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 from the Academic Year 2017-2018 and onwards

Under CBCS PATTERN

P.K.R ARTS COLLEGE FOR WOMEN

(An autonomous institution, accredited by NAAC with 'A' Grade)
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BACHELOR OF SCIENCE-PHYSICS
Course Scheme and Scheme of Examinations
(For students admitted in 2017-18)

Part	Category	Course Code	Title of the Course	Hrs/ week	Exam hrs.	CIA	ESE	Total marks	Credits
I –SEMESTER									
I	Language : I	17LTU01/ 17LHU01/ 17LFU01/ 17LKU01/ 17LMU01/ 17LSU01	Tamil- I/ Hindi-I/ French-I/ Kanada-I/ Malayalam-I/ Sanskrit-I	6	3	25	75	100	4
II	English : I	17LEU01	English: I	6	3	25	75	100	4
III	Core : I	17PHU01	Mechanics, Properties of Matter and Sound	6	3	25	75	100	5
III	Core : II	17PHU02	Physics I – Practical	3	-	-	-	-	-
III	Allied : I	17PHU03	Mathematics – I	7	3	25	75	100	4
IV	Foundation Course : I	17FCU01	Environmental studies	2	3	--	50	50	2
			TOTAL	30				450	19
II –SEMESTER									
I	Language : II	17LTU02/ 17LHU02/ 17LFU02/ 17LKU02/ 17LMU02/ 17LSU02	Tamil- II/ Hindi-II/ French II/ Kanada-II/ Malayalam-II/ Sanskrit-II	6	3	25	75	100	4
II	English : II	17LEU02	English: II	6	3	25	75	100	4
III	Core : IV	17PHU04	Heat and Thermodynamics	6	3	25	75	100	5
III	Core : II	17PHU02	Physics I –Practical	3	3	40	60	100	3
III	Allied : II	17PHU05	Mathematics – II	7	3	25	75	100	4
IV	Foundation Course : II	17FCU02	Yoga and Value Education	2	3	--	50	50	2
			TOTAL	30				550	22

III –SEMESTER									
I	Language: III	17LTU03/ 17LHU03/ 17LFU03/ 17LKU03/ 17LMU03/ 17LSU03	Tamil- III/Hindi-III/French-III/ Kannada-III/ Malayalam-III/ Sanskrit-III	6	3	25	75	100	4
II	English: III	17LEU03	English III	6	3	25	75	100	4
III	Core : VI	17PHU06	Optics	4	3	25	75	100	5
III	Core : VII Practical II	17PHU07	Physics II – Practical	2	-	-	-	-	-
III	**Core:** VIII	17PHU08	Comprehension in Physics (Online Exam Self Study - I)	-	1½	-	50	50	1
III	Allied : III	17PHU09	Chemistry I	3	3	25	75	100	3
III	Allied : IV	17PHU10	Chemistry – Practical	2	-	-	-	-	-
IV	Skill Enhancement Course : I	17SEU01	Information Security	2	-	100	-	100	2
IV	Non- Major Elective : I	17NMU01A 17NMU01B	Indian Women and Society / Basic Tamil	2	3	--	50	50	2
IV	Non-Major Elective :II	17NMU02A 17NMU02B	Career Enhancement / Consumer Rights (Online Exam)	3	--	--	--	--	--
			TOTAL	30				600	21
IV –SEMESTER									
I	Language: IV	17LTU04/ 17LHU04/ 17LFU04/ 17LKU04/ 17LMU04/ 17LSU04	Tamil- IV/Hindi- IV/ French-IV/ Kannada-IV/Malayalam-IV/ Sanskrit-IV	6	3	25	75	100	4
II	English: IV	17LEU04	English – IV	6	3	25	75	100	4
III	Core : XI	17PHU11	Mathematical Physics	5	3	25	75	100	5
III	Core : VII	17PHU07	Physics II – Practical	3	3	40	60	100	3
III	Core : XII	17PHU12	Comprehension in physics (Online Exam Self Study - II)	--	$1^{1}/_{2}$	--	50	50	1
III	Core:X Allied : IV	17PHU10	Chemistry – Practical	2	3	40	60	100	2
III	Core : XIII Allied : V	17PHU13	Chemistry II	3	3	25	75	100	3
IV	Skill Enhancement Course : II	17SEUPH2	Energy Resources	2	3	40	60	100	2
IV	Non-Major Elective :II	17NMU02A 17NMU02B	Career Enhancement / Consumer Rights (Online Exam)	3	$1^{1}/_{2}$	--	50	50	2
			TOTAL	30				800	26
V –SEMESTER									
III	Core : XIV	17PHU14	Digital Electronics and	5	3	25	75	100	5

			Microprocessor						
III	Core : XV	17PHU15	Solid State Physics	5	3	25	75	100	5
III	Core : XVI	17PHU16	Electricity and Magnetism	5	3	25	75	100	5
III	Core : XVII	17PHU17	Comprehension in Physics (Online Exam Self Study - III)	--	$1^{1}/_{2}$	--	50	50	1
III	Core : XVIII	17PHU18	Industrial Training	-	-	-	100	100	2
III	Core : XIX	17PHU19	Electronics- Practical-III	3	-	-	-	-	-
III	Core : XX	17PHU20	Digital Electronics and Microprocessor - Practical-IV	2	-	-	-	-	-
III	Core : XXI Optional	17PHUCO1	Core Optional – Physics in day to day life	3	3	25	75	100	3
III	Core : XXII Elective I	17PHU21a/ 17PHU21b/ 17PHU21c	Applied Instrumentation/ Soil Physics / Geo Physics	4	3	25	75	100	3
IV	Skill Enhancement Course : III	17SEUPH3	Soft Skills	3	3	40	60	100	2
V	Proficiency Enhancement	17PEUPH1	Lasers – Self Study	-	3	-	100	100	2
			TOTAL	30				850	28
VI –SEMESTER									
III	Core : XXIII	17PHU22	Quantum Mechanics and Relativity	5	3	25	75	100	5
III	Core : XXIV	17PHU23	Atomic and Nuclear Physics	5	3	25	75	100	5
	Core : XXV	17PHU24	Electronics& Communication	5	3	25	75	100	5
III	Core : XXVI	17PHU25	Fundamentals of Spectroscopy	5	3	25	75	100	5
III	Core : XXVII	17PHU26	Comprehension in Physics (Online Exam Self Study - IV)	--	1½	--	50	50	1
III	Core : XIX	17PHU19	Electronics- Practical-III	3	3	40	60	100	3
III	Core : XX	17PHU20	Digital Electronics and Microprocessor - Practical-IV	2	3	40	60	100	3
III	Core : XXVIII Elective II	17PHU27a/ 17PHU27b/ 17PHU27c	Basic Concepts of C, C++/ Introduction to Space Physics /Smart Materials	3	3	25	75	100	3
IV	Skill Enhancement Course :IV	17SEUPH4	Programming in C, C++	2	3	40	60	100	2
			TOTAL	30				850	32
V	Proficiency Enhancement		NSS/YRC/RRC/CCC/PHY.EDU		II – VI SEMESTER				1
			Department extension activity		II – VI SEMESTER				1

