

**P.K.R Arts College for Women**  
**(Accredited with 'A' Grade by NAAC)**  
**An Autonomous Institution Affiliated to Bharathiar University**  
**GOBICHETTIPALAYAM – 638476**

**Department of Physics**

**Scheme of Examinations and Syllabus**

*for the candidates admitted in the Academic Year 2020-21 and onwards*

*Under CBCS PATTERN*



## UG COURSE STRUCTURE

### CBCS – 2020-2021

Part and Category	No. of Courses	Credit(s)	Total Credits	Proposed Semester
<b>Part – I</b> Tamil/Hindi/French/Kannada/Malayalam/Sanskrit	4	4	16	I – IV
<b>Part – II</b> English	4	4	16	I – IV
<b>Part - III</b> Core Theory /Core Practical	21	5/3/1	93	I-VI
Allied Theory/ Allied Practical	5	4/3/2		
Elective	2	2		
Institutional Training/ Mini Project	1	2	2	To be done in Semester V
<b>Part – IV</b> <b>A. Foundation Courses</b> i. Environment Studies ii. Yoga and Ethics	1 1	2 2	4	I II
<b>B. Ability Enhancement Courses</b> i. Information Security ii. Consumer Rights	1 1	2 2	4	III IV
<b>C. Skill Enhancement Courses</b> i. Energy Resources ii. Life Skills iii. Programming in C, C++ - Practical	1 1 1	2 2 2	6	IV V VI
<b>D. Non-Major Elective</b> i. Indian Women and Society / Basic Tamil	1	2	2	III
<b>E. Open Elective</b>	1	3	3	V
<b>Part - V</b> i. Proficiency Enhancement I - Self Study Course	1	2	4	V Semester
ii. Community Engagement -NSS/YRC/RRC/ CCC/PHY.EDU	1	1		I to VI Semesters
iii. Community Engagement - Students Social activity	1	1		Between I to II Semesters
<b>Total Marks : 4200</b>		<b>Total Credits : 150</b>		

**P.K.R ARTS COLLEGE FOR WOMEN**  
(An Autonomous Institution, accredited by NAAC with 'A' Grade)  
**BACHELOR OF SCIENCE - PHYSICS**  
Programme Scheme and Scheme of Examinations  
(For students admitted in the academic year 2020-21 & onwards)

Part	Category	Course Code	Title of the Course	Hrs/week	Exam hrs.	CIA	ESE	Total marks	Credits
<b>I – SEMESTER</b>									
I	Language : I	20LTU01/ 20LHU01/ 20LFU01/ 20LKU01/ 20LMU01/ 20LSU01	Tamil- I/ Hindi-I/ French-I/ Kanada-I/ Malayalam-I/ Sanskrit-I	6	3	25	75	100	4
II	English : I	20LEU01	English: I	6	3	25	75	100	4
III	Core : I	20PHU01	Mechanics	6	3	25	75	100	5
III	Core : II	20PHU02	Comprehension in Physics – I ( Self –Study/ Online Exam)	--	1½	--	50	50	1
III	Core : III Allied : I	20PHU03	Mathematics - I	7	3	25	75	100	4
III	Core : IV	20PHU04	Physics – Practical I	3	--	--	--	--	--
IV	Foundation Course : I	20FCU01	Environmental studies	2	3	--	50	50	2
<b>TOTAL</b>				30				500	20
<b>II – SEMESTER</b>									
I	Language : II	20LTU02/ 20LHU02/ 20LFU02/ 20LKU02/ 20LMU02/ 20LSU02	Tamil- II/ Hindi-II/ French II/ Kanada-II/ Malayalam-II/ Sanskrit-II	6	3	25	75	100	4
II	English : II	20LEU02	English: II	6	3	25	75	100	4
III	Core : V	20PHU05	Heat and Thermodynamics	6	3	25	75	100	5
III	Core : VI	20PHU06	Comprehension in Physics – II ( Self –Study/ Online Exam)	--	1½	--	50	50	1
III	Core : VII Allied : II	20PHU07	Mathematics – II	7	3	25	75	100	4
III	Core :IV	20PHU04	Physics – Practical I	3	3	40	60	100	3
IV	Foundation Course : II	20FCU02	Yoga and Ethics	2	3	--	50	50	2
<b>TOTAL</b>				30				600	23

III - SEMESTER									
I	Language: III	20LTU03/ 20LHU03/ 20LFU03/ 20LKU03/ 20LMU03/ 20LSU03	Tamil- III/ Hindi-III/ French-III/ Kannada-III/ Malayalam-III/ Sanskrit-III	6	3	25	75	100	4
II	English: III	20LEU03	English III	6	3	25	75	100	4
III	Core : VIII	20PHU08	Optics	5	3	25	75	100	5
III	Core : IX	20PHU09	Comprehension in Physics -III ( Self-Study / Online Exam)	--	1½	--	50	50	1
III	Core : X Allied : III	20PHU10	Chemistry I	4	3	25	75	100	3
III	Core : XI	20PHU11	Physics - Practical II	3	-	-	-	-	-
III	Core : XII Allied : IV	20PHU12	Chemistry - Practical	2	-	-	-	-	-
IV	Ability Enhancement Course - I	20AEU01	Information Security	2	-	100	-	100	2
IV	Non- Major Elective	20NMU01A 20NMU01B	Indian Women and Society/ Basic Tamil	2	3	--	50	50	2
TOTAL				30				600	21
IV - SEMESTER									
I	Language : IV	20LTU04/ 20LHU04/ 20LFU04/ 20LKU04/ 20LMU04/ 20LSU04	Tamil- IV/ Hindi- IV/ French-IV/ Kannada-IV/ Malayalam-IV/ Sanskrit-IV	6	3	25	75	100	4
II	English : IV	20LEU04	English - IV	6	3	25	75	100	4
III	Core : XIII	20PHU13	Mathematical Physics	5	3	25	75	100	5
III	Core : XIV	20PHU14	Comprehension in Physics -IV ( Self-Study / Online Exam)	--	1½	--	50	50	1
III	Core : XV Allied : V	20PHU15	Chemistry II	3	3	25	75	100	3
III	Core : XI	20PHU11	Physics - Practical II	3	3	40	60	100	3
III	Core : XII Allied : IV	20PHU12	Allied Chemistry - Practical	2	3	40	60	100	2
IV	Skill Enhancement Course : I	20SEU01	Energy Resources	2	3	25	75	100	2
IV	Ability Enhancement Course - II	20AEU02	Consumer Rights	3	2	--	50	50	2

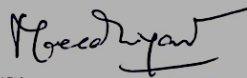


		TOTAL		30				800	26
<b>V – SEMESTER</b>									
III	Core : XVI	20PHU16	Properties of Matter & Sound	6	3	25	75	100	5
III	Core : XVII	20PHU17	Solid State Physics	6	3	25	75	100	5
III	Core : XVIII	20PHU18	Electronics & Communication	5	3	25	75	100	5
III	Core : XIX	20PHU19	Comprehension in Physics -V ( Self-Study / Online Exam)	--	1½	--	50	50	1
III	Core : XX	20PHU20	Institutional training/Industrial Training/Mini Project	--	--	50	50	100	2
III	Core : XXI	20PHU21	Electronics- Practical-III	2	-	-	-	-	-
III	Core : XXII	20PHU22	Digital Electronics and Microprocessor - Practical-IV	2	-	-	-	-	-
III	Open Elective	****	Physics in day to day life	4	3	25	75	100	3
III	Core : XXIII Elective I	20PHU 23A/ 20 PHU 23B/ 20 PHU 23C	Digital Electronics and Microprocessor / Soil Physics / Geo Physics	3	3	25	75	100	2
IV	Skill Enhancement Course : II	20SEU02	Life Skills (Soft skills/Entrepreneurship skills/Homepreneurship)	2	--	100	--	100	2
V	Proficiency Enhancement	20PEUPH1	Lasers (Self Study)	--	3	--	100	100	2
		TOTAL		30				850	27
<b>VI – SEMESTER</b>									
III	Core : XXIV	20PHU24	Quantum Mechanics and Relativity	5	3	25	75	100	5
III	Core : XXV	20PHU25	Atomic and Nuclear Physics	5	3	25	75	100	5
III	Core : XXVI	20PHU26	Electricity and Magnetism	5	3	25	75	100	5
III	Core : XXVII	20PHU27	Applied Instrumentation	5	3	25	75	100	5
III	Core : XXVIII	20PHU28	Comprehension in Physics -IV ( Self-Study / Online Exam)	--	1½	--	50	50	1
III	Core : XXI	20PHU21	Electronics- Practical-III	3	3	40	60	100	3
III	Core : XXII	20PHU22	Digital Electronics and Microprocessor - Practical-IV	2	3	40	60	100	3
III	Core : XXIX Elective II	20 PHU 29A/ 20 PHU 29B/ 20 PHU 29C	Basic Concepts of C, C++ Introduction to Space Physics/ Smart Materials	3	3	25	75	100	2

IV	Skill Enhancement Course :III	20SEU03	Programming in C, C++ Practical	2	3	40	60	100	2
			TOTAL	30				850	31
V	Community Engagement	NSS/YRC/RRC/CCC/PHY. EDU			I – VI SEMESTER				1
		Students Social activity (Curriculum related)			Between I to II SEMESTER				1

Total Marks: 4200

Total credits: 150

  
(Signature with Seal)  
Head,  
Department of Physics,  
P.K.R. Arts College for Women,  
Gobichettipalayam - 638 476.

**I - SEMESTER**

Course Code	Course Name	Category	L	T	P	Credit
20PHU01	MECHANICS	CORE	90	6	-	5

**Preamble**

To provide the student's deeper knowledge in motion of the particles & objects

**Course Outcome**

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the Parameters defining the motion of mechanical systems	K1, K2, K3
CO2	Describe dynamics of particles and rigid bodies	K1, K2, K3
CO3	Understand the concept of moment of inertia and be able to solve the problems related to it	K1, K2, K3
CO4	Understanding of the laws and principles of statics of a Rigid bodies	K1, K2, K3
CO5	Describe the physics of hydrostatics and laws of flotation	K1, K2, K3

**UNIT I - System of Particles**

**(18 Hours)**

Dynamics of a system of particles and concept of rigid bodies – Centre of mass coordinates – Centre of mass of rigid body – Motion of centre of mass and linear momentum – Collision – Elastic collision – Inelastic collision – Co-efficient of restitution– Rocket

**UNIT II - Dynamics of Rigid Bodies – I**

**(18 Hours)**

Rigid bodies – Rotational kinetic energy – Moment of inertia and its physical significance – Angular acceleration – Angular momentum and torque – Angular momentum of system and centre of mass – Conservation of angular momentum – Torque – Torque as a cross product of  $F$  and  $r$  – Analogy between translatory motion and rotatory motion – Work done by a Torque – Theorem of perpendicular axes - Theorem of parallel axes

**UNIT III - Dynamics of Rigid Bodies – II** **(18 Hours)**

Moment of inertia of thin uniform bar, rectangular lamina, ring, circular disc, solid sphere and hollow sphere – Kinetic energy of a body rolling on a horizontal plane – Acceleration of a body rolling down an inclined plane – Simple pendulum - Compound pendulum

**UNIT IV - Statics** **(18 Hours)**

Force of friction – Limiting friction – Laws of friction – Angle of friction and resultant reaction – Cone of friction – Motion of a body on a rough inclined plane when (i) angle of inclination of the inclined plane is equal to angle of friction and (ii) angle of inclination of the inclined plane is greater than the angle of friction - Centre of gravity – Expressions for centre of gravity in the case of a solid cone, solid hemisphere and hollow hemisphere

**UNIT V - Hydrostatics** **(18 Hours)**

Definition and determination of centre of pressure – General case – Expression for centre of pressure of rectangular lamina with one side on the surface of the liquid – Expression for centre of pressure of a triangular lamina in the case of (i) vertex in the surface of the liquid and (ii) base in the surface of the liquid – Laws of floatation – Definition for metacentre and metacentric height – Determination of metacentric height of a ship

**Books for study**

1. Mechanics - D.S.Mathur, 1<sup>st</sup> Edition, 2001, S.Chand &Co (Unit 1, 2, 3)
2. Mechanics – Subramaniam, Jayaraman, Rangarajan, 1990, S. Viswanathan Private Ltd., (Unit 4, 5)



Course Code	Course Name	Category	L	T	P	Credit
20PHU04	PHYSICS – PRACTICAL I	CORE PRACTICAL	90	-	3	3

**(EXAMINATION AT THE END OF SECOND SEMESTER)**

**ANY TWELVE (12) EXPERIMENTS ONLY**

1. Young's Modulus – Uniform bending – Optic lever
2. Young's Modulus – Non- Uniform bending – Pin and Microscope
3. Air Wedge – Thickness of Wire
4. Spectrometer – Refractive of liquid – Hollow prism
5. Spectrometer – Refractive index of Solid Prism
6. Potentiometer – Low range Ammeter Calibration
7. Compound Pendulum
8. Spectrometer – (i.d) Curve
9. Rigidity modulus – Static Torsion – Scale and Telescope
10. Viscosity of highly viscous liquid - Stoke's method
11. Surface tension - Drop weight method
12. Comparison of Viscosities – Capillary Flow Method
13. Field along the axis of a coil – Moment of a Magnet
14. Potentiometer – Specific Resistance of a wire
15. Moment of magnet – Tan C Position
16. Resonance Column – Velocity of Sound
17. Sonometer – Frequency of A.C
18. Young's Modulus Cantilever Depression – Scale & Telescope

