BACHELOR OF SCIENCE (PHYSICS)

REGULATIONS

ELIGIBILITY

Candidates seeking admission to first year of the Bachelor of Science -Physics shall be required to have passed the Higher secondary examination with Mathematics, Physics and Chemistry conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereto by the Syndicate subject to the conditions as may be prescribed thereto are permitted to appear and qualify for B.Sc., (Physics) degree examination of Periyar University after a course of study of three academic years.

DURATION OF THE COURSE

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

OBJECTIVES OF THE COURSE

In today's technological world, many important devices can be understood correctly only with the knowledge of the underlying Physics.

By studying Physics one can:

- Acquire skills like thinking logically and analytically.
- Improve the skills like problem solving, making simplifying assumptions, constructing mathematical models using valid approximations and making precise definitions.
- Learn some of the basic scientific principles and intellectual skills necessary to ask probing questions and to formulate informed opinions on important matters.
- Develop a sense of the beauty of the fundamental laws governing the universe.

SCHEME OF EXAMINATION

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
First Semester							
Part I							
15UTALA101/ 15UHILA101/ 15UMMLA101 15UFRLA101	Tamil I / Hindi I / Malayalam I French I /	5	3	25	75	100	3
Part II							
15UENLA101	Foundation English I	5	3	25	75	100	3
Part III							
15UPHM101	Core I: Properties of Matter and Sound	5	3	25	75	100	4
15UPHM102	Core II: Heat and Thermodynamics	5	3	25	75	100	4
15UMAPHA101	Allied I: Algebra and Differential calculus	5	3	25	75	100	4
15UPHMP101	Core Practical I	3	3	40	60	100	2
Part IV							
15UVE101	Value Education I: Yoga	2	3	25	75	100	2
		30				**700**	**22**
Second Semester							
Part I							
15UTALA201/ 15UHILA201/ 15UMMLA201 15UFRLA201	Tamil II/ Hindi II / Malayalam II French II /	5	3	25	75	100	3
Part II							
15UENLA201	Foundation English II	5	3	25	75	100	3
Part III							
15UPHM201	Core III: Mechanics	5	3	25	75	100	4
15UPHM202	Core IV: Optics	5	3	25	75	100	4
15UMAPHA201	Allied II: Integral calculus and vector calculus	5	3	25	75	100	4
15UPHMP201	Core Practical II	3	3	40	60	100	2
Part IV							
15UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2
		30				**700**	**22**

Subject code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
Third Semester							
Part I							
15UTALA301/ 15UHILA301/ 15UMMLA301/ 15UFRLA301	Tamil III/ Hindi III/ Malayalam III/ French III	5	3	25	75	100	3
Part II							
15UENLA301	Foundation English III	5	3	25	75	100	3
Part III							
15UPHM301	Core V: Atomic Physics	6	3	25	75	100	5
15UCSPHA301	Allied III: Programming in C	3	3	25	75	100	3
15UPHMP301	Core Practical III	3	3	40	60	100	2
15UCSPHAP301	Allied Practical I: Programming in C	2	3	40	60	100	2
Part IV							
15UPHSBC301	SBC I: Instrumentation	2	3	25	75	100	2
	NMEC I	2	3	25	75	100	2
Non Credit							
15ULS301	Career Competency Skills I	1	-	-	-	-	-
	Total	**29**				**800**	**22**
Diploma*							
Fourth Semester							
Part I							
15UTALA401/ 15UHILA401/ 15UMMLA401/ 15UFRLA401	Tamil IV/ Hindi IV/ Malayalam IV/ French IV	5	3	25	75	100	3
Part II							
15UENLA401	Foundation English IV	5	3	25	75	100	3
Part III							
15UPHM401	Core VI: Basic Electronics	6	3	25	75	100	5
15UCHPHA401	Allied IV: Chemistry	3	3	25	75	100	3
15UPHMP401	Core Practical IV	3	3	40	60	100	2
15UCHPHAP401	Allied Practical II: Chemistry	2	3	40	60	100	2
Part IV							
15UPHSBC401	SBC II: Laser Physics	2	3	25	75	100	2
	NMEC II	2	3	25	75	100	2
Non Credit							
15ULS401	Career Competency Skills II	1	-	-	-	-	-
	Total	**29**				**800**	**22**
Diploma*							

Subject code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
Fifth Semester							
	Part III						
15UPHM501	Core VII: Electricity and Electromagnetism	6	3	25	75	100	5
15UPHM502	Core VIII: Electronics and Communication	5	3	25	75	100	5
15UPHM503	Core IX: Solid State Physics	6	3	25	75	100	5
15UPHM504	Core X: Mathematical Physics (100% Internal Evaluation)	6	3	100	-	100	5
15UPHM505	Core XI: Energy Physics (Self Study & 100% External Evaluation)	-	3	-	100	100	4
15UPHMP501	Core Practical V	3	3	40	60	100	2
15UPHPR601	Project & Viva - Voce	2	-	-	-	-	-
	Part IV						
15UPHSBC501	SBC III: Spectro Physics	2	3	40	60	100	2
	Part V						
15UPHE501	Extension Activity	-	-	-	-	-	2
	Total	**30**				**700**	**30**
Sixth Semester							
	Part III						
15UPHM601	Core XII: Digital Electronics and Microprocessor	5	3	25	75	100	5
15UPHM602	Core XIII: Nuclear Physics	6	3	25	75	100	5
15UPHM603	Core XIV: Quantum Mechanics and Relativity	5	3	25	75	100	5
	Elective	6	3	25	75	100	5
15UPHMP601	Core Practical VI	3	3	40	60	100	2
15UPHPR601	Project & Viva - Voce	3	-	40	60	100	4
	Part IV						
15UPHSBC601	SBC IV: Materials and Processing	2	3	40	60	100	2
	Total	**30**				**700**	**28**
			Grand total			**4400**	**146**

* Students have to complete their diploma course during their second year (III & IV Semesters)

ELECTIVE

The students can choose any one of the following subjects in the VI semester

S.No	Subject Code	Subject
1	15UPHEL601	Nano Science
2	15UPHEL602	Biomedical Instrumentation

DIPLOMA COURSE

During the III and IV Semesters student should undergo a diploma course.

S.No	Subject Code	Subject	Total Hours
1	15UPHD401	Astrophysics (with Sky Observations)	90 (Each Semester 45 Hours)

NON MAJOR ELECTIVE COURSE

Students from the other Departments can study the course in III and IV semesters.

S.No	Subject Code	Semester	Subject
1	15UPHN301	III	Laser and its applications
2	15UPHN401	IV	Applied Physics

FOR COURSE COMPLETION

Students should complete:

- Language subjects (Tamil/Hindi/Malayalam/French, English) in I, II, III and IV semester.
- Value Education Yoga and Environmental Studies in I and II semester respectively.
- Allied subjects in I, II, III and IV semesters.
- One Diploma course in the second year of their course of study.
- Non Major Elective Courses in III and IV semesters
- Skill based Courses in III, IV, V and VI semesters
- Self study and external evaluation subject, internal evaluation subject in the V Semester.
- Extension activity in V semester.
- Project & Viva – Voce in VI semester.

TOTAL CREDIT DISTRIBUTION

S.NO	COMPONENTS	MARKS	CREDITS	Cumulative Credits
1	PART I :Tamil/ Hindi/ Malayalam /French	4 X 100 = 400	4 X 3 = 12	12
2	PART II : Foundation English	4 X 100 = 400	4 X 3 = 12	12
3	PART III : Core , External and Internal Evaluation subjects	14 X 100=1400	5 X 4 = 20 9 X 5 = 45	104
	Elective	1 X 100 = 100	1 X 5 = 05	
	Core Practical	6 X 100 = 600	6 X 2 = 12	
	Allied Theory	4 X 100 = 400	2 X 4 = 08 2 X 3 = 06	
	Allied Practical	2 X 100=200	2 X 2 = 04	
	Project & Viva - Voce	1 X 100 = 100	1 X 4 = 04	
4	PART IV : Skill Based courses Value Education I :Yoga Value Education II : Environmental Studies	4 X 100 = 400 1 X 100 = 100 1 X 100 = 100	4 X 2 = 08 1 X 2 = 02 1 X 2 = 02	16
	NMEC	2 X 100 = 200	2 X 2 = 04	
6	PART V: Extension Activity	--	1 X 2 = 02	02
TOTAL (44 Papers)		**4400**		**146**

15UPHM101	CORE I: PROPERTIES OF MATTER AND SOUND	SEMESTER - I

Total Hours: 45

OBJECTIVES:

1. To inculcate the concepts of various Properties of Matter.
2. To impart knowledge about acoustics and properties of materials used in the construction of buildings.

CONTENTS

UNIT - I **(9 Hours)**

Elasticity: Elastic limit - Hooke's law - Young's modulus - Bulk modulus - Rigidity modulus - Yield point, Elastic Fatigue - Poisson's ratio - Work done in stretching and twisting a wire - Expression for couple per unit twist - Torsion Pendulum - Bending of beams - Bending moment - Expression for internal bending moment - Cantilever - Theory and Experiment - Uniform and Non - uniform bending - Theory and Experiment - I section of girders.

UNIT - II **(9 Hours)**

Viscosity: Viscosity - Co - efficient of viscosity - Stream line flow and turbulent flow - Expression for critical velocity - Reynold's number - Poiseuille's formula- Determination of co - efficient of viscosity by capillary flow method –Stoke's method for co-efficient of viscosity of highly viscous liquid - Variation of viscosity with temperature and pressure - Viscosity of gases - Meyer's formula for the rate of flow of a gas through a capillary tube.

UNIT - III **(9 Hours)**

Surface Tension: Surface tension - Definition - Surface energy - Pressure difference across a spherical surface - Angle of contact - Determination (Mercury in glass and water in glass) - Determination of surface tension of water by drop weight method - Quincke's method of determining surface tension and angle of contact of mercury - Vapour pressure over flat and curved surface - Effect of curvature on Evaporation and condensation.

UNIT - IV **(9 Hours)**

Simple Harmonic Motion: Theory of free, damped and forced vibration - Resonance - Fourier's theorem - Application for saw tooth wave and square wave – Intensity and

loudness of sound – Decible – Intensity levels – Musical notes – Musical scale - Determination of frequency using Melde's apparatus.

Acoustics: Reverberation and time of reverberation – Absorption co-efficient – Sabine's formula – Measurement of reverberation time – Acoustics of buildings – Factors affecting acoustics of building.

UNIT - V **(9 Hours)**

Ultrasonics Ultrasonics –Production - Piezo electric method - Magnetostriction method – Detection – Properties – Behaviour – Focusing – Stationary waves and resonance – Attenuation – Diffraction – Applications.

TEXT BOOKS :

1. *Murugeshan, R.* 1994. **Properties of Matter.** [First Edition]**.** S. Chand & Co Pvt. Ltd., New Delhi. (UNIT-I, II & III)
2. *Brij Lal and Subramaniyam, N.* 1995. **Textbook of Sound.** [First Edition]. Vikas Publishing House, New Delhi. (UNIT - IV & V)

REFERENCE BOOKS:

1. *Mathur, D.S.* 1993. **Elements of Properties of Matter.** [First Edition]. Shyamlal Charitable Trust, New Delhi.
2. *Brij Lal* and *Subramaniyam, N.* 2000. **Waves and Oscillations.** [First Edition]. Vikas Publishing House, New Delhi.
3. *Mary Jones, Geoff Jones* and *Philip Marchingston.* 1999. **Physics.** [Second Edition] Cambridge University Press, New Delhi.

15UPHM102	CORE II: HEAT AND THERMODYNAMICS	SEMESTER - I

Total Hours: 45

OBJECTIVES:

1. To enhance the student's skills in basic concepts of heat like temperature measurement, Specific heat measurement, Liquefaction of gases, their applications, principles of heat conduction and radiation.
2. It also aims at imparting knowledge on basic laws of thermodynamics and working of heat engines.

CONTENTS

UNIT- I **(9 Hours)**

Thermometry and Calorimetry: Thermometry - Types of thermometers - Platinum resistance thermometer - Calendar and Griffith's bridge - Seebeck effect - Thermo electric thermometer - Calorimetry – Copper black calorimeter - Specific heat capacity of liquid by Newton's law of cooling - Specific heat capacity of gases - Meyer's relation between Cp and Cv – Determination of Cv by Joly's differential steam calorimeter and C_p by Regnault's method.