Total Marks: 4100 Total credits: 150

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BACHELOR OF SCIENCE-PHYSICS
Course Scheme and Scheme of Examinations
(For students admitted in 2017-18)
Semester-I

Course Code	Course Name	Category	L	T	P	Credit
17PHU01	**MECHANICS, PROPERTIES OF MATTER AND SOUND**	**CORE**	90	6	-	4

Preamble

To provide the student to acquire basic knowledge of mechanics, properties of matter and gravitation and learn motion of bodies and sound waves

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the Laws of friction and Conservation Law	K1, K2, K3
CO2	Understand the Motion of rigid body and To Calculate and represent the Moment of inertia of rigid bodies	K1, K2, K3
CO3	Understand the Gravitational law and theory of elasticity.	K1, K2, K3
CO4	Understand the concepts of Surface Tension and Viscosity	K1, K2, K3
CO5	Understand that sound is caused by vibration.	K1,K2, K3

UNIT I **(18 hrs)**

Conservation Law: Impulse – Impact – Direct and oblique impact – Final velocity and loss of kinetic energy –Motion of a particle in a vertical circle – friction – Laws of friction – angle of friction – resultant reaction – cone of friction – Equilibrium of a body on a rough inclined plane to the horizontal and when the inclination in greater than the angle of friction.

UNIT II **(18 hrs)**

Motion of rigid body: Moment of inertia – Parallel and perpendicular axes theorem – M.I. of rectangular Lamina and triangular lamina – M.I. of a solid sphere about an axis through it C.G. – Compound pendulum –torque and angular momentum – Relation – Kinetic rotation – conservation of angular momentum

UNIT III **(18 hrs)**

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

Elasticity: Elastic modules – Poisson's ratio – relation between them – Expression for bending moment – determination of Young's modulus by uniform and non-uniform bending I section girders – Static Torsion – Expression for couple per unit twist – Torsional oscillation.

UNIT IV **(18 hrs)**

Surface Tension: Definition and dimension of surface Tension – Excess of Pressure over a curved surface – Variation of S.T. with temperature – Jaeser's Experiment.

Viscosity: Definition – Rotation viscometer- viscosity of gases, Meyer's Modification of Poiseuille's formula – Rankine's method for viscosity of a gas.

UNIT V **(18 hrs)**

Sound: Simple Harmonic vibration – Progressive waves – properties – Composition of two S.H.M. and beats – stationary waves – Properties Melde's Experiment for the frequency of electrically maintained tuning fork – Transverse and longitudinal modes – Ultrasonic –Properties and application.

Text Books

1. Properties of Matter – Brijlal and N. Subramaniam - S Chand & Co
2. Text Book of Sound – Brijlal and N. Subramaniam - S Chand & Co

Reference Books

1. Mechanics, Properties of matter and sound, Thermal Physics – Murugesan, Edition 2002.
2. University Physics – Sears Semansky and Ground
3. Text books of Sound – Ghosh
4. Elements of Properties of Matter – D.S. Mathur
5. Mechanics - B.S. Mathur, S. Chand and Co.

Course Code	Course Name	Category	L	T	P	Credit
17MAU03	**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 hrs)**

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 hrs)**

Heat and Thermodynamics: Vanderwaal's equation of state-critical constants of a gas-derivation of critical constants in terms of Vanderwaal's contants – 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 hrs)**

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 hrs)**

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 hrs)**

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

Course Code	Course Name	Category	L	P	Credit
17FCU01	**Environmental Studies**	**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 hrs)**

Multidisciplinary Nature of Environmental Studies

i) Definition, Scope and Importance
ii) Need for Public Awareness
iii) Natural Resources
a) Natural Resources and Associated Problems

- Forest Resources: Use and Over-exploitation, Deforestation, Case Studies. Timber Extraction, Mining, Dams and their Effects on Forests and Tribal People.
- Water Resources: Use and Over-utilisation of Surface and Ground Water, Floods, Drought, Conflicts over Water, Dams – Benefits and Problems.
- Mineral Resources: Use and Exploitation, Environmental Effects of Extracting and using Mineral Resources, Case Studies.
- Food Resources: World Food Problems, Changes Caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer-Pesticide Problems, Water Logging, Salinity, Case Studies.
- Energy Resources: Growing Energy Needs, Renewable and Non-Renewable Energy Sources, Use of Alternate Sources, Case Studies.
- Land Resources: Land as a Resource, Land Degradation, Man Induced Landslides, Soil Erosion and Desertification.

b) Role of an Individual in Conservation of Natural Resources
c) Equitable Use of Resources for Sustainable Lifestyles

UNIT II **(5 hrs)**

Ecosystems

Concept of an Ecosystem
i) Structure and Function of an Ecosystem
ii) Producers, Consumers and Decomposers
iii) Energy Flow in the Ecosystem
iv) Ecological Succession
v) Food Chains, Food Webs and Ecological Pyramids
vi) Introduction Types, Characteristics Features, Structure and Function of the following Ecosystem:
a). Forest Ecosystem
b). Grassland Ecosystem
c). Desert Ecosystem
d). Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Ocean, Estuaries)

UNIT III **(5 hrs)**

Biodiversity and its Conservation

i. Introduction – Definition – Genetic, Species and Ecosystem Diversity
ii. Bio-geographical Classification of India
iii. Value of Biodiversity – Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Value
iv. Biodiversity at Global, National and Local Levels
v. India as a Mega-Diversity Nation

vi. Hot-Spots of Biodiversity
vii. Threats to Biodiversity – Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts
viii. Endangered and Endemic Species of India
ix. Conservation of Biodiversity – In-situ and Ex-situ and Conservation of Biodiversity

