

## **BACHELOR OF PHYSICS**

### **REGULATIONS**

#### **ELIGIBILITY :**

A pass in Higher Secondary Examination in Academic stream or Vocational stream under Higher Secondary Board of Examination, Tamil Nadu with Physics as one of the subjects and as per the norms set by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **Bachelor of Physics Degree Examination** of this College after a course of study of three Academic years.


#### **OBJECTIVES OF THE COURSE :**

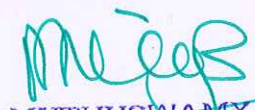
The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. Producing graduates who are well acquainted with the fundamentals of Physics and requisite skills, in order to use their knowledge in Physics in a wide range of practical applications.
2. Developing creative thinking and the power of imagination to enable graduates work in research in academia and industry for broader applications.
3. Relating the training of Physics graduates to the employment opportunities within the country.
4. To promote societal values through Physics related activities

**SCHEME OF EXAMINATIONS**

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
<b>First Semester</b>							
<b>Part - I</b>							
16UTL11T 15UHL11H 15UML11M 15UFL11F	Tamil-I Hindi-I Malayalam-I French - I	6	3	25	75	100	4
<b>Part - II</b>							
16UEG12E	English - I	6	3	25	75	100	4
<b>Part - III</b>							
16UPY13A	<b>CORE-- I:Mechanics, Properties of Matter and Acoustics</b>	6	3	25	75	100	4
16UMA1AC	<b>Allied- I: Mathematics -I</b>	7	3	20	55	75	3
	<b>Core Practical-I: General Experiments</b>	3	-	-	-	-	-
<b>Part - IV</b>							
15UFC1FA	Environmental Studies	2	3	-	50	50	2
		30				425	17
<b>Second Semester</b>							
<b>Part - I</b>							
16UTL21T 15UHL21H 15UML21M 15UFL21F	Tamil-II Hindi-II Malayalam-II French - II	6	3	25	75	100	4

  
 24/6/2016  
**BoS Chairman/HoD**  
 Department of Physics  
 Dr. N. G. P. Arts and Science College  
 Coimbatore - 641 048

  
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 PRINCIPAL  
 Dr. NGP Arts and Science College  
 Dr. NGP - Kalapatti Road  
 Coimbatore - 641 048  
 Tamilnadu, India

B.Sc - Physics (Students Admitted from 2016-17 Onwards)

Part - II							
16UEG22E	English - II	6	3	25	75	100	4
Part - III							
16UPY23A	<b>CORE-- II:</b> Heat and Thermodynami	6	3	25	75	100	4
16UPY23P	<b>Core Practical- I: General Experiments</b>	3	3	40	60	100	4
16UMA2AC	<b>Allied - I:</b> Mathematics- II	7	3	20	55	75	3
Part - IV							
15UFC2FA	Value Education: Human Rights	2	3	-	50	50	2
		<b>30</b>				<b>525</b>	<b>21</b>
Third Semester							
Part - I							
15UTL31U 15UHL31H 15UML31M 15UFL31F	Tamil-III Hindi-III Malayalam-III French - III	5	3	25	75	100	4
Part - II							
16UEG32E	English - III	5	3	25	75	100	4
Part - III							
16UPY33A	<b>CORE-III:</b> Optics	4	3	25	75	100	4
	<b>Core Practical- II: General</b>	2	-	-	-	-	-
16UCY3AA	<b>Allied - II:</b> Chemistry- I	4	3	20	55	75	3
	Allied Practical- I	3	-	-	-	-	-
Part - IV							
15UPY3SA	<b>Skill based Subject -I:</b> Principles of Programming Concepts and C Programming	3	3	20	55	75	3
	NMEC -I:	2	3	-	50	50	2
15UFC3FA	Tamil /	2	3	-	50	50	2

B.Sc - Physics (Students Admitted from 2016-17 Onwards)

15UFC3FB 15UFC3FC 15UFC3FD 15UFC3FE	Advanced Tamil (OR) (Yoga for Human Excellence)/ Women's Rights/ Constitution of India							
		30				550	22	
<b>Fourth Semester</b>								
<b>Part - I</b>								
15UTL41U 15UHL41H 15UML41M 15UFL41F	Tamil-IV Hindi-IV Malayalam-IV French - IV	5	3	25	75	100	4	
<b>Part - II</b>								
16UEG42E	English - IV	5	3	25	75	100	4	
<b>Part - III</b>								
16UPY43A	<b>CORE- IV:</b> Atomic Physics and Spectroscopy	4	3	25	75	100	4	
16UPY43P	<b>Core Practical- II: General</b>	2	3	40	60	100	4	
16UCY4AA	<b>Allied - II:</b> Chemistry -II	4	3	20	55	75	3	
16UCY4AP	<b>Allied Practical- I:</b> Chemistry	3	3	20	30	50	2	
<b>Part - IV</b>								
15UPY4SA	<b>Skill based Subject - II:</b> Object Oriented Programming with C++	3	3	20	55	75	3	
	NMEC -II:	2	3	-	50	50	2	
15UFC4FA 15UFC4FB 15UFC4FC	Tamil/ Advanced Tamil (or) General Awareness	2	3	-	50	50	2	
		30				700	28	

B.Sc - Physics (Students Admitted from 2016-17 Onwards)

<b>Fifth Semester</b>							
<b>Part - III</b>							
16UPY53A	<b>CORE- V:</b> Classical Mechanics and Mathematical Physics	4	3	25	75	100	4
16UPY53B	<b>CORE- VI:</b> Electricity and Magnetism	4	3	20	55	75	3
16UPY53C	<b>CORE-VII:</b> Applied Electronics	4	3	20	55	75	3
16UPY53D	<b>CORE-VIII:</b> Nuclear Physics	4	3	25	75	100	4
	<b>Core Practical- III:</b> General Experiments	3	-	-	-	-	-
	<b>Core Practical- IV:</b> Digital Electronics and Microprocessor	2	-	-	-	-	-
	<b>Core Practical- V:</b> Computer Programming	2	-	-	-	-	-
	Elective- I:	4	3	25	75	100	4
<b>Part - IV</b>							
15UPY5SA	<b>Skill based Subject III:</b> Digital Electronics	3	3	20	55	75	3
16UPY53T	<b>Industrial Training</b>	Grade A to C					
		<b>30</b>				<b>525</b>	<b>21</b>
<b>Sixth Semester</b>							
<b>Part - III</b>							
16UPY63A	<b>CORE- IX:</b> Quantum Mechanics and Relativity	5	3	25	75	100	4

B.Sc - Physics (Students Admitted from 2016-17 Onwards)

16UPY63B	<b>CORE-X:</b> Solid State Physics	5	3	25	75	100	4
16UPY63P	<b>Core Practical-III:</b> General Experiments	3	3	40	60	100	4
16UPY63Q	<b>Core Practical-IV:</b> Digital Electronics and Microprocessor	3	3	30	45	75	3
16UPY63R	<b>Core Practical-V:</b> Computer Programming	3	3	30	45	75	3
	Elective- II:	4	3	25	75	100	4
	Elective- III:	4	3	25	75	100	4
<b>Part - IV</b>							
15UPY6SA	<b>Skill based subject - IV:</b> Micro processors	3	3	20	55	75	3
<b>Part - V</b>							
16UEX65A	Extension Activity	-	-	-	50	50	2
		30				775	31
<b>GRAND TOTAL</b>						<b>3500</b>	<b>140</b>

### ELECTIVE - I

(Student shall select any one of the following subjects as Elective-I in Fifth semester)

S.No	Subject Code	Name of the Subject
1.	15UPY5EA	Material Science
2.	15UPY5EB	Energy Physics
3.	15UPY5EC	Agricultural Physics

### ELECTIVE - II

(Student shall select any one of the following subjects as Elective-II in Sixth semester)

S.No	Subject Code	Name of the Subject
1.	15UPY6EA	Fundamentals of Nano Science
2.	15UPY6EB	Optical Fibres and Fibre Optic Communication Systems
3.	15UPY6EC	Bio-Physics

### ELECTIVE - III

(Student shall select any one of the following subjects as Elective-III in Sixth semester)

S. No	Subject Code	Name of the Subject
1.	15UPY6ED	Space Physics
2.	15UPY6EE	Geophysics
3.	15UPY6EF	Medical Physics

**NON MAJOR ELECTIVE COURSES (NMEC)**

The Department offers the following two papers as Non Major Elective Course for other than the Physics students.

Student shall select the following subject as Non Major Elective Course during their third and fourth semester.

<b>S. No</b>	<b>Subject Code</b>	<b>Name of the Subject</b>
1	15UED34V	Everyday Physics -I
2	15UED44V	Everyday Physics -II



**Total Credit Distribution**

<b>Subjects</b>	<b>Credits</b>	<b>Total</b>		<b>Credits</b>	<b>Cumulative Total</b>
<b>Part I:</b> Tamil	4	4 X 100 =	400	16	32
<b>Part II:</b> English	4	4 X 100 =	400	16	
<b>Part III:</b>					
CORE-	4	8 X 100 =	800	32	82
	3	2 X 75 =	150	06	
CORE- Practical	4	3 X 100 =	300	12	
	3	2 X 75 =	150	06	
Allied	3	4 X 75 =	300	12	
Allied Practical	2	1 X 50 =	50	02	
Elective	4	3 X 100 =	300	12	
<b>Part IV:</b>					
Skill based Subject	3	4 X 75 =	300	12	24
NMEC	2	2 X 50 =	100	04	
Value Education	2	2 x 50=	100	04	
Environmental studied	2	1 X 50 =	50	02	
General Awareness	2	1 X 50 =	50	02	
<b>Part V:</b>					
Extension	2	1 X 50 =	50	02	02
<b>Total</b>			<b>3500</b>	<b>140</b>	<b>140</b>

### FOR COURSE COMPLETION

Students have to complete the following -Industrial training: Subject code: 16UPY53T.

- Students must undergo Industrial training for 15 – 30 days during IV Semester Summer Vacation. Evaluation of the Report done by the Internal and External Examiner in the V Semester. Based on their performance Grade will be Awarded as follows:
  - Grade 'A' - 75marks and above
  - Grade 'B' 60-74 marks
  - Grade 'C' 40-59 marks
  - Below 40 marks - Reappear (RA)

**Earning Extra credits is not mandatory for course completion**  
**Extra credits**

Subject	Credit	Total credits
BEC/ Self study courses	1	1
Hindi / French/ Other foreign Language approved by certified Institutions	1	1
Type Writing / Short Hand Course	1	1
Diploma/certificate/CPT/A CS Inter/ NPTEL Course	1	1
Representation - Academic/Sports /Social Activities/ Extra Curricular / Co-Curricular activities at University/ District/ State/ National/ International	1	1
<b>Total</b>		<b>5</b>

**Rules:**

The students can earn extra credits only if they complete the above during the course period (I to V sem) and based on the following criteria. Proof of Completion must be submitted in the office of the Controller of Examinations before the commencement of the VI Semester. (Earning Extra credits are not mandatory for Course completion)

1. Student can opt for BEC course/ Self-study course to earn one credit. They have to Enroll and complete any one of the courses during their course period before fifth semester (I sem to V sem).

**Self study paper offered by the PHYSICS Department**

S. No.	Semester	Course Code	Course Title
1.	I Sem. to V Sem.	16UPYSS1	Electrical and Electronic Appliances
2.		16UPYSS2	Biophysics and Biomedical Instrumentation

2. Student can opt Hindi/ French/ Other foreign Language approved by certified Institutions to earn one credit. The certificate(Hindi) must be obtained from **Dakshina Bharat Hindi Prachar Sabha** and He/ she has to enroll and complete during their course period ( **first to fifth semester**)
3. Student can opt for Type writing /short hand course to earn one extra credit. He/she has to enroll and complete the course during their course period to obtain certificate through **Tamil Nadu Board of Technical Education**
4. Student can opt for Diploma/certificate/CPT/ACS Inter/ NPTEL Course to earn one extra credit. Student who opt for Diploma/

Certificate course have to enroll any diploma/certificate course offered by Bharathiar University through our Institution. Student who opt for CPT/ ACS/CMA have to enroll and complete the foundation level during the course period. Students who opt for NPTEL course should complete the course certificate through NPTEL.

5. Award Winners in Academic/ Representation in Sports /Social Activities/ Extra Curricular/ Co-Curricular Activities at University/ District/ State/ National/ International level can earn one extra credit.

16UPY13A	CORE- I:MECHANICS, PROPERTIES OF MATTER AND ACOUSTICS	SEMESTER-I
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Total Credits: 4  
Hours/Week6

**OBJECTIVE :**

1. To enable students learn the basic principles, theory and concepts of Mechanics, Matter and Sound.

**CONTENTS**

**UNIT-I**

**Kinetic Energy and Work:** Work - Kinetic energy - Work - Kinetic energy Theorem - Work done by the gravitational force - work done by the spring force - work done by an applied force - Power

**Potential Energy and Conservation of Energy:** Work and Potential energy - Conservative and Nonconservative forces - Conservation of mechanical energy - Work done on a system by an external force - Conservation of energy.

**UNIT-II**

**Moment of Inertia:** Definition-conservation of angular momentum - torque - Parallel and perpendicular axes theorem - M.I. of rectangular Lamina and triangular lamina - M. I of a solid sphere.