UNIT- II **(9 Hours)**

Low temperature physics: Kinetic theory of gases - Vander Waal's equation- Derivation of critical constants – Joule - Thomson effect - Porous plug experiment - Liquefaction of gases – Regenerative cooling - Liquefaction of Helium – Properties of Helium I and II - Practical applications of low temperature – Air conditioning machine – Refrigerating mechanism.

UNIT- III **(9 Hours)**

Conduction and Radiation : Definition of thermal conductivity – Rectilinear flow of heat along a bar - Thermal conductivity of a metal by Forbe's method - Thermal conductivity of bad conductor by Lee's disc method - Radiation - Black body radiation - Wien's law, Rayleigh - Jean's law and Planck's law (only statement no derivation) - Solar constant – Angstrom pyrheliometer - Temperature of sun.

UNIT- IV **(9 Hours)**

Thermodynamics : Zeroth, first law of thermodynamics – Isothermal,Adiabatic processes - Heat engines – Carnot's, petrol and diesel engines and their efficiencies - Second law of thermodynamics - Reversible and irreversible processes .

UNIT -V **(9 Hours)**

Entropy- Change of entropy in reversible and irreversible processes - Temperature - Entropy diagram - Third law of thermodynamics - Derivation of Maxwell's Thermodynamic relations – Applications – Clausius clapeyron's latent heat equation – Specific heat relations - Adiabatic demagnetization.

TEXT BOOK:

1. *Brijal* and *Subramaniyam, N.* 1995. **Heat and Thermodynamics**. [Sixteenth Edition]. S. Chand & Company, New Delhi.

REFERENCE BOOKS:

1. *Mathur, D.S.* **Heat and Thermodynamics**. Sultan Chand & Sons, New Delhi.1991.
2. *Brijal* and *Subrahmaniyam, N,* **Heat and Thermodynamics and Statistical Physics**. S.Chand & Company, New Delhi, 2010.
3. *Garg, S.C, Bansal, R. M* and *Ghosh, C. K,* **Thermal Physics**, Tata Mcgraw Hill, New Delhi, 2011.

15UMAPHA101	ALLIED I: ALGEBRA AND DIFFERENTIAL CALCULUS	SEMESTER - I

Total Hours: 50

OBJECTIVES:

1. To get the knowledge about matrices and various methods of solving algebraic equations
2. To learn basic concepts of differentiation this is instrumental in constructing many of Mathematical concepts and also applied in all sciences and social sciences.

CONTENTS

UNIT - I **(10 Hours)**

Characteristic Equation - Eigen Values and Eigen Vectors - Cayley-Hamilton Theorem (Statement Only) and its problems-Rank of a matrix-Problems.

UNIT - II **(10 Hours)**

Polynomial Equations - Imaginary and Irrational roots- Relation between roots and coefficients-Transformation of equations-Descarte's rule of signs-Problems.

UNIT - III **(10 Hours)**

Successive differentiation – n^{th} derivative-Leibnitz formula for n^{th} derivative- Problems.

UNIT - IV **(10 Hours)**

Partial Differentiation-Partial Derivatives of Higher orders-Homogeneous Functions-Problems.

UNIT - V **(10 Hours)**

Radius of Curvature in Cartesian and polar coordinates-Pedal Equation of a curve-Radius of curvature in p-r coordinates.

TEXT BOOK :

1. *Vittal. P.R*. 2002. **Allied Mathematics**. Margham Publications. Chennai – 600017.

REFERENCE BOOKS:

1. *Manickavasagam Pillai, T.K. and Narayanan, S*. 2004. **Algebra- Vol –II**. Vijay Nicole Imprints Pvt Ltd., Chennai – 29.
2. *Singaravelu, A*. 2002**. Allied Mathematics**. Meenakshi Publishers. Chennai – 601302.

15UPHMP101	CORE PRACTICAL I	SEMESTER – I

OBJECTIVES:

1. To enhance the basic skills of the students in taking Measurements using microscope, telescope, spectrometer, Potentiometer etc.,
2. To impart knowledge in properties of matter and Mechanics.

List of Experiments: (3 Hours for each Lab)

1. Young's modulus – Non uniform bending –Pin and Microscope.
2. Young's modulus – Uniform bending –Scale and Telescope.
3. Specific heat capacity by Newton's law of cooling.
4. Lee's disc method – Coefficient of thermal conductivity of a bad conductor.
5. Surface tension and interfacial tension – Drop weight method.
6. Sonometer – Frequency of a fork.
7. Determination of frequency – Melde's apparatus.
8. Specific heat capacity – Method of mixtures.
9. Torsion pendulum – Rigidity modulus -with masses.
10. Coefficient of Viscosity – Poiseuille's method

TEXT BOOK:

1. *Srinivasan, M.N, Balasubramanian,S* and *Ranganathan,R.* 2004. **A Book for study of Practical Physics**. S.Chand & Co. New Delhi.

REFERENCE BOOKS:

1. *Usha Rani.Subbarayan,A.* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.
2. *Arora,C.L.* 1995 **. B.Sc Practical Physics.** S.Chand & Co. New Delhi.

15UVE101	VALUE EDUCATION I: YOGA மனவளக்கலையோகா	SEMESTER - I

Total Hours: 30

CONTENTS

UNIT - I **(6 Hours)**

YOGA AND PHYSICAL HEALTH

1:1Physical Structure-Three bodies- Five limitations

1:2Simplified Physical Exercises - Hand Exercises - Leg Exercises- Breathing Exercises – eye Exercises - Kapalapathi

1:3Maharasanas 1-2– massages – acu-puncture – Relaxation

1:4Yogasanas-Suriya Namaskar – Padamasana –Vajrasanas – Chakrasanas(Side) – Viruchasanas –Yoga muthra –Patchimothasanas-Ustrasanas–Vakkarasanas Salabasanas.

UNIT - II **(6 Hours)**

ART OF NURTURING THE LIFE FORCE AND MIND

2:1Maintaining the youthfulness - postponing the ageing process

2:2 Sex and spirituality– significance of sexual vital fluid – Married Life–Chastity.

2:3 Ten Stages of Mind

2:4 Mental Frequency – Methods for Concentration

UNIT - III **(6 Hours)**

SUBLIMATION

3:1 Purpose and Philosophy of life

3:2 Introspection – Analysis of Thought

3:3 Moralization of Desires

3:4 Neutralization of Anger

UNIT - IV **(6 Hours)**

HUMAN RESOURCES DEVELOPMENT

4:1 Eradication of worries

4:2 Benefits of Blessings

4:3 Greatness of Friendship

4:4 Individual Peaceand World Peace

UNIT - V **(6 Hours)**

LAW OF NATURE

5:1 Unified Force – Cause and Effect System

5:2 Purity of thought and Deed and Genetic Centre

5:3 Love and Compassion

5:4 Cultural Education –Five fold Culture

TEXT BOOK:

1. Manavalakalai Yoga – World Community Service Center
   VethathiriPathippagam,
   156, Gandhij Road, Erode – 638 001.
   PH: 0424 – 2263845.

REFERENCE BOOKS:

1. Yoga for Modern Age
2. Journey of Consciousness
2. Simplified Physical Exercises – World Community Service Center
   VethathiriPathippagam,
   156, Gandhij Road, Erode – 638 001.
   PH: 0424 – 2263845.

15UPHM201	CORE III: MECHANICS	SEMESTER-II

Total Hours: 45

OBJECTIVES:

1. To develop the knowledge in basic concepts of forces acting on a static body and forces acting on a body in motion.
2. It also imparts knowledge about forces acting on fluids at rest and also in motion.

CONTENTS

UNIT - I **(9 Hours)**

Projectile: Range up and down an inclined plane - Maximum range– Two directions of Projections for a given velocity range.

Impact: Laws of impact – Coefficient of restitution - Impact of a smooth sphere on a fixed smooth plane – Direct impact between two smooth spheres – Loss in kinetic energy - Oblique impact between two smooth spheres.

UNIT - II **(9 Hours)**

SHM: Composition of two SHM's of same period along a straight line and at the right angles to each other - Lissajous figures.

Dynamics of Rigid Bodies: Compound pendulum - Condition for minimum period Interchangeability of suspension and center of oscillation –Determination of g using compound Pendulum – Kater's pendulum-Bessel's modification - Bifilar pendulum – Parallel threads.

UNIT - III **(9 Hours)**

Center of gravity: Center of gravity of a solid cone, hemisphere, hollow hemisphere and a tetrahedron.

Friction: Laws of friction – Angle of friction – Resultant reaction- Cone of friction – equilibrium of a body on an inclined plane under the action of a force.

UNIT - IV **(9 Hours)**

Hydrostatics: Center of pressure - Definition – Center of pressure of a rectangular lamina and triangular lamina – Floating bodies – Laws of flotation – Stability of floating bodies – Determination of the Meta centric height of ship.

Hydrodynamics: equation of continuity of flow – Bernoulli's theorem – Applications - Venturimeter – Pitot tube – Filter pump.

UNIT- V **(9 Hours)**

Classical-Mechanics: Constraints – Classification of Constraints – Degrees of freedom - Generalized coordinates – Transformation equations – Principle of virtual work - D'Alembert's principle – Lagrange's equation of motion from D'Alembert's principle – Application – Simple pendulum and linear harmonic oscillator – Cyclic coordinates - Conservation theorem for generalized momentum – Conservation theorem for energy.

TEXT BOOK :

1. *Murugesan, R.* 2005. **Mechanics and Mathematical Methods**. [Second Edition] S. Chand and Company, New Delhi.

REFERENCE BOOKS:

1. *Mathur, D. S.* 2006. **Mechanics**. [Nineteenth Edition] S. Chand & Company, New Delhi.
2. *Brijlal* and *Subramanyam, N* and *Jivan Seshan*. 2008. **Mechanics and Electrodynamics.** [Seventh Edition]. S. Chand & Company, New Delhi.
3. *Goldstein, H.* 2001. **Classical Mechanics.** [Second Edition]. Narosa Publishing House, New Delhi.

15UPHM202	CORE IV: OPTICS	SEMESTER - II

Total Hours: 45

OBJECTIVES:

1. To provide a good foundation in optics.
2. To inspire interest for the knowledge of concepts is physical and Geometrical optics.
3. To provide knowledge about optical instruments

UNIT – I: Lens aberrations: (9 hours)

Spherical aberration of a thin lens–Methods of reducing spherical aberration – Coma – Astigmatism – Curvature of the field – Distortion-chromatic aberrations in a lens - condition for achromatism of two thin lenses separated by a finite distances.

UNIT- II: Interference (9 hours)

Fresnel's biprism - Interference-Interference in thin film due to reflected light – Fringes due to wedge shaped thin film - Determination of diameter of a thin wire by air wedge - Michelson's Interferometer - Theory - Applications - thickness of thin transparent material and resolution of spectral lines - Fabry Perot interferometer.

UNIT -III: Diffraction (9 Hours)

Fresnel's and Fraunhofer diffraction -Fresnel's half period zones - Area of the half period zones - Zone plate - Comparison of zone plate with convex lens - Fraunhoffer diffraction pattern with N slits (diffraction grating) - Normal and oblique incidence - Absent and overlapping spectra of diffraction grating.

UNIT -IV: Polarization (9 Hours)

Polarization- Nicol prism as polarizer and analyzer - Dichroic polarizer's - Huygens theory of double refraction in uniaxial crystals - Double image polarizing prisms - Quarter wave plate, Half wave plate - Babinet's compensator - Production and detection of Plane, elliptically and circularly polarized light.

UNIT – V: Optical Instruments (9 Hours)

Eye pieces: Ramsden's eyepiece – Huygen's eyepiece.

Resolving power of optical instruments: Resolving power – Rayleigh's criterion of resolution - Resolving power of a Telescope, Microscope, Prisms and Grating- Dispersive power of a grating.