UNIT IV **(5 hrs)**

Environmental Pollution

i) Definition, Causes, Effects and Control Measures of:
   a) Air Pollution
   b) Water Pollution
   c) Soil Pollution
   d) Noise Pollution
   e) Thermal Pollution

ii) Solid Waste Management – Causes, Effects and Control Measures of Urban and Industrial Wastes
iii) Role of an Individual in Prevention of Pollution
iv) Pollution Case Studies
v) Disaster Management – Floods, Earthquake, Cyclone and Landslides

UNIT V **(5 hrs)**

Social Issues and the Environment

i) Sustainable Development
ii) Urban Problems Related to Energy
iii) Water Conservation, Rainwater Harvesting, Watershed Management
iv) Resettlement and Rehabilitation of People; Its Problems and Concerns, Case Studies
v) Environmental Ethics – Issues and Possible Solutions
vi) Climate Change, Global Warming, Ozone Layer, Depletion, acid Rain, Nuclear Accidents and Holocaust, Case Studies
vii) Consumerism and Waste Products
viii) Environmental Protection Act
ix) Air (Prevention and Control of Pollution) Act
x) Water (Prevention and Control of Pollution) Act
xi) Wildlife Protection Act
xii) Forest Conservation Act
xiii) Issues Involved in Enforcement of Environmental Legislation
xiv) Public Awareness
xv) Human Population and the Environment

- Population Growth and Distribution
- Population Explosion – Family Welfare Programme
- Environment and Human Health
- Human Rights
- Value Education
- HIV/AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health

- Medical Transcription and Bioinformatics

Text Book:
Environmental Studies, Bharathiar University, Publication Division, 2004

Reference Book:

S.No	Authors	Title	Publishers	Year of Publication
1	R.C.Sharma & Gurbir Sangha	Environmental Studies	Kalyani Publishers	2005

Semester-II

Course Code	Course Name	Category	L	T	P	Credit
17PHU04	**HEAT &THERMODYNAMICS**	**CORE**	90	6	-	4

Preamble
To provide the student to acquire basic knowledge of heat, work and energy and know how to apply the kinetic theory of gases

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

CO Number	CO Statement	Knowledge Level
CO1	Understand and to define heat, work, thermal efficiency.	K1, K2, K3
CO2	Understand and describe energy exchange processes.	K1, K2, K3
CO3	Understand the steady flow of energy	K1, K2, K3
CO4	Understand and derive the various laws of Thermal Radiation	K1, K2, K3
CO5	Understand the working principle of various heat engines.	K1, K2, K3

UNIT I **(18hrs)**

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.

UNIT II **(18hrs)**

Kinetic Theory of Gases: Postulates – Mean free path – Degree of freedom – 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

UNIT III **(18hrs)**

Thermal Conduction: 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 **(18hrs)**

Thermal Radiation: 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 **(18hrs)**

Thermodynamics: Carnot's Theorem – Otto Cycle-Petrol Engine – Diesel engine - Clapeyron's Latent heat equation – Entropy – Change in entropy (Reversible and irreversible process) – Temperature-Entropy diagram – Entropy of a perfect gas

Book for Study:

1. Heat and Thermodynamics by Brijlal and Subramaniam - S.Chand & Co.

Books for Reference:

1 .Thermal Physics by R. Murugesan - S. Chand & Co.
2. Text book of heat by JB Rajam - S. Chand and Co (1988)
3. Text book of heat by Mehnad Saha B. N. Srivatsava - Science Book Agency (1962)

Course Code	Course Name	Category	L	T	P	Credit
17MAU06	**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 **(12hrs)**

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 **(12hrs)**

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 **(12hrs)**

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 **(12hrs)**

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 **(12hrs)**

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- S.Chand & Company PVT.LTD,New Delhi. (2016)
2. Engineering physics–M. Arumugam–Anuradha Agencies, Educational Publishers (1998).
3. Laser Physics – Thiagarajan - Narosa Publishing House. (2013)
4. Basic Electronics – B.L. Theraja -S. Chand & Company LTD, New Delhi.(2000)

Course Code	Course Name	Category	L	P	Credit
17FCU02	**Yoga and Value Education**	**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

CO Number	CO Statement	Knowledge Level
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
C04	Lead a meaningful life for the fulfillment of the needs of family, workplace, society and country.	K4

UNIT I **(5hrs)**
YOGA AND HEALTH
Theory:
Yoga-Meaning- Importance of Yoga – Pancha Koshas - Benefits of Yoga-General Guidelines.
Practice:
Dynamic Exercise- Surya Namaskar-Basic Set of Asanas-Pranayama & Kriya.

UNIT II
ART OF NURTURING THE MIND **(5hrs)**
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 **(5hrs)**
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 **(5hrs)**

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 **(4hrs)**

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.

Course Code	Course Name	Category	L	T	P	Credit
17PHU02	**CORE PRACTICAL I**	**CORE PRACTICAL**	45	-	3	3

(EXAMINATION AT THE END OF SECOND SEMESTER)
ANY TWELVE 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

Course Code	Course Name	Category	L	T	P	Credit
17MAU07	**ALLIED PRACTICAL I**	**ALLIED PRACTICAL-I**	45	-	3	4

(EXAMINATION AT THE END OF SECOND SEMESTER)
ANY TWELVE 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 solid 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 gates

Semester-III

Course Code	Course Name	Category	L	T	P	Credit
17PHU06	**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_1, K_2
CO2	Understand the concept of interference	K_1, K_2
CO3	Understand the concept of diffraction	K_1, K_2
CO4	Basic knowledge about Polarization	K_1, K_2
CO5	Basic knowledge about quantum optics	K_1, K_2

UNIT I **(12hrs)**

Geometrical Optics

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

UNIT II **(12hrs)**

Physical Optics - Interference

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 **(12hrs)**

Diffraction

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 **(12hrs)**

Polarization

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 **(12hrs)**

Quantum Optics

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 – thresholdcondition for laser – Stimulated Raman scattering.

