Heat and Thermodynamics –S.Chand and Co. Ltd., New Delhi, 2008.
4. R.Murgeshan – Electricity and Magnetism – S.Chand & Co. Ltd, New Delhi, 2008.
5. R.Murgeshan and KiruthigaSivaprasath - Modern Physics –S.Chand& Co. Ltd., New Delhi, 2007.
6. V.K.Mehta– Principles of Electronics –S.Chand& Co. Ltd., Mew Delhi, 2008.

Books for Reference:

1. D.S. Mathur– Elements of Properties of matter–Shyamalt Charitable Trust, New Delhi, 2007.
2. N.Brijilal and N.Subramaniam– Waves and oscillations –Vikas Publishing house Pvt. Ltd., 1992.
3. N.Brijilal and N.Subramaniam– A text book of Optics –S.Chand and Co. Ltd., New Delhi, 2004.
4. V.Rajendran and A.Marikani– Material Science - Tata McGraw Hill Publishing company Ltd., 2004.
5. P.Mani– A text book of Engineering Physics –Dhanam Publications, Chennai, 2013.

SEMESTER – II / IV

UAPHB20 – Allied II: Physics II

Year: II Sem: IV	Course Code:	Title of the Course:	Course Type:	Course Category:	H/W	Credits	Marks
	UAPHB220 /420	ALLIED II: PHYSICS II	Theory	Allied	4	4	100

Course Objectives

1. To emphasize the significance of Physics to the students of Mathematics and Chemistry
2. To impart the knowledge of the various branches of Physics.

Course Outcomes (CO)

1. Gain the knowledge about electricity and properties of magnetic materials.
2. Understand the importance of Wave mechanics.
3. Able to understand the concepts of nuclear reactions and the types of accelerators and detectors.
4. Perceive the fundamental knowledge about crystallography and the advancement in the field of communication
5. Learn about rectifiers, filters and opto-electronic devices with its applications

CO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	M	L	L	M	H
CO2	M	H	H	H	H	L
CO3	M	M	L	H	H	M
CO4	L	M	M	L	H	L
CO5	M	L	M	L	M	M

CO	PSO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	M	L	M	M	L
CO2	M	M	L	L	H	L
CO3	L	L	M	M	L	H
CO4	M	M	L	M	H	L
CO5	H	M	M	M	H	L

(Low- L, Medium - M, High - H)

Unit I: Electricity and Magnetism **(12 hours)**

1.1 Transient current (DC) – Growth and decay of current in a (LR circuit) circuit containing inductance and resistance –Decay of current in a (LR circuit) circuit containing inductance and resistance (K1, K2,K3)

1.2 Growth of a charge of a capacitor through resistor (RC-circuit) - Decay of charge of a capacitor through resistor (RC-circuit) – time constant (K3, K4)

1.3 Measurement of high resistance by Leakage method - problems (K3)

1.4 Magnetic Induction (B) – Magnetization (M) – Magnetic Susceptibility - Permeability – Relation between B, H and M (K1, K2, K3)

1.5 Properties of dia, para and ferro magnetic materials - Hysteresis loop – Definitions of Retentivity – Coercivity (K1, K2, K3)

1.6 Energy loss due to hysteresis– the importance of hysteresis curves –choice of magnetic materials (K2, K3, K4)

Unit II: Wave Mechanics **(12 hours)**

2.1 Wave mechanics – Dual nature of matter – De Broglie wave length– problems - Definition of phase velocity and group velocity – Relationship between them. (K1,K2,K3)

2.2 Experimental study of matter waves – Davisson and Germer's experiment (K3, K4)

2.3 Heisenberg's uncertainty principle – Applications – Determination of position of an electron with γ ray microscope (K1, K2, K3)

2.4 - Diffraction of electron beam through a slit - Proof for non-existence of electrons inside the nucleus. (K2, K3)

2.5 Wave function – Properties of wave function – Basic Postulates of wave mechanics (K1, K2)

2.6 Derivation of time dependent Schrödinger's equation – Time independent

Schrödinger's Equation (K3, K4)

Unit III : Nuclear Physics (12 hours)

3.1 Artificial transmutation – Rutherford's experiment – Types of nuclear reactions (K1,K2,K3)

3.2 Energy balance in nuclear reactions and the Q-value – Q value equation for a nuclear reaction– Threshold energy of an endoergic reaction (K2,K3)

3.3 Neutron– Properties of neutron - Neutron Charge – Decay of neutron – Neutron diffraction- spin and Magnetic moment of neutron (K1, K2,K3)

3.4 Classification of Neutrons - Neutron detection – Boron Detectors (slow neutrons)- Proton recoil detectors (fast neutrons) (K3, K4)