**II - SEMESTER**

Course Code	Course Name	Category	L	T	P	Credit
20PHU05	HEAT & THERMODYNAMICS	CORE	90	6	-	5

**Preamble**

The student acquires the extensive fundamental knowledge about transfer of thermal energy by different analysis and to provide the basic knowledge of thermodynamics

**Course Outcome**

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Define temperature and specific heat by different methods	K1, K2, K3
CO2	Learn the fact about kinetic theory of gases and liquefaction process of gases	K1, K2, K3
CO3	To measure the thermal conductivity by different methods	K1, K2, K3
CO4	Understand the behavior of black body with laws	K1, K2, K3
CO5	Explains the basic laws of thermodynamics and study the behavior of heat engine	K1, K2, K3

**UNIT I**

**(18 Hours)**

**Thermometry:** Temperature coefficient of Resistance — Platinum Resistance Thermometer — Thermocouple — Seebeck Effect — Peltier Effect — Thermoelectric thermometer

**Calorimetry:** Specific heat of solids – Radiation correction – Copper block calorimeter – Nernst vacuum calorimeter – Newton's law of cooling – Specific heat capacity of a liquid by cooling – Specific heat capacity of gases – Jolly's differential steam calorimeter and Regnault method

**UNIT II - Kinetic Theory of Gases**

**(18 Hours)**

Postulates – Mean free path – Degree of freedom – Maxwell's law of velocity distribution and Theorem of equipartition of energy – Viscosity of gases – Van der Waals

equation – Critical constants and their determination Low Temperature Physics: Joule-Thomson Effect – Liquefaction of air, hydrogen and helium – Peculiar properties of He II

**UNIT III - Thermal Conduction (18 Hours)**

Conduction, convection and radiation – Coefficient of thermal conductivity, thermal diffusivity – Steady state – Lee's disc method of determining the thermal conductivity of a bad conductor – Searle's method – Forbe's method – Spherical Shell method – Cylindrical flow of heat

**UNIT IV -Thermal Radiation (18 Hours)**

Black body – Kirchoff's law of heat radiation – Prevost's theory of heat exchange – Stefan's law – Mathematical derivation – Derivation of Newton's law of cooling from Stefan's law – Experimental verification of Stefan's law – Distribution of energy in the spectrum of black body – Derivation of Planck's law – Derivation of Wein's law and Rayleigh-Jean's law from Planck's law

**UNIT V - Thermodynamics (18 Hours)**

First law of Thermodynamics–Isothermal and Adiabatic process–gas equation during an adiabatic process– Work done on adiabatic expansion of gas–Carnot's Theorem–efficiency, Carnot's cycle – Otto Cycle–Entropy – Change in entropy (Reversible and irreversible process) – Temperature–Entropy diagram – Entropy of a perfect gas–Maxwell's thermodynamic relations and applications– Helmholtz function – Gibb's function

**Book for Study**

1. Heat and Thermodynamics– Brijlal and Subramaniam, Revised Edition 2016, S.Chand & Co (Unit 1-5)

**Books for Reference**

1. Thermal Physics– R. Murugesan, 3<sup>rd</sup> Edition, 2012, S. Chand & Co
2. Text book of heat– JB Rajam, 1988, S. Chand & Co

### ALLIED PAPERS

Course Code	Course Name	Category	L	T	P	Credit
20MAU04	ALLIED PHYSICS – I	ALLIED	60	4	-	4

#### Preamble

To understand the fundamentals of physics, give the basic understanding of material properties and to acquire knowledge on magnetism and electricity

#### Course Outcome

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the universal law of gravitation and elastic properties of solids	K1, K2, K3
CO2	Understand thermodynamic state properties for liquids and vapors, and for ideal gases	K1, K2, K3
CO3	Understand how sound is produced and propagated	K1, K2, K3
CO4	Outline the technologies that are used to harness the power of solar energy	K1, K2, K3
CO5	Gain basic understanding of the combined effect of electric and magnetic fields	K1, K2, K3

#### UNIT I

(12 Hours)

**Gravitation:** Newton's law of Gravitation-Determination of G by Boy's method-mass and density of earth – acceleration due to gravity- Determination of g by compound pendulum

**Elasticity:** Bending of beams - Bending moment - Depression at the free end of a cantilever - Hooke's law – Kinds of moduli of Elasticity - Experimental determination of Young's Modulus by Uniform and Non-Uniform bending methods

#### UNIT II

(12 Hours)

**Heat and Thermodynamics:** Vanderwaal's equation of state-critical constants of a gas-derivation of critical constants in terms of Vanderwaal's constants – Theory of porous plug experiment – Joule-Kelvin effect: Temperature of inversion - Liquefaction of air

(Linde's process) - Liquefaction of hydrogen - Liquefaction of Helium - Properties of liquid Helium I and Helium II - Second law of thermodynamics - Carnot's theorem and its proof

**UNIT III** **(12 Hours)**

**Sound:** Transverse waves – velocity along a stretched string-laws of transverse vibration of strings verification of laws- Melde's string - Determination of frequency of a tuning fork (Transverse and longitudinal modes) - Frequency of AC by sonometer- Production of ultrasonic waves by piezo-electric method - Applications of Ultrasonic Waves

**UNIT IV** **(12 Hours)**

**Solar Physics:** - solar constant – measurement of solar radiations by Pyroheliometer and Pyranometer – general applications of solar energy – flat–plate collector - box type cooker - solar water heaters – solar photo – voltaic cells – general applications of solar cells

**UNIT V** **(12 Hours)**

**Electricity:** Moving coil Galvanometer - Conversion of Galvanometer into Ammeter and voltmeter –Ballistic Galvanometer – construction and theory – Electromagnetic induction - Transformers – theory, energy loss and applications

**Magnetism:** Basic concepts of magnetic materials – magnetic properties of Dia, Para and Ferro magnetic materials– Antiferro magnetism and Ferri magnetism - electric and magnetic circuits – Curie temperature

**Books for study**

1. Properties of Matter and Sound - R. Murugesan,1998, S.Chand & Company Pvt. Ltd., (Unit 1)
2. Heat and Thermodynamics - Brijlal and Subramaniam,2012, S.Chand & Company Pvt. Ltd.,(Unit 2)
3. Sound - Brijlal and Subramaniam,1994, Vikas Publishing House Pvt. Ltd., (Unit 3)
4. Solar physics - G.D.Rai,2012, Khanna Publishers New Delhi (Unit 4)
5. Electricity and Magnetism - Brijlal and Subramanyam, 2011, Vikas Publishing House Pvt. Ltd., (Unit 5)

Course Code	Course Name	Category	L	T	P	Credit
20MAU09	ALLIED PHYSICS – II	ALLIED	60	4	-	4

### Preamble

To provide the theoretical basis for the understanding of physical measurement methods and to understand the optical, nuclear and electronic properties of solids

### Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Obtain basic understanding of the particle nature of light (e.g., Photoelectric effect)	K1, K2, K3
CO2	Understand the properties of the nuclear force properties	K1, K2, K3
CO3	Attain basic knowledge on different types of lasers and their applications	K1, K2, K3
CO4	Gain basic understanding of the semiconductor devices	K1, K2, K3
CO5	Understand fundamental concepts of number systems and different types of Logic Gates	K1, K2, K3

### UNIT- I

(12 Hours)

**Modern physics:** Einstein's photo electric equation – verification of Einstein's photo electric equation by Millikan's experiment – photo electric cells – applications

**Wave mechanics:** De Broglie concept of matter waves – Calculation of De Broglie wave length - Study of De Broglie matter wave by G.P.Thomson experiment

### UNIT- II

(12 Hours)

**Nuclear physics:** Nuclear forces – nuclear structure by liquid drop model – Binding energy – mass defect – particle accelerators – cyclotron – nuclear Fission and nuclear Fusion – Nuclear Fission reactors – introduction to elementary particles – Leptons, Mesons and Baryons



**UNIT III (12 Hours)**

**Laser physics:** Principles of laser – population inversion – Meta stable state – Spontaneous and Stimulated Emission – conditions for laser actions – Ruby Laser – Helium – neon laser – applications of lasers – Raman Effect – Raman shift– stoke and anti stokes lines

**UNIT IV (12 Hours)**

**Semiconductor Devices:** Semi conductors – Energy band in Solids – Types of Semi conductors – PN junction Diode – Volt–Ampere Characteristics – Zener diode – Volt–Ampere Characteristics – Rectifiers – Half wave rectifier – Bridge Rectifier

**UNIT V (12Hours)**

**Digital Electronics:** Number systems - Binary system - Addition - Subtraction - Complement method of Subtraction-Multiplication - Division - Binary-to-decimal and decimal-to-binary conversion - AND, OR, NOT gates - NAND and NOR as universal gates - Laws of Boolean algebra – Simplification of Boolean expressions - De Morgan's theorems

**Books for study**

1. Modern Physics – R. Murugesan,2016,S.Chand & Company. Pvt. Ltd, New Delhi
2. Engineering physics–M. Arumugam, 1998, Anuradha Agencies, Educational Publishers
3. Laser Physics – Thiagaraja, 2013, Narosa Publishing House
4. Basic Electronics – B.L. Theraja, 2000, S. Chand & Company LTD, New Delhi

Course Code	Course Name	Category	L	T	P	Credit
20MAU05	ALLIED PRACTICAL	ALLIED PRACTICAL	90	-	3	4

**(EXAMINATION AT THE END OF SECOND SEMESTER)**

**ANY TWELVE (12) EXPERIMENTS ONLY**

1. Acceleration due to gravity – Compound pendulum method
2. Moment of inertia – Torsional pendulum method
3. Young's modulus – Uniform bending – Optic lever method
4. Young's modulus – Non-uniform bending – Pin and microscope

5. Rigidity modulus – Static torsion method
6. Frequency of A.C - Sonometer
7. Thermal conductivity – Lee’s disc method
8. Refractive index of a liquid prism - Spectrometer
9. Refractive index of a liquid prism - Spectrometer
10. (i-d) curve-solid prism - Spectrometer
11. Wavelengths of spectral lines – Grating – Normal incidence - Spectrometer
12. Wavelength of spectral lines – Grating – Minimum deviation - spectrometer
13. Radius of curvature of lens – Newton’s rings method
14. Viscosity of highly viscous liquid – Stoke’s method
15. Surface tension – Drop weight method
16. Low range voltmeter calibration - potentiometer
17. Low range ammeter calibration - Potentiometer
18. Construction of IC regulated power supply
19. Characteristics of Pn junction diode
20. Characteristics of Zener diode
21. Construction of Hartley oscillator
22. Construction of Colpitt’s oscillator
23. Verification of truth tables of logic gate

### FOUNDATION COURSES

<b>20FCU01</b>	Environmental Studies	<b>CATEGORY</b>	<b>L</b>	<b>P</b>	<b>CREDIT</b>
		Foundation Course: I	24	-	2

#### **Preamble**

To bring about an awareness of a variety of environmental concerns and to create a pro-environmental attitude and a behavioral pattern in society that is based on creating sustainable lifestyle

#### **Course Outcomes**

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To give information about the environment and the resources to act at our own level to protect them.	K1
CO2	To analyse the roles of organisms as part of interconnected food webs, populations, communities, and ecosystems	K4
CO3	Understand the scale dependence of biodiversity and its measurement	K2
CO4	To learn how to assess pollution sources, study exposure pathways and fate, and evaluate consequences of human exposure to pollution and its impacts to environmental quality.	K1,K3
CO5	To balance our economic, environmental and social needs, allowing prosperity for now and future generations	K5

## Unit I

(4 Hours)

### Multidisciplinary Nature of Environmental Studies:

**Environment:** Definition, Components, Segments and Types. **Natural Resources:** Meaning, Components: (1. **Forest**-Meaning, Importance and Types 2. **Water**- Meaning, Types and Problems 3. **Mineral**- Meaning and Classification 4. **Food**-Meaning and Problems 5. **Energy**- Meaning, Forms and Types 6. **Land**- Meaning, Structure and Functions, Components), **Classification:** Renewable and Non-Renewable Resources, Role of an Individual in Conservation of Natural Resources.

## Unit II

(5 Hours)

**Ecosystems** – Definition, Features, Structure and Function of an Ecosystem, Producers, Consumers and Decomposers, Energy Flow in the Ecosystem (Water, Carbon, Nitrogen, Oxygen and Energy), Food Chains, Food Webs and Ecological Pyramids

**Introduction Types, Characteristics Features, Structure and Function of the following Ecosystem:**

- Forest Ecosystem
- Grassland Ecosystem
- Desert Ecosystem
- Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Ocean, Estuaries)

**Unit III** (5 Hours)

**Biodiversity and its Conservation**-Introduction – Definition – Genetic, Species and Ecosystem Diversity, Bio geographical Classification of India -Value of Biodiversity – Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Value- Biodiversity at Global, National and Local Levels- India as a Mega-Diversity Nation- Hot-Spots of Biodiversity- Threats to Biodiversity – Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts- Endangered and Endemic Species of India Conservation of Biodiversity – In-situ and Ex-situ and Conservation of Biodiversity.