**Simple harmonic motion:** Simple harmonic oscillator - potential energy and kinetic energy and their average values - Simple pendulum - Compound pendulum: graph between time period and distance from centre of gravity-Condition for minimum time period - Torsional pendulum.

**UNIT-III**

**Gravitation:** Kepler's Law of Planetary motion - Newton's Law of gravitation - Boy's method for G - Gravitational potential - Gravitational field at a point due to spherical shell - Variation of 'g' with latitude, altitude and depth.

**Elasticity:** Elastic modules - Poisson's ratio - relation between them - Expression for bending moment - Cantilever-determination of Young's modulus by non-uniform bending- I section girders.

#### UNIT-IV

**Surface Tension:** Surface Tension –Surface Energy-Excess of Pressure over a curved surface – Angle of Contact-Variation of surface tension with temperature – Jaeger’s Experiment.

**Viscosity:** Definition –Stoke’s law- Poiseuille’s formula-Rotation viscometer- Viscosity of gases– Meyer’s Modification of Poiseuille’s formula-Rankine’s method.

#### UNIT-V

**Theory of vibrations:** Simple Harmonic vibration – Progressive waves – properties – Composition of two S.H.M. and beats – stationary waves – Properties- Melde’s Experiment – Transverse and longitudinal modes

**Acoustics:** Acoustics of buildings: Requisites of good acoustics – Sabine’s reverberation formula. Ultrasonics-Production of ultrasonic waves: Magnetostriction method, Piezo electric method – Properties and application.

#### TEXT BOOKS :

1. *Robert Resnick, David Halliday and Kenneth S.Krane.* 2001. **Physics.** [10<sup>th</sup> Edition] Wiley India, New Delhi
2. *Brij Lal and Subrahmanyam N.* 2003. **Properties of Matter,** S.Chand and Co, New Delhi
3. *Brij Lal and Subrahmanyam N.* 2008. **A Text Book of Sound.** [2<sup>nd</sup> Edition], Vikas Publishing House, New Delhi

#### REFERENCE BOOKS :

1. *Murugesan R.* 2002. **Mechanics, Properties of matter and Sound.** S.Chand and Co, New Delhi
2. *Sears Semansky and Ground.* 2011. **University Physics.** [13<sup>th</sup> Edition] Addison-Wesley, Boston
3. *Ghosh M.* 1984. **A Text books of Sound.** Chand and Co, New Delhi
4. *Mathur D.S.* 2008. **Elements of Properties of Matter.** S. Chand and Co, New Delhi
5. *Mathur D.S.* 2006. **Mechanics.** S. Chand and Co, New Delhi

16UMA1AC	ALLIED-I: MATHEMATICS - I	SEMESTER - I
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Total credits: 3  
Hours Per Week:7

### OBJECTIVES :

1. On completion of this course the students should gain knowledge about solving equations, solving first and second order differential equations using Laplace transforms,
2. To know about the concept of Fourier series which will be useful in their field of study.

### CONTENTS

#### UNIT-I

**Theory of Equations:** Polynomial Equations with real coefficients : Imaginary and irrational roots - Transformation of equation by Diminishing or increasing its roots by a constant-Reciprocal Equation.

#### UNIT-II

**Matrices:** Eigen Values and eigen vectors, Cayley-Hamilton theorem (without proof) - Verification and computation of inverse.

#### UNIT-III

**Trigonometry:** Expansion of  $\cos n\theta$  and  $\sin n\theta$  in terms of powers of cosine and sine-Expansions of  $\cos^n\theta$ ,  $\sin^n\theta$  in powers of sine and cosine - hyperbolic functions.

#### UNIT-IV

**Laplace Transforms:** Definition-Standard forms of Laplace Transform - Linearity transformation- shift theorem-Transform of  $tf(t), f(t)/t$ .

#### UNIT-V

**Inverse Laplace transforms:** Inverse of standard functions -Application to solution of differential equations - Solving of simultaneous differential equation.

**TEXT BOOK :**

1. *Abdul Rasheed ,A. **Allied Mathematics.** 2006.*Tata McGraw-Hill Education (P) Ltd, Chennai.

**REFERENCE BOOKS :**

1. *Manichavasagam Pillai, T.K and Narayanan,S. 2002. **Trigonometry.** Viswanathan Publishers and Printers Pvt.Ltd.*
2. *Narayan,S and Manicavachagam Pillai,T.K. 2002. **Ancillary Mathematics.** Viswanathan Publishers and Printers Pvt.Ltd.*



16UPY23A	<b>CORE- II: HEAT AND THERMODYNAMICS</b>	<b>SEMESTER-II</b>
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**Total Credits:4  
Hours/Week6**

**OBJECTIVE :**

1. To enable students learn the basic principles and concepts of Heat and Thermodynamics

**CONTENTS**

**UNIT-I**

**Thermometry:** Temperature Coefficient of Resistance -- Platinum Resistance Thermometer - Thermocouple - Thomson Effect - Thomson Coefficient - Thermo Electric Thermometer - Helium Vapour Pressure Thermometer.

**Calorimetry:** Definitions - Newton's law of cooling - specific heat of a liquid-Joule's Electrical method- Calendar and Barne's continuous flow method - two specific heats of a gas - specific heat of a gas by Joly's differential steam calorimeter - Regnault's method - Dulong and Petit's law - variation of specific heat ad atomic heat with temperature.

**UNIT-II**

**Transmission of heat:** Conduction, Convection and Radiation-- Conduction - Co-efficient of the thermal conductivity - Cylindrical flow of heat - determination of thermal conductivity of rubber and glass - Lee's disc method. Radiation - Black body radiation - Wein's Law - Raleigh - Jean's Law - Stefan's law - Experimental Determination of Stefan's constant - Mathematical derivation of Stefan's law

**UNIT-III**

**Kinetic theory of gases:** Postulates -- Mean free path - Degrees of freedom - Maxwell's Law of Equipartition of energy - Distribution of Velocity -- Transport phenomena - Viscosity and thermal conduction of gases - Van der waals equation - Low Temperature physics - Temperature of Inversion - Liquefaction of Gases - Liquefaction of air by Linde's Process.

#### UNIT-IV

**Thermodynamics:** First law of Thermodynamics - Isothermal and Adiabatic process - Determination of  $\gamma$  by Clement and Desorme's method - Second law of thermodynamics - Carnot's engine- Working efficiency - Carnot's refrigerator - Carnot's Theorem - Otto Cycle - Petrol and Diesel engines.

**Statistical Thermodynamics:** Ensembles - Types - Microcanonical Ensemble - Canonical Ensemble - Grand Canonical Ensemble - Comparison of Ensembles.

#### UNIT-V

**Entropy:** Entropy Change Reversible and Irreversible process - Third law of Thermodynamics - Temperature - Entropy diagram - Entropy of a perfect gas - Increase of entropy in any irreversible process - Thermodynamic variables - Thermodynamic potentials - Maxwell's thermodynamics relations - Clausius and Clapeyron equation from Maxwell's equation.

#### TEXT BOOKS :

1. *Brij Lal and Subrahmanyam N.* 2010. **Heat and Thermodynamics.** S Chand and Co, New Delhi
2. *Murugesan R. and Kiruthiga Sivaprasath.* 2002. **Thermal Physics.** [1<sup>st</sup> Edition] S Chand and Co, New Delhi
3. *Brij Lal, Subrahmanyam N. and Hemne P.S.* 2014. **Heat Thermodynamics and Statistical Physics.** S Chand and Co, New Delhi

#### REFERENCE BOOKS :

1. *Zemansky and Deltanann R.H.* 2012. **Heat and Thermodynamics.** [8<sup>th</sup> Edition] McGraw-Hill, New York
2. *Mathur D.S.* 2002. **Heat and Thermodynamics.** S Chand and Co, New Delhi
3. *Agarwal Singhal and Sathyaprakash.* 2009. **Heat and Thermodynamics.** Pragati Prakashan, Meerut

<b>16UPY23P</b>	<b>CORE PRACTICAL - I: GENERAL EXPERIMENTS</b>	<b>SEMESTER-II</b>
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**Total Credits:4**  
**Hours/Week3**

**LIST OF EXPERIMENTS:**

**Any 12 Experiments**

1. Young's Modulus-Uniform Bending (Microscopic Method)
2. Young's Modulus-Non-uniform Bending (Microscopic Method)
3. Compound Pendulum - determination of 'g' and 'K'
4. Torsional Pendulum - Rigidity Modulus
5. Rigidity Modulus - Static Torsion
6. Spectrometer - Refractive Index of a glass Prism
7. Spectrometer - Grating- Minimum deviation & Normal Incidence
8. Moment of a Magnet - Tan C position
9. Viscosity - Poiseuille's Method
10. Meter Bridge- Temperature Coefficient of resistance
11. Meter Bridge- Specific Resistance of a material
12. Specific Heat capacity of a Liquid - Newton's method of cooling
13. Sonometer - Frequency of a tuning fork
14. Post office box- Determination of Temperature Coefficient of Resistance
15. Post office box- Determination of Specific Resistance

16UMA2AC	ALLIED-I: MATHEMATICS - II	SEMESTER - II
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Total credits: 3  
Hours / Week:7

### OBJECTIVES :

1. On successful completion of course the students should have series of knowledge about the curvature, Beta, Gamma functions and its application.
2. To Learn the partial differential equation types and integration of vectors.

### CONTENTS

#### UNIT-I

**Multiple Integrals:** Double Integrals - Evaluation of double integrals - Change of order of integration in double integrals - Triple Integral - Applications of double and triple integration.

#### UNIT-II

**Differential Calculus:** Introduction - Curvature and Radius of curvature - Gamma and Beta Function: Gamma function - Beta Function - Relation between Gamma and Beta Function.

#### UNIT-III

**Differential Equations:** Linear differential equations of second order with constant coefficient whose R.H.S is of the form  $ve^{mx}$ , where  $v$  is any function of  $x$  - Linear equations with variable coefficients.

#### UNIT-IV

Formation of partial differential equations by elimination of arbitrary constants and functions -Definitions of general, particular and complete solutions - Solving standard forms  $f(p, q) = 0$ ,  $f(x,p,q) = 0$ ,  $f(y,p,q) = 0$ ,  $f(z, p, q) = 0$ ,  $f(x,p) = f(y,q)$  - Lagrange's Differential equations  $Pp+Qq = R$ .

## UNIT-V

Scalar and vector fields -Differentiation of vectors - Gradient, Divergence and Curl -Integration of vectors - Line integral - Surface integral - Volume integral.

### TEXT BOOK :

1. *Duraipandian, P and Udhyabaskaran, S. Allied Mathematics Volume II*, S.Chand and Company Ltd, New Delhi.

### REFERENCE BOOKS:

1. *Abdul Rasheed ,A. Allied Mathematics*,Vijay Nicole imprints (P) Ltd,Chennai.
2. *Narayan,S and Manicavachagam Pillai,T.K. 2002.Ancillary Mathematics*. Viswanathan Publishers and Printers Pvt. Ltd.
3. *Kandasamy. P and Thilagavathi. K. 2004. Allied Mathematics II*. S.Chand and Company Ltd, New Delhi.

16UPY33A	CORE- III: OPTICS	SEMESTER-III
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Total credits:4

Hours/Week4

### OBJECTIVE :

1. To enable students understand the behavior of light, concepts in physical and geometrical optics and their applications.

### CONTENTS

#### UNIT-I

**Geometrical Optics:** Aberrations - Spherical aberrations in lens - Coma - Astigmatism - Chromatic aberration - dispersion by a prism - Cauchy's dispersion formula - dispersive power --Achromatism in prism - chromatic aberrations in a lens - achromatic lens - condition for achromatism of two thin lenses separated by a finite distances.

#### UNIT-II

**Interference:** Interference in thin films due to reflected light - Fringes produced by a wedge shaped thin film - Newton's rings - Refractive index of the Liquid - Michelson interferometer - Determination of a wavelength of monochromatic light - Difference -- Wavelength between two neighbouring spectral lines - Jamin's Refractometer - Rayleigh's Refractometer.

#### UNIT-III

**Diffraction:** Fresnel's assumptions - rectilinear propagation of light - half period zone - Zone Plates - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction at a Single slit, Double slit and Narrow slit- Diffraction grating - Determination of Wavelength -- Resolving power and Dispersive power of Grating.

#### UNIT-IV

**Polarization:** Brewster's law --Double Refraction - Huygen's explanation - Production and Detection of Plane, Circularly and Elliptically Polarized light - Optical Activity - Fresnel's explanation - Specific rotation - Laurent's Half Shade Polarimeter.

**Optical Instruments:** Eye pieces – Huygens and Ramsden eyepieces – Cardinal Points – Comparison. Microscopes – Electron Microscope, SEM, TEM, STEM.

#### UNIT-V

**Laser and Fibre Optics:** Spontaneous and Stimulated emission – Einstein's coefficient – Optical Pumping and Population Inversion – Lasing action -- He-Ne, CO<sub>2</sub>, Nd:YAG laser.

Optical fibres – Critical Angle – Modes of Propagation – Numerical Aperture and Acceptance Angle (Expression) – Types of Optical fibres – Fibre optic communication system – Fibre optic sensors.