3.5 Particle Accelerators – Linear Accelerator - Betatron (K3, K4)

3.6 Particle detectors – Wilson cloud chamber (K3, K4)

Unit IV: Crystallography, Fibre Optics and Optics (14 hours)

4.1 Crystal – Definition of unit cell – Miller Indices – Seven types of crystal systems (K1, K2,K3)

4.2 Definition of Bravais lattice - Definition of reciprocal lattice and its properties –Derivation of Bragg's law (K1, K2,K3)

4.3 Fibre Optics - Introduction – Optical fibre – Construction - Principle - Acceptanceangle and condition for propagation through optical fibre (K1, K3)

4.4 Classification of optical fibres– Single mode and multimode fibres– Step index and graded index fibres (K3).

4.5 Step index single mode fibre – Step index multimode fibre– Graded index multimode fibre – Fibre optic communication system with block diagram. (K3)

4.6 Laser – Principle – Types of laser - Semi conductor Laser –Nd-YAG Laser – Applications of laser. (K3, K4)

Unit V: Electronics (14 hours)

5.1 Rectifiers – Half and full wave rectifiers - Full-Wave Bridge Rectifier construction – working and Mathematical Analysis (K1, K2,K3)

5.2 Filters - Types of Filter circuits – Capacitor filter – Choke input filter - π section filter (K2, K3)

5.3 Zener Diode – Characteristics of Zener Diode –Zener diode as voltage regulator (K2, K3)

5.4 Opto-Electronic Devices : Photo Diode – Principle – Characteristics of Photo Diode – Applications – Alarm Circuit – Counter circuit (K3, K4)

5.5 Light Emitting Diode (LED) – Principle – Characteristics of LED – Applications –Power indicator – Seven Segment Display (K3, K4)

5.6 Solar Cell – Construction - Working - Characteristics – Uses (K4)

Books for Study:

1. R.Murgeshan– Allied Physics –S.Chand & Co. Ltd., New Delhi, First Edition, 2008.
2. Dr.Dhanalakshmi and Dr.R.Sabesan – Allied Physics – Popular Book Dept, 2005.

3. N.Brijilal and N.Subramaniam– Heat and Thermodynamics –S.Chand and Co. Ltd., New Delhi, 2008.

4. R.Murgeshan– Electricity and Magnetism –S.Chand & Co. Ltd, New Delhi, 2008.
5. R.Murgeshan and Kiruthiga Sivaprasath - Modern Physics –S.Chand& Co. Ltd., New Delhi, 2007.
6. V.K.Mehta– Principles of Electronics –S.Chand& Co. Ltd., Mew Delhi, 2008.

Books for Reference:

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2. M.Narayamurthi and others – A text book of Sound – The National Publishing company, Chennai, 1986.
3. N.Brijilal and N.Subramaniam– Waves and oscillations –Vikas Publishing house Pvt. Ltd.,1992.
4. N.Brijilal and N.Subramaniam– A text book of Optics –S.Chand and Co. Ltd., New Delhi, 2004.
5. V.Rajendran and A.Marikani– Material Science - Tata McGraw Hill Publishing company Ltd., 2004.
6. S.O.Pillai– Solid State Physics – New Age International (P) Ltd. Publishers, New Delhi, 2006.
7. P.Mani– A text book of Engineering Physics –Dhanam Publications, Chennai – 42, 4th edition, 2018.

SEMESTER II

UCPHC20 - PRACTICAL – I

(Any 16 experiments)

1. Compound Pendulum – Determination of g and k.
2. q by Non-Uniform Bending – Pin and Microscope.
3. q by Non-Uniform Bending – Optic Lever.
4. Torsional Pendulum – Rigidity modulus of a wire (without masses).
5. n by Static Torsion (Mirror and telescope method).
6. Surface tension and interfacial surface tension by drop weight method.
7. Focal Length and Refractive Index of Convex Lens (UV and Conjugate foci method for 'f' and direct reflection method for R).
8. Focal Length and Refractive Index of short focal Concave Lens (Combination method, in contact and out of contact methods for 'f' and direct reflection method for R).
9. Spectrometer - μ of solid prism.
10. Specific heat capacity of a liquid – Method of Mixtures (Barton's correction).
11. Sonometer – Determination of AC Frequency of the given steel wire.
12. Sonometer – Determination of AC Frequency of the given Brass wire.
13. Potentiometer – Calibration of low range voltmeter.
14. Field along the axis of a coil – B_H using deflection magnetometer.
15. Torsional Pendulum – M, n and I (with mass).
16. Lee's Disc – Thermal conductivity of bad conductors and emissivity.
17. Spectrometer - μ of hollow prism.