Books for Study:

1.A Text book of Optics - Brijlal & Subramaniam
2.Modern Physic- R Murugesan

Books for Reference:

1.Optics and Spectroscopy - R Murugesan
2.Optoelectronics - Thiyagarajan

Course Code	Course Name	Category	L	T	P	Credit
17PHU07	**PHYSICS II PRACTICAL**	**CORE VII**	75	-	5	3

(EXAMINATION AT THE END OF SECOND SEMESTER)

ANY TWELVE 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 t he 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 ben ding
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
17PHU09	**CHEMISTRY – I**	**ALLIED-III**	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_1, K_2
CO2	To select and use eco-friendly fuels industrial and domestic purpose	K_1, K_2
CO3	To suggest methods to minimize problems related to hard water in industrial operations	K_1, K_2
CO4	The students will get knowledge on the structural basics of organic compounds	K_1, K_2
CO5	To use appropriate methods to study chemical reactions	K_1, K_2

UNIT I **(9hrs)**

Metals and its Extraction

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 **(9hrs)**

Fuels and Fertilisers

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 **(9hrs)**

Water Treatment

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 **(9hrs)**

F**undamentals of Organic Chemistry**

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 **(9hrs)**

Chemical Kinetics and Photochemistry

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.

TEXT BOOKS:

1 Dr. Veeraiyan V., Texf book of Ancillary Chemistry, High mount Publishing house, Chennai-14 ,Edition - 2008. (Both In Tamil and English)

2 Vaithyanathan S. and Others, Texf book of Ancillary Chemistry, Priya Publications, Karur-2. Edition-2006.

BOOK FOR REFERENCE:

1 Soni P.. and Others, Texf book of Organic chemistry, Sultan Chand and Company, New Delhi, Edition - 2006.

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

Course Code	Course Name	Category	L	T	P	Credit
17PHU10	**CHEMISTRY PRACTICAL**	**ALLIED-IV**	30	-	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.

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
17SEU01	**INFORMATION SECURITY**	**SKILL 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

CO Number	CO Statement	Knowledge Level
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 **(5hrs)**

Introduction to Information Security

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 **(5hrs)**

Information Risk

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

UNIT III **(5hrs)**

Security Planning

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 **(5hrs)**

Privacy and Ethical Issues in Information Security

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 **(4hrs)**

Cryptography

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

TEXT BOOK:

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 .

REFERENCE BOOK:

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

Course Code	Course Name	Category	L	T	P	Credit
17NMU01A	**INDIAN WOMEN AND SOCIETY**	**NON - MAJOR ELECTIVE : I**	30	2	-	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 **(5hrs)**

Historical Background

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 II **(5hrs)**

Role of Women (Challenges & remedies)

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

UNIT III **(5hrs)**

Women and Health

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

UNIT IV **(5hrs)**

Issues of Women

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

UNIT V **(4hrs)**

Women Empowerment

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
17NMU01B	**BASIC TAMIL**	**NON - MAJOR ELECTIVE : I**	30	2	-	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; nkhopapd; 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;
   gpioePf;fp vOJjy; : (xw;Wg;gpio> vOj;Jg;gpio)

   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 (Basic Tamil)	**Section A**	K1: Remember Level K2: Understand Level	4 X 5 = 20 Four out of Six *(Open choice)* *(At least one question from each unit)*	50*

	Section 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)*	

Course Code	Course Name	Category	L	T	P	Credit
17NMU02B	**CONSUMER RIGHTS**	**NON - MAJOR ELECTIVE : II**	45	3	-	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.

UNIT I **(9hrs)**

Introduction of consumer protection act1986-other amendments-salient features

UNIT II **(9hrs)**

Definitions of the terms- : consumer - appropriate laboratory - complainant - consumer dispute - complaint-restrictive trade practice.

UNIT III **(9hrs)**

The various consumer rights:-right to safety, Right to information, Right to choose, -right to be heard -Right against exploitation -Right to consumer education

UNIT IV **(9hrs)**

Consumer protection councils:-Central - State.

UNIT V **(9hrs)**

Consumer disputes redressal agencies:-Direct forum-state commission-national commission.

Semester-IV

Course Code	Course Name	Category	L	T	P	Credit
17PHU11	**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_1, K_2
CO2	Understand the concepts of vector calculus	K_1, K_2
CO3	Study the basic concepts in statistics and probability	K_1, K_2
CO4	Describe and understand Empirical Laws and Curve Fittings	K_1, K_2
CO5	Demonstrate knowledge of core principles in mechanics Understand and apply Lagrange's equations and Hamilton's equation to simple physical systems	K_1, K_2

UNIT I **(15hrs)**

Matrices

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 **(15hrs)**

Vector Calculus

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

UNIT III **(15hrs)**

Statistics

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 **(15hrs)**

Empirical Laws and Curve Fittings

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

UNIT V **(15hrs)**

Lagrangian & Hamiltonian Formulation

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 – S.Chand & Company Ltd, New Delhi,2005(Unit 3)
3. Classical Mechanics by Gupta, Kumar and Sharma (Units 4 & 5)
4. Numerical Methods by P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand & Co,

Books for References:

1. Mathematical Physics with Classical Mechanics by Satyaprakash, Sultan Chand & Sons, New Delhi-2002

Course Code	Course Name	Category	L	T	P	Credit
17PHU13	**CHEMISTRY – II**	**ALLIED:IV**	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

CO Number	CO Statement	Knowledge Level
CO1	Study the applications of coordination compounds	K_1, K_2
CO2	Understand the concepts of biomolecules	K_1, K_2
CO3	Describe and understand the knowledge about phase rule.	K_1, K_2
CO4	Demonstrate knowledge about Electro chemistry	K_1, K_2
CO5	To know about uses of analytical techniques.	K_1, K_2

UNIT I **(9hrs)**

Co-Ordination Chemistry

Definition of terms - Classification of Ligands - Nomenclature - Chelation - EDTA and its application – Werner's Theory - Effective Atomic Number - Pauling's theory- Postulates - Applications to $Ni(CO)_4$,$Ni(CN)_4$, $K_4[Fe(CN)_6]$- 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 **(9hrs)**

Biomolecules

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 **(9hrs)**

Phase Diagram

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 **(9hrs)**

Electrochemistry

Galvanic cells – emf - standard electrode potential - reference electrodes - electrochemical series and its applications - Determination of pH using H_2,Quinhydrone and glass electrodes - Electroplating process -Nickel and Chrome plating – Batteries- Primary and Secondary- Ni-Cd Battery- Lithium ion Battery- Fuel cells- H_2-O_2 fuel cells- Advantages.

Self study Topic: Batteries in future.