#### TEXT BOOKS :

1. *Brij Lal and Subrahmanyam N.* 2006. **A Text book of Optics.** S Chand and Co, New Delhi
2. *Murugesan R. and Kiruthiga Sivaprasath Er.* 2008 **Modern Physics.** S Chand and Co, New Delhi
3. *Senthil Kumar I.G.* 2013. **Engineering Physics I.** VRB Publications, Chennai

#### REFERENCE BOOKS :

1. *Ajoy Ghatak.* 2006. **Optics.** [3<sup>rd</sup> Edition] Tata McGraw Hill Publishing Company Ltd, New York
2. *Murugesan R.* 2010. **Optics and Spectroscopy.** S Chand and Co, New Delhi.
3. *Thyagarajan K. and Ajoy Ghatak.* 2004, **Introduction To Fiber Optics.** Cambridge University Press, New Delhi

16UCY3AA	ALLIED: II - CHEMISTRY I	SEMESTER III
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**Total Credits:3**

**Hours/Week: 4**

### **OBJECTIVES :**

On successful completion of this course the students shall gain knowledge in the basics of chemistry which helps bioscience students to understand chemical bonding in the biomolecules and the techniques involved in the biochemistry.

### **CONTENTS**

#### **UNIT-I**

##### **Chemical bonding**

1. Molecular Orbital Theory - bonding, antibonding and nonbonding orbitals. MO configuration of  $H_2$ ,  $N_2$ ,  $O_2$ ,  $F_2$ - bond order - diamagnetism and paramagnetism.
2. Ionic Bond: Nature of ionic bond, structure of NaCl and CsCl, factors influencing the formation of ionic bond.
3. Covalent Bond: Nature of covalent bond, structure of  $CH_4$ ,  $NH_3$ ,  $H_2O$ , shapes of  $BeCl_2$ ,  $BF_3$ , based on VSEPR theory and hybridization.

#### **UNIT-II**

##### **Solutions**

1. Normality, molarity, molality, mole fraction, mole concept.
2. Preparation of standard solutions - primary and secondary standards.
3. Principle of Volumetric analysis.
4. Strong and weak acids and bases - Ionic product of water- pH, pKa, pKb, Buffer solution, pH and pOH simple calculations.

#### **UNIT-III**

##### **Basic Organic Chemistry**

1. Electron displacement effect in organic compounds - Inductive effect - Electromeric effect - Resonance effect, Hyperconjugation and Steric effect.



2. Isomerism, Symmetry of elements (Plane, Centre and Axis of symmetry), Molecules with one chiral carbon and two adjacent chiral carbons -Optical isomerism of lactic acid and tartaric acid, Enantiomers, Diastereomers, Separation of racemic mixture (chemical, mechanical, biochemical and kinetic), Geometrical isomerism (maleic and fumaric acid).

#### UNIT-IV

##### 1. Surface Chemistry

Adsorption - adsorbent and adsorbate, adsorption and absorption - chemisorption - physisorption - Difference between chemisorption and physisorption - applications of adsorption - Factors influencing adsorption, adsorption isobar, adsorption isostere.

2. Chromatography - Principles and applications of column, paper and thin layer Chromatography.

#### UNIT-V

##### Dyes

1. Terms used - chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic shift and hypochromic shift. Classification of dyes based on chemical structure and application-Preparation of azo (Methyl orange) and triphenyl methane (Malachite green) dyes.

#### TEXT BOOKS :

1. R. D. Madan. 2001. **Modern Inorganic Chemistry**. S. Chand & Company, New Delhi.
2. Puri, Sharma, Pathania. 2004. **Principles of Physical Chemistry**, Vishal Publishing Company, Jalandhar.
3. B.S.Bhal , Arun Bhal,1997. **Advanced Organic Chemistry**, S. Chand & Co Limited, New Delhi.
4. M. K. Jain, S. C. Sharma. 2001. **Organic Chemistry**, Shoban Lal Nayin Chand, Jalandhar.
5. Gopalan R. 1991.**Elements of Analytical Chemistry**, Sultan Chand & Sons, New Delhi.

15UPY3SA	<b>SKILL BASED SUBJECT-I : PRINCIPLES OF PROGRAMMING CONCEPTS AND C PROGRAMMING</b>	<b>SEMESTER-III</b>
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**Total credits:3  
Hours/Week3**

**OBJECTIVES :**

1. To enable students learn the basic principles and concepts of C Programming language

**CONTENTS**

**UNIT-I**

Introduction - character sets - constants - keywords - and identifiers - variables - variables - data types - declaration of variables - assigning values to variables - defining symbolic constants.

**UNIT-II**

Arithmetic operators - relational operators - logical operators - assignment operators - increment and decrement operators - conditional operators - special operators - arithmetic expression - evaluation of expression. - precedence of arithmetic operators - some computer problems - type conversion in expression - operator precedence and associativity - mathematical functions.

**UNIT-III**

Reading and writing character - formatted input and output - decision making : IF statement : Simple IF - IF ELSE - Nesting of IF.. ELSE - ELSE. IF Ladder - Switch Statement - operator - go to statement - while .. do while - For loop - Jumps in loops - simple programs.

**UNIT-IV**

Arrays : Introduction - One dimensional array - declaration of array - Initiating on two and multidimensional arrays - declaring and initializing string variables - reading strings from terminal - writing strings on the screen - Arithmetic operations on characters - simple programs.  
Need for user defined functions - A multifunction program - RETURN values and their types - functions calls - category of functions - no arguments and no return values - simple programs.

## UNIT-V

Conversion of Temperature from C to F and F to C - Determination of Velocity of Light - Foucault's Rotating Mirror method - Determination of G by Boy's Method - Young's Modulus - Uniform and Non Uniform method - Determination of Frequency: Sonometer - Spectrometer: Refractive index and Dispersive power of Prism - Newton's rings: Radius of Curve

### TEXT BOOKS :

1. *Balagurusamy E.* 2012. **Programming in ANSI C.** [6<sup>th</sup> Edition], Tata McGraw Hill Publishing Company Ltd, New York
2. *Karthikeyan E.* 2008. **A Textbook on C.** Prentice Hall India, New Delhi
3. *Palaniswamy S.* 2004. **Physics Through C Programming.** Pragati Publication.

### REFERENCE BOOKS :

1. *Ashok N. Kamthane.* 2011. **Programming in C.** [2<sup>nd</sup> Edition], Pearson Education, Chennai
2. *Yaswanth, Kanitkar.* 2012. **Let Us C.** [13<sup>th</sup> Edition], BPB Publication, New Delhi
3. *Gotfried B.* 2010. **Programming with C.** [3<sup>rd</sup> Edition], Tata McGraw Hill Publishing Company Ltd, New York

16UPY43A	CORE- IV:ATOMIC PHYSICS AND SPECTROSCOPY	SEMESER-IV
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Total credits:4  
Hours/Week4

**OBJECTIVE :**

1. To acquaint students with detailed study of an atom, its various states and the application of observed theories.

**CONTENTS**

**UNIT-I**

**Positive Rays:** Positive rays - Discovery - Properties - Positive ray analysis - Thomson's Parabola method - action of Electric and Magnetic fields - Determination of  $e/m$  - determination of mass - discovery of stable isotopes- Limitations - Dempster's mass spectrograph -Aston's mass spectrograph- mass defect and packing fraction - polarization of X-rays - scattering of X-rays (Thomson's formula)

**UNIT-II**

**Structure of the Atom:** The Bohr atom model (Bohr Formula and Total energy) - Critical Potentials - Method of excitation of atoms - Experimental determination of critical potentials by Davis and Goucher's method.

Sommerfield's relativistic model- Vector atom model - Quantum numbers associated with Vector atom model - coupling schemes (LS, JJ coupling) - Pauli's exclusion principle - Periodic classification of elements.

**UNIT-III**

**Magneto Optical Properties of Spectrum:** Magnetic dipole moment due to orbital motion of the electron - Magnetic dipole moment due to spin - The Stern and Gerlach experiment -Spin-Orbit Coupling.

Optical spectra - Fine Structure of the sodium D line - Zeeman effect - Experimental arrangement- Lorentz classical theory - Expression for the Zeeman shift - Larmor's theorem - Quantum mechanical explanation of the normal Zeeman effect - Anomalous Zeeman effect - Paschen - Back effect - Stark effect

#### UNIT-IV

**X-ray Spectra:** X-ray – Coolidge tube – Properties -- X-ray diffraction- Bragg's law- Bragg's spectrometer - Powder crystal method – Rotating crystal method- X-ray Spectra – Characteristics and Continuous X-ray spectrum – Moseley's law (Statement, Explanation and Importance) – Compton effect – Expression for change of wave length.

#### UNIT-V

**Molecular Spectra:** Origin of pure rotational spectra of a molecule -- Theory of the origin of vibration-rotation – Rayleigh's scattering - Raman Effect – Experimental study - Quantum Theory of Raman Effect – Applications – Ultraviolet Spectroscopy – Quartz Spectrograph for near U.V. region - Infrared Spectroscopy – Double beam Infrared spectrometer - Raman Spectroscopy.

#### TEXT BOOKS :

1. *Murugesan R and Kiruthiga Sivaprasath Er.* 2008. **Modern Physics.** S Chand and Co, New Delhi
2. *Arthur Beiser.* 2008. **Concepts of Modern Physics.** [7<sup>th</sup> Edition] Tata McGraw Hill Publishing Company Ltd, New York

#### REFERENCE BOOKS:

1. *Sehgal D.L, Chopra K.L and Sehgal N.K.* 1983. **Modern Physics.** S Chand and Co, New Delhi
2. *Galsstons S.* 2014. **Source book on Atomic Energy.** [3<sup>rd</sup> Edition], Krieger Publishing Company, Florida
3. *Rajam J. B.* 2010. **Atomic Physics.** S Chand and Co, New Delhi

<b>16UPY43P</b>	<b>CORE PRACTICAL - II: GENERAL EXPERIMENTS</b>	<b>SEMESTER - IV</b>
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**Total credits:4  
Hours/Week2**

**LIST OF EXPERIMENTS :**

**Any 12 Experiments**

1. Air wedge - Thickness of a wire
2. Young's Modulus - Koenig's Method - Non Uniform bending
3. Young's Modulus - Koenig's Method - Uniform bending
4. Spectrometer - (i-i) Curve
5. Spectrometer - (i-d) Curve
6. Comparison of Viscosities - Capillary Flow Method
7. Characteristics of a Junction Diode
8. Newton's rings - Refractive index of a lens
9. Potentiometer- Low range Voltmeter calibration
10. Potentiometer- Low range Ammeter calibration
11. Lee's Disc method - Thermal conductivity of a bad conductor
12. Viscosity - Stoke's Method
13. Carey Foster's Bridge - Temperature Coefficient
14. Zener diode - Characteristics
15. LASER- Determination on wavelength and particle size

<b>16UCY4AA</b>	<b>ALLIED: II - CHEMISTRY - II</b>	<b>SEMESTER IV</b>
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**Total Credits:3**

**Hours/Week: 4**

### **OBJECTIVES :**

On successful completion of this course the students shall gain knowledge in the basics of chemistry which helps bioscience students to understand the periodic table, IUPAC nomenclature of organic compounds, enzyme kinetics and water technology.

### **CONTENTS**

#### **UNIT-I**

##### **Periodic Table**

1. Long form of periodic table - Classification of elements on the basis of electronic configuration - Periodicity in properties - Causes of periodicity- and factors affecting the magnitude of electron affinity, ionization energy, electronegativity, atomic radii and ionic radii.

#### **UNIT-II**

1. Carbohydrates - Classification, preparation, properties and structure of glucose, fructose, inter conversion of glucose to fructose and fructose to glucose, mutarotation.
2. Vitamins - Sources of vitamins, diseases caused by the deficiency of vitamins.

#### **UNIT-III**

1. IUPAC Nomenclature of organic compounds - alkanes, alkenes, alcohols, aldehydes, ketones, carboxylic acids (mono and dicarboxylic), benzene and naphthalene derivatives.
2. Heterocyclic Compounds - Preparation and properties (physical, chemical and electrophilic substitution reactions) of furan, pyrrole, pyridine and thiophene.

## UNIT-IV

### Chemical Kinetics

1. Rate of reaction, rate law, order, molecularity, first order rate law, half life period of first order equation, pseudo first order reaction, zero and second order reactions. Derivation of rate expression for I and II order kinetics.
2. Catalysis - homogenous, heterogeneous and enzyme catalysis (definition only), enzymes used in industry, characteristics of catalytic reactions.

## UNIT-V

### Water Technology:

1. Introduction- dissolved impurities in water - hard water - disadvantages of hard water, hardness, estimation of hardness by EDTA titration.
2. Softening methods - zeolite ,demineralization process, reverse osmosis - purification of drinking water, biological oxygen demand (BOD) and chemical oxygen demand (COD).