**Unit IV** (5 Hours)

**Environmental Pollution:** Definition, Causes, Effects, control measures and Prevention Acts for Air, Water, Soil, Noise, Thermal Pollutions and Nuclear Hazards. **Solid Waste Management:** Meaning, Causes, effects and control measures of urban and industrial wastes. **Disaster Management:** Meaning, Types of Disasters: floods, earthquake, cyclone and landslides. **Environmental Ethics:** Issues and possible solutions- Climate change, global warming, acid rain, ozone layer depletion, nuclear - accidents and holocaust. Consumerism and waste products, Public Awareness.

**Unit V** (5 Hours)

**Social Issues and the Environment:** From Unsustainable to Sustainable development- Urban problems related to energy- Water conservation, rain water harvesting, watershed management- Resettlement and rehabilitation of people; its problems and concerns.

**Human Population and the Environment:** Population growth and distribution- Population explosion – Family Welfare Programme-Environment and human health- HIV/AIDS- Role of Information Technology in Environment and human health- Medical transcription and bio-informatics.

**REFERENCE**

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,
6. Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

8. Down to Earth, Centre for Science and Environment (R)
9. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,
10. Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
11. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural
12. History Society, Bombay (R)
13. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge Univ. Press 1140p.
14. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws, Himalaya Pub. House, Delhi 284 p.
15. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
16. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
17. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
18. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
19. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.
20. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
21. Survey of the Environment, The Hindu (M)
22. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

20FCU02	YOGA AND ETHICS	CATEGORY	L	P	C
		Foundation Course: II	24	-	2

### Preamble

To enable the learners to acquire the knowledge on basic yogasanas and values and practice them in real life.

### Course Outcomes

On the successful completion of the course, students will be able to

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
CO1	Acquire the basic knowledge on yoga and value education.	K1
CO2	Understand the importance of yoga, mental exercises, principles of life and components of values	K2
CO3	Enhance their physical and mental health by practicing the different types of asanas, kriyas, mental exercises and values.	K3
CO4	Lead a meaningful life for the fulfillment of the needs of family, workplace, society and country.	K4

**UNIT I (5 Hours)**

**YOGA AND HEALTH**

**Theory:**

Yoga-Meaning- Importance of Yoga – PanchaKoshas - Benefits of Yoga-General Guidelines.

**Practice:**

Dynamic Exercise- Surya Namaskar-Basic Set of Asanas-Pranayama &Kriya.

**UNIT II**

**ART OF NURTURING THE MIND (5 Hours)**

**Theory:**

Ten Stages of Mind-Mental Frequency – Methods for Concentration

Eradication of Worries- Benefits of Blessings- Greatness of Friendship- Individual Peace and World Peace

**Practice:** - Worksheet

**UNIT III**

**(5 Hours)**

**PHILOSOPHY AND PRINCIPLES OF LIFE**

Purpose and Philosophy of Life- Introspection – Analysis of Thought - Moralization of Desires- Neutralization of Anger.

Vigilance and Anti- Corruption- Redressal mechanism - Urban planning and Administration.

**Practice** – Worksheet



**UNIT IV**

**(5 Hours)**

**VALUE EDUCATION (Part-I)**

Ethical Values: Meaning – Need and Significance- Types - Value education – Aim of education and value education

Components of value education: Individual values – Self discipline, Self Confidence, Self Initiative, Empathy, Compassion, Forgiveness, Honesty, Sacrifice, Sincerity, Self-control, Tolerance and Courage.

**Practice - Worksheet**

**UNIT V**

**(4 Hours)**

**VALUE EDUCATION (Part-II)**

Family Values

Constitutional or National values – Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom and Fraternity.

Social values – Pity and probity, self control, universal brotherhood.

Professional values – Knowledge thirst, sincerity in profession, regularity, punctuality and faith.

Religious values – Tolerance, wisdom, character.

**Practice - Worksheet**

**Reference Books:**

1. Vethathiri Maharishi (2015), 'Yoga for human excellence'- Sri Vethathiri Publications.
2. Value Education for human excellence- study material by Bharathiar University.
3. Value Education - Study Material by P.K.R Arts College for Women.

**III - SEMESTER**

Course Code	Course Name	Category	L	T	P	Credit
20PHU08	OPTICS	CORE	60	4	-	5

**Preamble**

To provide a knowledge about the optical instruments and nature of light

**Course Outcomes**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the types of aberrations	K <sub>1</sub> , K <sub>2</sub> ,
CO2	Understand the concept of interference	K <sub>1</sub> , K <sub>2</sub>
CO3	Understand the concept of diffraction	K <sub>1</sub> , K <sub>2</sub> ,
CO4	Basic knowledge about Polarization	K <sub>1</sub> , K <sub>2</sub>
CO5	Basic knowledge about quantum optics	K <sub>1</sub> , K <sub>2</sub>

**UNIT I - Geometrical Optics**

**(12 Hours)**

Aberrations - Spherical aberrations in lens – coma - Astigmatism - chromatic aberration - dispersion by a prism - Cauchy's dispersion formula- dispersive power, achromatism in prism - deviation without dispersion - chromatic aberrations in a lens - circle of least confusion – achromatic lens - condition for achromatism of two thin lenses separated by a finite distances

**UNIT II - Physical optics Interference**

**(12 Hours)**

Fresnel's Biprism – Interference in thin films due to reflected light – Fringes due to wedge shaped thin film – Newton's rings – Refractive index of the Liquid – Michelson interferometer – Determination of a wave length of monochromatic light – difference in Wave length between two neighboring spectral lines

**UNIT III - Diffraction**

**(12 Hours)**

Fresnel's assumptions – rectilinear propagation of light – half period zone – Zone Plates – Action and Construction – comparison with a convex lens – Fresnel and Fraunhofer

diffraction – Fraunhofer diffraction at a Single light – Diffraction grating – Resolving power & Dispersive power of Grating

#### **UNIT IV - Polarization**

**(12 Hours)**

Double Refraction – Huygen’s explanation --Optic axis in the plane of incidence, inclined and perpendicular to the crystal surface – Production and Detection of Plane, Circularly and Elliptically Polarized light – Optical Activity – Fresnel’s explanation – Specific rotation – Half Shade Polarimeter

#### **UNIT V - Quantum Optics**

**(12 Hours)**

Light quanta and their origin – Resonance radiation– Metastable states – Population Inverse – Optical pumping – Spontaneous and Stimulated emission – Einstein’s coefficient– Ruby, He-Ne, CO laser – Resonant cavities – elements of non linearoptics – second harmonic generation –threshold condition for laser – Stimulated Raman scattering

#### **Books for Study**

1. A Text book of Optics - Dr. N. Subramaniam Brijlal, Dr. M.N. Avadhanulu, 2016, S. Chand & Company Pvt. Ltd (Unit 1-5)

#### **Books for Reference**

1. Modern Physics - R.Murugesan, Kiruthiga Sivaprasath, 2018, S.Chand and Company Limited
2. Optics and Spectroscopy - R.Murugesan , 5<sup>th</sup> Edition, 2005,S.Chand and Company Limited

<b>Course Code</b>	<b>Course Name</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
20PHU11	PHYSICS - PRACTICAL II	CORE PRACTICAL	90	-	3	3

I  
**(EXAMINATION AT THE END OF SECOND SEMESTER)**

#### **ANY TWELVE (12) EXPERIMENTS ONLY**

1. Rigidity Modulus – Torsional Pendulum – with &without symmetrical masses
2. Quincke’s method – Surface Tension and Angle of Con tact of Mercury

3. Specific heat capacity – Newton’s law of cooling – Spherical calorimeter
4. Spectrometer – Hollow prism – Refractive index of the Prism
5. Determination of  $M_H$  and  $B_H$
6. Zener diode - Characteristics
7. Spectrometer – (i – i’) curve
8. Newton’s rings – Refractive index of a lens
9. Reduction factors of a Tangent Galvanometer - BG
10. Comparison of Mutual Inductance - BG
11. Spectrometer – Grating – Minimum deviation & Normal Incidence
12. Young’s Modulus – Koenig’s Method – Non Uniform bending
13. Young’s Modulus – Koenig’s Method – Uniform bending
14. Spectrometer – Cauchy’s constant
15. Spectrometer – Dispersive Power
16. Spectrometer – Narrow Angled Prism
17. Carey Foster’s Bridge – Temperature Coefficient
18. Potentiometer – Reduction factor of T.G in Primary
19. Potentiometer – EMF of a thermocouple
20. B.G - Absolute Capacity
21. B.G – Determination of High Resistance

Course Code	Course Name	Category	L	T	P	Credit
20PHU10	ALLIED CHEMISTRY – I	ALLIED	45	3	-	3

### Preamble

The aim is to provide the student to understand problems associated with hard water and treatment methods. To understand about basic concepts of organic chemistry, Metals and its extraction & basic aspects of chemical kinetics and photochemistry

### Course outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of extraction of metals	K <sub>1</sub> , K <sub>2</sub>

CO2	To select and use eco-friendly fuels industrial and domestic purpose	K <sub>1</sub> , K <sub>2</sub>
CO3	To suggest methods to minimize problems related to hard water in industrial operations	K <sub>1</sub> , K <sub>2</sub>
CO4	The students will get knowledge on the structural basics of organic compounds	K <sub>1</sub> , K <sub>2</sub>
CO5	To use appropriate methods to study chemical reactions	K <sub>1</sub> , K <sub>2</sub>

**Unit I - Metals and its Extraction (9 Hours)**

Minerals and Ores-Oxide and Sulphide ores .General methods of extraction of metals- Extraction of Uranium from its Ore. Methods of ore dressing-Gravity separation, Magnetic separation and Froth flotation- Reduction methods-Roasting, Calcination and Smelting- Types of refining Van Arkel method, Zone refining and Electro refining

**Unit II - Fuels and Fertilizers (9 Hours)**

Fuels- Classification-Composition and uses of gaseous fuels like water gas, producer gas, liquefied petroleum gas, gobar gas, Compressed natural gas-Advantages of gaseous fuels over solid fuels - Fertilizers- Classification – Urea , Ammonium sulphate, superphosphate, Triple super phosphate, potassium nitrate- manufacture and uses - Silicones - Preparation, properties and applications

**Unit III - Water Treatment (9 Hours)**

Hardness of water: temporary and permanent hardness, disadvantages of hard water - Softening of hard water - Zeolite process, demineralization process and reverse osmosis - Purification of water for domestic use - Chlorination-Break point chlorination, Ozonolysis and UV treatment- Definition and importance of BOD and COD.

**Self study Topics:** Role of activated carbon in water treatment – Adsorption

**Unit IV - Fundamentals of Organic Chemistry (9 Hours)**

Hybridization in methane, ethane, acetylene, benzene - Classification of reagents - electrophiles, nucleophiles and free radicals - Classification of reactions addition, substitution, elimination, condensation and polymerisation - Polar Effects - Inductive effect, resonance, hyper-conjugation, steric effect - electrophilic substitution mechanism in benzene (Nitration , Sulphonation, Friedal crafts alkylation and acylation)

### Unit V - Chemical Kinetics and Photochemistry

(9 Hours)

Rate of chemical reaction- Differential rate expression - order and molecularity - Integrated rate expression for first, second and zero order reactions - Half-life period— Effect of temperature on reaction rate - Activation energy- Arrhenius equation

Photochemistry - Statement of Grothus - Draper Law, Stark-Einstein's Law- Difference between Photo chemical and Thermal reaction- Quantum Yield-Definition- Kinetics of  $H_2-Br_2$  reaction. Photosynthesis, Photosensitisation, Phosphorescence, Fluorescence, Chemiluminescence - Definition with examples

#### Books for Study

1. Text book of Ancillary Chemistry -Dr. Veeraiyan V, Edition - 2008, High mount Publishing house, Chennai-14 (Both in Tamil and English)
2. Text book of Ancillary Chemistry - Vaithyanathan S. and Others, Edition-2006, Priya Publications, Karur-2

#### Books for Reference

1. Text book of Organic chemistry - Soni P and Others, Edition -2006, Sultan Chand and Company, New Delhi
2. Text book of inorganic chemistry - Soni P and Others, Edition -2006, Sultan Chand and Company, New Delhi
3. Text book of Physical Chemistry - Puri B.R., Sharma and Pathania, Edition-2006, Vishal Publishing Co., New Delhi

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20PHU12	ALLIED CHEMISTRY - PRACTICAL	ALLIED PRACTICAL	60	-	2	2

#### I. VOLUMETRIC ANALYSIS:

1. Estimation of sodium hydroxide using standard sodium carbonate
2. Estimation of hydrochloric acid- standard oxalic acid
3. Estimation of oxalic acid- standard sulphuric acid
4. Estimation of ferrous sulphate- standard Mohr salt solution
5. Estimation of oxalic acid- standard ferrous sulphate



6. Estimation of potassium permanganate- standard sodium hydroxide

**II. ORGANIC ANALYSIS:** systematic analysis

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

**Books for Reference**

1. Basic Principles of practical Chemistry: Venkateswaran, Veerasamy & Kulandaivel,  
S.Chand & Co

**Total Marks: 100**

**External - 60**

**Organic Qualitative Analysis – 24, Volumetric Estimation -24, Record - 12**

**Internal Assessment - 40**

**Volumetric Analysis(mark split up)**

- i) Procedure 4 marks
- ii) Results < 2 % - 20 marks 2-3 % -16 marks 3-4 % - 12 marks 4 > 4 % - 6 marks