UNIT V **(9hrs)**

Analytical Techniques

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

TEXT BOOKS

1 Dr. Veeraiyan V., Text book of Ancillary Chemistry, Highmount Publishing house, Chennai 14. Edition -206o. (Both in Tamil and English)
2 Vaithiyanathan S. and Others, Text book of Ancillary Chemistry, Priya Publications, Karur-2.

Edition -2006.

BOOKS FOR REFERENCE

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

Course Code	Course Name	Category	L	T	P	Credit
17SEUPH2	**ENERGY RESOURCES**	**SKILL ENHANCEMENT COURSE-II**	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_1, K_2
CO2	Study about the concepts of renewable energy sources	K_1, K_2
CO3	Study the basic concepts of Biomass energy fundamentals	K_1, K_2
CO4	To know about Biomass Utilization To understand its merits and demerits	K_1, K_2
CO5	To describe other forms of energy sources To understand the Importance of energy management.	K_1, K_2

UNIT I **(6hrs)**

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 **(6hrs)**

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 **(6hrs)**
Biomass energy fundamentals
Biomass energy – classification – photosynthesis – Biomass conversion process– biogas plant – biomass applications.

UNIT IV **(6hrs)**
Biomass Utilization
Gobar gas plants – wood gasification – advantages & disadvantages of biomass as energy source

UNIT V **(6hrs)**
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:
Text Book

1.G.D.Rai, Non- Conventional Energy Sources, Kanna Publishers, IVth Edn., 15th Reprint, 2005.

References

1."Renewable energy sources and emerging Technologies", by D.P. Kothari, K.C. Singal & Rakesh Ranjan, Prentice Hall of India pvt. Ltd., New Delhi. 2008.

2."Renewable Energy sources and their environmental impact" – S.A. Abbasi and Nasema Abbasi PHI Learning Pvt. Ltd., New Delhi, 2008.

Semester-V

Course Code	Course Name	Category	L	T	P	Credit
17PHU14	**DIGITAL ELECTRONICS AND MICROPROCESSOR**	**CORE**	75	5	-	5

Preamble
The aim is to provide basic knowledge of binary addition, combinations of logic circuits and 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_1, K_2, K_3
CO2	Understand the concepts of Boolean algebra and Memory Devices	K_1, K_2,K_3
CO3	Study the working of Flip-flops and their applications.	K_1, K_2
CO4	Understand the basics of 8085 Microprocessor	K_1, K_2
CO5	To write various programs for 8085 Microprocessor	K_1, K_2,

UNIT I **(15hrs)**

Number System and Codes

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-NORgates – Universal building blocks.

UNIT II **(15hrs)**

Boolan algebra and Arithmetic circuits

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 **(15hrs)**

Flip-flops and their applications

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

Applications: Shift Registers – 3 and 4 bit shift registers – Counters –Asynchronous counters – Synchronous counters – MOD-3, MOD-6, MOD-10 counters.

UNIT IV **(15hrs)**

Microprocessors

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

addresses interfacing - Address decoding - interfacing circuit – Address decoding and memory address.

UNIT V **(15hrs)**

Programming the 8085

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 by S.Salivahanan and S.Arivazhagan,
2. Digital principle and Applications, Malvino and Leach, Vikas Publishing
3. Microprocessor Organizations and Architecture by Ramesh S.Gaonkar

Books for Reference:

1. Handbook of Electronics by Gupta and Kumar
2. Introduction to Microprocessors by D.S.Matur

Course Code	Course Name	Category	L	T	P	Credit
17PHU15	**SOLID STATE PHYSICS**	**CORE**	75	5	-	5

Preamble

The aim is to provide the student to acquire knowledge about solids and their bonds.To gain an idea about different alloys in semiconducting and conducting materials and 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	Learn about various types of solids and crystal classifications.	K_1, K_2
CO2	Understand the concepts of crystal defects, crystallography and bonding in solids.	K_1, K_2
CO3	Study the basic concepts Magnetic Properties of Materials	K_1, K_2
CO4	Demonstrate knowledge of core principles in elementary band theory.	K_1, K_2
CO5	Study the Superconductivity, Polarization and Dielectrics along	K_1, K_2

	with various properties of magnetic materials.	

UNIT I **(15hrs)**

Solids

Amorphous and Crystalline Materials Crystal: Distinction between crystalline and amorphous solids – Different features of the crystal – Crystal lattice – Basis – Unit cell – Crystal structure – Number of lattice points per unit cell – Bravais lattice – Lattice Translation -Types of Lattices-Miller indices.

UNIT II **(15hrs)**

Crystallography

Elements of symmetry – Structure of KCl and NaCl crystal – Atomic Packing – Atomic Radius – Lattice constant and Density – Crystal structure (sc; hcp; bcc; fcc.) **X-rays:** Bragg's law – Laue Method- Rotating crystal method – Powder Photograph method.

Bonding in Solids: (Qualitative treatment) Ionic – Covalent – Metallic – Molecular bonds – Dulong and Pettit's law – Einstein's theory of specific heat of solids – Fermi levels and Debye theories of specific heat of solids-T^3 law.

Crystal Defects: (Qualitative study): Frenkel defect – Schottky Defect – Edge dislocation – Screw dislocation.

UNIT III **(15hrs)**

Magnetic Properties of Materials

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 **(15hrs)**

Free Electron Theory

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

Kronig Penny model-Band Gaps-Conductors-Semiconductors and insulators, P and N type Semiconductos, Conductivity of Semiconductors.

UNIT V **(15hrs)**

Dielectrics

Dielectrics-Dielectric constant and displacement vector-Clausiuss mossotti relation – Atomic or molecular polarizability-Types of polarizability- Super conductivity- Phenomena- magnetic properties – Super conductor- Meissner effect- Experimental facts –Isotopes effect-Thermodynamic effect.

Books for Study:

1. Solid State Physics-Gupta and Kumar
2. Modern Physics- R Murugesan

Books for References:

1. Introduction to solid state physics, CharlesKittel, 8th Ed., 2004, Wiley India Pvt.Ltd.
2. Solid State Physics A J Dekker
3. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 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.David Mermin,1976, Cengage Learning
6. Solid State Physics, Rita john,2014,McGraw Hill.