### TEXT BOOKS :

1. *R. D. Madan. 2001. Modern Inorganic Chemistry. S. Chand & Company, New Delhi,*
2. *Puri , Sharma, Pathania. 2004.Principles of Physical Chemistry, Vishal Publishing Company, Jalandhar.*
3. *M. K. Jain, S. C. Sharma. 2001. Organic Chemistry, Shoban Lal Nayin Chand, Jalandhar.*
4. *Gopalan R. 1991.Elements of Analytical Chemistry, Sultan Chand & Sons, New Delhi.*
5. *N Krishnamurthy, K Jeyasubramanian, P Vallinayagam.2000. Applied chemistry, Tata McGraw-Hill Publishing Company limited, New Delhi.*



16UCY4AP	ALLIED PRACTICAL I : CHEMISTRY	SEMESTER IV
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Total Credits:2  
Hours/Week: 3

## CONTENTS

### I VOLUMETRIC ANALYSIS :

1. Estimation of Sodium Hydroxide using standard Sodium Carbonate.
2. Estimation of Hydrochloric acid using standard Oxalic acid.
3. Estimation of Oxalic acid using standard Sulphuric acid.
4. Estimation of Ferrous sulphate using standard Mohr salt solution.
5. Estimation of Oxalic acid using standard Ferrous sulphate solution.
6. Estimation of Ferrous ions using Mohr salt solution.

### II ORGANIC ANALYSIS :

1. To distinguish between aliphatic & aromatic.
2. To distinguish between saturated & unsaturated.
3. Detection of Elements (N, S, Halogens).
4. Functional group tests for phenols, acids (mono & di), aromatic primary amine, monoamide, diamide, carbohydrate.  
Functional group characterized by Confirmatory test.

### TEXT BOOK :

1. *V. Venkateswaran, R. Veeraswamy & A. R. Kulandaivelu. 2004. Basic Principles of practical chemistry, Sultan Chand & Co.*

15UPY4SA	<b>SKILL BASED SUBJECT - II: OBJECT ORIENTED PROGRAMMING WITH C++</b>	<b>SEMESTER-IV</b>
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**Total credits:3**  
**Hours/Week3**

### **OBJECTIVES :**

1. To enable students learn the basic principles and concepts of Object Oriented Programming with C ++

### **CONTENTS**

#### **UNIT-I**

Software evolution - Procedure Oriented programming object oriented programming (OOP) - Basic concepts benefits of OOP - Object oriented languages - Application of OOP - A simple C++ program - Structure of C++ program- Tokens - Key words- Identifiers and constants Basic data types - User defined Data Types - Derived data types - symbolic constants - Type compatibility - Declaration of variables - Dynamical Initialization of variables - Reference variables - Operators in C++ - Scope resolution operators.

#### **UNIT-II**

The main function - Function prototyping - Call by reference - Return by reference - Inline functions - Default arguments - Constant Arguments - Function overloading - Math library functions - classes and objects.

#### **UNIT-III**

Specifying a class - Defining Member Functions - Static Data Members - Static Member Functions - Arrays of Objects - Objects as Function arguments - Friend Functions - Return Objects - Constant Member Functions - Pointers to Members. Constructors and Destructors - copy constructor - dynamic constructor - constant objects - operator overloading and type conversions - overloading Unitary and Binary operators

#### **UNIT-IV**

Inheritance : Single, Multilevel, Multiple, Hierarchical and Hybrid - Extending classes - Pointers- Polymorphism - pointers to objects - this

pointer pointers to derived classes - Virtual functions - pure virtual functions - Managing console I / o operators.

#### **UNIT-V**

Classes or File stream operations - Opening and closing a file - Text file operations - Binary file operations - Error handling during file operations.

Templates: Function templates - Class Templates - Member Functions.  
Exception Handling: Basics and Mechanism.

#### **TEXT BOOKS :**

1. *Balagurusamy E.* 2013. **Object Oriented Programming with C++** [6<sup>th</sup> Edition], Tata McGraw Hill Publishing Company Ltd, New York
2. *John R. Hubbard.* 2000. **Programming with C++**. [2<sup>nd</sup> Edition], Tata McGraw Hill Publishing Company Ltd, New York

16UPY53A	<b>CORE - V: CLASSICAL MECHANICS AND MATHEMATICAL PHYSICS</b>	<b>SEMESTER-V</b>
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**Total Credits:4  
Hours/Week4**

**OBJECTIVE :**

1. To enable students acquire the problem solving ability and to apply the equations for different physical problems.

**CONTENTS**

**UNIT-I**

**Lagrangian Formulation**

Constraints and Degrees of Freedom - Generalized coordinates - Generalized displacement - Velocity - Acceleration - Momentum - Force - Potential Energy - D'Alembert's Principle - Lagrangians equation from D'Alembert's principle - Application of Lagrange's equation of motion to Linear Harmonic Oscillator, Simple Pendulum and Compound Pendulum.

**UNIT-II**

**Hamiltonian Formulation**

Phase Space - Hamiltonian function - Hamiltonian Principle - Hamilton's canonical equations of motion- Physical significance of H - Applications of Hamiltonian equations of motion to Simple Pendulum, Compound Pendulum and Linear Harmonic Oscillator - Principle of Least Action - Canonical Transformations - Generating Functions - Advantages and Examples of Canonical Transformations.

**UNIT-III**

**Matrices:** Basic ideas of matrices - addition, subtraction, scalar multiplication, Transpose of a matrix, conjugate of a matrix, diagonal matrix - Representation of vectors as column matrix - Determinants - Cramer's rule - Eigen Values and Eigen Vectors - Hermitian Matrix, Unitary Matrix.

**Vector Analysis:** Vector Operations - Vector Algebra - Component form - How vectors transform, Applications of vectors in Physics.

## UNIT-IV

**Integral Calculus:** Line integral, surface integral and volume integral – Fundamental theorem of Gradients – Gauss’s Divergence Theorem (Statement only) – The fundamental theorem of curl – Stoke’s theorem(Statement only). Divergence less and curlless fields. Curvilinear co-ordinates: – Spherical polar coordinates – cylindrical coordinates (Basic ideas).

**Differential Calculus:** The operator  $\Delta$  - Gradient, Divergence, Curl – Physical interpretation - Product rules of  $\Delta$  - Second derivatives.

## UNIT-V

### Special Functions

Definitions – The Beta function – Gamma function – Evaluation of Beta function – Other forms of Beta function – Evaluation of Gamma function – Other forms of Gamma function - Relation between Beta and Gamma functions – Problems.

### TEXT BOOKS :

1. *Gupta B.D.* 2004. **Mathematical Physics.** [3<sup>rd</sup> Edition], Vikas Publishing House, New Delhi
2. *Gupta, Kumar and Sharma.* 2012. **Classical Mechanics.** Pragati Prakashan, Meerut
3. *Sathiya Prakash.* 2014. **Mathematical Physics.** [6<sup>th</sup> Edition] S Chand and Co, New Delhi
4. *David J. Griffiths.* **Introduction to Electrodynamics –**, Prentice Hall India Pvt. Ltd.,

### REFERENCE BOOKS :

1. *Rajput B.S.* 2011. **Mathematical Physics.** [23<sup>rd</sup> Edition], Pragati Prakashan, Meerut
2. *Dass H.K.* 2010. **Mathematical Physics.** S Chand and Co, New Delhi

16UPY53B	<b>CORE- VI: ELECTRICITY AND MAGNETISM</b>	<b>SEMESTER-V</b>
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**Total credits:3  
Hours/Week4**

**OBJECTIVE :**

1. To enable students learn the basic principles, theories and concepts of electricity and magnetism.

**CONTENTS**

**UNIT-I**

**Gauss theorem and its applications:** Gauss Law - Applications - Field due to a uniformly charged sphere - Field due to an infinite plane sheet of charge - Field due to two parallel sheets of charge - Coulomb's Theorem - Mechanical force experienced by unit area of a charged conductor - Energy stored per unit volume in the medium surrounding the charged conductor - Deduction of Coulomb's inverse square law from Gauss's law.

**UNIT-II**

**Thermo-electricity :** Seebeck effect - Laws of thermo e.m.f - Peltier effect; determination of Peltier Coefficient Starling Method - thermo dynamical consideration of Peltier effect - Thomson effect - Thomson co-efficient - Thermodynamics of Thermocouple - Expressions for Peltier and Thomson coefficients -Thermoelectric diagrams and their uses.

**UNIT-III**

**Varying currents:** Growth and decay of currents in L-R circuit - charging and discharging of capacitor in C-R circuit - Decay of charge in LCR circuit - Importance in wireless Telegraphy.

**Alternating current:** Mean and RMS values of current and emf with sinusoidal wave form - LR, CR and series LCR circuits - reactance - impedance - phase-angle - power factor - vector diagram - resonance in a series LCR circuit - Q-factor - Vector diagram - Parallel Resonant Circuit - Comparison between series and parallel resonant circuits.

#### UNIT-IV

**Magnetic Effects of Electric current:** Biot-Savart Law - Force on a current carrying conductor - Force between two parallel current carrying conductors - Force experienced by an electron moving in a magnetic field - Torque on a current loop in a uniform magnetic field - Moving Coil Ballistic Galvanometer - Correction for damping - Dead beat - Comparison of two capacitances using BG. Ampere's circuital law (statement only) - Magnetic field due to a straight conductor, circular coil, solenoid, endless solenoid, Magnetic field due to a small current loop .

#### UNIT-V

**Magnetic Properties of materials:** Basic definitions - Magnetic field B - Magnetization M -- Magnetic field intensity H -- Magnetic Susceptibility and Magnetic Permeability -- dia, para, ferromagnetism and their properties - Antiferromagnetism and Antiferromagnetism - The Electron theory of Magnetism. Magnetic hysteresis - area of the hysteresis loop - energy loss -- Determination of susceptibility- Curie Balance method - Magnetic circuits - Circuits comparison of magnetic application with electrical circuits.

#### TEXT BOOKS :

1. *Murugesan R.* 2011. **Electricity and Magnetism.** [9<sup>th</sup> Edition], S Chand and Co, New Delhi.
2. *Brijlal and Subramaniam.* **Electricity and Magnetism.** S Chand and Co, New Delhi

#### REFERENCE BOOKS :

1. *Vasudeva D.N.* 2011. **Fundamentals of Magnetism and Electricity.** S Chand and Co, New Delhi
2. *Duggal B.D. and Chhabra C.L.* **Fundamental of Electricity and Magnetism** Vishal Publishing Co, Jalandhar.
3. *Robert Resnick, David Halliday and Kenneth S.Krane.* 2001. **Physics.** [5<sup>th</sup> Edition] Wiley India, New Delhi
4. *Griffiths. D.J.* 2006. **Introduction to Electrodynamics.** Pearson Prentice Hall, New Delhi.

16UPY53C	<b>CORE- VII: APPLIED ELECTRONICS</b>	<b>SEMESTER-V</b>
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**Total credits:3**  
**Hours/Week4**

### **OBJECTIVE :**

1. To make students learn fundamentals of electronics and apply in their everyday life

### **CONTENTS**

#### **UNIT-I**

##### **Semiconductor Fundamentals and devices:**

Energy band in solids - Types of semiconductors - majority and minority charge carriers.

**Diodes, Rectifiers and Filters** Characteristics of PN Junction – Zener diode - Zener diode as voltage regulator - Half wave and Full wave rectifier - Bridge rectifier and ripple factor -- Filter circuits.

**Special purpose diodes:** LED, Photodiode and Tunnel diode, SCR.

#### **UNIT-II**

**Transistor and Transistor biasing:** Transistor action - Common Emitter and Common base connections - Relation between  $\alpha$  and  $\beta$  - Characteristics of CE connection - Transistor load line analysis - DC load line - Operating point.

Need for transistor biasing - Stabilization - Essentials of transistor biasing circuit - Stability factor - Base resistor method for transistor biasing - Voltage driver biasing

#### **UNIT-III**

**Amplifiers:** Voltage and power amplifiers - Classification of amplifiers - RC coupled Amplifier - Transformer coupled amplifier - Power amplifiers - Class A, Band C amplifiers - Push-Pull amplifiers.

**Oscillators:** Introduction - Types of oscillators - Fundamental principle of oscillators--Hartley oscillators - Colpitts oscillators - Phase shift oscillators - Wien bridge oscillators- Crystal oscillators.

#### **UNIT-IV**

**Modulation and Demodulation:** Modulation -- Types - Amplitude Modulation - Modulation factor - Analysis of AM wave -Side band frequencies in AM wave - Transistor AM modulator - Power - Limitations of AM-- Frequency modulation - Demodulation - AM diode



detector – AM radio receivers – super heterodyne receiver – FM detection.

Multivibrator – Types of multivibrator – Astable – Monostable – Bistable multivibrators.

#### **UNIT-V**

**Power Electronics:** JFET – Difference between JFET and BJT – Principle and working of JFET – Characteristics and Parameters of JFET.

MOSFET – Working, characteristics of Depletion and Enhancement MOSFET

Uni junction transistor – Constructions – Operations - equivalent circuit of UJT – Characteristics of UJT - advantages of UJT – UJT relaxations Oscillator.