SEMESTER IV

UCPHF20 - PRACTICAL – II

(Any 16 experiments)

1. Bifilar Pendulum .
2. Young's modulus of the beam-Uniform bending – Pin and Microscope.
3. Young's modulus of the beam-Uniform bending – Optical lever.
4. Young's modulus by cantilever – Mirror and Telescope method.
5. Surface Tension – Capillary rise method – Radius by Mercury Pellet method.
6. Sonometer – Specific gravity of Solids and Liquids.
7. Melde's String – Frequency of Vibrator.
8. Melde's String-Specific gravity of Solids and Liquids.
9. Air wedge- Determination of thickness of a thin wire.
10. Specific heat capacity of a liquid –Newton's law of cooling
11. Spectrometer – i-d curve .
12. Spectrometer - grating – normal incidence – standardization – wavelength of mercury lines.
13. Spectrometer – grating – Minimum deviation – wavelengths of mercury lines.
14. Potentiometer – Calibration of ammeter.
15. Potentiometer – Unknown Resistance and Specific resistance.
16. P.O Box- Measurement of temperature and co-efficient of Resistance.
17. Figure of Merit - Aperiodic Galvanometer.
18. Determination of M and B_H using deflection and vibration magnetometers – Tan A and Tan B position.

SEMESTER VI

UCPHL20- PRACTICAL III

(Any 16 experiments)

1. Young's modulus by Non uniform bending – Koenig's Method
2. Spectrometer – i-i' Curve.
3. Spectrometer – Dispersive power of a prism.
4. Spectrometer – Narrow angled prism.
5. Spectrometer –grating –normal incidence – dispersive power.
6. Spectrometer – prism – Cauchy's constant
7. Newton's rings – Determination of R and μ.
8. Newton's rings - Refractive index of water.
9. Conversion of Galvanometer into Voltmeter and its calibration
10. Conversion of Galvanometer into Ammeter and its calibration.
11. Potentiometer – Calibration of high range Voltmeter.
12. Potentiometer – emf of thermocouple.
13. Deflection of Magnetometer - Tan C position.
14. Determination of B_H using Deflection-bar magnet - Null deflection method.
15. Vibration Magnetometer – Determination of B_H - Field along the axis of coil apparatus.
16. Mirror Galvanometer - emf of a thermocouple-Direct deflection method.
17. Quantity Sensitiveness of B.G.
18. Absolute capacity of a condenser – B.G.-Damping correction.
19. Comparison of Capacitances – B.G.
20. Comparison of EMF'S – B.G
21. Internal resistance of the cell – B.G.

SEMESTER VI

UCPHM20 – PRACTICAL IV: APPLIED ELECTRONICS

(Any 16 experiments)

1. Construction of full wave rectifier-solid state (using 2 diodes).
2. Voltage stabilization using Zener diode and IC 7805.
3. Construction of dual power supply using 7812 and7912.
4. Single stage amplifier using transistor- Frequency response, voltage gain and variation with load.
5. Construction of Hartley Oscillator (using transistor) –Frequency determination using CRO.
6. Construction of Colpitt's Oscillator (using transistor) –Frequency determination using CRO.
7. OR, AND gates using diodes, NOT using transistors.
8. NAND and NOR gates – Universal building block.
9. Verification of Demorgan's theorem.
10. OP – AMP - Inverting amplifier.
11. OP – AMP - Summer and subtractor.
12. FET – Characteristics.
13. Flip-flop - RS, JK, D using NAND gate.
14. Half adder, Full adder using logic gates.
15. Modulus Counters using 7490.
16. Simplification of Boolean equation using K-map using NAND gates only
17. Astable Multivibrator using IC 555.
18. Single stage amplifier using FET - Frequency response, voltage gain and variation with load.
19. Addition and subtraction using 8085.
20. Multiplication and division using 8085.
21. Code conversion binary to HEX.

SEMESTER II

UAPHC20: ALLIED PRACTICAL: PHYSICS

(Any 15 experiments)

1. Young's modulus – Non- Uniform ending – Pin and microscope
2. Rigidity modulus by Torsional oscillations.
3. Rigidity modulus by static torsion method.
4. Surface tension of a liquid and interfacial tension between liquids by drop weight method (Densities being given)
5. Comparison of co-efficient of viscosity using burette method – (Radius using microscope.
6. Specific heat capacity of a liquid – Method of mixtures – Half time correction.
7. Sonometer – Determination of AC frequency using steel wire.
8. Focal length of a lens by distant object method, U-V method and Conjugate foci method.
9. Figure of merit of a galvanometer (Table galvanometer or mirror galvanometer)
10. Potentiometer – Calibration of low range voltmeter.
11. Potentiometer – Calibration of low range ammeter.
12. Determination of horizontal component of earth's magnetic induction using deflection magnetometer.
13. Air wedge – Determination of thickness of wire.
14. Newton's rings – Determination of radius of curvature.
15. Spectrometer – grating – Wavelength of mercury lines.
16. Zener diode – Characteristics study.
17. Construction of OR, AND, NOT gates using diodes and transistors and verification of truth table.