TEXT BOOK:

1. *Subramaniam, N, Brij Lal* and *Avadhanula, M.N.* 2006.**A Book for study of Optics,** [First Edition], S.Chand & Co. Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. *R.Murugeshan* and *Kiruthiga sivaprasath*.**Optics and Spectroscopy**. [Eighth Edition] S.Chand & Co. Pvt. Ltd., New Delhi, 2012.
2. *Francis A Jenkins* and *Harvey E White*, **Fundamentals of Optics,** [Fourth Edition], TMH,New Delhi,2011.
3. *Ajay Ghatak,* **Optics** , Tata McGraw-Hill publishing Co. Ltd., New Delhi,1998.

15UMAPHA201	ALLIED II :INTEGRAL CALCULUS AND VECTOR CALCULUS	SEMESTER – II

Total Hours: 50

OBJECTIVES:

1. To learn the concepts about Integration
2. To introduce the concept of Fourier series.
3. To Study in detail about vector differentiation and vector integration.

CONTENTS

UNIT - I **(10 Hours)**

Integral Calculus - Integration by parts $\int_0^{\pi/2} \sin^n x dx$; $\int_0^{\pi/2} Cos^n x dx$; $\int_0^{\pi/2} \tan^n x dx$ - Definite integrals – Properties – Reduction formulae – Problems.

UNIT- II **(10 Hours)**

Fourier series: Definition – To find Fourier coefficients of Periodic functions with period 2π - even and odd functions - Half range series – problems.

UNIT - III **(10 Hours)**

Vector Diffrentiation: Definition of gradient of a Scalar point function - Directional derivative of a vector point function - Unit normal vector
Vector point function: Divergence and Curl of a vector point function - Definitions - solenoidal and irrotational vector - Problems.

UNIT- IV **(10 Hours)**

Line integrals-Surface integrals and Volume integrals – problems

UNIT- V **(10 Hours)**

Gauss Divergence Theorem-Stoke's Theorem-Green's Theorem (Statements only) - problems.

TEXT BOOK:

1. *Vittal, P.R*. 2002. **Allied Mathematics**. Margham Publications, Chennai.

REFERENCE BOOKS:

1. *Manickavasagam Pillai, T.K*. and *Narayana, S*. 2004. **Algebra- Vol –II**. Vijay Nicole Imprints Pvt Ltd., Chennai.
2. *Singaravelu, A*. 2002**. Allied Mathematics**. Meenakshi Publishers, Chennai.

15UPHMP201	CORE PRACTICAL II	SEMESTER – II

OBJECTIVES:

1. These Practical aims at providing basic skill to the students in taking Measurements using microscope, Telescope, Spectrometer, Potentiometer etc.,
2. They also impart knowledge in properties of matter, Mechanics, Light and Electricity.

List of Experiment: (3 Hours for each Lab)

1. Koenig's method – Non uniform bending.
2. Koenig's method - Uniform bending.
3. Compound pendulum.
4. Bifilar pendulum.
5. Air wedge – Thickness of wire and insulation.
6. Spectrometer – Grating – Normal incidence method.
7. Spectrometer- Grating – Minimum deviation.
8. Newton's Rings – Refractive index of liquid.
9. Spectrometer-Dispersive power of a prism.
10. One dimensional elastic collision using two hanging spheres.

TEXT BOOK:

1. *Srinivasan, M.N, Balasubramanian,S* and *Ranganathan,R.* 2004. **A Book for study of Practical Physics**. S.Chand & Co. New Delhi.

REFERENCE BOOKS:

1. *Usha Rani. Subbaraya, A.,* and *Somasundaram.* 2007. **Practical Physics.** APSARA Publication, Trichy.
2. *Arora.C.L.*2010.**B.Sc Practical Physics**.S.Chand,New Delhi.

15UVE201	VALUE EDUCATION II: ENVIRONMENTAL STUDIES	SEMESTER - II

Total Hours: 30

CONTENTS

UNIT - I **(6 Hours)**

Environment– Definition– Scope– Structure and function of ecosystems- producers, consumers and decomposers- Energy flow in the ecosystem- Ecological succession– food chain, food webs and ecological pyramids– Concept of sustainabledevelopment.

UNIT - II **(6 Hours)**

Natural resources: Renewable- air, water, soil, land and wildlife resources. Non–renewable – Mineral coal, oil and gas. Environmental problems related to the extraction and use of naturalresources.

UNIT - III **(6 Hours)**

Biodiversity– Definition– Values– Consumption use, productive social, ethical, aesthetic and option values threats to bio diversity – hotspots of bio diversity– conservation of bio- diversity: in– situEx – situ. Bio– wealth - National and Global level .

UNIT - IV **(6 Hours)**

Environmental Pollution :Definition– causes, effects and mitigation measure s– Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution– Nuclear hazards – Solid wastes acid rain–Climate change and global warming environmental laws and regulations in India– Earth summit.

UNIT - V **(6 Hours)**

Population and environment – Population explosion – Environment and human health – HIV/AIDS – Women and Child welfare – Resettlement and Rehabilitation of people, Role of information technology in environmental health – Environmental awareness.

TEXT BOOK:

1. Department of Biochemistry. Environmental Studies (Study Material). Published by K.S.Rangasamy College of Arts & Science (Autonomous). Tiruchengode.

REFERENCE BOOK:

1. *Erach Bharucha*. 2005. **Textbook of Environmental studies**. Universities press. PVT. Ltd.

15UPHM301	CORE V: ATOMIC PHYSICS	SEMESTER - III

Total Hours: 45

OBJECTIVES:

1. To impart knowledge on the basic principles of mass spectrograph, photo electricity and atom models.
2. To provide basic concepts regarding spectral lines- fine structure and Zeeman Effect.

CONTENTS

UNIT- I **(9 Hours)**

Positive Ray Analysis: Positive rays - properties - e / m of positive rays - Thomson's parabola method - Aston's mass spectrograph – Bainbridge mass spectrograph - determination of masses of isotopes – Uses of mass spectrographs – Separation of isotopes- Mass Spectrograph Method – Diffusion method – Thermal diffusion method – Pressure diffusion method.

UNIT- II **(9 Hours)**

Photo electricity : Photoelectric emission - Laws - Lenard's experiment - Richardson and Compton experiment – Relation between photo electric effect and retarding potential – Relation between velocity of photo electrons and frequency of light – Failure of electromagnetic theory – Einstein's light quantum hypothesis- Einstein's photoelectric equation - Experimental verification of Einstein's photoelectric equation by Millikan's experiment - Photo electric cells.

UNIT -III **(9 Hours)**

Bohr and Sommerfeld Atom Model : Bohr atom model – Nature of privileged quantum orbits- Bohr's correspondence principle – Effect of motion of nucleus – Evidences in favour of Bohr's theory – Determination of critical potential – Davis and Goucher's method – Sommerfeld's relativistic atom model –Application to fine structure of Hα line.

UNIT- IV **(9 Hours)**

Vector Atom Model : Vector atom model **-**Various quantum numbers – L-S and j-j coupling - Pauli's exclusion principle - Electronic configuration of elements and periodic classification - Magnetic dipole moment of electron due to orbital and spin motion - Bohr magnetron - Spatial quantization - Stern and Gerlach experiment.

UNIT - V **(9 Hours)**

Fine Structure of Spectral Lines: Spectral terms and notations - Selection rules - intensity rule and interval rule – Fine structure of sodium D lines - Zeeman Effect - Larmor's theorem - Debye's explanation of normal Zeeman effect- Anamalous Zeeman effect - theoretical explanation- Lande's 'g' factor and Explanation of splitting of D l and D2 lines of sodium – Stark effect – Paschen Back effect.

TEXT BOOK:

1. *Murugesan, R.* 2007. **Modern Physics,** [Thirteenth Edition], S. Chand & Company, New Delhi.

REFERENCE BOOKS:

1. *Rajam, J.B*. 2004. **Atomic Physics,**[First Edition], S. Chand & Company, New Delhi.
2. *Ghoshal,S.N.*1991.**Atomic Physics,** [First Edition], S. Chand & Company,New Delhi.
3. *Wehr, M.R*, *Richards, J.A* and *Adair, T.W*. 2002. **Physics of the atom**, [Fourth Edition], Narosa Publishing House, New Delhi.

15UCSPHA301	ALLIED III: PROGRAMMING IN C	SEMESTER - III

Total Hours: 50

OBJECTIVES:

On completion of the course the students shall have knowledge on:

1. Basic principles of Programming using C.
2. How to solve the given problem in the form of coding by using C?

CONTENTS

UNIT - I **(10 Hours)**

Overview of C: History of C - Importance of C – Sample Programs - Basic Structure of C Programs- Executing a 'C' program. **Constants, Variables, and Data Types :** Introduction - Character Set - C Tokens - Keywords and Identifiers - Constants - Variables - Data Types - Declaration of Variables – Declaration of Storage Class- Defining Symbolic Constants - Overflow and Underflow of Data. **Operators and Expressions**: Arithmetic Operators- Relational Operators- Logical Operators- Assignment Operators- Increment and Decrement Operators- Conditional Operator- Bitwise Operators- Special Operators - Arithmetic Expressions - Evaluation of Expressions -Precedence of Arithmetic Operators - Type Conversions in Expressions.

UNIT - II **(10 Hours)**

Managing Input and Output Operations: Reading a Character - Writing a Character - Formatted Input - Formatted Output. **Decision Making and Branching:** Decision making with IF statement – Simple IF statement – The IF…..ELSE statement – Nesting of IF…..ELSE statements – The ELSE IF Ladder - The Switch Statement – The?: Operator – The GOTO Statement - **Decision Making and Looping:** The WHILE statement – The DO statement – The FOR statement - Jumps in LOOPS.

UNIT - III **(10 Hours)**

Arrays: Introduction – One-Dimensional Arrays - Declaration of One-Dimensional Arrays - Initialization of One-Dimensional Arrays – Two- Dimensional Arrays - Initializing Two-Dimensional Arrays – Multi-Dimensional Arrays - Dynamic Arrays. **Character Arrays and Strings:** Declaring and Initializing String Variables - Reading Strings from Terminal - Writing Strings to Screen - Arithmetic Operations on Characters - Putting Strings Together - Comparison of Two Strings - String Handling Functions.

UNIT - IV **(10 Hours)**

User-defined Functions: Need for User-Defined Function - A Multi-Function Program - Elements of User-Defined Function - Definition of Functions - Return Values and their Types - Function Calls - Function Declaration - Category of Functions - No Arguments and No Return Values – Arguments but No Return Values – Arguments with Return Values – No Arguments but Returns a Value – Functions that Return Multiple Values - Nesting of Functions - Recursion - Passing Arrays to Functions - Passing Strings to Functions – The Scope, Visibility and Lifetime of Variables. **Structures and Unions:** Defining a Structure - Declaring Structure Variables - Accessing Structure Members - Structure Initialization - Copying and Comparing Structure Variables - Operations on Individual Members - Array of Structures - Arrays within Structures - Structures within Structures - Structures and Functions - Unions - Size of Structures - Bit Fields.

UNIT - V **(10 Hours)**

File Management in C: Introduction – Defining and Opening a File - Closing a File - Input/Output Operations on Files - Error Handling During I/O Operations - Random Access to Files - Command Line Arguments.

TEXT BOOK:

1. *Balagurusamy, E*. 2009. **Programming in ANSI C.** [Fourth Edition]. Tata Mc-Graw Hill, New Delhi.

REFERENCE BOOKS:

1. *Suresh K. Srivastava*. 1999. **C in Depth**. [First Edition], BPB Publications, New Delhi.
2. *Yashavant Kanetkar*. 1999**. Let Us C**. [Third Edition]. BPB Publications, New Delhi.
3. *Thamarai Selvi, S. and Murugesan, R*. 1999. **C for all**. [First Edition]. Anuradha Agencies, Kumbakonam.

15UPHMP301	CORE PRACTICAL III	SEMESTER – III

OBJECTIVES:

1. These Practical aims at providing basic skill to the students in taking measurements using microscope, telescope, spectrometer, potentiometer etc.,
2. They also impart knowledge on Heat, light and electricity.