#### **TEXT BOOKS :**

1. *Metha V.K. and Mehta R.* 2010, **Principles of Electronics**, [11<sup>th</sup> Edition], S Chand and Co, New Delhi
2. *B L Theraja.* 2006. **Basic Electronics**. S Chand and Co, New Delhi.
3. *Millman J. Halkias C. and Chetan Parikh.* 2009, **Integrated Electronics**, [2<sup>nd</sup> Edition] Tata McGraw Hill Publishing Company Ltd, New York

#### **REFERENCE BOOKS :**

1. *Chattopadhyaya D. and Rakshit P.C.* 2014. **Foundation of Electronics**. New Age International, New Delhi
2. *Murugesan R and Kiruthiga Sivoaprasath Er.* 2008. **Modern Physics**. S Chand and Co, New Delhi
3. *Sedha R.S.* 2008. **A Text Book of Applied Electronics**. [3<sup>rd</sup> Edition], S Chand and Co, New Delhi
4. *Millman and Halkias.* 1967. **Electronics Devices and Circuits**. Tata McGraw Hill Publishing Company Ltd, New York

16UPY53D	<b>CORE- VIII: NUCLEAR PHYSICS</b>	<b>SEMESTER-V</b>
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**Total credits:4**  
**Hours/Week4**

### **OBJECTIVES :**

1. To make students acquire fundamental knowledge about the theoretical concepts of Nuclear Physics and elementary particles

### **CONTENTS**

#### **UNIT-I**

**Introduction to the Nucleus:** General properties of Nucleus (Size, Mass, Density, Charge, Spin, Angular momentum, Magnetic dipole moment) – Binding energy – Packing fraction – Nuclear stability – Nuclear forces – Definition – Properties – Meson theory – Model of Nuclear Structure – The Liquid Drop model – Semi-Empirical mass formula – The Shell model – Evidence for Shell model –The collective model.

#### **UNIT-II**

**Particle Accelerators and Detectors:** Interaction between the energetic particles and matter – Heavy charged particles - Ionization chamber – Solid State detector – GM counter – Wilson Cloud chamber – Diffusion cloud chamber - Nuclear emission – Linear accelerators – Cyclotron – Betatron – Synchrotron.

#### **UNIT-III**

**Radioactivity:** Natural Radioactivity – Alpha, Beta and Gamma rays – Properties – Determination of  $e/m$  of Alpha particle – Determination of Charge of Alpha particle – Determination of  $e/m$  of Beta particle – determination of Wavelength of Gamma rays (Du Mond Spectrometer) – Origin of Gamma rays – Laws of Radioactivity – Soddy-Fajan's displacement law – Law of Radioactive disintegration – Half life period – Mean life period (Definitions, Expression) – Artificial Radioactivity – Preparation of radio elements – Application of radio isotopes.

#### **UNIT-IV**

**Nuclear Fission:** Nuclear fission – Energy released in Fission – Bohr and Wheelers theory of Nuclear fission – Chain reaction – Multiplication

factor - Critical size - Natural Uranium and chain reactions - Atom Bomb - Nuclear reactor.

**Nuclear Fusion:** Nuclear fusion - Source of Stellar energy - Carbon Nitrogen cycle - Proton-Proton cycle - Hydrogen bomb - Controlled thermo nuclear reactions.

#### UNIT-V

**Cosmic rays:** Cosmic rays - Origin of cosmic rays - Latitude effect - Azimuth effect - Attitude effect - Seasonal, Diagonal changes - Primary and Secondary Cosmic rays cascade theory of shower - Pair production and Annihilation - Van Allen Belts.

**Elementary particles:** Introduction - particles and antiparticles - Antimatter - The fundamental interactions - Classification of elementary Particles - The Quark model.

#### TEXT BOOKS :

1. *Murugesan R. and Kiruthiga Sivaprasath Er.* 2008. **Modern Physics.** S Chand and Co, New Delhi
2. *Tayal D.C.* 2011. **Nuclear Physics.** Himalaya Publishing House, Mumbai

#### REFERENCE BOOKS :

1. *Arthur Beiser.* 2008. **Concepts of Modern Physics.** [6<sup>th</sup> Edition], Tata McGraw Hill Publishing Company Ltd, New York
2. *Richtmyer F.K.* 1956. **Introduction to Modern Physics.** Tata McGraw Hill Publishing Company Ltd, New York

15UPY5EA	<b>ELECTIVE- I: MATERIAL SCIENCE</b>	<b>SEMESTER-V</b>
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**Total credits:4  
Hours/Week4**

**OBJECTIVE :**

1. To enable students to acquire the fundamental knowledge in Mechanical behavior of materials and dielectrics.

**CONTENTS**

**UNIT-I**

**Engineering materials and chemical bonding**

Classification of engineering materials - levels of structure - structure-property relationship in materials - stability and metastability - bond energy - bond type and bond length - ionic and covalent bonding - variation in bonding character and properties.

**UNIT-II**

**Mechanical behavior of materials**

Elastic behavior - atomic model of elastic behavior - Young's modulus - Poisson's ratio - shear modulus - bulk modulus - the modulus as a parameter of design - rubber like elasticity - plastic deformation - tensile stress - strain curve.

**UNIT-III**

**Magnetic materials and dielectric materials**

Terminology and classification - magnetic moment due to electron spin - ferromagnetism and the domain structure - soft and hard magnetic materials. Polarization - electronic, ionic, orientation and space charge polarization - temperature and frequency effects - electric breakdown - ferroelectric materials.

**UNIT-IV**

**Smart Materials**

Definition of smart materials - Types- Piezoelectric materials-Materials for MEMS and NEMS- Ferrofluid- Magnetic shape-memory alloys (MSMAs)- Shape memory alloy (SMA)- One way and Two way memory effect- Dielectric elastomers (DEs)- Light sensitive materials- Smart catalysts

## UNIT-V

### **Non-destructive testing**

Radiographic methods - photo-elastic methods - magnetic methods - electrical method - ultrasonic method. Equipments used for NDT - metallurgical microscope - electron microscope - scanning electron microscope (SEM).

### **TEXT BOOKS :**

1. *Raghavan, V.* 1990. **Materials Science and Engineering - A first course.** [3<sup>rd</sup> Edition] Prentice Hall, New Delhi
2. *Arumugam.* 1990. **Materials Science.** Anuradha agencies & publishers.
3. *Gandhi, M.V. and Thompson, B.S.* 1992. **Smart Materials and Structures.** Chapman & Hall.

### **REFERENCE BOOKS :**

1. *Kittel C.* 2012. **Introduction to Solid State Physics.** [8<sup>th</sup> Edition], Wiley India, New Delhi
2. *Manchandra V.K.* 1992. **A Text Book of Materials Science.** New India Publishing House.
3. *Myer Kutz,* 2006. **Mechanical Engineers' Handbook: Materials and Mechanical Design.** [3<sup>rd</sup> Edition], John Wiley & Sons, Inc.
4. *Culshaw B Smart,* 1996. **Structures & Materials.** Artech House.

<b>15UPY5EB</b>	<b>ELECTIVE- I: ENERGY PHYSICS</b>	<b>SEMESTER-V</b>
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**Total credits:4**  
**Hours/Week4**

**OBJECTIVE :**

1. To enable students learn fundamentals of energy sources and its applications.

**CONTENTS**

**UNIT-I**

**ELECTRICAL ENERGY**

Heat developed in current carrying conductor - Application of heating effect - Electric heater or stove - Electric radiation and Electric Iron - Electric welding and electric furnace - Carbon arc - Electric Lamp - Efficiency of a Lamp - Measurement of Electric Power.

**UNIT-II**

**OPTICAL ENERGY**

Characteristics of Light - Light sources - LED, LASER - optical fibre - Light propagation through optical fibres: Basic optical laws used in optical fibres - Optical parameters of optical fibres: Acceptance angle and Numerical aperture - Types of optical fibres: Based on material, Number of modes and refractive index profile - Fibre optical communication system - Block Diagram - Source - Transmitter - Optical fibre - Receiver.

**UNIT-III**

**ATOMIC AND MOLECULAR ENERGY**

Degrees of freedom - Number of Degrees of Freedom of Mono, Di and Tri Atomic system - Maxwell's Law of equipartition of Energy - Molar Specific heat capacity at constant volume and constant pressure - Total Internal Energy and Ratio of Heat capacities in monoatomic gas, Diatomic gas, Non Linear and Linear type of Tri atomic gas molecular system. Gas and Vapour Distinction - Measurement of saturated and unsaturated vapour Pressure: Regnault's statistical method - Their characteristics - Graphical Illustration of Gas laws.

## UNIT-IV

### THERMAL ENERGY

Definition of Total thermal Energy density - Spectral Energy density - Spectral Emissive power - Emissivity - Emissive power - Absorptive power - Reflective power - Kirchoff's Law of radiation and its proof - verification of Kirchoff's Results: Ritchie's Experiment. Distribution of Energy in the thermal spectrum - Lummer and Pringsheim Experiment and its Results - Wien's Displacement Law and Radiation Law - Rayleigh Jean's Law Planck's Radiation Law - Deduction of Wien's Law and Rayleigh - Jean's Law from Planck's law. Solar constant - Temperature of sun - Disappearing filament optical Pyrometer - Pyroheliometers: Angstrom Pyroheliometer - Water flow Pyroheliometer.

## UNIT-V

### NON CONVENTIONAL ENERGY

**SOLAR ENERGY:** Solar radiation - Solar radiation outside the earth's atmosphere Solar radiation at the earth's surface - Solar Thermal Energy - Solar Thermal devices and systems: Solar water heater - Sub components of solar water heater - Solar Cooker and its merits and demerits.

**WIND ENERGY:** Power in the wind - Types of wind energy systems - Horizontal axis wind Turbine - Vertical axis wind Turbine.

**OCEAN ENERGY:** Tidal Energy - Ocean Thermal Energy Conversion (OTEC) - Closed Cycle OTEC system - Open Cycle OTEC System.

### TEXT BOOKS :

1. *Rai G.D.* 2004. **Solar Energy Utilization.** Khanna Publishers, New Delhi.
2. *Brij Lal and Subrahmanyam N.* 2010. **Heat and Thermodynamics.** S Chand and Co, New Delhi
3. *Maheshwar Dayal.* 1991. **Renewable Energy Environment and Development.** Konark Publication, New Delhi
4. *Sukhatme S.P. and Nayak J. K.* 2009. **Solar Energy.** [3<sup>rd</sup> Edition], Tata McGraw Hill Publishing Company Ltd, New York

**REFERENCE BOOKS :**

1. *Brijlal and Subramanyam N.* 2001. **Electricity and Magnetism.** S Chand and Co, New Delhi
2. *Senthil Kumar I.G.* 2013. **Engineering Physics.** VRB Publications, Chennai
3. *Singhal, Agarwal and Prakash.* 2009. **Thermodynamics and Statistical Physics.** Pragati Prakashan, Meerut
4. *Mathur D.S.* 2002. **Heat and Thermodynamics.** S Chand and Co, New Delhi
5. *Rajam J.B. and Arora C.L.* 1981. **A Text Book of Heat and Thermodynamics.** S Chand and Co, New Delhi



15UPY5EC	<b>ELECTIVE- I: AGRICULTURAL PHYSICS</b>	<b>SEMESTER-V</b>
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**Total credits:4  
Hours/Week4**

**OBJECTIVE :**

1. To make students aware of the different concepts of Physics in Agriculture and its varied applications.

**CONTENTS**

**UNIT-I**

**SOIL PHYSICS**

Mechanical composition of soil – physical properties of soil, pore space, bulk density, particle density – classification – significance of clays – plasticity, shrinkage, flocculation and deflocculation – Soil structure – soil colour – Thermal properties of soil and soil temperatures types of soil water – its retention, movement – viscosity, swelling – soil moisture losses – Elementary ideas of soil water conservation.

**UNIT-II**

**WATER PHYSICS**

Water qualities – Rain fall – Ground water – surface water pollution – instrumentation and sampling – water quality monitoring

**UNIT-III**

Principle of production of A.C. – Average value of A.C. voltage or current – R.M.S. value of alternating voltage or current – power consumed in A.C. Circuits – kilo watt hour – A.C. generator – Three phase A.C. – Distribution of three phase A.C. Three phase four system – The choke-The transformer – Transmission of electric power over long distances.

**UNIT-IV**

**HYGROMETRY**

Absolute Humidity – Relative Humidity – Dew point, Daniell's Hygrometer, Regnault's hygrometer. Advantages of Regnault's hygrometer – wet and Dry and Bulb hygrometer

## PUMPS

Water pumps - common pump - force pump - Fire engine, inflator (or) compression pump - pressure after n strokes - Exhaust pump (or) common air pump.

## UNIT-V

### SOLAR COLLECTOR AND APPLICATIONS

Solar Air heaters- Application of solar air heaters. Solar Drying with various driers - Heating and Drying of Agricultural products - Theory of solar drying - moisture content and its measurement - solar ponds - Application of solar ponds - Solar pumping - Solar pump system components - Turbine driven pump - Application of solar energy to agricultural crops.