**Organic Qualitative Analysis (mark split up)**

- i) Identification of Nitrogen - 6 marks
- ii) Saturated on unsaturated - 2 marks
- iii) Aliphatic or Aromatic - 2 marks
- iv) Preliminary reactions with Procedure - 6 marks
- v) Functional group identified correctly- 8 marks

Course Code	Course Name	Category	L	T	P	Credit
20AEU01	INFORMATION SECURITY	ABILITY ENHANCEMENT COURSE - I	30	2	-	2

**Preamble**

To learn about the basics of Information Security

**Course Outcomes**

On the successful completion of the course, students will be able to

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
CO1	Obtain fundamental knowledge of Information Security	K1,K2
CO2	Learn basic concepts of Risks in Information Security	K1,K2
CO3	Familiarize the ideas of security planning and policies	K2,K3
CO4	Understand with Privacy and Ethical Issues in Information Security	K3,K4
CO5	Learn about Cryptography	K4, K5

**Unit I - Introduction to Information Security (5 Hours)**

Information Security: Principles, Concepts and definitions - The need for Information Security - Benefits of information security. The Security Problem in Computing: The meaning of computer Security - Computer Criminals

**Unit II - Information Risk (5 Hours)**

Information Risk: Threats and vulnerabilities of Information systems – Introduction to Risk management. Information security management Policy, standards and procedures

**Unit III - Security Planning (5 Hours)**

Administering Security: Security planning - Security planning team members - Assuring Commitment to a security plan - Business Continuity Plan - Incident response plan - Organizational Security policies, Physical Security

**Unit IV - Privacy and Ethical Issues in Information Security (5 Hours)**

Legal Privacy and Ethical Issues in Information Security: Protecting Programs and data - Information and the law - Rights of Employees and Employers - Software failures - Computer Crime - Ethical issues in Information Security

**Unit V - Cryptography (4 Hours)**

Cryptography: Introduction to Cryptography - What is Cryptography – Plain text – Cipher text – Substitution Ciphers - Transposition Ciphers

### Books for Study

1. Sumitra Kisan and D.Chandrasekhar Rao, Information Security Lecture Notes, Department of Computer Science and Engineering & Information Technology, Veer Surendra Sai University of Technology (Formerly UCE, Burla) urla, Sambalpur, Odisha

### Books for Reference

1. Andy Taylor (Editor) ,David Alexander, Amanda Finch & David Sutton, Information Security Management Principles An ISEB Certificate, The British Computer Society, 2008

20NMMU01A	INDIAN WOMEN AND SOCIETY	CATEGORY	L	P	CREDIT
		Non - Major Elective	24	-	2

### Preamble

To familiarize students with the specific cultural contexts of women in India

### Course Outcomes

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate knowledge of the history of women's studies as an academic discipline	K1,K2
CO2	Analyze the various roles of women and the challenges faced by them in the society	K3
CO3	Assimilate and evaluate the importance of women health	K3,K5
CO4	Identify the different issues related to women in general	K4
CO5	Assessing the Women Empowerment and the role of Central & State Government in developing Women	K5

### Unit 1: Historical Background

(5 Hours)

History of Women's status from Vedic times, Women's participation in India's Pre and Post Independence movement and Economic Independence, fundamental rights and importance of women in Modern Society

**Unit 2: Role of Women (Challenges & remedies) (5 Hours)**

Women in Family, Agriculture, Education, Business, Media, Defense, Research and Development, Sports, Civil Services, Banking Services, Social Work, Politics and Law

**Unit 3: Women and Health (5 Hours)**

Women and health issues, Malnutrition, Factors leading to anemia, Reproductive maternal health and Infant mortality, Stress

**Unit 4: Issues of Women (5 Hours)**

Women's issues, Dowry Related Harassment and Dowry Deaths, Gender based violence against women, Sexual harassment, Loopholes in Practice to control women issues.

**Unit 5: Women Empowerment (4 Hours)**

Meaning, objectives, Problems and Issues of Women Empowerment, Factors leading to Women Empowerment, Role and Organization of National Commission for Women, Central and State Social Welfare Board for Women Empowerment, Reality of women empowerment in the era of globalization.

**Reference Books:**

S.No	Authors	Title	Publishers	Year of Publication
1	Mala Khullar	Writing the Women's Movement: A Reader	Zubaan	2005
2	IAWS	The State and the Women's Movement in India	IAWS, Delhi	1994
3	Kosambi, Meera	Crossing Thresholds: Feminist Essays in Social History	Permanent Black	2007
4	T Rowbotham, Sheila	Hidden from History: Women's Oppression and the Fight against It	Pluto Press, London	1975
5	Susheela Mehta	Revolution and the Status of Women	Metropolitan Book co.pvt ltd, New Delhi	1989

Course Code	Course Name	Category	L	T	P	Credit
20NMU01B	BASIC TAMIL	NON - MAJOR ELECTIVE	24	-	-	2

**gFjp –IV: mbg;gilj;jkpo;j;jhs; -1**

**%d;whk; gUtk;**

**,sq;fiy 2017-18 fy;tpahz;L Kjy; Nru;Nthu;f;FupaJ**

**(12-Mk; tFg;G tiu jkpo; nkhopg;ghlk; gapyhjth;fSf;F)**

**Gw kjpg;gPl;Lj; Njh;T kl;Lk;**

1. jkpo; nkhopad; mbg;gilf; \$Wfs;.  
vOj;Jfs; : KjnyOj;Jfs; (caph; vOj;J> nka; vOj;J> caph;nka; vOj;J)  
nrhw;fs; : ngah;r;nrhy;> tpidr;nrhy;> ,ilr;nrhy;> chpr;nrhy;  
njhlh; : njhluikg;G (vOtha;> nrag;gLnghUs;> gadpiy)

2. Fwpg;G vOJjy; : gj;Jg; gjpide;J njhlh;fspy; Fwpg;G tiujy;  
gpiopf;fp vOJjy; : (xw;Wg;gpiop vOj;Jg;gpiop)

**2017 – 2018 fy;tpahz;L Kjy; gapy;gth;fSf;Fg; gpd;tUk; tpdhj;jhs; mikg;G  
gpd;gw;wg;gl Ntz;Lk;.**

Course	Sections	Assessment Domain	Marks and Unit Weightage	Total ESE
Non-Major Elective I (Advanced Tamil)	<b>Section A</b>	K1: Remember Level K2: Understand Level	4 X 5 = 20 Four out of Six (Open choice) (At least one question from each unit)	50*
	<b>Section B</b>	K3: Apply Level K4: Analyze Level K5: Evaluate Level	3 X 10 = 30 Three out of Five (Open choice) (At least one question from each unit)	

**IV - SEMESTER**

Course Code	Course Name	Category	L	T	P	Credit
20PHU13	MATHEMATICAL PHYSICS	CORE	75	5	-	5

**Preamble**

The aim is to provide the student to acquire knowledge and apply it to various physical problems and to develop the problem solving ability.

**Course Outcome**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Study the matrices and apply it to solve problems	K <sub>1</sub> , K <sub>2</sub>
CO2	Understand the concepts of vector calculus	K <sub>1</sub> , K <sub>2</sub>
CO3	Study the basic concepts in statistics and probability	K <sub>1</sub> , K <sub>2</sub>
CO4	Describe and understand Empirical Laws and Curve Fittings	K <sub>1</sub> , K <sub>2</sub>
CO5	Demonstrate knowledge of core principles in mechanics Understand and apply Lagrange's equations and Hamilton's equation to simple physical systems	K <sub>1</sub> , K <sub>2</sub>

**Unit I – Matrices**

**(15 Hours)**

Introduction – Special types of Matrices - Adjoint of a matrix – Eigen values and Eigen Vectors – Characteristic Equation of a Matrix- Cayley – Hamilton theorem -Problems

**Unit II - Vector Calculus**

**(15 Hours)**

Gradient of a scalar field – Divergence of a Vector function - Curl of a Vector function and its physical significance – Gauss divergence theorem and its proof -problems – Stoke's theorem and its proof –problems



**Unit III - Statistics (15 Hours)**

Measures of central tendency – Mean - Median and Mode - Mean deviation – Standard deviation – Moments - Moment Generating Function – simple problems – Probability - Addition and Multiplication laws of Probability - simple problems

**Unit IV-Empirical Laws and Curve Fittings (15 Hours)**

Introduction – The linear law – Laws reducible to linear law – Graphical method – Method of group averages – Fitting a straight line – Equations involving three constants – Principle of least squares – Fitting a straight line and a parabola

**Unit V- Lagrangian & Hamiltonian Formulation (15 Hours)**

Concept of Lagrangian - Generalized Coordinates- D'Alembert's Principle – Lagrangian equation of motion from D'Alembert's Principle – Application of Lagrangian equation to simple pendulum, Linear harmonic oscillator - Hamiltonian function H – Physical significance of H – Applications of Hamilton's equation to Simple pendulum, Linear Harmonic Oscillator.

**Books for Study**

1. Mathematical Physics – Jaya Prakash
2. Mathematical Physics – H.K.Dass,2005, S.Chand & Company Ltd, New Delhi (Unit 1, 2 &3)
3. Classical Mechanics - Gupta, Kumar and Sharma, 2015, Pragati Publications (Unit 5)
4. Numerical Methods - P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand & Co (Unit 4)

**Books for References**

1. Mathematical Physics with Classical Mechanics - Satyaprakash, 2002, Sultan Chand & Sons, New Delhi
2. Mathematical Physics – B.D.Gupta, 4<sup>th</sup> Edition, 2010, Vikas Publishing House

Course Code	Course Name	Category	L	T	P	Credit
20PHU15	ALLIED CHEMISTRY – II	ALLIED	45	3	-	3

### Preamble

The aim is to provide the student to acquire knowledge about experimental techniques in chemistry & to apply chemistry in Batteries

### Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Study the applications of coordination compounds	K <sub>1</sub> , K <sub>2</sub>
CO2	Understand the concepts of biomolecules	K <sub>1</sub> , K <sub>2</sub>
CO3	Describe and understand the knowledge about phase rule.	K <sub>1</sub> , K <sub>2</sub>
CO4	Demonstrate knowledge about Electro chemistry	K <sub>1</sub> , K <sub>2</sub>
CO5	To know about uses of analytical techniques	K <sub>1</sub> , K <sub>2</sub>

### Unit I - Co-Ordination Chemistry

(9 Hours)

Definition of terms - Classification of Ligands - Nomenclature - Chelation - EDTA and its application – Werner’s Theory - Effective Atomic Number - Pauling's theory- Postulates - Applications to Ni(CO)<sub>4</sub>, Ni(CN)<sub>4</sub>, K<sub>4</sub>[Fe(CN)<sub>6</sub>]- Merits and Demerits of Werner’s and Pauling's theory - Biological Role of haemoglobin and Chlorophyll (elementary idea only) - Applications of coordination compounds in qualitative analysis and Quantitative analysis like Separation of copper and cadmium ions; Nickel and cobalt ion; Identification of metal ions like Cu, Fe and Ni. Estimation of Ni using DMG and Al using Oxine

### Unit II –Biomolecules

(9 Hours)

Carbohydrates- Classifications, preparation and reactions of glucose and fructose. Discussion of open and ring structure of glucose-Mutarotation-Inter conversion of glucose to fructose and vice versa - Preparation and properties of sucrose. Properties of starch, cellulose and derivatives of cellulose - Diabetes - causes and control measures - Amino acids: Classification, preparation and properties of alanine -preparation of dipeptide using Bergman method

**Unit III -Phase Diagram**

**(9 Hours)**

Phase rule: Definition of Phase- Component- Degree's of freedom- One component system- Water system- Reduced phase rule- Simple Eutectic system- Pb-Ag system- Pattinson's process – Extraction of Silver from Lead ore

**Unit IV – Electrochemistry**

**(9 Hours)**

Galvanic cells – emf - standard electrode potential - reference electrodes - electrochemical series and its applications - Determination of pH using H<sub>2</sub>,Quinhydrone and glass electrodes - Electroplating process -Nickel and Chrome plating – Batteries- Primary and Secondary- Ni-Cd Battery- Lithium ion Battery- Fuel cells- H<sub>2</sub>-O<sub>2</sub> fuel cells- Advantages

**Self study Topic:** Batteries in future

**Unit V - Analytical Techniques**

**(9 Hours)**

Fundamental principles, theory, instrumentation and simple applications: UV-Visible, FT-IR Spectroscopy, and Raman spectroscopy- Difference between Raman and FT-IR Spectroscopy. Separation techniques- Chromatography- Types- Principle and Applications of Thin Layer Chromatography - Gas Chromatography (GC) and HPLC

**Books for Study**

1. Text book of Ancillary Chemistry -Dr. Veeraiyan V, Edition - 2008, High mount Publishing house, Chennai-14 (Both in Tamil and English)
2. Text book of Ancillary Chemistry - Vaithyanathan S. and Others, Edition-2006, Priya Publications, Karur-2

**Books for Reference**

1. Text book of Organic chemistry - Soni P L and Others, Edition -2006, Sultan Chand and Company, New Delhi
2. Text book of inorganic chemistry - Soni P L and Others, Edition -2006, Sultan Chand and Company, New Delhi
3. Text book of Physical Chemistry - Puri B.R., Sharma and Pathania, Edition-2006, Vishal Publishing Co., New Delhi

Course Code	Course Name	Category	L	T	P	Credit
20SEU01	ENERGY RESOURCES	SKILL ENHANCEMENT COURSE – I	30	2	-	2