Course Code	Course Name	Category	L	T	P	Credit
17PHU16	**ELECTRICITY AND MAGNETISM**	**CORE**	75	5	-	5

Preamble

To acquire knowledge in electricity and magnetism, problem solving ability and 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_1, K_2
CO2	Understand the properties of magnetic materials.	K_1, K_2
CO3	Study the basic concepts of thermoelectricity.	K_1, K_2
CO4	Explanation of Helmhertz equation of varying current.	K_1, K_2
CO5	To understand the dynamics of charged particles.	K_1, K_2

UNIT I **(15hrs)**

Electrostatics

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 guass 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 plate - polarization in dielectric materials.

UNIT II **(15hrs)**

Magnetic Properties of materials

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 hysterisis – area of the hysterisis loop-determination of susceptibility : Guoy's method – magnetic circuits – circuits comparison of magnetic application with electrical circuits.

UNIT III **(15hrs)**

Thermo Electricity

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 **(15hrs)**

Helmholtz equation of varying current

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 **(15hrs)**

Dynamics of charged particles

Charged particles in a 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
2. Electricity and Magnetism – R. Murugesan

Books for Reference

1. Electricity and Magnetism – D.N. Vasudeva
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

Course	Course Name	Category	L	T	P	Credit

Code						
17PHU19	**ELECTRONICS PRACTICAL III**	**CORE PRACTICAL – III**	45	-	3	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
17PHU20	**DIGITAL ELECTRONICS AND MICROPROCESSOR PRACTICAL IV**	**CORE PRACTICAL**	30	-	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**
17PHUCO1	**PHYSICS IN DAY TO DAY LIFE**	**CORE OPTIONAL**	45	3	-	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_1, K_2
CO2	Understand the concepts in Electricity	K_1, K_2
CO3	Study About The Magnetism	K_1, K_2
CO4	Study The Some Natural Phenomena.	K_1, K_2
CO5	Demonstrate Knowledge In Management Of Natural Resources	K_1, K_2

UNIT I **(9hrs)**

Motion and Measurements of Distances

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

UNIT II **(9hrs)**

Electricity

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

UNIT III **(9hrs)**

Chemical Effects of Electric Current and Magnetism

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

UNIT IV **(9hrs)**

Some Natural Phenomena

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

UNIT V **(9hrs)**

Management of Natural Resources

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. Concepts of Physics – Volume I & II- H.C.Verma- Bharathi bhavan Patna
2. Basic Physics – Second Edition – Karl F.Kuhn

Course Code	Course Name	Category	L	T	P	Credit
17PHU21a	**APPLIED INSTRUMENTATION**	**ELECTIVE-I**	60	4	-	3

Preamble

To provide a knowledge in measuring various properties by using instruments through learning the principles behind it.

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_1, K_2,
CO2	Knowledge about pressure measurement	K_1, K_2
CO3	Understand thermal and nuclear radiation	K_1, K_2,

CO4	Knowledge of signal conditioning and data conversion	K_1, K_2
CO5	Basic knowledge of digital interments and display devices.	K_1, K_2

UNIT I **(12hrs)**

Basic Concept of Measurement

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

Transducers

Capacitive transducers – Piezoelectric transducers – Photoelectric effect – Photoconductive transducers – Ionization transducers – Hall Effect transducers – Digital displacement transducers.

UNIT II **(12hrs)**

Pressure Measurement

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 **(12hrs)**

Thermal and Nuclear Radiation Measurements

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 **(12hrs)**

Data Acquisition and Conversion

Introduction – Signal conditioning of the inputs – Single channel data acquisition systems – Data conversion – Digital of Analog converter – Analog to Digital converter.

UNIT V **(12hrs)**

Digital Instruments

Introduction – Digital Multi meter-Oscilloscope -Basic principles – CRT features – Basic principles of signal displays – Block Diagram of oscilloscope – Simple CRO – Vertical amplifier – Horizontal deflecting system – Delay line in triggered sweep – CRT connection. Display devices: LED – LCD.

Book for Study

1.Unit 1,2 & 4: Instrumentation Devices and Systems –C S Rangan, G R Sharma, V S V Mani TMH.

2.Unit 3 : Experimental methods for Experiments by Jack P Holm.

3. Unit 4 & 5 : Electronic Instrumentation by H S Kalsi TMH.

Course Code	Course Name	Category	L	T	P	Credit

17PHU21b	**SOIL PHYSICS**	**ELECTIVE-I**	60	4	-	3

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 **(12hrs)**

Introduction

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 **(12hrs)**

Basic Physical Properties of Soils

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 **(12hrs)**

Soil Water

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 **(12hrs)**

Water Flow in Saturated Soils

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 **(12hrs)**

Water Flow in Unsaturated Soils

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

REFERENCES:

1. Text book of soil physics, by Arunkumar saha Anuradha saha
2. Soil physics an introduction CRC press Manoj K.Shukla.
3. Principles of soil physics Rattan Lal, Manoj k. shukla.
4. Environmental Soil Physics, by Daniel Hillel, 1998. Academic Press, Inc. San Diego, California.

Study material available in the website: www.soilphysicsnotes.com

Course Code	Course Name	Category	L	T	P	Credit
17PHU21c	**GEO PHYSICS**	**ELECTIVE-I**	60	4	-	3

Preamble

The aim is to provide the student to gain deeper knowledge in geological Physics, earth structure and 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 **(12hrs)**

Physical Geology

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 **(12hrs)**

Mountains

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

UNIT III **(12hrs)**

Structural Geology

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

UNIT IV **(12hrs)**

Paleontology

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

UNIT V **(12hrs)**

Brachilopods - 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.

References

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

Course Code	Course Name	Category	L	T	P	Credit

17SEUPH3	**SOFT SKILLS**	**SKILL ENHANCEMENT-III**	45	3	-	2

Preamble

The aim is to provide the student to know about interpersonal skills, team work & also self motivation.

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Learning to connect and work with others to achieve a set task	K1, K2
CO2	Identifying the strengths within the team	K1, K2
CO3	Learning to handle emotions including tolerance and behavioral responses	K1, K2
CO4	Defining and committing to achieving one's goals	K1, K2
CO5	Knowing the right choice and predict all possible outcomes in order to succeed	K1, K2

UNIT I **(9hrs)**

Interpersonal Skills

Understanding the relationship between Leadership Networking & Team work - Assessing Interpersonal Skills Situation description of Interpersonal Skill - Team Work: Necessity of Team Work Personally, Socially and Educationally.

UNIT II **(9hrs)**

Leadership

Skills for a good Leader - Assessment of Leadership Skills

UNIT III **(9hrs)**

Stress Management

Causes of Stress and its impact - how to manage & distress - Circle of control - Stress Busters - Emotional Intelligence -Emotional quotient - Emotion Scales - Managing Emotions.