SEMESTER –I/II

USPHAn20 - SKILL BASED ELECTIVE:EVERYDAY PHYSICS

Year/ Semester 2020	**Course Code**	**Title of The Course**	**Course Type**	**Course Category**	**H/ W**	**Credits**	**Marks**
SEM: I/II	USPHAn20	Everyday Physics	Theory	SBE	2	-	60

Course Objectives

1. To make students aware of the concepts of Physics involved in day-to-day life.
2. To impart knowledge on basics of Electricity.
3. To learn safety precautions in handling electrical appliances.
4. To study the principles domestic electric appliances.

Course Outcomes (CO):

1. Appraise the importance of Physics in daily life.
2. Apply the knowledge to identify the components used in direct current machines
3. Describe the difference between alternating current and direct current.
4. Explain Electrical safety measurements
5. Examine the working of basic household appliances

CO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	M	M	H	H	L
CO2	M	H	L	L	M	H
CO3	H	L	H	H	M	L
CO4	M	L	H	M	M	L
CO5	M	M	H	M	L	H

(Low - L, Medium – M, High - H)

Unit I: Laws of motion

1.1 Velocity – Acceleration – Force (K1,K2)

1.2 Momentum - Law of Conservation Momentum (K1,K2)

1.3 Newton's Law's of Motion (K3,K4)

1.4 Construction and Working of Aero planes (K3,K4)

1.5 Jet Planes – Rockets (K2,K3)

1.6 Relative Velocity - Apparent change in the velocity when trains move in the same and Opposite Directions. (K2,K3)

Unit II: Circular motion

2.1 Circular Motion - Centripetal Force and its Applications (K3,K4)

2.2 Centrifugal Force (K1.K2)

2.3 Motion of a Cyclist along a Circular Path and Reason for Bending (K3,K4)

2.4 Centrifuge and its Applications (K3,K4)

2.5 Escape velocity – Orbital velocity – Parking orbits (K2,K3)

Unit III: Semi-conductors

3.1 Energy – Law of Conservation Energy (K2,K3)

3.2 Basic concepts of atom- atomic number – mass number - isotopes - Nuclear Fission (K3,K4)

3.3 Chain reaction - Nuclear fusion (K2,K3)

3.4 Reactions Taking Place in Sun And Stars – Carbon nitrogen cycle – Proton – Proton cycle (K3,K4)

3.5 Semi conductors – doping – P-type n-type – semi conductor diode (K2,K3)

3.6 Light Emitting Diode (LED) and its Application - Seven segment display.(K3,K4)

Unit IV: Electricity

4.1 Current – Voltage – Ohm's law (K1,K2)

4.2 Photo Electric Effect (K2)

4.3 Principle, Construction and Working of Solar Cell (K3,K4)

4.4 Description and working of Emergency Lamp (K3,K4)

4.5 Sodium Vapour Lamp - Mercury Vapour Lamp. (K3,K4)

Unit V: House Wiring Accessories

5.1 House Wiring Accessories - Switches –Types of Switches (K1,K3,K4)

5.2 Lamp Holders – Types of Lamp Holders (K3,K4)

5.3 Ceiling Roses - Socket Outlets (K2)

5.4 Plugs – Wires and Cables (K1,K2)

5.5 Types of Wiring System (Tree And Distribution System) (K3,K4)

5.6 Supply of Electricity to Homes – Fuse – Earthing (K3,K4)

Books for Study and Reference:

1. M Arul Thalapathi - Basic and Applied Electronics – Com teck Publishers, 2005.
2. Dr. Prem Kumar – Basic Electrical and Electronics Engineering – Anuradha Publications, 2016.
3. Brijilal & Subramaniyam.N. - Properties of Matter, 1st Edition - Vikas Publication House, New Delhi, 2001.
4. R.Murugeshan – Modern Physics – S.Chand Publication – Reprint 2007.

SEMESTER – III

USPHB320 - SKILL-BASED ELECTIVE: ELECTRICAL APPLIANCES - I

Year/ Semester 2020-2021	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: III	USPHB320	Skill-Based Elective: Electrical Appliances - I	Theory	-	2	-	60

Course Objectives

1. To give introduction to different electrical appliances.
2. To make the students of other discipline to understand the day-to–day applications of Physics.
3. To make the students apply the concepts of Physics and its application in electrical appliances.

Course Outcomes (CO)

1. Learn the effect of electric current and Safety precautions to be taken when working with electricity.
2. To Study the colour code for insulation wires
3. Study about supply of electricity to homes.
4. Study about different types of lamps and the behaviour of Lamps in series and lamps in parallel connection.
5. Study the construction and working of domestic appliances.