List of Experiments: (3 Hours for each Lab)

1. Determination of e/m by Thomson's method.
2. V-I Characteristics of Solar cell.
3. Solar spectrum – determination of absorption lines.
4. Copper voltameter – determination of B_H.
5. Absorption spectra of iodine vapour – determination of dissociation energy.
6. Spectrometer – Hartmann's interpolation formula.
7. Field along the axis of the coil – Vibration magnetometer.
8. Determination of m and B_H – Tan C position.
9. Field along the axis of the coil – deflection magnetometer.
10. Post Office Box – Temperature Co-efficient of Coil..

TEXT BOOK:

1. *Srinivasan, M.N, Balasubramanian,S* and *Ranganathan,R.* 2004. **A Book for study of Practical Physics**. S.Chand & Co. New Delhi.

REFERENCE BOOKS:

1. *Arora, C. L.* 1995. **B.Sc.Practical Physics.** S.Chand & Co., New Delhi.
2. *Harnam Singh & Dr.P.S.Hemne.*2011.**B.Sc Practical Physics**. S.Chand & Co., New Delhi.
3. *Usha Rani. Subbaraya, A* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.

15UCSPHAP301	ALLIED PRACTICAL I : PROGRAMMING IN C	SEMESTER- III

LIST OF PRACTICAL:

1. Program to Find the Sum of N Natural Numbers.
2. Program to Check whether a Given Number is Prime or Not.
3. Program to Find the Roots of Quadratic Equation.
4. Program to Reverse the Given Number.
5. Program to Sort the Given Numbers in Ascending or Descending Order.
6. Program to Generate Fibonacci Series.
7. Matrix Manipulation
    a. Program to Perform Matrix Addition.
    b. Program to Perform Matrix Subtraction.
    c. Program to Perform Matrix Multiplication.
    d. Program to Perform Matrix Transpose.
8. String Handling
    a. Program to Reverse a Given String.
    b. Program to Check whether the Given String is Palindrome or Not.
9. Program to Find the Factorial using Recursion.
10. Program to Implement the Concept of Structures.
11. Program to Implement the Concept of Union.
12. Program for Random File Organization.

15UPHSBC301	SBC I: INSTRUMENTATION	SEMESTER-III

Total Hours: 25

OBJECTIVES:

1. To provide a fundamental knowledge in measurements
2. To impart a good understanding about the functioning of the instruments

CONTENTS

UNIT - I **(5 Hours)**

Basic Concept of Measurement : Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices – Calibration.

UNIT - II **(5 Hours)**

Force and Torque Measurement : Force – Measuring Sensor – Load cell – Column – Type – Devices – Cantilever Beam – Torque Measurement – Absorption Type – Transmission Type – Stress Type – Deflection Type.

UNIT - III **(5 Hours)**

Input – Output Devices and Displays : Introduction – Analog display and recorder – Graphic recorder – Optical oscillograph – Digital input – output devices – Punched card – Bar code – Line printer – Ink-Jet printer – Digital tape recording

UNIT - IV **(5 Hours)**

Basic meter movements : Permanent magnetic moving coil movements – Practical PMMC movements – Taut band instrument

Display devices: Light Emitting Diodes (LED) – Liquid Crystal Display (LCD) – Gas discharge Plasma displays – Segmental display LED's.

UNIT - V **(5 Hours)**

Digital Instruments : Introduction – Digital Multi meter – Digital panel meters – Digital measurement of time – Universal counter – Digital pH Meter.

TEXT BOOK:

1. *C. S. Rangan, G. R. Sharma, V. S. V. Mani*. 1997. **Instrumentation Devices and Systems**, Tata McGraw-Hill Publishing Company Ltd, New Delhi.

REFERENCE BOOKS:

1. *H. S. Kalsi.* 1995. **Electronic Instrumentation**, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
2. *Anderson,Norman.A.*2010. **Instrumentation for process management and control**.[Third edition],CRC press,Florida.

15ULS301	CAREER COMPETENCY SKILLS I	SEMESTER – III

Total Hours: 15

OBJECTIVE:
To enhance employability skills and to develop career competency.

CONTENTS

UNIT – I **(3 Hours)**

Speed Maths: Squaring of Numbers - Multiplication of Numbers - Finding Square Roots - Finding Cube Roots - HCF, LCM - Decimals - - Averages - Powers and Roots.

UNIT – II **(3 Hours)**

Problems on ages- Ratio and proportion- Chain rule-Percentages- Simple and Compound Interest.

UNIT – III **(3 Hours)**

Time and Work- Time and Distance- Problems on Trains

UNIT – IV **(3 Hours)**

Analogies - Sentence Formation - Sentence Completion - Sentence Correction - Idioms & Phrases - Jumbled Sentences-- Reading Comprehension –Deriving conclusions

UNIT – V **(3 Hours)**

Tenses- Articles and Preposition - Change of Voice - Change of Speech - Synonyms & Antonyms - Phrasal Verbs-One Word Substitution- Odd Man Out - Spelling & Punctuation

15UPHM401	CORE VI: BASIC ELECTRONICS	SEMESTER-IV

Total Hours: 45

OBJECTIVES:

1. To provide fundamental knowledge regarding semiconductors, diodes, rectifiers Transistor and amplifiers.
2. To provide basic concepts regarding oscillators, Special semiconductor devices and operational amplifiers.

CONTENTS

Unit - I **(9 Hours)**

Semiconductors and diodes: Classification of solids in terms of forbidden energy gap – Intrinsic and extrinsic semi conductor – PN junction diode – Biasing of PN junction – VI Characteristics of diode – Rectifiers – Half wave – full wave and bridge rectifiers – Break down mechanisms – Zener diode characteristics of Zener diode – Zener diode as voltage regulator.

Unit - II **(9 Hours)**

Transistors: Transistor Types - different modes of operation -Characteristics in CE-CC and CB modes - Transistor biasing- Base bias- Emitter bias- Voltage divider bias.

Transistor amplifier: Two port representations of a transistor - h-parameters- RC coupled amplifier-frequency response -classification of amplifiers- class A power amplifier – Push pull- class B power amplifier - Emitter follower.

Unit - III **(9 Hours)**

Feedback and oscillators: Feed back in amplifier - effect of negative feedback - concept of feedback oscillators- Hartley-Colpitt's- phase shift and Wein bridge oscillators - expressions for frequency of oscillation and condition for oscillation in each case.

Unit - IV **(9 Hours)**

Special Semiconductor devices: Light Emitting Diode **(**LED) and its applications- Photo diode- Characteristic of photodiode- Applications- Field Effect Transistor (FET) – Types- JFET – Working principle of JFET- JFET parameters- Comparison between JFET and Transistor – Applications of JFET- MOSFET – Working principle of MOSFET.

Unit - V **(9 Hours)**

Operational Amplifiers: Introduction- Differential amplifier - Common mode rejection ratio – Characteristics of an ideal op-amp – Virtual ground – Inverting amplifier – Non inverting amplifier –Adder – substractor – Integrator – Differentiator.

TEXT BOOK:

1. *Metha, V.K. and Shalu Metha.*2002. **Principles of Electronics**. [Eight Edition]. S.Chand, New Delhi.

REFERENCE BOOKS:

1. *Theraja ,B.L.* 1985. **Basic Electronics**. [First Edition]. S.Chand, New Delhi.
2. *Sedha, R.S.* 2006. **A Book for study of Applied Electronics**. [Second Edition]. S.Chand,New Delhi.
3. *Robert*,L.Boylestad,Louis Nashelsky 2009. **Electronic devices and circuit theory**. Dorling Kinderslay (India) Private Limited.
4. *Millman Halkias and Parikh*. 2011 .**Integrated Electronics.** [Second edition]. Tata McGraw Hill Ltd.

15UCHPHA401	ALLIED IV: CHEMISTRY	SEMESTER – IV

Total hours: 30

OBJECTIVES:

1. To build a good foundation in chemistry and in basic concepts of chemical bonding, nuclear chemistry.
2. To know the fundamental concepts of benzene and its reactions
3. To study the nature of soaps, cosmetics, rubber and cement.

CONTENTS

UNIT-I **(6 Hours)**

Chemical Bonding - Molecular Orbital Theory bonding- Antibonding - Nonbonding orbitals- M.O. diagrams of Hydrogen – Helium – Nitrogen - Fluorine – Oxygen - Nitric Oxide-discussion of bond order - Magnetic properties - Hydrides-Classification – Characteristics - Preparation - Properties - Uses of Borazole.

UNIT-II **(6 Hours)**

Benzene-General methods of preparation of benzene – Molecular orbital picture – Aromatic character – Huckel's rule of aromaticity– Aromatic Electrophilic substitution Reactions of benzene and its Mechanism of Nitration, sulphonation, halogenations, Friedel-Craft's Alkylation and Acylation.

UNIT-III **(6 Hours)**

Fundamental particles of Nucleus – Nuclide – Isotopes - Isobars – Isotones - Natural radioactivity - Radioactive series including Neptunium series - Group displacement law -Nuclear Binding energy - Mass defect – Calculations - Nuclear Fission - Nuclear Fusion - Differences - Stellar energy - Applications of radioisotopes - C-14 dating - Rock dating - Radio diagnosis.

UNIT-IV **(6 Hours)**

Soaps and detergents: Composition and function-- Cleaning agents – Soap – Detergents – Laundary detergents – Brighteners – Bleaching agents – Disinfectants.

Cosmetics: Tooth paste – Shampoo, Hair dyes – Skin chemicals – Lipsticks perfumes – colognes – After shave precipitation – Deodorants – Anti persipirants. **Rubber**-Natural and synthetic rubber – Composition of natural rubber–Neoprene rubber, styrene butadiene rubber (SBR). Vulcanization – Uses of rubber.

Cement – Manufacture of Portland cement – Setting of cement - Special cements – Mortars and Concretes.

UNIT-V **(6 Hours)**

Photochemistry – Laws of photochemistry – Beer-Lambert's law Grotthus-Droper law- Stark Einstein law of photochemical equivalence- Quantum yield – Phosphorescence – Fluorescence - Chemiluminescence – Photosensitization. Phase rule- Phase rule - Definition of terms in phase rule- Application of phase rule to water system- Reduced phase rule- its application to a simple eutectic system (lead- sliver system).

TEXT BOOKS:

1. *Madan, R.L.* 2010. **Chemistry for degree students**, S.Chand and Co., New Delhi.
2. Krishnamurthy. N., Jayasubramanian. K and Vallinayagam .1990, **Applied Chemistry**, [Second edition], Tata McGraw-Hill Publishing Company Limited. New Delhi.

REFERENCE BOOKS:

1. *Mukherjee, S.M. Singh, S.P.* and *Kapoor, R.P.* 1985. **Organic Chemistry.** [First Edition]. New Age International (P) Ltd. Publishers, New Delhi.
2. *Puri, B.R., Sharma, L.R.* and *Pathania, M.S.* 1998. **Principles of Physical Chemistry.** Shoban Lal Nagin Chand and Co., New Delhi.

15UPHMP401	CORE PRACTICAL IV	SEMESTER –IV

OBJECTIVES:

1. These Practical aims at providing basic skill to the students in constructing circuits.
2. They also impart knowledge on basic electronics.

List of Experiment: (3 Hours for each Lab)

1. Characteristics of Zener diode.
2. Carey Foster's bridge – Resistance and Specific resistance of coil.
3. Hartely oscillator.
4. Potentiometer- EMF of a thermocouple.
5. Colpitt's oscillator.
6. Addition and subtraction using Op-amp.
7. Figure of merit – Table Galvanometer.
8. Characteristics of FET.
9. Characteristics of transistor.
10. Bridge rectifier with voltage regulator.

TEXT BOOKS:

1. *Srinivasan, M.N. Balasubramanian, S* and *Ranganathan, R.* 2004**. A book for study of Practical Physics**. Sultan Chand & Sons, New Delhi.
2. *Usha Rani. Subbarayan,* and *Somasundaram, A.* 2007. **Practical Physics**. APSARA Publication, Trichy.