### TEXT BOOKS :

1. *Brij Lal and Subrahmanyam N.* 2010. **Heat and Thermodynamics.** S. Chand and Co, New Delhi
2. *Mathur D.S.* 2006. **Mechanics.** S Chand and Co, New Delhi
3. *Rai G.D.* 2004. **Solar Energy Utilization.** Khanna Publishers, New Delhi

### REFERENCE BOOKS :

1. *Buckman H.O. and Brady.* 1990. **Nature and properties of Soil.** [10<sup>th</sup> Edition], Maxwell Macmillan International, London
2. *William A. Jury, Wilford R. Gardner and Hale Gardner W.* 1972. **Soil physics.** Wiley, New York
3. *Kohnke H.* 1988. **Soil physics.** Tata McGraw Hill Publishing Company Ltd, New York
4. *John C. Rodda, Richard A. Downing, Frank M. Law,* 1976, **Systematic Hydrology,** Newnes Butterworths

15UPY5SA	<b>SKILL BASED SUBJECT-III : DIGITAL ELECTRONICS</b>	<b>SEMESTER-V</b>
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**Total credits:3  
Hours/Week3**

**OBJECTIVE :**

1. To enable students learn the basic concepts Number System, Boolean Algebra and its applications.

**CONTENTS**

**UNIT-I**

**Number System, Binary Arithmetic and Codes**

Binary Numbers- Octal numbers- Hexadecimal numbers (Conversion of one number system into other)

Arithmetic operation - Binary Addition - Binary subtraction - 1's complement subtraction - 2's complement subtraction

Codes - Binary coded decimal - BCD addition and subtraction - Weighted binary codes - Non- weighted codes- Excess 3 codes - Grey code - Error detection and correction codes - ASCII & EBCDIC codes

**UNIT-II**

**Boolean algebra and Minimization techniques**

Boolean logic operations - Logic AND, OR, NOT, ExOR, NOR, ExNOR operations - Basic laws of Boolean algebra - Boolean addition and multiplication - Properties of Boolean algebra - De Morgan's theorems. Minimization and Boolean expressions - Minimization using algebraic method - SOP and POS - Minterm - Maxterm - Karnaugh map (upto four variables only)

**UNIT-III**

**Logic gates and Arithmetic Circuits**

OR, AND, NOT, NAND, NOR ExOR, ExNOR gates - Universal building blocks - Mixed logic symbols. Arithmetic circuits - Half adder - Full adder - Half Subtractor - Full Subtractor - K-map simplifications - Parallel binary adder - Parallel binary subtractor - Binary to Grey code converter - Grey to Binary converter

#### **UNIT-IV**

##### **Flip-flops and their applications**

SR flip-flop - Clocked SR flip flop - D flip-flop JK flip-flop - T flip-flop - Triggering of flip-flops - Level triggering - Edge triggering - Master-Slave JK flip-flop

Applications: Shift Registers - 3 and 4-bit shift registers - Counters - 4 bit Ripple binary counter - MOD 3 counters - MOD 6 counters and Decade counter (all MOD counters using JK flip-flop only)

#### **UNIT-V**

##### **A/D and D/A Converters and Memory Devices**

A/D Converters - Simultaneous type and counter type - D/A Converters - Weighted resistors type - R-2R ladder type

Memory Devices: Classification of memories - ROM - Architecture of ROM - 32 x 4 ROM using OR gates - Diode matrix ROM - PROM, EPROM, EEPROM, RAM (Basic ideas only)

#### **TEXT BOOKS :**

1. *Salivahanan S. and Arivazhagan S.* 2009. **Digital Circuits and Design.** Vikas Publishing House, New Delhi
2. *Malvino and Leach.* 2010. **Digital Principles and Applications,** Tata McGraw Hill Publishing Company Ltd, New York

#### **REFERENCE BOOKS :**

1. *Moris Mano.* 2004. **Digital Logic and Computer Design.** Pearson India, New Delhi
2. *Gothmann W.H.* 2009. **Digital Electronics.** Phi Learning, New Delhi

16UPY63A	CORE- IX: QUANTUM MECHANICS AND RELATIVITY	SEMESTER-VI
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Total credits:4  
Hours/Week5

**OBJECTIVE :**

1. To enable students learn fundamentals of wave mechanics, Schrodinger wave equations and its applications along with fundamental concepts in Relativity.

**CONTENTS**

**UNIT-I**

**Particle Properties of Waves:** Electromagnetic waves - Blackbody radiation - Planck radiation formula - Photoelectric effect - Nature of light - Wave particle duality - Compton effect and its demonstration.

**Wave Properties of Matter:** Introduction - de Broglie wavelength - Phase velocity and Group velocity - Expression - Electron Microscope - Davisson and Germer's experiment - G.P.Thomson's Experiment.

**UNIT-II**

**Uncertainty Principle:** Introduction - Uncertainty Principle - Elementary proof between Displacement and Momentum - Energy and Time - Physical Significance of Heisenberg's Uncertainty Principle - Determination of position with Gamma ray microscope - Diffraction of electrons through a slit - complementarity principle of Bohr - Mathematical proof of uncertainty principle for one dimensional wave packet.

**UNIT-III**

**Wave Mechanics:** Postulates -- Time-dependent and Time independent Schrodinger wave Equations. Properties of wave function - Physical significance of  $\Psi$  - Orthogonal and normalized wave functions - Eigen functions and Eigen values - Particle in a box - Postulates of Quantum Mechanics - Operators - Linear, Hermitian, Angular Momentum -- Probability current density - Ehrenfest's theorem - Statement and proof.

#### UNIT-IV

**Hydrogen Atom:** Schrodinger equation for the hydrogen atom - Separation of variables - Quantum numbers - Principal quantum number - Orbital quantum number - Magnetic quantum number - Electron probability density - Radiative transitions - Selection rules - Zeeman effect - Electron spin - Exclusion principle - Stern-Gerlach experiment.

#### UNIT-V

**Theory of Relativity:** Classical relativity - Galilean transformation - Ether Hypothesis - Michelson-Morley experiment - Lorentz transformation - consequences of Lorentz transformation - length contraction - time dilation- relativity of simultaneity - Addition of Velocities - Variation of Mass with velocity - Mass energy equivalence - Minkowski's Four dimensional Space-time Continuum.

#### TEXT BOOKS :

1. *Arthur Beiser*. 2008. **Concepts of Modern Physics**. [7<sup>th</sup> Edition] Tata McGraw Hill Publishing Company Ltd, New York
2. *Murugesan R. and Kiruthiga Sivaprasath Er*. 2008. **Modern Physics**. S Chand and Co, New Delhi
3. *Gupta, Kumar and Sharma*. 2012. **Quantum Mechanics**. [31<sup>st</sup> Edition], Jai Prakash Nath Publications, Meerut
4. *Aruldas*. 2008. **Quantum Mechanics**. [2<sup>nd</sup> Edition], PHI Learning, New Delhi

#### REFERENCE BOOKS:

1. *Schiff L.I*. 1968. **Quantum Mechanics**. [3<sup>rd</sup> Edition], Mcgraw-Hill College, Blacklick
2. *Richtmyer and Et Al F.K*. 1956. **Introduction to Modern Physics**. Tata McGraw Hill Publishing Company Ltd, New York
3. *Agarwal B.K. and Prakash Hari*. 2007. **Quantum Mechanics**. [1<sup>st</sup> Edition], PHI Learning, New Delhi

16UPY63B	<b>CORE- X: SOLID STATE PHYSICS</b>	<b>SEMESTER-VI</b>
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**Total credits:4**  
**Hours/Week5**

**OBJECTIVE:**

1. To enable students to acquire the fundamental knowledge of bond theory and formation of different materials.

**CONTENTS**

**UNIT-I**

**Crystal Structures:** Crystallography: Distinction between crystalline and amorphous solids – Different features of the crystal – Crystal lattice – Basis – Crystal structure – Unit cell – Number of lattice points per unit cell- Bravais lattices – Miller indices – Elements of Symmetry – Structure of diamond and NaCl crystal – Atomic Packing – Atomic radius --Lattice constant and density- Crystal structures (SC, HCP, FCC, BCC) – Interplanar distance.

**UNIT-II**

**Bond theory of solids:** Classification of solids – Basics of Bond theory in crystals – Ionic, Covalent, Metallic, Molecular and Hydrogen bonding -- Optical properties of solids.

**Thermal properties of solids:** Specific heat capacity of solids – Einstein's theory of specific heat of solids –Debye's theory of specific heat capacity of a solid -- Fermi levels.

**UNIT-III**

**Free electron theory:** Drude Lorentz theory – Explanation of Ohm's law – Electrical conductivity – Thermal conductivity – Widemann and Franz law – Sommerfield model – Schottky effect.

**Hall Effect:** Hall voltage and Hall coefficient – Mobility and Hall angle – Importance of Hall effect – Experimental determination of Hall coefficient.

**UNIT-IV**

**Dielectrics:** Dielectric constant and displacement vector- Dielectric loss - Clausius Mossotti relation- Atomic or molecular polarizability – Types of polarizability.

**Super conductivity:** Phenomena – Magnetic properties – Meissner effect – Experimental facts – Isotopes effect – Thermodynamic effect – Types of Superconductors – Applications -- BCS Theory.

#### UNIT-V

**Magnetism:** Introduction – Dia, Para and Ferromagnetic materials -- Langevin's theory of diamagnetism – Langevin's theory of paramagnetism – Ferromagnetism – Domain theory of Ferromagnetism Hysteresis based on domains – Antiferromagnetism – Ferrimagnetism – Ferrites – Ferro electricity – Ferroelectric crystals -- Nuclear magnetic resonance.

#### TEXT BOOKS :

1. *Gupta and Kumar.* 2012. **Solid State Physics.** K.Nath & Co, Meerut
2. *Murugesan R. and Kiruthiga Sivaprasath Er.* 2008. **Modern Physics.** S Chand and Co, New Delhi
3. *Pillai S.O.* 2010. **Solid State Physics.** [6<sup>th</sup> Edition], New Age Publisher, New Delhi

#### REFERENCE BOOKS :

1. *Charles Kittel.* 2004. **Introduction to Solid State Physics.** [8<sup>th</sup> Edition], John Wiley & Sons, New York
2. *Dekker A.J.* 1969. **Solid State Physics,** Macmillan India. New Delhi



16UPY63P	CORE PRACTICAL -III: GENERAL EXPERIMENTS	SEMESTER -VI
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**Total credits:4**  
**Hours/Week3**

**LIST OF EXPERIMENTS :**

**Any 12 Experiments**

1. Young's Modulus – Cantilever – Static method
2. Young's Modulus – Cantilever – Dynamic method
3. Spectrometer –Refractive index of a hollow Prism
4. Spectrometer – Cauchy's constant and Dispersive Power of the Prism
5. Resistivity of Semiconductors – Four Probe method
6. Band gap energy of a semiconductor
7. M and H Determination
8. Hall Effect
9. Ballistic Galvanometer – Comparison of Mutual Inductance
10. Ballistic Galvanometer – Calibration of Ammeter and Voltmeter
11. Characteristics of UJT
12. Power Supply Construction (5V)
13. Hartley Oscillator
14. Field along the axis of a coil – Determination of  $B_H$
15. RC Coupled Amplifier – Single Stage.

<b>16UPY63Q</b>	<b>CORE PRACTICAL - IV: DIGITAL ELECTRONICS AND MICROPROCESSOR</b>	<b>SEMESTER -VI</b>
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**Total credits:3**  
**Hours/Week3**

**LIST OF EXPERIMENTS :**

**Any 12 Experiments**

1. Sine wave generator using 741 IC
2. Square wave generator using 555 IC
3. Verification of Truth tables of IC gates: OR, AND, NOT, XOR, NOR and NAND.
4. NAND as universal building block- AND, OR, NOT
5. NOR as universal building block- AND, OR, NOT
6. De Morgan's theorem verification
7. Study of RS Flip-Flop.
8. Study of Shift -Registers -Serial in Parallel out.
9. Half Adder and Full Adder
10. Half Subtractor and Full Subtractor
11. 8085 ALP for 8 bit Addition and Subtraction
12. 8085 ALP for 8 Bit Multiplication and Division
13. 8085 ALP for finding the Biggest number element in the array and Sum of the elements in the Array
14. 8085 LED Interfacing
15. 8085 traffic Light Controller

<b>16UPY63R</b>	<b>CORE PRACTICAL - V: COMPUTER PROGRAMMING</b>	<b>SEMESTER -VI</b>
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**Total credits:3**  
**Hours/Week3**

**LIST OF EXPERIMENTS :**

**Any 12 Experiments**

1. Conversion of Temperature from C to F
2. Conversion of Temperature from F to C
3. Determination of Velocity of Light - Foucault's Rotating Mirror method
4. Determination of G by Boy's Method
5. Young's Modulus - Uniform Bending method
6. Young's Modulus - Uniform Non Uniform method
7. Determination of Frequency: Sonometer
8. Spectrometer: Refractive index and Dispersive power of Prism
9. Newton's rings: Radius of Curvature.
10. Determination of acceleration due to gravity as a function of altitude
11. Solution of quadratic equation
12. Trace of a matrix
13. Arranging the elements of an array in the ascending order
14. Arranging the elements of an array in descending order
15. Matrix Addition, Subtraction and Multiplication

15UPY6EA	<b>ELECTIVE- II: FUNDAMENTALS OF NANOSCIENCE</b>	<b>SEMESTER-VI</b>
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**Total Credits:4  
Hours/Week4**

### **OBJECTIVES :**

1. To enable students learn fundamentals of Nanoscience, nanomaterials synthesis mechanisms and applications.

### **CONTENTS**

#### **UNIT-I**

##### **Introduction to Nanotechnology**

Scientific revolution, Historical milestones, Emergence of Nanotechnology, Definition of nanotechnology, Bohr radius, Quantum confinement, Nanosized effects, Challenges in Nanotechnology

#### **UNIT-II**

##### **Synthesis of Nanomaterials**

Physical method: Ball Milling, Sputter deposition, electric arc deposition, Ion beam technique. Chemical method: Wet chemical synthesis - sol-gel processing, co-precipitation, hydrothermal, chemical vapor condensation, chemical bath deposition

#### **UNIT-III**

##### **Types of Nanostructures**

Definition of a Nano system - Types of Nanocrystals-One Dimensional (1D)-Two Dimensional (2D) -Three Dimensional (3D) nanostructured materials - Quantum dots - Quantum wire - CORE-/Shell structures

#### **UNIT-IV**

##### **Functional Nanomaterials**

Carbon (CNT, graphene), Noble Metals (Au, Ag), Metal oxides (TiO<sub>2</sub>, SnO<sub>2</sub>, ZnO), Semiconductors (CdS, CdSe, CdTe), Magnetic nanoparticles, Semiconductor Nanocomposites

## UNIT-V

### **Applications of Nanomaterials**

Applications in Physics: Nanoelectronics, Quantum dot and Dye sensitized solar cells, Photovoltaics, Hydrogen Production, Quantum electronic devices, CNT based transistor and Field Emission Display, Other applications: Nanosensors, Nanomedicine, Nanorobotics.