CO	PO					
	1	**2**	**3**	**4**	**5**	**6**
CO1	M	M	M	H	H	L
CO2	M	M	H	H	M	H
CO3	H	M	L	H	M	L
CO4	M	H	H	M	M	M
CO5	M	L	H	M	H	L

(Low - L, Medium – M, High - H)

Unit I: Electric Current

1.1 Effects of electric current (K1,K2)
1.2 Safety precautions to be taken when working with electricity (K1,K2)
1.3 Causes of fire on electrical appliances (K1,K2)
1.4 Precautions and remedial measures (K1,K2)
1.5 Fuse (K1,K2)
1.6 Earthing (K2,K3)

Unit II: AC and DC

2.1 AC and DC (K1,K2,K3)
2.2 Single phase and three phase connections (K3,K4)
2.3 RMS and peak values (K2,K3)
2.4 Star and delta connection, overloading (K3,K4)
2.5 Earthing and short circuiting (K2,K3)
2.6 Colour code for insulation wires (K1,K2)

Unit III: Electrical Accessories

3.1 House Wiring Accessories (K1,K2)
3.2 Switches, Types of Switches and circuit breaker (K1,K2,K3)
3.3 Lamp Holders, Types of Lamp Holders (K1,K2,K3)
3.4 Ceiling Roses, Socket Outlets, Plugs (K2,K3)
3.5 Wires and Cables (K1,K2)
3.6 Types of Wiring System (Tree And Distribution System)- Supply of Electricity to Homes (K3,K4)

Unit IV: Lamps

4.1 Light effect (K1)
4.2 Working of electric bulb (K1,K2)
4.3 Carbon Arc lamps (K1,K2)
4.3 SodiumVapour lamp (K1,K2,K4)
4.4 MercuryVapour lamp (K1,K2,K4)
4.5 Grouping of lamps: Lamps in series and lamps in parallel (K1,K3)

Unit V: Domestic appliances

5.1 Construction and working of domestic appliances (K1)
5.2 Electric iron box (K2,K3,K4)
5.3 Immersion heater (K2,K3)
5.4 Electric stove (K2,K3,K4)
5.5 Washing machine (K2,K3)
5.6 Air conditioner (K2,K3)

Books for Study and Reference:

1. Dr.P.Mani – A Textbook of Engineering Physics – Dhanam Publications, Chennai, 2011.
2. M.L.Anwani – Basic Electrical Engineering – DhanpatRai and Co., NaiSarak, Delhi, 2009.

SEMESTER – IV

USPHC420 - SKILL-BASED ELECTIVE: ELECTRICAL APPLIANCES - II

Year/ Semester 2020-2021	**Course Code**	**Title Of The Course**	**Course Type**	**Course Category**	**H/W**	**Credits**	**Marks**
SEM: IV	USPHC420	Skill-Based Elective: Electrical Appliances - II	Theory	-	2	-	60

Course Objectives

1. To give introduction to different electrical appliances.
2. To make the students of other discipline to understand the day-to–day applications of Physics.
3. To make the students apply the concepts of Physics and its application in electrical appliances.

Course Outcomes (CO)

1. Learn the importance of passive components and charges.
2. To Study the behaviour of resistance and capacitance
3. Study the applications of electric and magnetic fields.
4. Study the behaviour electrical appliances like inverter, UPS and lamps.
5. Study the construction, working and applications of domestic appliances.

CO	**PO**					
	1	2	3	4	5	6
CO1	M	M	L	H	H	H
CO2	M	M	H	H	M	L
CO3	H	M	L	H	M	H
CO4	M	H	H	M	M	M
CO5	H	L	H	M	L	H

(Low - L, Medium – M, High - H)

Unit I: Passive Components and Charges

1.1 Resistance (K1,K2)
1.2 Resistors in series and in parallel (K3,K4)
1.3 Capacitance (K1,K2)
1.4 Capacitors in series and in parallel (K3,K4)
1.5 Electrical Charge (K1,K2)
1.6 Current – Electrical Potential (K1,K2,K3)

Unit II: Electric Circuit

2.1 Ohm's law (K1,K2)
2.2 Galvanometer, Ammeter (K1,K2)
2.3 Voltmeter and Multimeter (K1,K2)
2.4 Analog and Digital (K2)
2.5 Electrical Energy - Power – Watt – kWh (K3,K4)
2.6 Consumption and electrical power (K2)

Unit III: Electricity and Magnetism

3.1 Electromagnetic Induction (K1,K2)
3.2 Self induction and Mutual indication (K3,K4)
3.3 Electromagnets (K1,K2)
3.4 Chokes (K1,K2)
3.5 Transformers (K3,K4)
3.6 Applications - Electric bell (K3,K4)

Unit IV: Electrical Appliance

4.1 Inverter – UPS (K1,K2)
4.2 Generator and Motor (K1,K2,K3,K4)
4.3 Different types of windings (K1,K2)
4.4 Fluorescent lamps (K3,K4)
4.5 Street Lighting – Flood lighting (K1,K2,K3)
4.6 Electrical Fans (K1,K2)