15UCHPHAP401	**ALLIED PRACTICAL II: CHEMISTRY**	**SEMESTER – IV**

Total hours: 30

OBJECTIVE:

1. To provide basic knowledge in titrimetric analysis and estimation.

CONTENTS

Volumetric Analysis

1. Estimation of Sodium hydroxide using standard Na_2CO_3.
2. Estimation of HCl using standard oxalic acid.
3. Estimation of Borax - using standard Na_2CO_3.
4. Estimation of Ferrous Sulphate - using standard Mohr salt solution.
5. Estimation of oxalic acid - using standard oxalic acid.
6. Estimation of $KMnO_4$ using standard oxalic acid.
7. Estimation of ferrous ion using diphenylamine as internal indicator.
8. Estimation of copper sulphate using standard potassium dichromate.
9. Estimation of hardness of water using standard sodium carbonate.

TEXT BOOK(S):

1. *Venkateswaran V, Veeraswamy R., Kulandaivelu A.R.*, 1997. **Basic Principles of Practical Chemistry**, New Delhi, Second edition, Sultan Chand & Sons, New Delhi.
2. *Kamboj, P.C.* 1999. **University Practical Chemistry**. Vishal Publications, Jalandar, Punjab.

15UPHSBC401	SBC II: LASER PHYSICS	SEMESTER-IV

Total hours: 25

OBJECTIVES:

1. To provide a fundamental knowledge in LASERs.
2. To impart a good understanding about the functioning of LASERs.

CONTENTS

UNIT - I **(5 Hours)**

Fundamentals of LASER: Spontaneous emission – Stimulated emission – Meta stable state – Population inversion – Pumping – Laser Characteristics – Einstein's relation.

UNIT - II **(5 Hours)**

Production of LASER: Helium – Neon Laser – Ruby Laser – CO2 Laser – Semiconductor Laser

UNIT - III **(5 Hours)**

Industrial Applications of LASER: Laser cutting – Welding – Drilling – Holography – Recording and reconstruction of hologram

UNIT - IV **(5 Hours)**

LASER in Medicine: Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment

UNIT - V **(5 Hours)**

Lasers in Communication: Optic fibre communication- Total internal reflection – Block diagram of fibre optic communication system – Advantages of fibre optic communication

TEXT BOOK :

1. *Dr.M.N. Avadhanulu* and *Dr.P.S.Hemne.* 2012. **An introduction to LASERS Theory and Applications,**[Second Edition], S. Chand & Company,New Delhi.

REFERENCE BOOKS:

1. ***W. Silfvast.*** 1996. **Laser Fundamentals**. [Second Edition], Cambridge University Press, London.
2. *K. Thyagarajan* and *A.K. Ghatak*. **LASER Theory and Application** .Macmillan, India Ltd.

15ULS401	CAREER COMPETENCY SKILLS II	SEMESTER – IV

Total Hours: 15

OBJECTIVE:
To enhance employability skills and to develop career competency

CONTENTS

UNIT – I **(3 Hours)**
A to Z Placement Terms-Assertiveness and Self Confidence-Career Opportunities-Skill set (Industry Expectations)

UNIT – II **(3 Hours)**
Principles of Communication (LSRW)-Describing Objects / Situations / People-Information Transfer - Picture Talk - News Paper and Book Review

UNIT – III **(3 Hours)**
Self Introduction - Situational Dialogues / Role Play (Telephonic Skills) - Oral Presentations- Prepared -'Just A Minute' Sessions (JAM)

UNIT – IV **(3 Hours)**
Dress code- Body Language- - Manners and Etiquettes -Resume Writing

UNIT – V **(3 Hours)**
Presentation Skills **–** Group Discussion-Interviewing Techniques- Mock Interview

15UPHM501	CORE VII: ELECTRICITY AND ELECTROMAGNETISM	SEMESTER - V

Total Hours: 50

OBJECTIVES:

1. To impart knowledge on basic concepts of Electricity and Electromagnetism.
2. To enhance the student's skill in basic concepts of Electrostatics, D.C circuits and A.C circuits.

CONTENTS

UNIT - I **(10 Hours)**

Electric field: Flux of electric field – Gauss's law (statement and proof) – Differential form of Gauss law – Application: Electric field due to uniformly charged sphere – Coulomb's theorem – Mechanical force experienced by unit area of a charged conductor – Deduction of Coulomb's inverse square law from Gauss's law.

Electric potential: Potential at a point due to point charge – Relation between electric field and electric potential – Electric potential energy – Potential at a point due to uniformly charged conducting sphere.

UNIT- II **(10 Hours)**

Electrostatics: Capacitance - Principle - Capacitance of a Spherical, Cylindrical and Parallel plate capacitor - Effect of dielectric – Energy stored in a capacitor - Loss of energy due to sharing of charges - Force of attraction in parallel plate capacitor - Types of capacitors.

UNIT -III **(10 Hours)**

DC Circuit: Growth and decay of current in a circuit containing resistance and inductance - Growth and decay of charge in a circuit containing resistance and capacitor - Growth and decay of charge in a LCR circuit - Condition for the discharge to be oscillatory - Frequency of oscillation.

UNIT - IV **(10 Hours)**

Alternating Currents: Peak- Average and RMS values of AC voltage and current - Power factor and current values in an AC circuit containing LCR (reactance and impedance) series and parallel resonant circuits - Power in an AC circuit - Wattless current - Choke coil - Construction and working of transformers - Energy losses and uses – Skin effect- Tesla coil.

UNIT- V **(10 Hours)**

Electromagnetism : Ampere's circuital law – Magnetic field inside a long solenoid - Moving Coil ballistic Galvanometer - Theory - Application to determine absolute capacity - Faraday's laws of electromagnetism - Lenz's law - Self inductance and mutual inductance Expression for self inductance of a coil - Expression for mutual inductance between two coils Experimental determination of self inductance by Anderson's method - Experiment to determine absolute mutual inductance - co - efficient of coupling.

TEXT BOOK:

1. *Murugeshan, R.* 1995. **Electricity and Magnetism.** [First Edition]. S.Chand & Co, *N*ew Delhi.

REFERENCE BOOKS:

1. *Brijal* and *Subrahmanyam*. 1994. A **book for study of Electricity and Magnetism** [Twelfth Edition]. Ratan prakashan Mandir educational and University Publishers, Agra.
2. *Tiwari, K.k*. 1987. **Electricity and Magnetism** [First Edition]. S.Chand & Co., New Delhi.
3. *Richard J Fowler*. 1998**. Electricity: Principles and applications**. [Fourth Edition]. Tata McGrawHill Publishing Company Ltd., New Delhi.

15UPHM502	CORE VIII : ELECTRONICS AND COMMUNICATION	SEMESTER - V

Total Hours: 50

OBJECTIVES:

1. To provide fundamentals regarding amplitude and frequency modulation.
2. To enhance the students skill in communication and application.

CONTENTS

UNIT - I **(10 Hours)**

Amplitude Modulation : The elements of communication systems – The electromagnetic spectrum – Amplitude modulation principles - Modulation index - Side bands - Power distribution – Single side band communication –amplitude modulators - Balanced modulators - SSB circuits.

UNIT - II **(10 Hours)**

Frequency Modulation: Frequency Modulation principle - phase modulation –Side bands - Modulation index - Frequency Modulator - Phase modulator - Frequency demodulator.

UNIT - III **(10 Hours)**

Receivers: The super heterodyne receiver – intermediate Frequency selection and images - AM receiver - FM receiver - Communication receiver.

UNIT - IV **(10 Hours)**

Communication Systems: Antenna fundamentals - Wave propagation. Satellites - Orbits - Satellite communication systems – Earth station. Fiber optic communication: Optical fibre – Propagation of light in optical fibre – Acceptance angle - Numerical Aperture – Modes of propagation – Step and graded index fibres –Optical fibre communication system.

UNIT - V **(10 Hours)**

Modern Communication systems and Applications : Facsimile – Concept – Charge coupled device – Scanning mechanism – Block Diagram of Facsimile – Cellular Radio system – Cellular transmitter and receiver – RADAR – Principle –Pulsed radar – Television – Interlaced – Scanning – Colour signals.

TEXT BOOK:

1. *Frenzel and Louis. E*. **Communication Electronics.** [Second Edition]. McGraw Hill International Edition, Singapore.

REFERENCE BOOKS:

1. *George Kennedy - Bernard Davis.* 2002. **Electronics Communication Systems.** [Fourth Edition]. Tata McGraw –Hill Publishing Company Ltd., New Delhi.
2. *William Schweber*. 2002. **Electronic Communication system.** [Fourth Edition]. Prentice Hall Ltd., New Delhi.
3. *Dennis Roddy* and *John Coolen*. 2008. **Electronic Communication**. [Fourth Edition]. Prentice Hall Ltd., New Delhi.

15UPHM503	CORE IX : SOLID STATE PHYSICS	SEMESTER - V

Total Hours: 50

OBJECTIVES:

1. To impart knowledge on the structure of crystals - X ray diffraction and on theories of Magnetism.
2. To provide basic concepts regarding dielectrics and modern engineering materials.

CONTENTS

UNIT - I **(10 Hours)**

Crystal structures: Crystal Lattice - Primitive and Unit cell - Seven Classes of Crystals - Bravais Lattice - Miller Indices - Structure of Crystals - Simple Cubic Structure - Hexagonal close packed structure - Face Centered Cubic Structure - Body Centered Cubic Structure - Sodium Chloride Structure - Zinc Blende Structure and Diamond Structure.

UNIT - II **(10 Hours)**

X-ray diffraction and Crystal defects: Diffraction of X-Rays by Crystals - Bragg's Law in one Dimension - Experimental Method of X - Ray Diffraction - Laue Method - Rotating Crystal Method - Powder Photograph Method - Point Defects - Line Defects - Surface Defects - Volume Defects - Effects of Crystal Imperfections.

UNIT - III **(10 Hours)**

Theory of magnetism: Different Types of Magnetic materials - Classical Theory of Diamagnetism (Langevin's theory) - Langevin's Theory of Para magnetism - Weiss Theory of Paramagnetism - Qualitative Explanation of Heisenberg's internal field and Quantum Theory of Ferromagnetism.

UNIT- IV **(10 Hours)**

Dielectrics: Fundamental Definitions in Dielectrics - Different types of dielectric polarization - Frequency and Temperature Effects on Polarization - Dielectric Loss - Qualitative study of Local Field or Internal Field - Clausius - Mossotti Relation - Determination of Dielectric Constant - Dielectric Breakdown - Properties of different types of Insulating Materials.

UNIT - V **(10 Hours)**

Modern Engineering materials: Polymers – Plastics – Ceramics – Super strong materials –Cermets - High temperature materials – Thermo electric materials – electrets - Nuclear engineering materials - Metallic glasses - Optical materials – Fiber optic materials & uses - Super conductors - Properties - Types and applications.

TEXT BOOK:

1. *M. Arumugam*.2008.**Materials Science** [Third Edition], Anuradha publications, Kumbakonam .

REFERENCE BOOKS:

1. *R. Murugesan*.2007. **Modern Physics [**Thirteenth Edition], S. Chand & Company, New Delhi.
2. *C. Kittel*.1996. **Introduction to Solid State Physics** [Seventh Edition], John Wiley & Sons (Asia) Pvt Ltd., New Delhi.
3. *V. Raghava*.1997. **Material Science and Engineering** [Fourth Edition], Prentice Hall of India Pvt Ltd., New Delhi.

15UPHM504	CORE X: MATHEMATICAL PHYSICS (100% Internal Evaluation)	SEMESTER - V

Total Hours: 50

OBJECTIVES:

1. To impart basic knowledge in Laplace transform - Matrices and Beta - Gamma functions which will be used for studies solving problems during research work.
2. To provide basic principles of electromagnetic theory and vector analysis.

CONTENTS

UNIT - I **(10 Hours)**

Vector analysis: Scalar and vector fields - Gradient of scalar field - Divergence of vector field - Curl of a vector field - vector integration - line integral - Surface integral - Gauss divergence theorem and it's proof in the simple problems –Stoke's theorem and its proof with simple problems.