UNIT IV **(9hrs)**

Goal Setting

Wish List - SMART Goals - Blue print for success - Short Term - Long Term - Life Time Goals -Time Management - Value of time - Diagnosing Time Management - Weekly Planner To do list - Prioritizing work.

UNIT V **(9hrs)**

Decision Making

Importance and necessity of Decision Making - Process and practical way of Decision Making - Weighing Positives & Negatives.

Reference

1.SOFT SKILLS, 2015, Career Development Centre, Green Pearl Publications

Course Code	Course Name	Category	L	T	P	Credit
17PEUPH1	**LASERS-SELF STUDY**	**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 Outcomes

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_1, K_2
CO2	Know about the concepts of pumping	K_1, K_2
CO3	Study about the basic properties of lasers	K_1, K_2
CO4	Understand the working of solid and gas lasers	K_1, K_2
CO5	know the principle and working of semiconductors lasers	K_1, K_2

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 (CO2) — 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.

Book for study:

1.Industrial application of Lasers – 2nd edition- John F.Reddy – Academic Press.

Books for reference:

1.Semiconductor Lasers – Fundamentals – Edited by Eli Kapon – Academic press
2.Solid stste Lasers : A graduate text – Walter Koechner Michael Bass – Springer.
3.Semiconductor Laser Fundamentals – Weng W.chow etal. - Springer

Semester-VI

Course Code	Course Name	Category	L	T	P	Credit
17PHU22	**QUANTUM MECHANICS AND RELATIVITY**	**CORE**	75	5	-	5

Preamble

To provide the student 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_1, K_2
CO2	Understand the idea of uncertainty principle and its applications	K_1, K_2, K_3
CO3	Understand the wave function and its physical interpretation through schroedinger's wave equation	K_1, K_2
CO4	Apply schroedinger's wave equation to solve problems, understand quantum numbers and commutation relations.	K_1, K_2, K_3
CO5	Understand the concepts of special and general theories of relativity.	K_1, K_2

Unit I Wave Properties of Matter (15 Hrs)

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 ofDe'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 – Verificationof De'Broglie relation – Davission and Germer's experiments – G P Thomson's experiments.

Unit II Uncertainty Principle (15 Hrs)

Introduction – Uncertainty Principle – Elementary proof between – Displacement andMomentum – 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 inthe ground state of Hydrogen atom

Unit –III Schrödinger's Wave Equation (15 Hrs)

Introduction – Wave function for a free particle – Schrödinger's One dimensional wave equation– Time-dependent and Time independent – Physical interpretation - Limitation – Normalizationof wave function – Operators – Eigen function – Eigen Value – Eigen equation – Operator forMomentum, Kinetic Energy and Total Energy – Postulates of Quantum Mechanics – Orthogonality of Energy Eigen function – Proof – Probability current density – Ehruenfest'stheorem – Statement and proof.

Unit –IV Applicationsof Schrodinger's Equation (15 Hrs)

Particle in a box - Potential step –The barrierpenetration problem – Linear harmonic oscillator. **Significance of Quantum Numbers:** Significance of various quantum numbers –**n**, **l**, $\mathbf{m_l}$- Electron probability density.

Unit –V Special Theory of Relativity (15 Hrs)

Galilean Transformation equation – Ether Hypothesis – Michelson-Morley experiment – Explanation of the Negative results – special theory of Relativity – Lorentz transformationequation – 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 and M.K Banda
2. Modern Physics R Murugesan

Books for Reference:

1. Quantum Mechanics Schiff
2. Introduction to Modern Physics F.K Richtmyer Etal

Course	Course Name	Category	L	T	P	Credit

Code						
17PHU23	**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_1, K_2
CO2	Understand the principles of atom models	K_1, K_2
CO3	Understand the properties and structure of nucleus	K_1, K_2
CO4	Describe and understand radioactivity, its properties and its applications	K_1, K_2
CO5	Understand the working principles of nuclear detectors and the basics concepts of nuclear fission and fusion	K_1, K_2

UNIT I **(15hrs)**

Positive Rays

Positive rays – Discovery – Properties – Positive ray analysis – Thomson's Parabola method – action of Electric and Magnetic fields – Determination of e/m – determination of mass – discovery of stable isotopes– Limitations – Dempster's mass spectrograph –Aston's mass spectrograph- mass defect and packing fraction.

UNIT II **(15hrs)**

Atom Models

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

UNIT III **(15hrs)**

Magneto Optical Properties Of Spectrum

Magentic dipole moment due to orbital motion of the electron – Magentic 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 **(15hrs)**

Radioactivity

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 **(15hrs)**

Nuclear Detectors

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, S.Chand & Co., (2005)
2. Atomic Physics by J.B. Rajam, S.Chand & Co., (2005)
3. Nuclear Physics by D.C.Tayal, Himalaya Publishing House.

BOOKS FOR REFERENCE

1. Modern Physics Sehgal Chopra Sehgal
2. Nuclear Physics D C Tayal
3. Concept of Modern Physics Arthur Beiser
4. Introduction to Modern Physics F K Richtmyer Etal

Course Code	Course Name	Category	L	T	P	Credit
17PHU24	**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_1, K_2, K_3
CO2	Understand the types of transistors and its biasing.	K_1, K_2

CO3	Understand the concepts of amplifiers and oscillators.	K_1, K_2, K_3
CO4	Understand the principles of FET, UJT and Multivibrators.	K_1, K_2
CO5	Acquire knowledge about AM and FM modulation and demodulation	K_1, K_2

UNIT I **(15hrs)**

Diodes, Rectifiers and Filters

Characteristics of PN Junction diode – Half Wave Rectifier – Efficiency and Ripple Factor – Centre Tapped Full Wave Rectifier – Bridge Rectifier – Efficiency and Ripple Factor – Zener Diode –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 **(15hrs)**

Transistors and Transistor Biasing

Transistor action – Expression for collector current in common base and common emitter connections – Relation between α and β – 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 **(15hrs)**

Amplifiers and Oscillators

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 **(15hrs)**

FET, UJT and Multivibrators

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 **(15hrs)**

Communication: Introduction

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 by VK Mehta and Rohit Mehta, S. Chand & Co. Ltd., 2005

Books for Reference:

1. Basic Electronics (Solid State) by B.L. Theraja, S. Chand & Co. Ltd.
2. Handbook of Electronics, Gupta and Kumar, Pragati Prakashan, Meerut
3. A textbook of Applied Electronics by R.S. Sedha, S. Chand & Co

Course Code	Course Name	Category	L	T	P	Credit
17PHU25	**FUNDAMENTALS OF SPECTROSCOPY**	**CORE**	75	5	-	5

Preamble

To demonstrate knowledge and understanding of the fundamental concepts in Spectroscopy

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate knowledge in elements of spectroscopy	K_1,K_2
CO2	Understand the concepts behind fine structures	K_1,K_2
CO3	Study the microwave spectra for various types of molecules	K_1,K_2
CO4	Study the techniques to create infrared spectrum for different molecules	K_1,K_2
CO5	Demonstrate knowledge in classical and quantum theory of raman effect	K_1,K_2

UNIT I **(15hrs)**

Basic Elements of Spectroscopy

Quantum of Energy-Regions of Spectrum-Representation of Spectrum-BasicElements of Practical Spectroscopy-Signal to Noise Ratio-Resolving Power-Width &Intensity of Spectral Transitions.

UNIT II **(15hrs)**

Atomic Spectroscopy

Constant deviation spectrometer – Hartmann's formula – fine structure and superfine structure – Solar Spectrum – high resolution Spectroscopy – L. G. plate – Fabry – Perot etalon application.

UNIT III **(15hrs)**

Microwave Spectroscopy

Classification of Molecules-Interaction of Radiation with Rotating Molecules- Rotational Spectrum of Rigid Diatomic Molecule-Example of CO-Information derived from Rotational Spectrum.

UNIT IV **(15hrs)**

Infrared Spectroscopy

Energy of diatomic molecules –simple harmonic oscillator – diatomic vibrating rotator – vibration –rotation spectrum of Carbon Monoxide – Breakdown of the Born Oppenheimer approximation–interaction of rotation and vibration – techniques and instrumentation – double and single – beam operation.

UNIT V **(15hrs)**

Raman Spectroscopy

Raman Effect – classical and quantum theory – molecular polarizability– pure rotational Raman spectra of linear molecules – vibrational Raman spectra – structure determination - vibrational spectroscopy techniques and instrumentation.

BOOKS FOR STUDY AND REFERENCE:

1. N. Subramaniyam, Brijlal and M.N. Avadhanulu, A text book of Optics, S. Chand & Co, New Delhi,(2012)
2. R. Murugeshan and Kiruthiga Sivaprasath, Optics and spectroscopy, S. Chand & Co, New Delhi (2010)
3. Banwell, Fundamentals of molecular spectroscopy, Tata Mcgraw Hill, New Delhi(2016)
4. G. Aruldass, Molecular Structure and Spectroscopy, PHI (2007)

Course Code	Course Name	Category	L	T	P	Credit
17PHU27a	**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 **(9hrs)**

Overview Of C

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

UNIT II **(9hrs)**

Conditional Statements

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

UNIT III **(9hrs)**

Arrays

One dimensional array- Two dimensional array- Multidimensional array

UNIT IV **(9hrs)**

Principles Of Object Oriented Programming

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

UNIT V **(9hrs)**

Inheritance

Single inheritance-multilevel-multiple inheritance-hierarchical-hybrid

BOOKS FOR STUDY:

1.Balagurusamy.E, (2008), ”Programming in ANSI C” , Second Edition, Tata McGraw Hill.
2.Balagurusamy.E, (2008), “Object Oriented Programming with C++”, Tata McGraw-Hill Publication.

REFERENCES:

1. Kamthane Ashok.N, (2013), ”Programming in C”, 2nd Edition, Pearson Education.
2. Yashvant P. Kanetkar, (2008), “Let us C”, 8th Edition, Infinity science press.

Course Code	Course Name	Category	L	T	P	Credit
17PHU27b	**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 **(9hrs)**

The Sun

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 **(9hrs)**

Introduction to Cosmic rays

Nature of Cosmic rays, the origin of cosmic rays, Cosmic ray showers, effect of geomagnetic field on cosmic rays, Primary cosmic radiation, Secondary Cosmic radiation, time variation of cosmic rays.

UNIT III **(9hrs)**

Galactic astronomy

Milkyway, Hubble telescope, classification of galaxies-Spiral galaxies, Elliptical galaxies, Irregular galaxies, Dwarf galaxies, Dark matter.

UNIT IV **(9hrs)**

Stellar Objects

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 **(9hrs)**

Age of Stars

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

Basic Reference:

1. An Introductory Course on Space Science and Earth's Environment by S.S.Degaonker (Gujarat University Publication, Ahmedabad)
2. Atomic and Nuclear Physics-An Introduction- Subrahmanayam

3. An introduction to Astro Physics-Saraswathy K.N
4. Study material available in the website: www.astronomynotes.com

Course Code	Course Name	Category	L	T	P	Credit
17PHU27c	**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 **(9hrs)**

Overview Of Smart Materials

Introduction to Smart Materials, Principles of Piezoelectricty, Perovskyte Piezoceramic Materials, Single Crystals vs Polycrystalline Systems, Piezoelectric Polymers, Principles of Magnetostriction, Rare earth Magnetostrictive materials, Giant Magnetostriction and Magneto-resistance Effect, Introduction to Electro-active Materials, Electronic Materials, Electro-active Polymers, Ionic Polymer Matrix Composite (IPMC), Shape Memory Effect, Shape Memory Alloys, Shape Memory Polymers, Electro-rheological Fluids, Magneto Rhelological Fluids.

UNIT II **(9hrs)**

High-Band Width, Low Strain Smart Sensors

Piezeoelctric 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 **(9hrs)**

Smart Actuators

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 **(9hrs)**

Smart Composites

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 **(9hrs)**

Advances In Smart Structures & Materials

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

REFERENCES:

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

Study material available in the website: www.smartmaterials.com

Course Code	Course Name	Category	L	T	P	Credit
17SEUPH4	**PROGRAMMING IN C, C++**	**SKILL ENHANCEMENT-IV**	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 Strings.
4. Write a Program to compare two files printing the Character position where they equal and where they are differ.
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++:

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 X n and to perform the Matrix addition
4. Write a Program to find the Inverse of Given m X n Matrix
5. Write a Program to compare two files printing the character position where they are equal and where they are differ.