### **TEXT BOOKS :**

1. *Viswanathan B.* 2006. **Structure and Properties of Solid State Materials** [2<sup>nd</sup> Edition], Oxford: Alpha Science International
2. *Pradeep T.* 2007. **Nano-The Essentials.** Tata McGraw-Hill publishing company limited, New Delhi

### **REFERENCE BOOKS :**

1. *Wilson M. Kannangara K. Smith G. Simmons M. and Raguse B.* 2005. **Nanotechnology: Basic Science and Emerging technologies**, [1<sup>st</sup> Edition], Overseas Press India Pvt Ltd, New Delhi.
2. *Hari Singh Nalwa.* 2002. **Nano Structured Materials and nanotechnology.** (Concise Edition) Academic Press.

<b>15UPY6EB</b>	<b>ELECTIVE- II: OPTICAL FIBRES AND FIBRE OPTIC COMMUNICATION SYSTEMS</b>	<b>SEMESTER-VI</b>
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**Total credits:4  
Hours/Week4**

**OBJECTIVE :**

1. To enable students learn fundamentals of Fiber optics and their communication mechanisms along with their applications.

**CONTENTS**

**UNIT-I**

**FIBRE CLASSIFICATION**

Propagation of light waves in an optical fibre - Acceptance angle and Acceptance cone of a fibre - Numerical Aperture (NA) - NA of a graded Index Fibre - Mode of propagation. Fibres - classification - stepped index fibre - stepped index monomode fibre - Graded index multimode fibre - Comparison of step and graded index fibres.

**UNIT-II**

**FIBRE FABRICATION AND CABLES**

Classification of Techniques - External chemical vapour deposition - Characteristics - Internal chemical vapour deposition (1st method only) - Characteristics - Phasil system Fibre cable construction - losses incurred during installation of cable - Testing of cables - cable selection criteria.

**UNIT-III**

**FIBRE LOSSES AND DISPERSION IN OPTICS**

Attenuation in optic fibre - Rayleigh Scattering losses - Absorption losses - Bending losses - Radiation induced losses - Inherent defect losses - CORE- and Cladding losses. Dispersion in an Optical Fibre - Inter-modal dispersion - Material Chromatic Dispersion - Dispersion Power penalty - Total Dispersion delay.

**UNIT-IV**

**LIGHT SOURCES FOR OPTICAL FIBRES**

LED - The process involved in LEDS - Structures of LED - Fibre - LED Coupling - Modulation bandwidth and Spectral Emission of LEDS.

## **UNIT-V**

### **APPLICATIONS**

Introduction - Video Link Satellite Link - Computer Link - Nuclear Reaction Link - Community Antenna Television - Switched Star CATV - Networking

### **TEXT BOOK :**

1. *Subir Kumar Sarkar*. 2007. **Optical Fibres and Fibre Optic Communication Systems**. [4<sup>th</sup> Edition] S Chand and Co, New Delhi

### **REFERENCE BOOK:**

1. *Thyagarajan K. and Ajoy Ghatak*. 2004, **Introduction To Fiber Optics**. Cambridge University Press, New Delhi

15UPY6EC	ELECTIVE- II: BIO-PHYSICS	SEMESTER-VI
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**Total credits:4**  
**Hours/Week4**

**OBJECTIVE :**

1. To enable students learn fundamentals of Biophysics, Molecular Kinetics and Radiation Biology.

**CONTENTS**

**UNIT-I**

**STRUCTURE OF BIOMOLECULES**

Introduction - Atomic structure - Hydrogen atom - Bonds between atoms and molecules - secondary or weak bonds - Bond energy - Disulphate bonds - Peptide bond - Structure of Proteins - Molecular weight determination - Kinetic methods - Static methods - Structure of nucleic acids - DNA - RNA.

**UNIT-II**

**KINETICS OF MOLECULES I**

**Diffusion:** Factors affecting diffusion - Simple diffusion - Fick's law of diffusion - Diffusion of electrolytes - Biological significance of diffusion

**Osmosis:** Osmosis - Osmotic pressure - Laws of osmosis - osmometry - osmotic pressure of electrolytes.

**Filteration :** Filteration - Passage of fluid though blood vessels - Formation of Urine- Dialysis Principle of dialysis in artificial kidney - kinds of dialysis.

**UNIT-III**

**KINETICS OF MOLECULES II**

**Adsorption:** Adsorption - Factors affecting adsorption - Adsorption of ions by Solids and Liquids - adsorption of Gases by solids - Biological significance of adsorption.

**Hydrotrophy :** Hydrotrophy - Biological importance of hydrotrophy.

**Precipitation:** Precipitation - Biological significance.

**Colloids:** Types of colloids - characteristics of colloids - stability of colloids - Gel - Emulsions - Techniques for the separation of colloids - Biological importance of colloids - Gibb's Donnan Equilibrium.



## UNIT-IV

### OPTICAL TECHNIQUES IN BIOLOGICAL STUDIES

Characteristics of light- compound microscope - Ultraviolet microscope - Electron microscope - Transmission electron microscope - Scanning Electron microscope - Monochromator - Light sensitive detectors- Spectrophotometer - Atomic absorption flame photometer - Electromagnetic radiation Spectroscopy - Ultraviolet, visible, infrared and fluorescent spectroscopy - Atomic absorption and emission spectroscopy - mass spectroscopy - Raman spectroscopy - x ray diffraction crystallography.

## UNIT-V

### BIOELECTRICITY AND RADIATION BIOLOGY

Membrane potential - Resting membrane potential - Action potential and nerve impulse conduction Rate of nerve impulse conduction- Recording of nerve impulses by C.R.O - Resting membrane potential -.J Injury potential- Monophasic and diphasic action potentials - Radioactivity - Natural radioactivity Artificial or induced radioactivity - Radioactive disintegration - units of Radioactivity.

### TEXT BOOKS :

1. *Subramanian, M.A.* 2006. **Biophysics: Principles and Techniques.** MJP Publishers, Chennai [Units II, IV & V]
2. *Palanichamy, S. and Shanmugavelu, M.* **Principles Of Biophysics.** Palani Paramount Publications, Palani (Units I & III)

### REFERENCE BOOKS :

1. *Thiravia Raj, S.* **Biophysics.** Saras Publications, Nagerkoil
2. *Daniel, M.* 1998. **Basic Biophysics for Biologist.** Agro-bios, Jodhpur.
3. *Pattabhi, V. and Gowtham, N.* 2011. **Biophysics.** [2<sup>nd</sup> Edition], Narosa Publishing House, New Delhi

<b>15UPY6ED</b>	<b>ELECTIVE- III: SPACE PHYSICS</b>	<b>SEMESTER-VI</b>
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**Total Credits:4**  
**Hours/Week4**

**OBJECTIVE:**

1. To make students learn fundamental concepts of Space Physics, Stellar Evolution and the theories of Universe, Galaxies and Star Clusters.

**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 of a star - 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 magnitude 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 .

#### 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. *Krishnasamy, K.S.* 2002. **Astro Physics - A Modern Perspective.** New Age International Pvt Ltd, New Delhi.
2. *Murugesan, R.* 2003. **Modern Physics**, [11<sup>th</sup> Edition] S Chand & Company Ltd, New Delhi.

#### REFERENCE BOOKS :

1. *Baidyanath Basu,* 2001. **An Introduction to Astro physics**, 2<sup>nd</sup> printing, Prentice Hall of India Private limited, New Delhi.
2. *Kumaravelu, S.* 1993. **Astronomy**, Janki calendar corporation, Sivakasi.
3. *Baker and Fredrick,* 1964. **Astronomy**. [9<sup>th</sup> Edition] Van No strand Rein hold Co, New York.
4. **Illustrated World of Science Encyclopedia** - Vol I and Vol VIII - Creative world publication - Chicago.

15UPY6EE	ELECTIVE -III: GEOPHYSICS	SEMESTER-VI
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**Total Credits:4**  
**Hours/Week4**

**OBJECTIVE :**

1. To enable students to learn fundamental concepts of Seismology, Geophysics and Geomagnetism

**UNIT-I**

**Introduction and Seismology**

Introduction - Seismology: P waves, S waves, their velocities - Time distance curves and the location of epicenters - Effect of boundaries - Major discontinuities and resulting phase of seismic waves - Derivation of properties from the velocities

**UNIT-II**

**Surface Waves and Seismometry**

**Surface waves:** Rayleigh waves and Love waves - Study of earth by surface waves. **Seismometry:** Horizontal seismograph and seismography equation - Strain seismograph.

**UNIT-III**

**Earthquakes and Gravity**

**Earthquakes:** Focus, magnitude, frequency - Detection and prediction - Gravity: The potential (Laplace's equation and Poisson's equation) - Absolute and relative measurements of gravity - Hammond Faller method - Worden gravimeter.

**UNIT-IV**

**Geomagnetism and Internal structure of the Earth**

**Geomagnetism:** Fundamental equations - Measurements: method of Gauss, saturation induction magnetometers, proton precession magnetometers, alkali vapour magnetometers - Theories of earth's magnetism - Causes of the main field -Dynamo theories - Internal

structure of the earth: The CORE- variation of mechanical properties with depth - Materials and equation of state of the interior of the earth.

## **UNIT-V**

### **Geochronology and Geothermal Physics**

**Geochronology:** Radioactivity of the earth - Radioactive dating of rocks and minerals Geological time scale - The age of the earth - Geothermal physics: Flow of heat to the surface of the earth - Sources of heat within the earth - Process of heat transport internal temperature of the earth.

### **TEXT BOOKS :**

1. *Garland, G.D.* 1979. **Introduction to Geophysics**, [11<sup>th</sup> Edition], WB Saunder Company, London
2. *Cook, A.H.* 1973. **Physics of the Earth and Planets**. [1<sup>st</sup> Edition], McMillan Press, London

<b>15UPY6EF</b>	<b>ELECTIVE -III: MEDICAL PHYSICS</b>	<b>SEMESTER-VI</b>
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**Total credits:4**  
**Hours/Week4**

**OBJECTIVE:**

1. To enable students learn fundamental concepts Radiation Physics and its applications in medical fields.

**CONTENTS**

**UNIT-I**

**X-RAYS**

Electromagnetic spectrum - production of x-rays - x-ray spectra - Brehmsstrahlung - Characteristic x-ray - X-ray tubes - Coolidge tube - x-ray tube design - tube cooling - stationary mode - Rotating anode x-ray tubes - Tube rating - quality and intensity of x-ray. X-ray generator circuits - half wave and full wave rectification - filament circuit - kilo voltage circuit - high frequency generator - exposure timers - HT cables.

**UNIT-II**

**RADIATION PHYSICS**

Radiation units - exposure - absorbed dose - rad gray - kera relative biological effectiveness - effective dose - sievert - inverse square law - interaction of radiation with matter - linear attenuation coefficient. Radiation Detectors -Thisble chamber - condenser chambers - Geiger counter - Scintillation counter - ionization chamber - Dosimeters - survey methods - area monitors - TLD and semiconductor detectors.

**UNIT-III**

**MEDICAL IMAGING PHYSICS**

Radiological imaging - Radiography - Filters - grids - cassette - X-ray film - film processing - fluoroscopy - computed tomography scanner - principle function -display - generations - mammography. Ultrasound imaging - magnetic resonance imaging - thyroid uptake system - Gamma camera (Only Principle, function and display)

**UNIT-IV**

**RADIATION THERAPY PHYSICS**

Radiotherapy - kilo voltage machines - deep therapy machines - tele-cobalt machines - Medical linear accelerator. Basics of Teletherapy units -

deep x-ray, telecobalt units, medical linear accelerator - Radiation protection - external beam characteristics - phantom - dose maximum and build up - bolus - percentage depth dose - tissue - air ratio - back scatter factor.

## UNIT-V

### RADIATION PROTECTION

Principles of radiation protection - protective materials - radiation effects - somatic, genetic stochastic and deterministic effect, Personal monitoring devices - TLD film badge - pocket dosimeter.