UNIT - II **(10 Hours)**

Matrices: Special matrices with their properties - Rank of a matrix - Solutions to linear equations – Cramer's rule – Characteristic equation of a matrix – Eigen values and eigen vectors – Cayley – Hamilton theorem - Sub spaces and null spaces – Transformations – Linear, similarity, unitary and orthogonal transformations

UNIT - III **(10 Hours)**

Beta and Gamma functions: Fundamental property of gamma functions – The value of gamma (1/2) and graph of the gamma function – Transformation of gamma function – different forms of beta function - Relation between beta and gamma functions

UNIT - IV **(10 Hours)**

Laplace Transforms: Laplace transform – Definition and properties – Methods of finding Laplace transforms –Direct method - Series expansion method - Method of differential equations - Inverse Laplace transform and its properties – Methods of finding inverse Laplace transforms –Partial fraction method - Series expansion method – Applications of Laplace transform to the solution of differential equation with constant and variable coefficients.

UNIT - V **(10 Hours)**

Electromagnetic Theory: Maxwell's equations for electromagnetic field - Relations connecting divergence and curl of D and B - Physical interpretation of Maxwell's equations - Decaying of free change - Poynting vector and poynting theorem.

Complex Analysis: Functions of complex variables – Differentiability - Cauchy-Riemann conditions.

TEXT BOOK :

1. *Gupta, B. D***.** 2004. **Mathematical Physics.** [Third Edition]. Vikas Publishing House Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. *Kakani, S.L and HemRajani, C.* 1994. **Mathematical Physics.** [First Edition]. Himalaya Publishing House Ltd., Mumbai.
2. *Singaravelu, A*. 1995. **Engineering Mathematics - I.** [First Edition]. Meenakakshi Agency, Chennai.
3. *Dass, H.K* 1998. **Mathematical Physics** [First Edition] S. Chand and Company, New Delhi.
4. *Erwin kreyszig*. 2009. **Advanced Engineering Mathematics.** [Eighth Edition]**.** John Wiley and Sons, New York.

15UPHM505	CORE XI: ENERGY PHYSICS (Self Study & 100% External Evaluation)	SEMESTER -V

OBJECTIVES:

1. To provide fundamental knowledge on Energy Physics.
2. To develop Knowledge on various Energy Generation, Utilization, and conversion methods

CONTENTS

UNIT- I

Fundamentals: Definitions – Energy sources – Classification - Scientific principles of renewable energy – Technical implications - Principles of Energy Conservation - Types of energy audit - Energy conservation technologies.

UNIT- II

Solar Energy: Physical principles of the conversion of solar radiation into heat - Types of Air Heaters-Applications of Solar Air Heaters-Types of Drier- Direct and Indirect Type Solar Drier - Principle of photovoltaic conversion of solar energy - Application of Solar Energy in Space.

UNIT- III

Wind Energy: Turbine types and terms – Characteristics of wind – Power extraction by turbine – Electricity generation – Classification of electricity systems using wind power – Mechanical power.

UNIT- IV

Biomass and Bio fuels: Introduction – Bio fuel classification – Biomass production for energy forming – Classification - Biomass conversion technologies - Pyrolysis – Alcoholic fermentation – Wastes and residues – Social and environment aspects.

UNIT- V

Energy storage systems: Importance – Chemical storage – Heat storage – Electrical storage – Lead acid battery – Advantages of batteries - Hydrogen storage - Fuel cells – Mechanical storage – national energy policy.

TEXT BOOK :

1. *John Twidell* and *Tony Weir***.**2013.**Renewal energy resources**,[Second editioin],Taylor & Francis, New York.

REFERENCE BOOKSS:

1. *Sultana*, S.P. 1997. **Solar Energy.** [Second Edition].TMH, New Delhi.
2. *Boyle***.** 2004. **Renewable Energy**. [Second Edition]. Oxford University Press, UK.
3. *Kothari, D.P, Singal, K.C.* and *Rajan, R.* 2011. **Renewable energy Sources and Emerging technologies.** [Second Edition]. Prentice Hall of India, New Delhi.

15UPHMP501	CORE PRACTICAL V	SEMESTER –V

OBJECTIVES:

1. These Practical aim at providing basic skill to the students in taking measurements using spectrometer- potentiometer ,Ballistic galvanometer etc.
2. They also impart knowledge in light and electricity.

List of Experiments: (3 Hours for each Lab):

1. Spectrometer-Narrow angled prism.
2. Potentiometer-Reduction factor of T.G.
3. B.G – Absolute determination of capacitance.
4. B.G – Comparison of mutual inductance.
5. Carey fosters bridge- Temperature coefficient of a coil.
6. Determination of band gap energy of thermistor.
7. Calibration of low range ammeter - potentiometer.
8. Calibration of high range voltmeter - potentiometer
9. B.G – Quantity sensitiveness
10. B.G – Comparison of EMF of two cells.

TEXT BOOKS :

1. *Srinivasan, M.N. Balasubramanian, S* and *Ranganathan, R.* 2004. **A book for study of Practical Physics**. Sultan Chand & Sons, New Delhi.
2. *Usha Rani. Subbarayan, A.* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.

15UPHSBC501	SBC III: SPECTROPHYSICS	SEMESTER - V

Total Hours: 25

OBJECTIVE:

1. To impart knowledge on principle, instrumentation and applications of various spectroscopy techniques.

CONTENTS

UNIT-I **(5 Hours)**

Electromagnetic spectrum: Types of spectra- The solar spectrum – Stellar spectrum Explanation of the Fraunhofer lines.

Ultraviolet Spectroscopy: Discovery – Sources – Detecting devices – Spectrograph for UV region: Quartz spectrograph for near UV region – Vacuum Spectrograph for extreme UV region– Applications (Elementary ideas only).

UNIT-II **(5 Hours)**

Microwave Spectroscopy: The rotation of molecules-Rotational spectra of diatomic molecules- Microwave spectrometer- Applications: Determination of Bond length- Determination of atomic mass.

UNIT-III **(5 Hours)**

Infrared Spectroscopy: Vibrational energy of a diatomic molecule - Infrared spectra: Preliminaries- IR spectrometer- Sample handling techniques- Applications.

UNIT-IV **(5 Hours)**

Raman Spectroscopy: Discovery of Raman Effect – Experimental study of Raman effect – Characteristics of Raman lines – Quantum theory of Raman effect– Mutual exclusion principle –Applications of Raman spectroscopy.

UNIT-V **(5 Hours)**

NMR Spectroscopy: Introduction – Theory of NMR – Experimental arrangement – NMR spectrum – Applications (Elementary ideas only).

ESR Spectroscopy: Introduction – Theory of ESR – Instrumentation – ESR spectrum – Applications (Elementary ideas only).

TEXT BOOKS :

1. *G. Aruldhas.*2013. **Molecular Structure and Spectroscopy**,[Second Edition], PHI, New Delhi.(All Units)
2. *Kiruthiga Sivaprasath and R Murugeshan***.**2006. **Optics and Spectroscopy**, [Sixth Revised Edition], S. Chand Publishing, New Delhi.(Introduction).

REFERENCE BOOKS:

1. *C.N. Banwell.*1972.**Fundamentals of Molecular Spectroscopy**, [Fourth Edition], Tata McGraw Hill, New Delhi.
2. *S.L. Gupta, V. Kumar, and R.C. Sharma.*1993.**Elements of Spectroscopy, [**Ninth Edition], Pragathi Prakasahan, Meerut.

15UPHM601	CORE XII: DIGITAL ELECTRONICS AND MICROPROCESSOR	SEMESTER - VI

Total Hours: 50

OBJECTIVES:

1. To provide knowledge in Digital electronic fundamentals- logic circuits and flip flops.
2. To impart basic concepts in microprocessors.

CONTENTS

UNIT- I **(10 Hours)**

Digital Electronics Fundamentals: Number systems - Conversion from one number system to another – BCD code - Logic gates - AND - OR - NOT gates - Truth tables - Boolean Algebra - Laws - Simplification of Boolean Functions - DeMorgan's theorem - NAND - NOR gates - Universal building blocks - Binary addition – Subtraction by 1's and 2's Complement forms.

UNIT - II **(10 Hours)**

Simplification of logic circuits: Sum of products - Product of sums - Simplification of logic equations using Boolean algebra - Simplification by Karnaugh map - Pairs- Quads- octets - upto 4 – Variables**.**

Half adder - Full adder - Half subtractor and Full subtractor - Decoder -Encoder - Multiplexer – Demultiplexer.

UNIT- III **(10 Hours)**

Flip Flops and counter: Flip Flops - RS Flip flop - JK Flip flop - D Flip flop - T Flip flop - JK Master Slave Flip flop - Shift register - Counters – Binary counter - BCD counter - Ring counter.

UNIT- IV **(10 Hours)**

Microprocessor 8085: Architecture of 8085 microprocessor - Registers - Flags - ALU - Address bus and data bus Demultiplexing address / data bus - Control and status signals - Control bus - Programming model of 8085 - Pin - out signal function diagram - Functions of different pins.

UNIT - V **(10 Hours)**

Microprocessor 8085 : Instruction set of 8085 - Data transfer - Arithmetic - Logic - branching and machine control group of instructions - Addressing modes - Register - register indirect - Direct - and immediate and implied addressing modes - Assembly language and machine language - Programming exercises - Addition - Subtraction - Multiplication and division.

TEXT BOOKS :

1. *Albert Paul Malvino and Donald P. Leach.* 1986. **Digital Principles and Applications.** [Fourth Edition]. Tata Mc Graw Hill, New Delhi.(Unit – I,II,III)
2. *Ramesh, S.Goankar,* 2006, **Microprocessor Architecture programming & Application with 8085/8086A.**[Fifth edition].Penram publications,NewDelhi. (Unit – IV,V)

REFERENCE BOOKS:

1. *Basavaraj, B*. 1998. **Digital Fundamentals**. [First Edition]. Vikas Publications House Pvt. Ltd., New Delhi.
2. *Krishna Kant*. 2007. **Microprocessors and Micro Controller: Architecture Programming and Systems Design.** [First Edition]. Prentice Hall Of India, New Delhi.
3. *Floyd*, *Thomas, L.* 2011. **Digital fundamentals.** [Tenth edition]. Pearson, New Delhi.

15UPHM602	CORE XIII : NUCLEAR PHYSICS	SEMESTER - VI

Total Hours: 45

OBJECTIVES:

1. To provide knowledge on
    a. Structure and properties of nucleus and its elementary particles.
    b. Radioactivity, nuclear transmutations, fission and fusion reactions.
2. To motivate the students to analyze the utility of nuclear energy - reactors, detectors and accelerators.

CONTENTS

UNIT - I **(10 Hours)**

Properties of nucleus: Nuclear size - Measurement of nuclear radius - Mirror nuclei method - Nuclear charge - Measurement of charge by alpha scattering method – Mass - density - Total angular momentum - Nuclear magnetic dipole and electric quadrople moment.

Nuclear structure: Models of nuclear structure - Liquid drop model (Weizacker's semi-empirical mass formula) - Nuclear shell model - Evidence for Shell model.

UNIT- II **(10 Hours)**

Radioactivity: Properties of alpha, beta, gamma rays - Laws of radioactive and successive disintegration - transient and secular equilibria - range of alpha particles - Geiger-Nuttal Law - alpha spectrum and fine structure – Gamow's Theory of alpha decay - beta ray spectra - Origin of line and continuous spectrum - Fermi theory of beta decay - K-electron capture - Nuclear Isomerism.

UNIT - I **(10 Hours)**

Artificial Transmutation: Rutherford's Experiment - Bohr's theory of nuclear disintegration - Q-value equation and threshold energy for nuclear reaction - Types of nuclear reactions - Exothermic and endothermic reactions - Threshold energy of an endoergic reaction.

Neutron: Mass – Charge – Decay - Spin - Magnetic moment - Neutron diffraction- Absorption of neutrons by matter - Neutron sources - Detectors - Neutron collimator.

UNIT - IV **(10 Hours)**

Nuclear Fission and Fusion Reactions: Nuclear fission - Bohr Wheeler theory - Chain reaction and multiplication factor - Critical size and critical mass – Atom bomb - Nuclear

fusion - Sources of Stellar energy - Carbon-Nitrogen cycle - Proton-Proton cycle - Controlled and uncontrolled thermo nuclear reactions - Nuclear reactors and its uses.

Elementary particles: Classification of elementary particles - Particle quantum numbers - Baryon number - Lepton number - Strangeness number - Hyper charge - Iso spin quantum number - Elementary idea of Quark model.