### Preamble

The aim is to provide the student to acquire knowledge of Conventional and non-Conventional Energy Sources and apply it in day to day life & to understand the Importance of energy management

### Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Study about the concepts of Conventional Energy Sources and its applications	K <sub>1</sub> , K <sub>2</sub>
CO2	Study about the concepts of renewable energy sources	K <sub>1</sub> , K <sub>2</sub>
CO3	Study the basic concepts of Biomass energy fundamentals	K <sub>1</sub> , K <sub>2</sub>
CO4	To know about Biomass Utilization To understand its merits and demerits	K <sub>1</sub> , K <sub>2</sub>
CO5	To describe other forms of energy sources To understand the Importance of energy management	K <sub>1</sub> , K <sub>2</sub>

### Unit I - Conventional Energy Sources

Worlds reserve - commercial energy sources and their availability – various forms of energy – renewable and conventional energy system – comparison – Coal, oil and natural gas – applications – Merits and Demerits

### Unit II - Solar Energy

Renewable energy sources – solar energy – nature and solar radiation – components – solar heaters – crop dryers – solar cookers – water desalination (block diagram) Photovoltaic generation – merits and demerits - Hydrogen production

### Unit III - Biomass energy fundamentals

Biomass energy – classification – photosynthesis – Biomass conversion process– biogas plant – biomass applications

#### Unit IV - Biomass Utilization

Gobar gas plants – wood gasification – advantages & disadvantages of biomass as energy source

#### Unit V - Other forms of energy sources

Geothermal energy – Wind energy – Ocean thermal energy conversion – energy from waves and tides (basic ideas) - Importance of energy management

#### Books for Study

1. Non- Conventional Energy Sources – G.D.Rai, 4<sup>th</sup> Edition, 2005, Kanna Publishers Ltd., (Unit 1-5)

#### Books for References

1. Renewable energy sources and emerging Technologies – D.P. Kothari, K.C. Singal & Rakesh Ranjan, 2008, Prentice Hall of India Pvt. Ltd., New Delhi
2. Renewable Energy sources and their environmental impact – S.A. Abbasi, , 2008, Nasema Abbasi PHI Learning Pvt. Ltd., New Delhi

20AEU02	CONSUMER RIGHTS	CATEGORY	L	P	CREDIT
		Ability Enhancement Course : II	36	-	2

#### Preamble

This paper seeks to familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights.

#### Course Outcomes

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level
CO1	Understand the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards	K2, K3
CO2	To provide a comprehensive introduction to the	K1,K2

	Consumer Protection Law in India	
CO3	Have a conceptual knowledge about the Grievance Redressal Mechanism under the Indian Consumer Protection Law	K3
CO4	Evaluate the regulations and legal actions that helps to protect consumers	K5
CO5	Evaluate the Contemporary Issues in Consumer Affairs	K4,K5

**Unit 1: Conceptual Framework (8 Lectures)**

**Consumer and Markets:** Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. **Experiencing and Voicing Dissatisfaction:** Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite

**Unit 2: The Consumer Protection Law in India (8 Lectures)**

**Objectives and Basic Concepts:** Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, and restrictive trade practice.

**Organizational set-up under the Consumer Protection Act:** Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, and National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

**Unit 3: Grievance Redressal Mechanism under the Indian Consumer Protection Law (8 Lectures)**

Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal; Offences and penalties. **Leading Cases decided under Consumer Protection law by Supreme Court/National Commission:** Medical Negligence; Banking;

Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

**Unit 4: Role of Industry Regulators in Consumer Protection (6 Lectures)**

- i. Banking: RBI and Banking Ombudsman
- ii. Insurance: IRDA and Insurance Ombudsman
- iii. Telecommunication: TRAI
- iv. Food Products: FSSAI
- v. Electricity Supply: Electricity Regulatory Commission
- vi. Real Estate Regulatory Authority

**Unit 5: Contemporary Issues in Consumer Affairs (6 Lectures)**

**Consumer Movement in India:** Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

**Quality and Standardization:** Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview

**Note: Unit 2 and 3 refers to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified**

**Suggested Readings:**

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) *Consumer Affairs*, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). *Consumer Protection Law Provisions and Procedure*, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). *Globalisation and Consumerism: Issues and Challenges*, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). *Consumer Protection in India: Issues and Concerns*, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), *Consumer is King*, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). *Consumer Right for Everyone* Penguin Books.

7. E-books :- [www.consumereducation.in](http://www.consumereducation.in)
8. Empowering Consumers e-book,
9. ebook, [www.consumeraffairs.nic.in](http://www.consumeraffairs.nic.in)
10. *The Consumer Protection Act, 1986 and its later versions.* [www.bis.org](http://www.bis.org)

#### **Articles**

1. Misra Suresh, (Aug 2017) “Is the Indian Consumer Protected? One India One People.
2. Raman Mittal, Sonkar Sumit and Parineet Kaur (2016) Regulating Unfair Trade Practices: An Analysis of the Past and Present Indian Legislative Models, Journal of Consumer Policy.
3. Chakravarthy, S. (2014). MRTP Act metamorphoses into Competition Act. CUTS Institute for Regulation and Competition position paper. Available online at [www.cuts-international.org/doc01.doc](http://www.cuts-international.org/doc01.doc).
4. Kapoor Sheetal (2013) “Banking and the Consumer” Akademos (ISSN 2231-0584)
5. Bhatt K. N., Misra Suresh and Chadah Sapna (2010). Consumer, Consumerism and Consumer Protection, Abhijeet Publications.
6. Kapoor Sheetal (2010) “Advertising-An Essential Part of Consumer’s Life-Its Legal and Ethical Aspects”, Consumer Protection and Trade Practices Journal, October 2010.
7. Verma, D.P.S. (2002). Regulating Misleading Advertisements, Legal Provisions and Institutional Framework. Vikalpa. Vol. 26. No. 2. pp. 51-57.

#### **Periodicals**

1. Consumer Protection Judgments (CPJ) (Relevant cases reported in various issues)
2. Recent issues of magazines: International Journal on consumer law and practice, National Law School of India University, Bengaluru
3. ‘Consumer Voice’, Published by VOICE Society, New Delhi.

#### **Websites:**

[www.ncdrc.nic.in](http://www.ncdrc.nic.in)  
[www.consumeraffairs.nic.in](http://www.consumeraffairs.nic.in)  
[www.iso.org](http://www.iso.org).  
[www.bis.org.in](http://www.bis.org.in)  
[www.consumereducation.in](http://www.consumereducation.in)  
[www.consumervoice.in](http://www.consumervoice.in)  
[www.fssai.gov.in](http://www.fssai.gov.in)  
[www.cercindia.org](http://www.cercindia.org)



**V - SEMESTER**

Course Code	Course Name	Category	L	T	P	Credit
20PHU16	PROPERTIES OF MATTER & SOUND	CORE	90	6	-	5

**Preamble**

The aim is to identify the characteristics of matter in terms their properties and to know the basic principles of acoustics

**Course Outcomes**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Study about the concepts of Elasticity and rigidity modulus	K <sub>1</sub> , K <sub>2</sub>
CO2	Study and understand the bending of beams	K <sub>1</sub> , K <sub>2</sub>
CO3	Study the basic concepts of Surface tension	K <sub>1</sub> , K <sub>2</sub>
CO4	To know about Hydrodynamics and Viscosity To understand Bernoulli's theorem and Poiseuille's formula	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO5	To describe about Sound To understand Ultrasonic and its applications	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>

**UNIT I - Elasticity**

**(15 Hours)**

Hooke's law - Stress – strain diagram – Elastic Moduli - Relation between elastic constants - Poisson's Ratio – Twisting couple on a wire – Work done in twisting – Torsional pendulum – determination of rigidity modulus of a wire. Determination of Rigidity modulus and moment of inertia -  $q$ ,  $\eta$  by Searles method - Torsion of a body – Expression for torque per unit twist – Determination of rigidity modulus: Static torsion method (Searle's apparatus - Scale and telescope) and Dynamic torsion method

**UNIT II - Bending of beams**

**(15 Hours)**

Expression for bending moment - Cantilever – Expression for depression at the loaded end - oscillations of a Cantilever - Expression for time period - Determination of Young's modulus by cantilever oscillations Nonuniform bending - Determination of young's modulus

by Koenig's method - Uniform bending - Expression for elevation – Experiment to determine young's modulus using pin and microscope method

**UNIT III - Surface tension (15 Hours)**

Surface tension- Definition and dimensions of surface tension - Surface tension and surface energy, molecular theory, angle of contact, elevation and depression of liquid columns in a capillary tube, excess pressure in a spherical bubble and spherical drop. Synclastic and anticlastic surface - Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaegar's method

**UNIT IV - Hydrodynamics and Viscosity (15 Hours)**

Equation of continuity – Energy of the liquid – Euler's equation for unidirectional flow – Bernoulli's theorem – Explanation and Applications of Bernoulli's theorem Coefficient of Viscosity – Poiseuille's formula for the flow of a liquid through a capillary tube – Corrections to Poiseuille's formula – Searle's viscometer: Rotating cylinder method of finding coefficient of viscosity – Modification of Poiseuille's formula for gases

**UNIT V - Sound (15 Hours)**

Laws of Transverse vibrations in strings-Determination of frequency by Melde's method - Musical Sound and Noise-Characteristics of Musical Sound-Intensity of Sound - Acoustics - Reverberation - Sabine's Reverberation formula - Determination of Absorption coefficient - Newton's Formula for velocity of sound –Effect of Temperature, Pressure, Humidity, Density of medium and Wind - Speech- Intensity of sound –Measurement of intensity of sound :Decibel and Phon- Bel. Reverberation – Sabine's Reverberation formula – Factors Affecting the Acoustics of Buildings – Sound distribution in an Auditorium – Requisites for good acoustics – Ultrasonics - Piezo-electric effect and Magnetostriction effect-Production of Ultrasonics by Piezoelectric oscillator and Magnetostriction oscillator- Detection and Applications of Ultrasonic waves

**Book for Study**

1. Properties of matter - Brijlal & N. Subrahmanyam, 2001, S.Chand & Co. Ltd., (Unit 1, 2, 3, 4)
2. A Text Book of Sound - Brijlal & N. Subramanyam, 2008, Vikas Publishing.

Pvt.Ltd.,(Unit 5)

### Book for Reference

1. Fundamentals of Physics - D Halliday, R Resnick and J Walker, 6<sup>th</sup> Edition, 2001, Wiley NY
2. Properties of matter - Brijlal & N. Subrahmanyam, 2001, S.Chand & Co. Ltd.,
3. Elements of Properties of matter- D.S. Mathur, Revised edition, 2010, S. Chand & Co
4. Properties of matter – Murugesan, 2004, S Chand & Co. Pvt. Ltd.,
5. A Text Book of Sound, R.L. Saihgal, 1979, S. Chand & Co. Pvt. Ltd.,

Course Code	Course Name	Category	L	T	P	Credit
20PHU17	SOLID STATE PHYSICS	CORE	90	6	-	5

### Preamble

The aim is to acquire knowledge about solids materials and their bonds. To motivate the students in order to apply the principles of band theory in their research studies

### Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To gain the knowledge of various types of crystal structure and symmetry elements	K <sub>1</sub> , K <sub>2</sub>
CO2	Understand the concepts of crystallography methods and thermal properties of solids	K <sub>1</sub> , K <sub>2</sub>
CO3	To study the different properties of magnetic materials	K <sub>1</sub> , K <sub>2</sub>
CO4	Analyze the success and failure of free electron theory.	K <sub>1</sub> , K <sub>2</sub>
CO5	Study the concepts of Superconductivity and Explore different kinds of polarization and its effects on dielectric constant	K <sub>1</sub> , K <sub>2</sub>

### Unit I –Crystal Structure

(15 Hours)

Crystal structure –Unit cell–Number of lattice points per unit cell –Bravais lattice – Miller indices- Elements of symmetry – Structure of NaCl crystal – Atomic Packing – Atomic Radius – Lattice constant and Density – Crystal structure (sc, hcp, bcc, fcc)

**Unit II- Crystallography (15 Hours)**

**X-rays:** Bragg's law – Experimental methods in X- ray diffraction: Laue Method- Rotating crystal method – Powder Photograph methods

**Thermal Properties of solids:** Dulong and Pettit's law – Einstein's theory of specific heat of solids – Debye theories of specific heat of solids

**Unit III- Magnetic Properties of Materials (15 Hours)**

Dia, Para, Ferri and Ferromagnetic Materials, Classical Langevin Theory of dia and Paramagnetic Domains - Quantum Mechanical Treatment of Paramagnetism - Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains - Discussion of B-H Curve - Hysteresis and Energy Loss

**Unit IV - Free Electron Theory (15 Hours)**

Free electron theory – Drude Lorentz theory – Explanation of Ohm's law – Electrical conductivity – Thermal conductivity – Wide-Mann and Franz ratio – Sommerfield model – Hall effect – Hall voltage and Hall coefficient – Mobility and Hall angle – Importance of Hall effect – Experimental determination of Hall coefficient

**Unit V- Dielectrics and Superconductivity (15 Hours)**

Dielectrics-Dielectric constant and displacement vector-Clausius mossotti relation – Atomic or molecular Polarizability- Types of Polarizability- Super conductivity: Phenomena-magnetic properties – High  $T_c$  Superconductivity- Meissner effect- Experimental facts – Isotopes effect- Thermodynamic effect

**Books for Study**

1. Solid State Physics– Gupta and Kumar, 9<sup>th</sup> Revised Edition, 2016, K. Nath & Co, Meerut (Unit 1-5)
2. Modern Physics– R Murugesan, 2018, S. Chand & Co (Unit 1-5)

**Books for References**

1. Introduction to Solid State Physics – Charles Kittel, 8<sup>th</sup> Edition, 2004, Wiley India Pvt.Ltd
2. Solid State Physics – A J Dekker, 1999, Macmillan India Pvt Ltd.,
3. Elements of Solid State Physics – J.P. Srivastava, 2<sup>nd</sup> Edition, 2006, Prentice-Hall of India

4. Introduction to solids –Leonid V.Azaroff, 2004, Tata Mc-Graw Hill
5. Solid State Physics – Neil W.Ashcroft and N.DavidMermin, 1976, Cengage Learning
6. Solid State Physics –Rita john,2014,McGraw Hill

Course Code	Course Name	Category	L	T	P	Credit
20PHU18	ELECTRONICS & COMMUNICATION	CORE	75	5	-	5

### Preamble

To provide the students to acquire knowledge about various electronic instruments and motivate them to apply principles of electronics in their day to day life.

### Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Study the basics of semiconductor diodes and analyze the rectifier and filter circuits	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO2	Understand the types of transistors and its biasing	K <sub>1</sub> , K <sub>2</sub>
CO3	Understand the concepts of amplifiers and oscillators	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO4	Understand the principles of FET, UJT and Multivibrators	K <sub>1</sub> , K <sub>2</sub>
CO5	Acquire knowledge about AM and FM modulation and demodulation	K <sub>1</sub> , K <sub>2</sub>

### Unit I - Diodes, Rectifiers and Filters

(15 Hours)

Characteristics of PN Junction diode – Half Wave Rectifier – Efficiency and Ripple Factor –Centre Tapped Full Wave Rectifier – Bridge Rectifier – Efficiency and Ripple Factor – ZenerDiode –Zener Voltage Stabilization – Applications of diodes – clipper and clamper circuits.Filter Circuits: Capacitor Filter – Choke input Filter – Capacitor input Filter (Pi Filter) Special Purpose Diodes: LED – Photodiode – Tunnel Diode

### Unit II - Transistors and Transistor Biasing

(15 Hours)

Transistor action – Expression for collector current in common base and common emitter connections – Relation between  $\alpha$  and  $\beta$  – Characteristics of CE connection – Transistor line analysis – DC load line – Operating point -Need for transistor biasing –

Stabilization – Essentials of transistor biasing circuit – Stability factor– Base resistor method of transistor biasing – Voltage divider biasing.

**Unit III - Amplifiers and Oscillators (15 Hours)**

Single stage transistor amplifier – Practical circuit of amplifier – Phase reversal – Load line analysis - Classification of amplifiers – RC coupled amplifier - Amplifier with negative feedback- Feedback – Principle of negative feedback amplifier – Gain - Sinusoidal Oscillator – Types – Oscillatory circuit – Positive feedback – Barkhausen criterion – Colpitt's oscillator – Hartley oscillator – Phase-shift oscillator – Wein Bridge oscillator

**Unit IV- FET, UJT and Multivibrators (15 Hours)**

JFET – Difference between JFET and BJT – Principle and working of JFET – output characteristics – Parameters of JFET- MOSFET – Working – Depletion and Enhancement mode - UJT – Construction and operation – Characteristics of UJT – Advantages – UJT as Relaxation Oscillator - Multivibrator – types – Astable – Monostable – Bistablemultivibrators

**Unit V – Modulation and Demodulation (15 Hours)**

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 – Essentials in demodulation – AM diode detector – AM radio receivers – Superheterodyne receiver – Advantages

**Book for Study**

1. Principles of Electronics – VK Mehta and Rohit Mehta, 2005,S. Chand & Co. Ltd., (Unit 1, 2, 3)
2. Electronic communications Modulations of Transmission, Prentice – Hall of India (Unit 5)
3. Handbook of Electronics, Gupta and Kumar, Pragati Prakashan, Meerut (Unit 1-5)

**Books for Reference**

1. Basic Electronics (Solid State) - B.L. Theraja, 1995, S. Chand & Co. Ltd
2. A textbook of Applied Electronics - R.S. Sedha, 1999, S. Chand & Co. Ltd

Course Code	Course Name	Category	L	T	P	Credit
20PHU21	ELECTRONICS - PRACTICAL - III	CORE PRACTICAL	60	-	2	3

**(EXAMINATION AT THE END OF SIXTH SEMESTER)**

**ANY TWELVE (12) EXPERIMENTS ONLY**

1. Bistable Multivibrator
2. Astable Multivibrator
3. Series and Parallel resonance circuits
4. Differentiating and Integrating circuits
5. Clipping and Clamping Circuits
6. Logic Gates – Discrete Components
7. Junction diode & Zener diode Characteristics
8. IC – Regulated Power Supply
9. Dual Power Supply
10. Square wave generator using IC 555
11. UJT Characteristics
12. Bridge rectifier with Voltage regulation
13. Emitter follower
14. Hartley Oscillator – Transistor
15. Colpitt's Oscillator – Transistor
16. Monostable Multivibrator
17. FET characteristics
18. RC Coupled amplifier - Transistor

Course Code	Course Name	Category	L	T	P	Credit
20PHU22	DIGITAL ELECTRONICS AND MICROPROCESSOR - PRACTICAL – IV	CORE PRACTICAL	60	-	2	3

**(EXAMINATION AT THE END OF SIXTH SEMESTER)**

**ANY TWELVE (12) EXPERIMENTS ONLY**

1. Verification of Truth tables of IC gates: OR, AND, NOT, XOR, NOR, and NAND
2. NAND as universal building block
3. NOR as universal building block
4. Verification of De Morgan's theorems
5. Boolean Algebra – problem solving
6. Study of RS Flip-flop
7. Study of Shift – Registers- Serial in Parallel out
8. Half Adder
9. Full Adder
10. Half Subtractor
11. Full Subtractor
12. Code converter (Binary to gray and vice versa)
13. 8085 ALP for 8 bit Addition and Subtraction
14. 8085 ALP for 8 bit Multiplication
15. 8085 ALP for 8 bit Division
16. 8085 ALP for finding the biggest number element in the array
17. 8085 ALP for Sum of the elements in the Array
18. 8085 ALP for One's Complement
19. 8085 ALP for Two's Complement Addition and Subtraction
20. 8085 ALP for Masking off most significant bits and setting bits



Course Code	Course Name	Category	L	T	P	Credit
****	PHYSICS IN DAY TO DAY LIFE	OPEN ELECTIVE	60	4	-	3

**Preamble**

To demonstrate knowledge and understanding of the fundamental concepts in Physics

**Course Outcomes**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate Knowledge In Measurement Of Distances.	K <sub>1</sub> , K <sub>2</sub>
CO2	Understand the concepts in Electricity	K <sub>1</sub> , K <sub>2</sub>
CO3	Study About The Magnetism	K <sub>1</sub> , K <sub>2</sub>
CO4	Study The Some Natural Phenomena.	K <sub>1</sub> , K <sub>2</sub>
CO5	Demonstrate Knowledge In Management Of Natural Resources	K <sub>1</sub> , K <sub>2</sub>

**Unit I - Motion and Measurements of Distances (15 Hours)**

History of Transportation-Measurement of Length – Distance-Conventional Methods of Measurement-Standard Units of Measurement-Types of Motion

**Unit II - Electricity (15 Hours)**

Electric current-Electric circuit-Components of basic electric circuit: Cell, Switch, and Bulb Conductor-Insulator-Electric potential and potential difference-Circuit diagram-Ohm's law Factors on which the resistance of conductor depends-Resistance of a system of resistors-Heating effect of electric current-Electric power

**Unit III - Chemical Effects of Electric Current and Magnetism (15 Hours)**

Conduction of Electricity-Conduction of Electricity in Liquids – Electrolysis-Electrolysis and Electroplating - Discovery of Magnets-Magnet-Poles of a magnet-Like poles repel and unlike poles attractMagnetic Field of Earth and Compass

**Unit IV - Some Natural Phenomena**

**(15 Hours)**

Lightning-Charging by rubbing-Transfer of Charge-The Story of Lightning-Lightning Safety Phenomena related to earthquakes-Protection against earthquakes

**Unit V - Management of Natural Resources**

**(15 Hours)**

Save the Environment from Environmental Pollution – Reuse– Recycle-Why do we need to manage our natural resources-Forest and wildlife-Sustainable management-Water for all : dam-Water harvesting-Coal and petroleum

**Books for Study and References:**

1. Monograph – Department of Physics

Course Code	Course Name	Category	L	T	P	Credit
20PHU23A	DIGITAL ELECTRONICS AND MICROPROCESSOR	ELECTIVE	45	3	-	2

**Preamble**

The aim is to provide basic knowledge of binary addition, combinations of logic circuits & microprocessor

**Course Outcomes**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Study the Number systems, Codes and its Conversions	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO2	Understand the concepts of Arithmetic Circuits and Memory Devices	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO3	Study the working of Flip-flops and their applications.	K <sub>1</sub> , K <sub>2</sub>
CO4	Understand the basics of 8085 Microprocessor	K <sub>1</sub> , K <sub>2</sub>
CO5	To write various programs for 8085 Microprocessor	K <sub>1</sub> , K <sub>2</sub> ,

**Unit I - Number System and Codes**

**(15 Hours)**

Binary - Octal - Decimal – Hexa decimal number systems – Conversion of one number system into other. Codes- BCD codes –Gray code –ASCII Code

Arithmetic operation – Binary addition- Binary subtraction – 1's complement subtraction- 2's complement subtraction – Binary to Gray code converter – Gray to Binary converter.

Logic gates: OR, AND, NOT, NAND, NOR, Ex-OR, Ex-NOR gates – Universal building blocks

**Unit II - Boolean algebra and Arithmetic circuits (15 Hours)**

Basic laws – Boolean addition and multiplication – properties – De Morgan's theorems- Minimization using algebraic method – Sum of Product method – Karnaugh map and its simplifications – Product of Sum method-Arithmetic circuits – Half adder – Full adder – Half subtractor – K map simplifications

**A/D and D/A Converters and Memory Devices:** A/D Converters– D/A Converters- Memory Devices: Classification of memories –ROM-PROM, EPROM, EEPROM, RAM (Basic ideas only)

**Unit III - Flip-flops and their applications (15 Hours)**

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 –Asynchronous counters – Synchronous counters – MOD-3, MOD-6, MOD-10 counters

**Unit IV - Microprocessors (15 Hours)**

8085 microprocessors – Microprocessor communication and bus timings – Demultiplexing the bus AD7-AD0 – Generating control signals – A detailed architecture of 8085 microprocessor – 8085 machine cycles and bus timings - Op-code fetch machine cycle – Memory read machine cycle –Memory interfacing: Memory structure and its requirements – Basic concepts in memory interfacing - Address decoding - interfacing circuit – Address decoding and memory address

**Unit V- Programming the 8085 (15 Hours)**

8085 programming model – Instruction classifications – Instruction and data format – 8085 Instructions: Data transfer operations – Logic operations – Branch operations – Programming techniques – Looping, counting and indexing – Additional data transfer and

16-bit arithmetic instructions – Counters and time delays – Simple programs – Addition, subtraction, multiplication, division, setting bits, masking bits

### Book for study

1. Digital circuits and Design - S.Salivahanan and S.Arivazhagan, 3<sup>rd</sup> Edition, 2007, Vikas Publisher (Unit 1,2,3)
2. Digital principle and Applications- Malvino and Leach, 4<sup>th</sup> Edition1993, Tata McGraw-Hill Publishing Company Ltd (Unit 1)
3. Microprocessor Architecture, Programming and applications with the 8085 - Ramesh S.Gaonkar,3<sup>rd</sup> Edition, 1997, Penram International Publisher(Unit 4,5)

### Books for Reference

1. Handbook of Electronics - Gupta and Kumar, 2012,Pragati Prakashan, Meerut
2. Introduction to Microprocessors - A.P.Matur,3<sup>rd</sup> Edition, 1996,Tata McGraw- Hill Publishing Company Ltd

Course Code	Course Name	Category	L	T	P	Credit
20PHU23B	SOIL PHYSICS	ELECTIVE	45	3	-	2

### Preamble

The aim is to provide the student to gain deeper knowledge and understanding of mechanical properties of soils and learn information about transfer processes in soils then know about the saturated and unsaturated soils

### Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Gain basic understanding of mechanical properties of soils	K1, K2
CO2	Comprehend transfer processes for water, air, solutes, and heat in soils	K1, K2
CO3	To measure selected physical properties (parameters) of soils and appropriate and transport parameters of agrochemicals in soils	K1, K2

CO4	Use mathematical models to quantify transfer processes for air, water, and solutes in saturated soils	K1, K2
CO5	Gain the knowledge about transfer processes for air, water, and solutes in water unsaturated soils	K1, K2

**Unit I - Introduction (15 Hours)**

Soil Physics before the 70s-Soil Physics in relation to Natural Sciences and Soil Science- How to acquire Physics knowledge by Scientific Methods-Application of Physics laws in Soil Physics- Fundamental and derived physical quantities and System of units

**Unit II - Basic Physical Properties of Soils (15 Hours)**

Soil as a porous medium, volume and mass relationship- Soil texture- specific surface area- soil structure and aggregation- Pore size and distribution- pore geometry

**Unit III - Soil Water (15 Hours)**

General properties of water- Water rise in a capillary tube- Soil water content- Measurement of soil water content- Energy status of soil water-Soil moisture release curves- Measurement of soil water potential

**Unit IV - Water Flow in Saturated Soils (15 Hours)**

Driving force for water flow-Darcy flux and pore water velocity Darcy's law and Poiseuille's Law- Saturated hydraulic conductivity, permeability, and fluidity Vertical and horizontal water flow-Water flow in layered soils

**Unit V - Water Flow in Unsaturated Soils (15 Hours)**

Darcy's Law in unsaturated soils- Hydraulic conductivity as function of water content and potential- Estimation of hydraulic functions and diffusivity from soil moisture release curves and from particle-and pore size distribution- Equation of continuity and Richard's equation- Steady and unsteady water flow- Infiltration, redistribution and evaporation

**Book for Study**

1. Text book of soil physics - Arunkumar saha Anuradha saha, 2012, Kalyani Publisher
2. Soil physics an introduction - Manoj K.Shukla, 2013, CRC press
3. Principles of soil physics - Rattan Lal, Manoj K. shukla, 2004, CRC press

4. Environmental Soil Physics, by Daniel Hillel, 1998. Academic Press, Inc. San Diego, California.

Study material available in the website: [www.soilphysicsnotes.com](http://www.soilphysicsnotes.com)

Course Code	Course Name	Category	L	T	P	Credit
20PHU23C	GEOPHYSICS	ELECTIVE	45	3	-	2

### Preamble

The aim is to provide the student to gain deeper knowledge in geological Physics, earth structure & fossil animals.

### Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Exploring and analyzing active processes of the Earth	K1, K2
CO2	Gain the knowledge about plateaus and plains	K1, K2
CO3	Analyzing geologic maps	K1, K2
CO4	Find out the preservation of fossils	K1, K2
CO5	Know about the fossil animals	K1, K2

### Unit I - Physical Geology

(15 Hours)

Origin of the Earth - Age of the Earth - Interior of the earth - Structure and constitution of the interior of the earth - Earthquakes: Definition - Effects - Causes - Earthquake waves and their transmission - Seismographs - Distribution of earthquake belts - Volcanoes: Distribution - Causes - Effects of volcanic eruptions - Concepts of Plate Tectonics.

### Unit II

(15 Hours)

Mountains: Origin - Types - Characteristics - Distribution - Types of Plateaus and Plains - Weathering: Types - Products.

**Unit III- Structural Geology (15 Hours)**

Introduction to Structural geology: Topographic maps - Geologic maps - Outcrops and their topography - Clinometer compass and its uses - Representation of attitude of beds.

**Unit IV- Paleontology (15 Hours)**

Definition of fossil -Nature and modes of preservation of fossils - Uses of fossils - General Morphology, classification, geological history and stratigraphical importance of the following invertebrates: Corals, Echinoids, Crinoids and Blastoid - Pelecypods and Cephalopods.

**Unit V (15 Hours)**

Brachiopods - Trilobites – Graptolites - A brief outline on the classification of vertebrates - A very short account of the evolution of Man, Elephant and horse - Gondwana flora of India - An outline of the uses of Micropaleontology.

**Book for Study**

1. Principles of Physical Geology - Arthur Holmes, Thomas Nelson and Sons Ltd., London, 1965
2. Elements of Structural Geology - E. Sherbon Hills, Chapman and Hall Ltd. and Science Paperback, 1963
3. An outline of Structural Geology by Bruce E. Hobbs, Winthrop D. Means and Paul F. Williams, John Wiley and Sons, New York, 1976
4. Vertebrate Palaeontology - A.S. Romer, 1960, Chicago Press.
5. Invertebrate Palaeontology - Henry Woods, 1967, Cambridge University Press, Cambridge.

Course Code	Course Name	Category	L	T	P	Credit
20PEUPH1	LASERS	PROFICIENCY ENHANCEMENT	-	-	-	2

**Preamble**

The aim is to provide the students to know the principles of laser light and also the applications of Lasers

### Course Outcome

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Gain the knowledge about fundamentals of Lasers	K <sub>1</sub> , K <sub>2</sub>
CO2	Know about the concepts of pumping	K <sub>1</sub> , K <sub>2</sub>
CO3	Study about the basic properties of lasers	K <sub>1</sub> , K <sub>2</sub>
CO4	Understand the working of solid and gas lasers	K <sub>1</sub> , K <sub>2</sub>
CO5	know the principle and working of semiconductors lasers	K <sub>1</sub> , K <sub>2</sub>

#### Unit I -Fundamentals of Lasers

Electromagnetic radiation – energy levels – Interaction of radiation and matter  
– fluorescence, absorption, stimulated emission

#### Unit II - Laser materials

Population inversion – optical pumping- excitation by electron collisions –  
resonant transfer of energy – resonant cavity

#### Unit III - Properties of laser light

Line width – collimation – spatial profiles of laser beams – temporal behavior  
of Laser output – Q switched operation – mode locked operation – cavity dumping –  
coherence – radiance – focusing properties of Laser radiation – power

#### Unit IV - Gas Laser

He-Ne Laser – ionized gas laser – Molecular Laser (CO<sub>2</sub>) — Solid state lasers:  
Neodymium YAG Lasers- glass Lasers- Ruby Lasers

#### Unit V - Semi conductor Laser

Semiconductor laser properties – Diode structures – diode doped solid state  
laser – Organic dye lasers – chemical lasers – X ray lasers – Tunable lasers



**Books for study**

1. Laser & Non – Linear Optics – B.B. Laud, 3<sup>rd</sup> Edition - New age International Publication (Unit 1-5)
2. Laser Systems and Applications – V.K.Jain, 2013, Narosa Publishing House (Unit 1-5)

**Books for reference**

1. Lasers and Optical fibre Communications – P.Sarah, 2008, I.K.International Publishing House
2. Laser Physics – S. Mohan, V. Arjunan, M. Selvarani, M. Kanahana mala, 2012, MJP Publishers

**VI - SEMESTER**

Course Code	Course Name	Category	L	T	P	Credit
20PHU24	QUANTUM MECHANICS AND RELATIVITY	CORE	75	5	-	5

**Preamble**

To develop the problem solving ability and to motivate the students to apply Schrödinger's equation or solving problems in wave mechanics, nuclear physics etc.,

**Course Outcomes**

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand and explain the wave properties of matter	K <sub>1</sub> , K <sub>2</sub>
CO2	Understand the idea of uncertainty principle and its applications	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO3	Understand the wave function and its physical interpretation through Schrödinger's wave equation	K <sub>1</sub> , K <sub>2</sub>
CO4	Apply Schrödinger's wave equation to solve problems, understand quantum numbers and commutation relations	K <sub>1</sub> , K <sub>2</sub> , K <sub>3</sub>
CO5	Understand the concepts of special and general theories of relativity	K <sub>1</sub> , K <sub>2</sub>

**Unit I - Wave Properties of Matter (15 Hours)**

Introduction – Phase velocity and Group velocity – Analytical expression for a group of waves – Nature of De’Broglie relation – Derivation of the De’Broglie relation – Phase velocity of De’Broglie waves – Relation between the Phase velocity and the wavelength of De’Broglie wave– De’Broglie wavelength associated with a particle of mass  $M$  and kinetic energy – Verification of De’Broglie relation – Davission and Germer’s experiments – G P Thomson’s experiments

**Unit II - Uncertainty Principle (15 Hours)**

Introduction – Uncertainty Principle – Elementary proof between – Displacement and Momentum – Energy and Time – Physical Significance of Heisenberg’s Uncertainty Principle – Illustration – Diffraction of electrons through a slit – Gamma ray microscope through experiment – Application – Non-existence of free electrons in the nucleus – Size and Energy in the ground state of Hydrogen atom

**Unit III - Schrödinger’s Wave Equation (15 Hours)**

Introduction – Wave function for a free particle – Schrödinger’s One dimensional wave equation– Time-dependent and Time independent – Physical interpretation - Limitation – Normalization of wave function – Operators – Eigen function – Eigen Value – Eigen equation – Operator for Momentum, Kinetic Energy and Total Energy – Postulates of Quantum Mechanics – Orthogonality of Energy Eigen function – Proof – Probability current density – Ehrenfest’s theorem – Statement and proof

**Unit IV- Applications of Schrodinger’s Equation (15 Hours)**

Particle in a box - Potential step – The barrier penetration problem – Linear harmonic oscillator

**Significance of Quantum Numbers:** Significance of various quantum numbers –  $n$ ,  $l$ ,  $m_l$  – Electron probability density

**Unit –V Special Theory of Relativity (15 Hours)**

Galilean Transformation equation – Ether Hypothesis – Michelson-Morley experiment – Explanation of the Negative results – special theory of Relativity – Lorentz

transformation equation – Length contraction – Time dilation – Addition of Velocities – Variation of Mass with velocity – Mass energy equivalence.

**General Theory of Relativity:** General theory of relativity- Effect of gravitational field on a ray of light- Gravitational red shift- Black hole

### Books for Study

1. Quantum Mechanics - S.P Singh, M.K Bagde, C.Kamal Singh, 1<sup>st</sup>Edition, 2001, S.Chand & Co (Unit 1-4)
2. Concepts of Modern Physics – Arthur Beiser, 5<sup>th</sup> Edition, 1995, Tata McGraw- Hill Publishing Company Ltd (Unit 5)

### Books for Reference

1. Quantum Mechanics - Leonard I. Schiff, 1968, Tata McGraw- Hill Publishing Company Ltd

Course Code	Course Name	Category	L	T	P	Credit
20PHU25	ATOMIC AND NUCLEAR PHYSICS	CORE	75	5	-	5

### Preamble

The aim is to provide the student to acquire knowledge about atom, nucleus and their properties. To motivate the students in order to apply the principles of radio activity in their research studies

### Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the properties of positive rays	K <sub>1</sub> , K <sub>2</sub>
CO2	Understand the principles of atom models	K <sub>1</sub> , K <sub>2</sub>
CO3	Understand the properties and structure of nucleus	K <sub>1</sub> , K <sub>2</sub>
CO4	Describe and understand radioactivity, its properties and its applications	K <sub>1</sub> , K <sub>2</sub>
CO5	Understand the working principles of nuclear detectors and the basics concepts of nuclear fission and fusion	K <sub>1</sub> , K <sub>2</sub>

**Unit I -Positive Rays** (15 Hours)

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

**Unit II - Atom Models** (15 Hours)

The Bohr atom model – Critical Potentials – Method of excitation of atoms – Experimental determination of critical potentials by Davis and Goucher's method - Sommerfeld's relativistic model -Vector model-Zeeman effect-Explanation from vector atom model -Pauli's exclusion principle – Periodic classification of elements

**Unit III - Magneto Optical Properties of Spectrum** (15 Hours)

Magnetic dipole moment due to orbital motion of the electron – Magnetic dipole moment due to spin – The Stern and Gerlach experiment – Optical spectra – Fine Structure of the sodium D line – Zeeman effect – Experiments – 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 - Radioactivity** (15 Hours)

Natural Radioactivity : Alpha, Beta and Gamma rays – Properties – Determination of  $e/m$  of Alpha particle – Origin of Gamma rays – Laws of Radioactivity – Law of Radioactive disintegration – Half life period – Mean life period (Definitions, Expression) – Units of Radioactivity – Artificial Radioactivity –Preparation of radio elements – Application of radio isotopes

**Unit V - Nuclear Detectors** (15 Hours)

Principle and working of solid state detector - proportional Counter - Wilson's cloud chamber - Scintillation counter. Accelerators: Synchrocyclotron - Synchrotron - Electron synchrotron - proton synchrotron - Betatron

**Nuclear Fission and Fusion:** Nuclear fission – Energy released in Fission – Bohr and Wheelers theory of Nuclear fission – Nuclear fusion

### Books for Study

1. Modern Physics by R. Murugesan, 2009, S.Chand & Co., (Unit 1-5)
2. Atomic Physics by J.B. Rajam, 2009, S.Chand & Co., (Unit 2)
3. Nuclear Physics by D.C.Tayal, 2002, Himalaya Publishing House. (Unit 5)

### Books for Reference

1. Modern Physics by Sehgal Chopra Sehgal, 8<sup>th</sup> Edition, 1998, Sultan Chand & Sons.
2. Concept of Modern Physics by Arthur Beiser, 5<sup>th</sup> Edition, International Edition Mc Graw Hill Inc.,

Course Code	Course Name	Category	L	T	P	Credit
20PHU26	ELECTRICITY AND MAGNETISM	CORE	75	5	-	5

### Preamble

To acquire knowledge in electricity and magnetism, problem solving ability & also understand the laws and equations

### Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Study the laws of electricity and magnetism and its applications	K <sub>1</sub> , K <sub>2</sub>
CO2	Understand the properties of magnetic materials	K <sub>1</sub> , K <sub>2</sub>
CO3	Study the basic concepts of thermoelectricity	K <sub>1</sub> , K <sub>2</sub>
CO4	Explanation of Helmholtz equation of varying current.	K <sub>1</sub> , K <sub>2</sub>
CO5	To understand the dynamics of charged particles	K <sub>1</sub> , K <sub>2</sub>

### Unit I - Electrostatics

(15 Hours)