### TEXT BOOKS :

1. *Thayalan, K.* 2003. **Basic Radiological Physics.** Jayapee Brothers Medical Publishing Pvt Ltd, New Delhi
2. *Williams and Wilkins,* 1990. **Christensen's Physics of Diagnostic Radiology:** Curry Dowdey and Murry - Lippincot
3. *Khan, F.M.* 2003 **Physics of Radiation Therapy** - Williamd and Wilkins, [3<sup>rd</sup> Edition]
4. *Bushberg, Seibert, Leidholdt, Boone Lippincot Williams and Wilkins,* 2002. **The Essential Physics of Medical Imaging:** [2<sup>nd</sup> Edition]

### REFERENCE BOOKS :

1. *Lippincot Williams and Wilkins,* 1998. **Nuclear Medicine Physics:** Chandra Publishers
2. *John R Gunni ingham and Johns,* 1990. **The Physics of Radiology.** Charles C Thomas USA
3. *William R Hendee* 1992. **Medical Imaging Physics** - Mosby, [3<sup>rd</sup> Edition]
4. *Govindarajan, K.N.* 1992. **Advanced Medical Radiation Dosimetry:** Prentice - Hall of India Pvt Ltd, New Delhi

15UPY6SA	<b>SKILL BASED SUBJECT-IV: MICROPROCESSORS</b>	<b>SEMESTER-VI</b>
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**Total credits:3**  
**Hours/Week3**

**OBJECTIVE:**

1. To foster students learn the basic concepts of Microprocessors, semiconductor memories and its programming.

**CONTENTS**

**UNIT-I**

**Microprocessor and Data Representation**

Basic concept - What is Microprocessor, 4, 8, 16, 32 - Organization of Microprocessor - Microprocessor Programming - Instruction - Machine and Mnemonic codes - Machine and Assembly Language Programming - High level Language programming - Timing diagram conventions.

Representation of Integers - Positive integers - Maximum Integer - Negative Number representation - Minimum Integer - Representation of Real numbers - Conversion of Real numbers - floating point notation - Representation of Floating numbers - Binary Arithmetic, Addition and Subtraction of Binary Integers - Over flow and Under flow addition of floating numbers - Character representation.

**UNIT-II**

**Programming a Microprocessor**

Organization of 8085 - Data and Address buses addressing - The I/O devices - Register in 8085 - Instruction types - Classification of Instruction - Addressing modes - Programming the 8085 -The Programming process - machine language programming - Assembler Programming - The instruction format, Assembler directives, Constant in assembly programming - Language for writing algorithms - The Stack - Subroutines.

**UNIT-III**

**Semi Conductor Memories**

Introduction - Registers - Primary memory - Mass storage, cache - off line backup - memory chips - static and dynamic RAMs, ROMs and their versions characteristics of memories: Memory chip capacity and organization - memory size - combining the chips together with example electrical signals. Static RAM : Organisation of 6264 - Read and write



cycle of 6264 – dynamic RAMS : Organisation of 51100 x – Read and write cycle of 51100 x RAS only fresh hidden fresh – Burst and distributed i.e., fresh – pseudo static ram and automatic refresh – page mode operation of dynamic RAM – Nibble mode operation – Static column mode – Power requirements of DRAMS.

#### **UNIT-IV**

##### **Microprocessor Timings**

Timing and control unit – Basic concept – The Fetch operation – The executive cycle – Machine cycle and state – Instruction and Data flow – Timing of Intel 8085, 8085 buses – Opcode fetch cycle – Memory and I/O read and write cycle – Interrupt timings – The Halt and Hold states – Register organization – General purpose register – The Stack.

#### **UNIT-V**

##### **Interfacing Memory and I/O Devices**

Introduction – Address space partitioning – The Address map – Address decoding – Using the 1 of N decoder – Memory Interfacing – Bus connection and 2 line control – Access time computations – Data transfer schemes – Programmed data transfer – Synchronous transfer – Asynchronous transfer – Interrupt driven data transfer – Multiple Interrupt enabling – disabling and Masking Interrupt – Direct Memory access data transfer – Multiple DMA devices – DMA transfer in an 8085 based system – Serial data transfer.

#### **TEXT BOOKS:**

1. *Aditya P Mathur.* 1990. **Introduction to Microprocessors.** [3<sup>rd</sup> Edition] Tata McGraw Hill Publishing Company Ltd, New York
2. *Nagoor Kani A.* 2012. **Microprocessors And Microcontrollers.** [2<sup>nd</sup> Edition], Tata McGraw Hill Publishing Company Ltd, New York

#### **REFERENCE BOOKS:**

1. *Ramesh S. Gaonkar.* 2002. **Microprocessor Architecture.** Programming, and Applications with the 8085. Prentice Hall, New Delhi
2. *Ramachandran K.* 2009. **Mechatronics and Microprocessors.** Wiley India Pvt. Ltd, New Delhi

15UED34V	<b>NMEC-I: EVERYDAY PHYSICS -I</b>	<b>SEMESTER-III</b>
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**Total Credits:2  
Hours/Week2**

**OBJECTIVE :**

1. To enable non-major Physics students to create interest in Physics and to make them aware with fundamental concepts of Physics

**CONTENTS**

**UNIT-I**

**How things work?**

Basic principles – Televisions – Lifts – Submarines – Helicopters – Fax machines – Nuclear reactors.

**UNIT-II**

**Heat**

Transmission of heat – Variation of boiling point with pressure – Pressure cooker – Refrigerator – AC Principle and their capacities.

**UNIT-III**

**Sound and Optics**

Sound waves – Doppler effect – SONAR. Power of a lens – Long sight, Short sight – Microscope, Telescope, Binocular and Camera.

**UNIT-IV**

**Bio materials & Smart materials**

Biomaterials – Biomedical compatibility of Ti-Al-Nb alloys for implant application. Smart materials – Shape Memory Alloys – Piezoelectric materials.

**UNIT-V**

**Solar energy and its Applications**

Solar energy – Solar water heater – Solar driers – Solar cells – Solar electric power generation – Solar distillation – Solar cooking.

**TEXT BOOKS :**

1. **The Learner's series - Everyday science**, Infinity Books, New Delhi
2. *Brij Lal and Subrahmanyam, N.* 2008. **A Text Book of Sound**. [2<sup>nd</sup> Edition], Vikas Publishing House, New Delhi
3. *Brij Lal and Subrahmanyam, N.* 1994. **A Textbook of Optics**, [4<sup>th</sup> Edition] S Chand and Co, New Delhi.
4. *Rai G.D.* 2004. **Solar Energy Utilization**. Khanna Publishers, New Delhi.
5. *Senthil Kumar I.G.* 2013. **Engineering Physics I & II**. VRB Publications, Chennai.

**REFERENCE BOOKS :**

1. *Resnick and Halliday*, **Principles of Physics**. 2015. [9<sup>th</sup> Edition], Wiley Publication
2. *Sukhatme. S.P.* 1997. **Solar Energy, Principles of thermal collection and storage** [2<sup>nd</sup> edition], Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
3. *Mathur, D.S.* 2002. **Heat and Thermodynamics**. S Chand and Co, New Delhi
4. **Illustrated World of Science Encyclopedia**, Vol I and Vol VIII, Creative world publication, Chicago.

15UED44V	NMEC-II: EVERYDAY PHYSICS -II	SEMESTER-IV
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**Total Credits:2**  
**Hours/Week2**

**OBJECTIVE :**

1. To enable non-major Physics students to create interest in Physics and to make them aware with fundamental concepts of Physics

**CONTENTS**

**UNIT-I**

**Force and Energy**

Force- Newton's laws of motion- circular motion – centripetal force – centrifugal force. Centrifuge – washing machine.

Energy – different forms of energy – Law of conservation of energy.

Electric bulb-tube light-CFL, LED bulbs.

**UNIT-II**

**Mobile Technology**

Mobile Technology - GSM, CDMA – Mobile phone Features –2G, 3G, 4G and 5G networks.

**UNIT-III**

**Nano Technology**

Nano Technology – Everyday applications of Nano technology – Medicine –Electronics – Environment – Consumer products

**UNIT-IV:**

**Geo physics**

Gravitation – The Moon and Tides - Earthquake – Richter scale – Thunder and lightning – lightning arrestors

**UNIT-V:**

**Fossil Fuel Energy**

Fossil Fuels – Definition – Energy Production – How Fossil Fuels work – Oil – Coal – Natural Gas - Advantages and Disadvantages of Fossil Fuels.

**TEXT BOOKS :**

1. **The Learner's series - Everyday science**, Infinity Books, New Delhi
2. *Brij Lal and Subrahmanyam N.* 2003. **Properties of Matter**, S.Chand and Co, New Delhi
3. *Garland, G.D.* 1979. **Introduction to Geophysics**, [11<sup>th</sup> Edition], WB Saunder Company, London
4. *Senthil Kumar I.G.* 2013. **Engineering Physics I & II**. VRB Publications, Chennai.

**REFERENCE BOOKS :**

1. *Resnick and Halliday*, 2015. **Principles of Physics**, [9<sup>th</sup> Edition], Wiley Publications.
2. **Illustrated World of Science Encyclopedia**, Vol I and Vol VIII, Creative world publication, Chicago.

16UPYSS1	<b>SELF STUDY PAPER -I: ELECTRICAL AND ELECTRONIC APPLIANCES</b>	<b>SEMESTER: I To V</b>
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**Total Credit:1**

## **CONTENTS**

### **OBJECTIVE :**

1. This paper is designed to make the students aware of the latest type of appliances and gadgets available and to know how they work.

### **UNIT-I**

#### **Test and Measurement**

Digital calipers - digital screw gauge - digital balance - digital clock - digital thermometer - digital multimeters - digital oscilloscopes.

### **UNIT-II**

#### **Home appliances**

Air conditioner - refrigerator - microwave oven - induction cooker - washing machines - inverters - solar powered appliances - digital cameras.

### **UNIT-III**

#### **Communication**

Fibre optics - cellular phones - cellular phone jammers - Bluetooth - WiFi - LiFi -- Global positioning system - RFID security systems.

### **UNIT-IV**

#### **Robotics**

Basics - robotic arm - mobile robots - autonomous robots - Honda's ASIMO robot.

### **UNIT-V**

#### **Computers**

Basic components - Motherboards - Memory - I/O devices - assembling - operating systems.

**BOOKS FOR STUDY:**

1. *Gottapu Sasibhushana Rao*, 2012. **Mobile Cellular Communication**, [1st Edition], Pearson.
2. *S K Saha*, 2008. **Introduction to Robotics**, [1st Edition], Tata McGraw-Hill Education.
3. *Alok Kumar*, 2008. **Computer General Awareness** [1st Edition], Upkar Prakashan.

<b>16UPYSS2</b>	<b>SELF STUDY PAPER -II: BIOPHYSICS AND BIOMEDICAL INSTRUMENTATION</b>	<b>SEMESTER: I To V</b>
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**Total Credit:1**

**OBJECTIVE:**

1. To understand the biological significance in terms of physical properties and understand the medical instrumentation based on physical concepts.

**UNIT-I**

**Fundamentals of Biophysics**

Atom - atomic structure - Chemical bonds: ionic bonds, covalent bonds, formation of covalent bonds, weaker interaction - Fundamental concepts: light, sound, pressure, heat content of food, blood pressure, pH - determination of pH - buffer solution - determination of pH by indicators -  
Nucleic acids: DNA, RNA.

**UNIT-II**

**Biophysical properties**

Surface tension - Diffusion: definition, factors affecting diffusion, biological signification of diffusion - Osmosis: definition, factors affecting osmosis, biological signification of osmosis - Adsorption: definition, factors affecting diffusion, biological signification of diffusion - Colloids: definition - characteristics of colloids: kinetic properties, optical properties, electrical properties, stability of colloids - biological importance of colloids - Dialysis: principle of dialysis - kinds of dialysis.

**UNIT-III**

**Fundamentals of Biomedical Instrumentation**

Sources of Biomedical signals - Basic medical instrumentation system - Intelligent medical instrumentation systems: Microprocessor based medical instruments - PC based medical instruments - Biomedical recorders: Basic electronic recording system, Electrocardiograph (ECG), Block diagram of ECG, Electroencephalograph (EEG), Block diagram of EEG.



## UNIT-IV

### Fundamentals of Biomedical imaging systems

X-ray Imaging system: Nature of X-rays, X-ray machine - Computed Tomography (CT scan): Principle, Components of CT scan system - Magnetic Resonance Imaging (MRI) system: Principle, basic NMR components, block diagram of the NMR detection system, biological effects of NMR imaging, advantages of NMR imaging system - Ultrasonic Imaging systems: Medical ultra sound, echocardiograph, digital scan converter, biological effects of ultra sound.

## UNIT-V

**Radiotherapy:** Radioactive decay - alpha, beta and gamma - Isotopes - Medical linear accelerator machine - radiation detectors - GM counter, Ionization chamber.

**Laser:** principle - types of lasers: Ruby laser, Helium-neon laser, semiconductor laser - laser safety - Uses of laser in medical field.

### TEXT BOOKS :

1. *Subramanian, M.A.* 2006. **Biophysics: Principles and Techniques.** MJP Publishers, Chennai.
2. *Palanichamy, S. and Shanmugavelu, M.* **Principles of Biophysics.** Palani Paramount Publications, Palani.
3. *R.S.Khandpur, 2014.* **Handbook of Biomedical instrumentation,** TMH Publication Ltd.
4. *Murugesan, R.* 2003. **Modern Physics,** [11<sup>th</sup> Edition] S Chand & Company Ltd, New Delhi.

### REFERENCE BOOKS :

1. *Thiraviva Raj, S.* **Biophysics.** Saras Publications, Nagercoil
2. *Daniel, M.* 1998. **Basic Biophysics for Biologist.** Agro-bios, Jodhpur.
3. *Pattabhi, V. and Gowtham, N.* 2011. **Biophysics.** [2<sup>nd</sup> Edition], Narosa Publishing House, New Delhi.

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