UNIT - V **(10 Hours)**

Nuclear Detectors and Accelerators: Interaction between energetic particles and matter - Heavy charged particles – Electrons – Gamma ray- Solid state detector- Proportional Counter - Geiger-Muller counter- Wilson's Cloud chamber - Bubble chamber - Scintillation counter - Cyclotron – Betatron.

TEXT BOOK:

1. *Murugesan R.* 2007. Modern **Physics [**Thirteenth Edition] S. Chand and Company, New Delhi.

REFERENCE BOOKS:

1. *Tayal, D. C.* 2005. **Nuclear Physics** Himalaya Publishing House, Mumbai
2. *Brijal and Subrahmanyam N.* 1994. **Atomic and Nuclear Physics** [Fifth Edition] S. Chand and Company, New Delhi.
3. *Pandiya M. L and Yadav R.P.S*. 2007. **Elements of Nuclear Physics** [Seventh Edition] Kedar Nath & Ram Nath Publishers, Meerut
4. *John R, Taylor, Chris D, Zafiratos and Michel A*. 2009. **Modern Physics** PMI Learning Private Limited.
5. Beiser, Mahajan and Chowdhry .2009. **Concepts of Modern physics** [Sixth edition] Tata Mc-Graw Hill Company Limited, New Delhi

15UPHM603	CORE XIV: QUANTUM MECHANICS AND RELATIVITY	SEMESTER –VI

Total Hours: 50

OBJECTIVES:

1. To provide basic concepts in wave nature of matter - Schrodinger's equations and their applications.
2. To impart fundamental knowledge in relativity - special and general theory of relativity

CONTENTS

UNIT - I **(10 Hours)**

Wave Nature of Matter : Inadequacy of Classical mechanics - matter waves - Phase and group velocity - Wave packet - Expression for De' Broglie wavelength - Davisson and Germar's experiment - G.P.Thomson's experiment - Electron microscope - Heisenberg's uncertainty principle - Illustration – Gamma ray microscope experiment - Diffraction of electrons through a single slit.

UNIT - II **(10 Hours)**

Schrodinger's Equations : Basic postulates of wave mechanics - Schrödinger's equation - Properties of wave function - Operator formalism - Linear operators - Self - Adjoint or Hermitian operator - and their properties - Expectation value - Eigen value - Eigen function - Commutator algebra - commutation relation between position and momentum - Commutation relation between the components of angular momentum - Commutativity and compatibility.

UNIT – III **(10 Hours)**

Applications of Schrodinger's Equations : Ehernfast's theorem - Free particle solution of Schrodinger's equation - particle in a box - Qualitative treatment (outlining steps only) of the Barrier penetration problem - Potential well – Elementary ideas - Linear harmonic oscillator - Rigid rotator and Hydrogen atom.

UNIT - IV **(10 Hours)**

Relativity - I : Frame of reference - Galilean transformation - Michelson - Morley experiment - Einstein's postulates of special theory of relativity - Lorentz transformation and its interpretation – consequence of Lorentz transformation - Length Contraction - Time dilation - Relativity of simultaneity.

UNIT - V **(10 Hours)**

Relativity - II : Addition of velocities - Variation of mass with Velocity - Mass energy equation - Minkowski's four dimensional space - Examples - Space Time continuum - Four vectors - Elementary ideas of general theory of relativity – Evidences in support of this theory.

TEXT BOOKS :

1. *R. Murugeshan, Kiruthiga Sivaprasath*. 2005. **Modern Physics**, **[**Twelfth Edition**]**, S. Chand & Company, New Delhi.(Unit – IV,V)
2. *Sathya prakash.* 1999. **Advanced Quantum Mechanics, [**Fifth Edition], Kedar Nath Ramnath Publishing, Meerut.(Unit – I,II,III)

REFERENCE BOOKS:

1. *Aruldhas, G.* 2004. **Quantum Mechanics**. Prentice Hall of India Private Ltd, New Delhi.
2. *Sriranjan Banerji* and *Asit banerji.* 2003. **The Special Theory Of Relativity**. Prentice Hall of India Pvt Ltd., New Delhi.
3. *Leonard I. Schiff.* 2010. **Quantum Mechanics.** [Third Edition].Tata Mcgraw Hill Edition, New Delhi.

15UPHEL601	ELECTIVE: NANOSCIENCE	SEMESTER-VI

Total Hours: 50

OBJECTIVES:

1. To understand the basic concepts of Nanoscience and its instrumentation techniques.
2. To impart the Knowledge on various Advantages and Applications of Nanotechnology

CONTENTS

UNIT - I **(10 Hours)**

Nanotechnology: Introduction – Nanomaterials defined – Nanoparticles – Properties of Nanoparticles over other materials – Properties of Nanomaterials – Physical – Chemical – Optical – Magnetic - Mechanical Properties – Applications of Nanomaterials – Materials Technology – Information Technology – Biomedicine – Energy storage.

UNIT- II **(10 Hours)**

Synthesis of Nanomaterials: Top down – Ball Milling - Bottom up self assembly - Sol - Gel Process - Aerosol - Based processes - Chemical Vapour Deposition (CVD) - Atomic or molecular condensation - Lithography - Dip - Pen lithography - Soft lithography and Nano scale printing - Combustion - Electro deposition.

UNIT - III **(10 Hours)**

MEMS and NEMS : Introduction of MEMS and NEMS - Materials for MEMS manufacturing – MEMS manufacturing technologies – Bulk Micromachining- Surface Micromachining - High aspect ratio (HAR) Silicon Micromachining - MEMS and Nanotechnology applications - Biotechnology - Communications - Accelerometers - MEMS thin film deposition processes - Electro deposition - Epitaxy - Thermal oxidation - Physical Vapour Deposition (PVD) - Evaporation - Sputtering – Casting.

UNIT – IV **(10 Hours)**

Carbon Nanotubes : Introduction - SWCNT (Single Wall Carbon Nanotubes) - MWCNT (Multi Wall Carbon Nanotubes) - CNT Fabrication - Laser ablation or pulsed laser vaporization – Arc Discharge method – Arc method in inert gas atmosphere- Arc method in liquid nitrogen – Plasma rotating arc discharge method- Properties of carbon nanotubes - Mechanical properties - Thermal conductivity - Electrical conductivity -

Applications of CNT – Sensor – Catalyst – medical/biomedical – Information technology.

UNIT- V **(10 Hours)**

Instrumentation techniques (Principle of Operation and instrumentation):

X-Ray Diffraction Technique (XRD) - Scanning Electron Microscope (SEM) - Tran smission Electron Microscope (TEM) - Atomic Force Microscope (AFM)-Imaging - Applications.

TEXT BOOKS:

1. *Appin Labs*.2007.**Nanotechnology,** [First Edition], BPB Publications, Chennai.(Unit – III,IV,V)
2. *P.K.Palanisamy*.2011.**Physics of Materials**, SCITECH Publications, Chennai.(Unit – I,II)

REFERENCE BOOKS:

1. *Mick Wilson, Kamali Kannangara Geoff Smit*. 2005. **Nanotechnology- (Basic science and Emerging technologies)** [First Edition] THI, London.
2. *Charles P. Poole, Jr and Frank J. Owens*. 2006.**Introduction to Nanotechnology**, John Wiley & Sons, Asia.
3. *Lynn.E, Foste.* 2006. **Nanotechnology- Science, innovation, and opportunity, [**First Edition], Pearson Education (P) Ltd, New Delhi.
4. *T. Pradeep.* 2009. **NANO the Essentials, [**Third Edition], Tata McGraw-Hill Publishing Company Ltd, New Delhi.

15UPHEL602	ELECTIVE: BIOMEDICAL INSTRUMENTATION	SEMESTER-VI

Total Hours: 50

OBJECTIVES:

1. To introduce basic application of Physics in medical field
2. To impart knowledge regarding medical instruments

Unit – I **(10 Hours)**

Introduction to physiology and anatomy: Cell and its function-Anatomy and physiology of respiratory system-cardio vascular system-Endocrine system-Central nervous system.

Bio-Electric phenomenon: Basic bio potentials-Bio electricity – Resting and action potentials-Sodium pump generation- Characteristics of electric signals from heart, brain and muscle.

Unit - II **(10 Hours)**

Electrodes: Half cell potential-Electrode paste –Electrode material –Metal micro electrodes-Depth needle electrodes-Surface electrodes-Multi point and floating needle electrodes-Distortion in the measured signals-chemical electrodes.

Unit - III **(10 Hours)**

Diagnosing Instruments: Computer axial tomography- Thermography –Blood pressure monitors-Respiration rate monitors-pH meters.

Unit - IV **(10 Hours)**

Recorders: Introduction – Characteristics – ECG – EEG – EMG – ERG – Electro oculograph (ECG) – high accuracy recorders – offline analyzers – Recorders.

Unit - V **(10 Hours)**

Assisting Devices: Introduction – Pace makers – Artificial heart valves- Defibrilators – Nerve and muscle –Stimulators – Heart lung machine –kidney machine.

TEXT BOOK:

1. *Arumugam.* 1994.**Biomedical Instrumentation,[Second Edition]** Anuratha Agencies Publishers.

REFERENCE BOOKS:

1. *B. Jacobson* and *J.G. Webster,* **Medicine and Clinical engineering,** Prentice Hall of India
2. *D.W. Hill.* 1965.**Principles of Electronics & Medical research ,**Butterworths , London .

15UPHMP601	CORE PRACTICAL VI	SEMESTER – VI

OBJECTIVES:

1. These practical aims at providing basic skill to the students in Construction of electronic circuits, Microprocessors and in taking measurements using CRO.

List of Expeiment: (3 Hours for each Lab)

1. Verification of Basic logic gates.
2. NAND and NOR as universal gates.
3. Verification of De Morgan's theorem.
4. Half adder and full adder.
5. Multiplexer and demultiplexer.
6. Encoder and decoder.
7. Construction of Flip flop.
8. 8 Bit addition with carry and subtraction with borrow using 8085 microprocessor.
9. 8 Bit multiplication using 8085 microprocessor.
10. 8 Bit division using 8085 microprocessor

TEXT BOOKS:

1. *Poorna Chandar, S* and *Sasikala, B*. 2006. **Electronics Laboratory Primer. A Design approach -** S.Chand & Co, New Delhi.
2. *Srinivasan, M.N. Balasubramanian, S* and *Ranganathan, R.* 2004**. A book for study of Practical Physics**. Sultan Chand & Sons, New Delhi.

15UPHSBC601	SBC IV: MATERIALS AND PROCESSING	SEMESTER - VI

Total Hours: 25

OBJECTIVES:

1. To provide a basic knowledge about different kinds of materials.
2. To inculcate the research thrust on processing of materials.

CONTENTS

UNIT – I **(5 hours)**

Materials: Material – Definition – Classification of materials – Functional materials – characteristics of materials – Elasticity – Toughness, Ductility, Brittleness – Effect of heat treatment – Technological properties of metals.

UNIT – II **(5 hours)**

Types of materials: Ferrous materials – Classification – Steels (carbon, alloy steels) – Non ferrous materials and their alloys (Cu, Mg, Ni, Al) – Materials for nuclear energy – ceramic materials, glass, polymers (qualitative only).

UNIT – III **(5 hours)**

Testing of materials: Introduction – Destructive testing – Tensile testing – Hardness testing – Torsion test – Nondestructive testing – Radiography – Liquid penetrant test – Ultrasonic inspection – Corrosion testing.

UNIT – IV **(5 hours)**

Heat treatment process: Definition – Classification – Principles of heat treatment – Annealing – Quenching – Tempering – Ausforming – Maraging – Production and heat treating process of glass – Polymer processing

UNIT – V **(5 hours)**

Surface treatment of materials: Introduction – Carburizing – Nitriding – Cyaniding – Carbonitriding – Hardening – Coating – Faced coatings – Weldings – Various welding processes – Process of soldering – Soldering alloys.

TEXT BOOK:

1. *O. P. Khanna* . 1996.**Material science and metallurgy**, Dhanpat Rai & sons, New Delhi,.

REFERENCE BOOKS:

1. *D. R. Askeland, Pardeep. P. Fulay, D. K. Bhattacharya*.2010. **Material science and Engineering**, Cengage learning , New Delhi .