**Gauss theorem and its applications:** Coulomb's law, Electric Field and potentials, Electric field due to a point charge. Normal electric induction Gauss theorem, application of Gauss theorem - Energy stored in unit volume of an electric field – Electric field due to an infinite plane sheet

**Capacitance and Capacitors:** Spherical capacitor, cylindrical capacitor, Force of attraction between charged plates of a capacitor – capacity of a parallel plate capacitor; effect of introducing a dielectric slab between the plates - polarization in dielectric materials

**Unit II - Magnetic Properties of materials (15 Hours)**

Electron theory of magnetism; dia, para, ferromagnetism and their properties - magnetic field B - magnetization M - magnetic field intensity H - magnetic susceptibility and magnetic permeability - magnetic materials and magnetization -magnetic hysteresis – area of the hysteresis loop- determination of susceptibility : Guoy's method – magnetic circuits – circuits comparison of magnetic application with electrical circuits

**Unit III - Thermo Electricity (15 Hours)**

Seebeck effect – Laws of thermo e.m.f – Peltier effect- Peltier Coefficient – determination of Peltier co-efficient – thermo dynamical consideration of Peltier -effect – Thomson effect – Thomson Co-efficient – e.m.f generated in a thermocouple taking both Peltier -effect and Thomson effect in the metals – Thermo electric power – Application of thermodynamics to Thermocouple – Thermoelectric diagrams and their uses

**Unit IV- Helmholtz equation of varying current (15 Hours)**

Growth and decay of current in an inductive – resistive circuit – charging and discharging of a capacitor through a resistance – charging and discharging of capacitor through an inductance – oscillatory circuits- Force on a current carrying conductor – Theory of Ballistic Galvanometer

**Unit V - Dynamics of charged particles (15 Hours)**

Charged particles in uniform and constant electric field – Charged particles in an alternating electric field – Charged particles in a uniform and constant magnetic field – charged particles in combined electric and magnetic field when the fields are parallel and are in mutually perpendicular direction. A conducting rod moving through a uniform magnetic field – inductance in series – in parallel – self inductance of coaxial cylinders – self inductance of toroidal coil of rectangular cross section – circular cross section – Grassot fluxmeter – comparison with Ballistic galvanometer – rotating magnetic field

### Books for Study

1. Electricity and Magnetism – Brijlal and Subramaniam, 1994, The National Publishing Company (Unit 1-5)
2. Electricity and Magnetism – R. Murugesan, 4<sup>th</sup> Edition, 1997, Shoban Lal Nagin CHAND & Co. (Unit 1-5)

### Books for Reference

1. Electricity and Magnetism – D.N. Vasudeva, Edition 1999, S. Chand & Company Ltd.
2. Electricity and Magnetism – Nagarathanam and Lakshminarayanan
3. Fundamental of Electricity and Magnetism – B.D.Duggal and C.L. Chhabra
4. Mechanics – D.S. Mathur, Edition 1998, S. Chand & Company Ltd.,

Course Code	Course Name	Category	L	T	P	Credit
20PHU27	APPLIED INSTRUMENTATION	CORE	75	5	-	5

### Preamble

To provide a good foundation in measurements, knowledge of the behaviour of instruments and to inspire interest for the knowledge of concepts regarding measurements

### Course Outcomes

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concept of measurement	K <sub>1</sub> , K <sub>2</sub> ,
CO2	Knowledge about pressure measurement	K <sub>1</sub> , K <sub>2</sub>
CO3	Understand thermal and nuclear radiation	K <sub>1</sub> , K <sub>2</sub> ,
CO4	Knowledge of signal conditioning and data conversion	K <sub>1</sub> , K <sub>2</sub>
CO5	Basic knowledge of Spectra and X-ray properties	K <sub>1</sub> , K <sub>2</sub>

### Unit I - Basic Concept of Measurement

(15 Hours)

Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices – Calibration

#### Measurement of Temperature

Temperature scales – The ideal gas thermometer -Thermistors – Thermoelectric effects – quartz crystal thermometer – liquid crystal thermography

**Unit II - Pressure Measurement (15 Hours)**

Mechanical Pressure measurement devices – Bourdon tube Pressure gauge – The Bridgeman Gauge – Dead weight tester – Low Pressure measurement – The Mc lead gauge – Pirani thermal Conducting gauge – The Knudsen gauge

**Unit III - Thermal and Nuclear Radiation Measurements (15 Hours)**

Introduction – Detection of thermal radiation – Measurement of emissivity – Reflectivity and Transmitting measurements – Solar radiation measurements – Detection of Nuclear radiation – The Geiger Muller counter

**Unit IV- Data Acquisition and Conversion (15 Hours)**

Introduction – Signal conditioning of the inputs – Single channel data acquisition systems – Data conversion – Digital to Analog converter – Analog to Digital converter - Oscilloscope -Basic principles – CRT features – Basic principles of signal displays – Block Diagram of oscilloscope – Simple CRO- Display devices: LED – LCD

**Unit V - X-ray Spectra (15 Hours)**

X-ray – Coolidge tubes – Properties – X-ray Spectra – Continuous and characteristics X-ray Spectrum – Mosley's law (Statement, Explanation and Importance) – Compton Effect – Expression for change of wave length

**Book for Study**

1. Instrumentation Devices and Systems –C S Rangan, G R Sharma, V S V Mani TMH (Unit 1&4)
2. Experimental methods for Experiments - Jack P Holman (Unit 1, 2&3)
3. Electronic Instrumentation - H S Kalsi, TMH (Unit 4)
4. Modern Physics - R Murugesan, S. Chand & Company Limited (Unit 5)

Course Code	Course Name	Category	L	T	P	Credit
20PHU29A	BASIC CONCEPTS OF C & C++	ELECTIVE	45	3	-	3

**Preamble**

The aim is to provide the student gain knowledge on of basics of C and C++



### Course Outcome

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To acquire basic knowledge about Programming in C	K1, K2, K3
CO2	To Gather Knowledge In C Programming And Developing Programming Skills	K1, K2, K3
CO3	To strengthen the knowledge on structures, arrays etc., of C programming	K1, K2, K3
CO4	To understand the principle of oriented program	K1, K2, K3
CO5	To understand the inheritance	K1, K2, K3

#### **Unit I - Overview of C (15 Hours)**

Introduction- Importance of C- Basic Structure of C program- Tokens-Variables- Data types- Operators and Expression- Managing Input and Output Operators

#### **Unit II - Conditional Statements (15 Hours)**

If statement- switch statement- goto statement- while statement- do statement-for statement- continue statement- break statement

#### **Unit III – Arrays (15 Hours)**

One dimensional array- Two dimensional array- Multidimensional array

#### **Unit IV – Principles of Object Oriented Programming (15 Hours)**

Object Oriented Programming Paradigms- basic concept of OOPS- benefits of OOP  
what is C++-simple C++ program-structure of C++ program

#### **Unit V –Inheritance (15 Hours)**

Single inheritance-multilevel-multiple inheritance-hierarchical-hybrid

### Books for Study

1. Computing Fundamental & C Programming - E .Balagurusamy, 2011, Tata McGraw Hill (Unit 1,2 & 3)
2. Object Oriented Programming with C++ - E. Balagurusamy,2008, Tata McGraw-Hill Publication (Unit 4,5)

### Books for Reference

1. Programming in C- N. Kamthane Ashok,2nd Edition, 2013,Pearson Education
2. let us C - Yashvant P. Kanetkar, 8th Edition, 2008,Infinity science press

Course Code	Course Name	Category	L	T	P	Credit
20PHU29B	INTRODUCTION TO SPACE PHYSICS	ELECTIVE	45	3	-	3

### Preamble

The aim is to provide the student gain knowledge on astronomical backgrounds, astronomical concepts and Understand cosmic rays

### Course Outcome

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of Milky Way.	K1, K2, K3
CO2	Understand and describe about the Galaxies	K1, K2, K3
CO3	Understand the features of Sun.	K1, K2, K3
CO4	Understand the Hubble theory behind Hubble telescope.	K1, K2, K3
CO5	Learning about the stars	K1, K2, K3

### Unit I - The Sun

(15 Hours)

Introduction - Astronomical background - General description of the sun - Sun's outer layers – Composition - Visible features on the sun - Temperature of the corona - Solar activity and Sunspot cycles

**Unit II - Introduction to Cosmic rays (15 Hours)**

Nature of Cosmic rays - the origin of cosmic rays - Cosmic ray shower - effect of geomagnetic field on cosmic rays - Primary cosmic radiation - Secondary Cosmic radiation - time variation of cosmic rays

**Unit III - Galactic astronomy (15 Hours)**

Milkyway - Hubble telescope - Classification of galaxies- Spiral galaxies - Elliptical galaxies - Irregular galaxies - Dwarf galaxies - Dark matter

**Unit IV - Stellar Objects (15 Hours)**

Composition of Stars- Velocity, Mass and Sizes of Stars-Types of Stars- Temperature Dependence - The colour index of a star - Luminosities of stars - Age of stars

**Unit V - Age of Stars (15 Hours)**

Stellar Evolution-Protostar-Main Sequence Star-Subgiant, Red Giant, Supergiant-Core Fusion - Planetary Nebula (or) Supernova-White Dwarfs-Novae And Supernovae- Neutron Stars-Pulsars-Black Holes-Detecting Black Holes

**Books for Reference**

1. An Introductory Course on Space Science and Earth's Environment - S.S.Degaonker, Gujarat University Publication, Ahmedabad
2. Atomic and Nuclear Physics-An Introduction- Subrahmanayam
3. An introduction to Astro Physics-Saraswathy K.N

Study material available in the website: [www.astronomynotes.com](http://www.astronomynotes.com)

Course Code	Course Name	Category	L	T	P	Credit
20PHU29C	SMART MATERIALS	ELECTIVE	45	3	-	3

**Preamble**

To gain deeper knowledge of smart materials, sensors, actuators &the advances in smart materials

**Course Outcome**

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understanding the different types of polymer materials	K1, K2
CO2	Gain the knowledge about low strain smart sensors	K1, K2
CO3	Discuss about actuators	K1, K2
CO4	Know about the composite beams	K1, K2
CO5	Know about the advances in smart structures	K1, K2

### **Unit I - Overview of Smart Material**

**(15 Hours)**

Introduction to Smart Materials - Principles of Piezoelectricity - Perovskite Piezoceramic Materials - Single Crystals vs Polycrystalline Systems - Piezoelectric Polymers - Principles of Magnetostriction - Rare earth Magnetostrictive materials - Giant Magnetostriction and Magneto-resistance Effect

### **Unit II - High-Band Width, Low Strain Smart Sensors**

**(15 Hours)**

Piezoelctric Strain Sensors - In-plane and Out-of Plane Sensing - Shear Sensing- Accelerometers - Effect of Electrode Pattern - Active Fibre Sensing - Magnetostrictive Sensing - Villari Effect - Matteuci Effect and Nagoka-Honda Effect - Magnetic Delay Line Sensing -Application of Smart Sensors for Structural Health Monitoring (SHM) - System Identification using Smart Sensors

### **Unit III - Smart Actuators**

**(15 Hours)**

Modelling Piezoelectric Actuators - Amplified Piezo Actuation – Internal and External Amplifications - Magnetostrictive Actuation - Joule Effect - Wiedemann Effect - Magnetovolume Effect -Magnetostrictive Mini Actuators - IPMC and Polymeric Actuators - Shape Memory Actuators - Active Vibration Control - Active Shape Control - Passive Vibration Control - Hybrid Vibration Control

### **Unit IV - Smart Composites**

**(15 Hours)**

Review of Composite Materials - Micro and Macro-mechanics - Modelling Laminated Composites based on Classical Laminated Plate Theory - Effect of Shear Deformation - Dynamics of Smart Composite Beam - Governing Equation of Motion - and Finite Element Modelling of Smart Composite Beams

**Unit V - Advances In Smart Structures & Materials**

**(15 Hours)**

Self-Sensing Piezoelectric Transducers - Energy Harvesting Materials - Autophagous Materials - Self- Healing Polymers - Intelligent System Design - Emergent System Design

**Books for Study and Reference**

1. Smart Structures and Materials - Brian Culshaw, Artech House, 2000
2. Smart Structures - Gauenzi.P Wiley, 2009
3. Piezoelectricity – Cady W. G, Dover Publication

Study material available in the website: [www.smartmaterials.com](http://www.smartmaterials.com)

Course Code	Course Name	Category	L	T	P	Credit
20SEU03	PROGRAMMING IN C, C++	SKILL ENHANCEMENT COURSE - III	30		2	2

**Programming in C**

1. Find the number of days elapsed between two dates
2. Convert Integer in the range 1 to 100 in words
3. Write a program that uses functions to compare two strings input by user. The Program should state whether the first string is less than, equal or greater than the second string
4. Write a Program to compare two files printing the character position where they equal and where they are different
5. Write a Program for Matrix Addition
6. Write a Program for Matrix Multiplication
7. Write a Program for Addition of Two times

**Programming in C++ (Any three (3) Programs only)**

1. To read any two number through the key board and to perform simple Arithmetic Operation (Use Do While Loop)
2. To display the name of the day in a week, depending upon the number entered through the Keyboard using Switch – Case statement

3. To read the elements of the given two matrix of  $m \times n$  and to perform the Matrix Addition
4. Write a Program to find the Inverse of given  $m \times n$  matrix
5. Write a Program to compare two files printing the character position where they are equal and where they are different