Unit V :Domestic Appliances

5.1 Wet Grinder – Mixer (K1,K2)
5.2 Stabilizer – Refrigerator (K1,K2,K3,K4)
5.3 Electromagnetic waves (K1,K2)
5.4 Applications – Microwave oven (K2,K3)
5.5 Television (K1,K2,K3)
5.6 Wi-Fi- Modem – LCD (K1,K2,K3)

Books for study:

1. Theraja B.L. Basic Electronics – S.Chand and Co. Pvt. Ltd., 2000.
2. A K Theraja- A text book in Electrical Technology- S chand& Co, 2014
3. Sedha R.S. – Text book of Applied Electronics -S.Chand and Co. Pvt. Ltd., 2000.

SEMESTER VI

USPHD520 – SKILL BASED ELECTIVE: PHYSICS FOR COMPETITIVE EXAMINATIONS

Year 2020	**Course Code**	**Title Of The Course**	**Course Type**	**Course Category**	**H/W**	**Credits**	**Marks**
SEM: VI	USPHD520	Skill Based Elective: Physics For Competitive Examinations	Theory	Elective	2	-	60

Learning Objectives

1. To make the students familiar with problems in Physics.
2. To prepare the students for various Entrance examinations.
3. To know the various applications of physics.
4. To summarize important topics in physics.

Course Outcomes (CO)

The learners will be able to

1. To know the basic laws in Physics and its applications
2. To learn the principle of optics and study the light experiments like Newton's ring and Air wedge.
3. To study and evaluate the problems in Electricity and magnetism.
4. To give an extended knowledge in atomic physics and nuclear physics to solve the problems.
5. To know the application of semiconductor materials in various electronic circuits.

CO	PO					
	1	2	3	4	5	6
CO1	M	L	M	H	M	H
CO2	L	M	L	H	M	H
CO3	H	M	H	L	M	H
CO4	M	H	H	M	H	M
CO5	M	M	L	M	H	H

(Low - L, Medium – M, High - H)

Unit I: Mechanics and Waves

1.1 Newton's laws of motion and its application Conservative forces and frictional forces -Centrifugal and Coriolis forces (K1,K2,K3,K4)

1.2 Kepler's laws – Escape velocity and artificial satellite - Gravitational Law and field. (K1,K2)

1.3 Motion under a central force - Moments of Inertia and products of Inertia - Principal moments and axes (K2,K3)

1.4 Rigid body motion, fixed axis rotations - Bernoulli's theorem – Elasticity (K3,K4)

1.5 Waves and Simple Harmonic motion – Lissajous figures- Damped and Undamped oscillators (K1,K2,K3,K4)

1.6 Wave equation -Resonance – Doppler effect in sound- Ultrasonics and applications. (K1,K3,K4)

Unit II: Light

2.1 Thick lens formulae - power of a lens - Fermat's Principle – Rayleigh criterion.(K1,K2)

2.2 Resolving power of a prism and grating - Conditions for constructive and destructive interferences. (K3,K4)

2.3 Newton's rings - Calculation of radius of curvature – Air wedge – Calculation of bandwidth. (K2,K3)

2.4 Fresnel and Fraunhofer diffraction (K3,K4)

2.5 Linear, circular and elliptic polarization - double refraction and optical rotation (K1,K2,K3)

2.6 Specific rotatory power of an optically active substance (K3,K4)

Unit III: Electricity and Magnetism

3.1 Electric Charge - Coulomb law – Gauss law – Electric potential (K3,K4)

3.2 Capacitors – Energy stored in a capacitor–Dielectric and polarization (K2,K3)

3.3 Ampere's law - BiotSavart law – Faraday's laws of electromagnetic induction (K1,K2)

3.4 Self-inductance – Mutual inductance – Alternating currents. (K3,K4)

3.5 Growth and decay of current and charge in LR circuit – RC circuit – LCR circuit. (K3,K4)

3.6 Magnetic permeability and susceptibility, Dia, para and ferromagnetism, Measurement of susceptibility, Hysteresis loop. (K1,K2)

Unit IV: Atomic and Nuclear Physics

4.1 Atomic physics: X-ray spectrum – Compton Effect (K1,K2)

4.2 Compton wavelength Photoelectric effect (K2,K3,K4)

4.3 Calculation of DeBroglie wavelength of electrons (K2,K3,K4)

4.4 Wave velocity and group velocity for DeBroglie waves (K3,K4)

4.5 Uncertainty principle - Pauli Exclusion Principle (,K3,K4)

4.6 Mass defect - Binding energy – Radioactive disintegration law – half life – Q value of nuclear reactions – Nuclear fission and fusion (K1,K2,K3,K4)