2. *B. K. Agarwal*.2003.**Introduction to Engineering materials**, Tata McGraw Hill publishing, New Delhi.

NMEC OFFERED BY THE DEPARTMENT

15UPHN301	NMEC I: LASER AND ITS APPLICATIONS	SEMESTER-III

Total Hours: 25

OBJECTIVES:

1. To provide a fundamental knowledge in LASERs.
2. To impart a good understanding about the functioning of the LASERs.

CONTENTS

UNIT - I **(5 Hours)**

Fundamentals of LASER: Spontaneous emission – Stimulated emission – Meta stable state – Population inversion – Pumping – Laser Characteristics

UNIT - II **(5 Hours)**

Production of LASER: Helium – Neon Laser – Ruby Laser – CO2 Laser – Semiconductor Laser

UNIT - III **(5 Hours)**

Industrial Applications of LASER: Laser cutting – Welding – Drilling – Hologram – Recording and reconstruction of hologram

UNIT - IV **(5 Hours)**

LASER in Medicine: Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment

UNIT - V **(5 Hours)**

Lasers in Communication

Optic fibre communication- Total internal reflection – Block diagram of fibre optic communication system – Advantages of fibre optic communication

TEXT BOOK:

1. *Dr.M.N. Avadhanulu* and *Dr.P.S.Hemne.*2012. **An introduction to LASERS Theory and Applications,**[Second Edition], S. Chand & Company,New Delhi.

REFERENCE BOOKS:

1. *W. Silfvas.*1996. **Laser Fundamentals**, [Second Edition], Cambridge University Press, London.
2. *K. Thyagarajan* and *A.K. Ghatak,* **LASER Theory and Application,** Mac millan, India Ltd.

15UPHN401	NMEC II: APPLIED PHYSICS	SEMESTER – IV

Total Hours: 25

OBJECTIVES:

1. To enhance the students knowledge on the basic concepts of physics.
2. To develop the students skills in the application of physics concepts.

CONTENTS

UNIT I: (5 Hours)

Laser: An Introduction-Comparison of ordinary beam of light and laser beam-Spontaneous Emission-Stimulated Emission- Stimulated Absorbance- Population Inversion- Ruby Laser-Characteristics of laser-Applications of Laser-Holography.

UNIT II: (5 Hours)

Ultrasonics: Ultrasonic waves-Piezoelectric effect-Ultrasound and animals-Detection and Applications of ultrasonic waves in industrial and medical.

UNIT III: (5 Hours)

Fibre Optics: Introduction-optical fibre –classification of optical fibre-Advantages of optical fibre cables over metallic based cables-Applications of optical fibre.

UNIT IV: (5 Hours)

Electromagnetic Induction: Faraday's law – induced emf and current – Lenz's law-Self induction – Mutual induction -AC generator-Eddy current – Applications – Transformer.

UNIT V: (5 Hours)

Acoustics: Origin of sound-reflection of sound-transmission of sound-reverberant-acoustics properties of auditorium-optimum reverberation-acoustics recording in studio.

TEXT BOOKS:

1. *Neeraj Mehta,* 2011, **Applied Physics for Engineers, PHI learning private limited,** New Delhi.(Unit – I,II,III,V)
2. *Murugeshan. R.* 1995. **Electricity and Magnetism.** [First Edition]. S. Chand & Co, *New* Delhi.(Unit – IV)

REFERENCE BOOKS:

1. *Francis A Jenkins* and *Harvey E White*. 2011. **Fundamentals of Optics.** [Fourth Edition].TMH,New Delhi.
2. *Ajay Ghatak*, **Optics** , Tata McGraw-Hill publishing Co. Ltd., New Delhi, 1998.
3. *Avadhanula, M.N.* 2001. **An Introduction to Laser Theory and Application.** S. Chand & Company, New Delhi.
4. *Murugesan, R.* 2007. **Modern Physics.** S. Chand & Company Limited, New Delhi.
5. *Murugesan, R.* Revised 2012. **Properties of Matter** S. Chand & Company Limited, New Delhi.

15UPHD401	DIPLOMA COURSE : ASTROPHYSICS	SEMESTER –III & IV

Total Hours: 90

OBJECTIVES:

1. To provide fundamental knowledge regarding solar system.
2. To provide basic concepts of astronomical instruments.

CONTENTS

UNIT - I

Astronomical Instruments: Optical telescope - Reflecting telescope - Types of reflecting telescope -advantages of reflecting telescope - Radio telescopes - astronomical spectrographs - photographic photometry - photo electric photometry - detectors and image processing.

UNIT - II

Solar system: The sun- physical and orbital data - Photosphere - Chromosphere - corona -Solar prominences - Sunspot - Sunspot cycle - Theory of sunspots - Solar flare - Mass of the sun - Solar constant - Temperature of the sun - Source of solar energy - Solar wind.

Other members of the solar system: Mercury - Venus -Earth - Mars - Jupiter - Saturn - Uranus - Neptune - Pluto - Moon - Bode's law -Asteroids - Comets - Meteors.

UNIT - III

Stellar Evolution, Binary and variable stars:

Birth and Death of a star - Chandrasekhar limit - white dwarfs - Neutron stars - black holes - Quasars - Nebulae – Supernovae Binary stars - Origin of Binary stars. Variable stars - Cepheid variables - RV Tauri variables - Long period variables - Irregular variables - Flare stars.

UNIT - IV

Magnitudes, distance and spectral classification of stars:

Magnitude and brightness - Apparent magnitude of stars - Absolute magnetic of stars - Relation between apparent magnitude and absolute magnitude of stars -Luminosities of stars - Measurement of stellar distance - Geometrical parallax method - Distance from red shift measurement - Harvard system of spectral classification – H-R diagram – Pogson's relation.

UNIT - V

Theories of the Universe, galaxies and star clusters:

Origin of the universe - The big bang theory - The steady state theory - The Oscillating universe theory - Hubble's law. Galaxies - Types of galaxies - Milky Way - Star clusters - Open clusters - Globular clusters.

TEXT BOOKS:

1. *K.S. Krishnasamy***.** 2002. **Astro Physics a modern perspective**, Reprint, New Age International (p) Ltd, New Delhi.(Unit – IV)
2. *Baidyanath Basu*.2001. **An introduction to Astro physics**, second printing, prentice - Hall of India Private limited, New Delhi.(Unit – I,II,III,V)

REFERENCE BOOKS:

1. *R. Murugesan*.2003.**Modern Physics**, [Eleventh revised edition], S. Chand & Company Ltd, New Delhi.
2. *Baker and Fredrick*.1964.**Astronomy**, [Ninth edition], Van No strand Rein hold, Co, New York.
3. *K.D Abyankar*,**Astrophysics of the solar system**,university press,India
4. *S. Kumaravelu*.1993.**Astronomy**, Janki calendar corporation, Sivakasi.

GUIDELINES

MARK DISTRIBUTION

1. SUBMISSION OF RECORD NOTE BOOKS AND PROJECT DISSERTATION:

Candidates appearing for Practical and Project &Viva-Voce Examinations shall submit Bonafide Record Note Books/ Dissertation prescribed for Practical/ Project Viva-voce Examinations, otherwise the candidates will not be permitted to appear for the Practical/ Project Viva-voce Examinations.

2. PASSING MINIMUM AND INTERNAL MARK DISTRIBUTION (Theory, Practical and Project)

A) THEORY :

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Theory paper with a passing minimum of 30 marks in External out of 75.

Internal Marks Distribution [CA - Total Marks: 25]

Attendance	: 05 marks
Assignment (3 Assignments)	: 05 marks
Internal Examinations	: 15 marks
Total	**: 25 marks**

B) i) THEORY: (If Internal Evaluation is for 100 Marks)

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks out of 100 in the Comprehensive Examination (Internal Evaluation only).

Internal Marks Distribution [CA - Total Marks: 100]

Attendance	: 10 Marks
Assignment and seminar	: 30 Marks (3 Assignments Compulsory)
Internal Examinations	: 60 Marks
Total	**: 100 Marks**

(ii) PRACTICAL

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Practical paper with a passing minimum of 24 marks in External out of 60.

***Internal Marks Distribution** [CA - Total Marks: 40]*

Experiments	: 10 Marks
Attendance	: 05 Marks
Record Submission	: 05 Marks
Internal Examinations	: 20 Marks
Total	**: 40 Marks**

***External Marks distribution** [CE - Total Marks: 60]*

Formula, symbol representation	: 10 Marks
Circuit , model graph	: 10 Marks
Observation	: 20 Marks
Calculation	: 10 Marks
Viva-Voce	: 05 Marks
Result	: 05 Marks
Total	**: 60 Marks**

(iii) PROJECT WORK /DISSERTATION

- The project work shall be carried out by group of students in the V semester and has to complete the work at the end of VI Semester.
- Upon completion of the project work/dissertation the candidate will be required to appear for a Viva-Voce conducted by an external examiner.
- The Student has to attend 3 reviews before completing his/her Project.
- All three reviews will be reviewed by Internal Resource Person.
- A candidate failing to secure the prescribed passing minimum in the dissertation shall be required to re-submit the dissertation with the necessary modifications.
- The assessment of students' performance in a semester is calculated by Continuous Internal Assessment (CA.) for 40 marks and External Assessment for 60 marks.

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Project with a passing minimum of 24 marks in External out of 60.

***Internal Marks Distribution** [CA -Total Marks: 40 Marks]*

Research Work done	: 10 marks
Attendance	: 05 marks
Observation	: 05 marks
Review	: 20 marks (3 reviews)
Total	**: 40 marks**

External Marks Distribution *[CE-Total Marks: 60 Marks]*

Project report	: 30 marks
Presentation	: 20 marks
Viva-Voce	: 10 marks
Total	**: 60 marks**

iv) METHODOLOGY OF ASSESSMENT – CAREER COMPETENCY SKILLS

On Line Objective Examination (Multiple Choice questions)- Semester III

- 100 questions-100 minutes
- Twenty questions from each UNIT.
- On line examination will be conducted at the end of the III Semester.

Viva –Voce Semester IV

- A Student has to come in proper dress code and he/she should bring 2 copies of Resume for the Viva Voce.
- A student may be asked to
    - Give Self Introduction
    - Submit the resume to the examiner(s) and answer the questions based on it.
    - Speak on any given topic for at least two minutes.
    - Give a presentation for 10 minutes on a topic of their choice.
    - Sit with other students in a Group for a Discussion.

3. QUESTION PAPER PATTERN: (Theory: for 75 marks)

1. PART – A (10 x 2 = 20 Marks)

   Answer ALL questions

   Two questions from each UNIT
2. PART – B (5 x 5 = 25 Marks)

   Answer ALL questions

   One question from each UNIT with Internal choice
3. PART – C (3 x 10 = 30 Marks)

   Answer ANY THREE questions

   Open Choice – 3 out of 5 questions

   One question from each UNIT

QUESTION PAPER PATTERN: (Theory: for 100 marks)

1. PART – A (10 x 2 = 20 Marks)

   Answer ALL questions

   Two questions from each UNIT

2. PART – B (5 x 7 = 35 Marks)

   Answer ALL questions

   One question from each UNIT with Internal choice

3. PART – C (3 x 15 = 45 Marks)

   Answer ANY THREE questions

   Open Choice – 3 out of 5 questions
   One question from each UNIT

ALLIED COURSE OFFERED BY THE DEPARTMENT

S.No	Subject code	Subject	Semester	Offered to the students of
1.	15UPHMAA101	Allied I :Physics I	I	B.Sc. Mathematics
2.	15UPHMAAP101	Allied Practical I: Physics	I	B.Sc. Mathematics
3	15UPHMAA201	Allied II : Physics II	II	B.Sc. Mathematics
4	15UPHMAAP201	Allied Practical II: Physics	II	B.Sc. Mathematics
5	15UPHCHA301	Allied III : Physics I	III	B.Sc. Chemistry
6	15UPHCHAP301	Allied Practical I: Physics	III	B.Sc. Chemistry
7	15UPHCHA401	Allied IV :Physics II	IV	B.Sc. Chemistry
8	15UPHCHAP401	Allied Practical II: Physics	IV	B.Sc. Chemistry