Unit V: Electronics

5.1 Semiconductors - Rectifiers (K2)

5.2 Zener diode as voltage regulator (K2,K3,K4)

5.3 Transistor as an Amplifiers – Relation between α and β (K3,K4)

5.4 Feedback amplifier – Oscillators (K1,K2)

5.5 Amplitude and frequency modulation (K2,K3)

5.6 OR, AND, NOR and NAND gates – OP amps (K3,K4)

Books for Study:

1. D S Mathur – Mechanics – S. Chand Publication, 2001.
2. Brijlal Subramaniyam - Properties of Matter (Unit I) – Eurasia Publication House Pvt. Ltd., 2001
3 Nelkan and Parker – Advanced Level Physics – Heinemann Longmann Education International Publication, 1995. (Unit II)
4. C.L Arora - Simplified Course in B.Sc Physics – S.Chand, 1999. (Unit III)

5. S.L.Kakani – Objective Physics – S.Chand and co. Ltd., New Delhi, 2001. (Unit IV)
6. R.S.Sedha – Basic Electronics – S.Chand Publications, New Delhi, 2006 (Unit V)
7. Dr.N.K.Nayyar - Unique Quintessence of physics – Unique Publishers, 2010.

Books for Reference:

1. Dr.Surekha Singh – UGC CSIR/NET/JRF/SLET – UpkarPrakashan Publishers.
2. Karen Cummings, Priscilla Laws, Edward Redish, Patrick Cooney - Understanding Physics, 6th Edition – Wiley Student Education, 2005.
3. The Pearson Guide to Objective Physics – S.Chand Publishing House, 2007.
4. Sathya Prakash Arya – Objective Physics – MTG Books Publishers, 2007.
5. S.L.Kakani - Objective Physics, 10th Edition - S.Chand Publishing House, 2007.
6. K.C.Jain, C.LArora – Numerical Problems in Physics - S.Chand Publishing House, 2005

SEMESTER VI

USPHE620 – SKILL BASED ELECTIVE: MOBILE COMMUNICATION

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: VI	USPHE620	Mobile Communication	Theory	SBE	2	-	60

Course Objectives

1. To make the students acquire knowledge about mobile phones.
2. To have the basic understanding of working of cell phones.
3. To know the various applications radio propagation.
4. To understand the multiple access techniques in communication.

Course Outcomes (CO)

The learners will be able to

1. To know the basics generations of mobile communication
2. To learn the cellular concept and techniques
3. To study the mobile radio propagation and concepts of diffraction, scattering and interference.
4. To attain knowledge in cell coverage for signal and traffic.
5. To understand the concepts of multiple access techniques.

	PO					
CO	**1**	**2**	**3**	**4**	**5**	**6**
CO1	M	M	L	M	H	H
CO2	M	L	H	M	M	H
CO3	L	M	L	H	M	H
CO4	M	H	M	H	L	L
CO5	L	M	M	M	L	H

(Low - L, Medium – M, High - H)

Unit I: Introduction to Cellular Mobile Communication

1.1 Zero generation - push to talk (K1,K2)
1.2 First generation – Advanced mobile phone system (K2,K3)
1.3 Second generation – Advantages and disadvantages (K3,K4)
1.4 Third generation (K1,K2,K3)
1.5 Fourth generation (K3,K4)

Unit II: Cellular Concept

2.1 Frequency Reuse concept (K1,K2)
2.2 Channel Assignment (K1,K2)
2.3 Handoff technique (K2,K3)
2.4 Trunking and Grade of service (K3,K4)
2.5 Cell splitting – Cell sectoring (K2,K3)

Unit III: Mobile Radio Propagation

3.1 Free Space propagation model (K1,K2)
3.2 Fraunhofer region (K1,K2)
3.3 Properties of Radio waves (K3,K4)
3.4 Concept of Reflection (K1)
3.5 Concept of Diffraction (K3,K4)
3.6 Scattering – Interference (K3,K4)

Unit IV: Cell coverage for Signal and Traffic

4.1 Introduction - Cell coverage for Signal and Traffic (K3,K4)
4.2 Propagation in near in distance (K2,K3)
4.3 Curves for near in propagation (K2,K4)
4.4 Long distance propagation (K3)
4.5 Mobile to Mobile Propagation (K3,K4)
4.6 Doppler shift. (K3,K4)

Unit V: Multiple Access Techniques

5.1 Introduction-Multiple Access Techniques (K1,K2)
5.2 FDMA (K3,K4)
5.3 TDMA (K4)
5.3 CDMA-Synchronous CDMA (K1,K2,K3,K4)
5.4 Soft handover – Hard handover (K1,K2)
5.5 Roaming – SDMA (K3,K4)

Books for Study:

1 G.K.Behera – Lopamudra: Mobile Communication – Sci-tech Publication Pvt.Ltd.,2009. (Unit I & V)
2 V.Jeyasri Arokiamary – Mobile Communication - Technical Publications, Pune, 2008. (Unit II & III.)
3 G.Radha Krishna – Cellular and Mobile Communications – BS Publications, 2010. (Unit IV)

Books for Reference:

1. T.G. Palanivelu, R.Nakkeeran - Wireless and Mobile Communication - PHI Learning Pvt Ltd., 2009.

SEMESTER V &VI

UGPHAn20 - NON MAJOR ELECTIVE: FUNDAMENTALS OF PHYSICS

Year 2020	Course Code	Title of the course	Course type	Course Category	H/w	Credits	Marks
SEM: V & VI	UGPHA 520/620	NME: Fundamentals of Physics	Theory	Core	3	-	100

COURSE OBJECTIVES

1. To make the students understand the Kinetics &Kinematics
2. To impart Knowledge of Heat and Temperature
3. To provide a deep understanding of the sound and light
4. To present a clear & consistent picture of the Nuclear reactor, Atom bomb, productionof X rays and explain the astronomy

COURSE OUTCOMES (CO)

1. To learn the Students understand the Newton's law's & applications
2. To highlight the importance of transmission of heat
3. To familiarize the ultrasonic and Laser
4. To help of the students understand the concepts of Nuclear fission and Nuclear fusion
5. To derive the equation for Newton's law of gravitation and satellite motion

CO	**PO**					
	1	**2**	**3**	**4**	**5**	**6**
CO1	H	L	M	H	M	L
CO2	M	M	H	L	M	H
CO3	H	L	H	H	L	H
CO4	L	H	H	M	M	M
CO5	M	M	L	M	M	L

(Low - L, Medium – M, High - H)

Unit I - Kinematics

1.1 Position and displacement – velocity – speed (K1,K2)
1.2 Newton's law of motion – applications of Newton's third law (K1,K2)
1.3 Fundamental forces in nature (K1, K4)
1.4 Apparent weight of a man in lift (K3,K4)
1.5 Work – power – energy (K1,K2)
1.6 Applications of centripetal and centrifugal forces (K3,K4)

Unit II – Heat

2.1 Heat – measures of heat(temperature) (K1,K2)
2.2 Specific heat – heat of fusion (K1,K2)
2.3 Heat of vaporization (K1)
2.4 Transmission of heat – conduction – Convection - radiation (K1, K4)
2.5 Peltier effect (K3,K4)
2.6 Super conductors - applications of super conductors (K1,K2)

Unit III: Sound and Light

3.1 Sound - properties of sound - Ultrasonics - Different types of scans – medical applications of ultrasonics (K3,K4)
3.2 Clinical applications of different types of scans (obstetrics - early pregnancy kidney and liver) (K3,K4)
3.3 Acoustics of buildings – reverberation (K2,K3)
3.4 Acoustics aspects of hall and auditorium (K1,K2)
3.5 Light - properties of light - different types of lenses (K1,K2)
3.6 Human eye – defects of vision – laser – its medical applications (K1,K2)

Unit IV: Atomic and nuclear Physics

4.1 Atom - nucleus - atomic number - mass number (K1,K2)
4.2 Nuclear fission - chain reaction – uncontrolled chain reaction (K1,K2,)
4.3 Application - atom bomb (K3,K4)
4.4 Controlled chain reaction - application - nuclear reactor (K3,K4)
4.5 Nuclear fusion – hydrogen bomb (K3,K4)
4.6 X – rays - production of X – rays properties of X - rays - medical applications of X – rays. (K1,K2,K3)

Unit V: Astronomy

5.1 Gravitation - Newton's law of gravitation (K1)
5.2 Satellite motion - escape velocity – weightlessness in a satellite (K1, K4)
5.3 Geocentric theory – heliocentric theory (K1,K2)
5.4 Kepler'slaw - solar system - individual planets (K1,K2,)
5.5 Comets - asteroids - and other constituents of solar system - (K3,K4)
5.6 Formation of stars (K1,K2)

Books for Reference:

1. Brijial and N.Subramaniam - A Textbook of Optics - S.Chand & Co. Ltd., New Delhi, 2004.
2. Brijial and N.Subramaniam - Heat and Thermodynamics - S.Chand & Co. Ltd., New Delhi, 1998.
3. R.Murugesan - Properties of Matter - S.Chand & Co. Ltd., New Delhi, 2005.
4. Brijial and N.Subramaniam - A Textbook of Sound - N.Vikias Publishing House, New Delhi, 2006.
5. G.K.Sadidharan - The Great Universe - S.Chand & Co. Ltd., 2003.
6. K.S.Krishnaswamy - Astrophysics: A Modern Prespective - New Age International Pvt. Ltd., New Delhi, 2002.