

## **DEPARTMENT OF PHYSICS**

### **VISION**

To achieve excellence in education and research in the field of Physics and other related areas through knowledge creation and dissemination.

### **MISSION**

- Impart quality education and promote scientific temper
- Blend theoretical knowledge with practical skills
- Motivate basic/academic and applied research in technically important fields
- Provide access to all sections of the society to pursue higher education
- Inculcate moral values and ethics among students
- Prepare students as responsible citizens
- Hasten the process of creating a knowledgeable society

### **B. Sc., PHYSICS**

#### **PROGRAMME EDUCATIONAL OBJECTIVES**

- To transform and empower women graduates to meet global challenges through holistic education in terms of recent Teaching-Learning methodologies
- To groom the graduates towards excellence through building communication skills, handling leadership challenges and negotiating career path ways
- To heighten the conscious of the graduates on socio-economic concern and to inculcate moral and ethical values to chisel them as better human being.
- To develop the students into professionally sound, lifelong learners and to kindle research interest and mould them into valuable Physicist through dynamic curriculum
- To motivate the students to pursue higher education and to succeed in obtaining employment appropriate to their interest

#### **PROGRAMME OUTCOMES**

Our programme will help to

PO1	Merge with competency in the subject of Physics and apply knowledge to cater to the needs of Society / Employer / Institution / Own Business Enterprise
PO2	Imbibe analytical/critical/logical/innovative thinking skills in the various fields of theoretical and experimental Physics
PO3	Acquire distinct traits and ethics with high professionalism to gain a broader insight into the domain concerned for nation building
PO4	Recognize the need for and have an ability to engage in life-long learning and be able to demonstrate knowledge of contemporary issues
PO5	Plan, execute and report the results of a complex, extensive experiment or investigation using apt methods to analyze data and to evaluate the level of its accuracy.

**Vellalar College for Women (Autonomous), Erode - 12.**

**Bachelor of Science in Physics**

2018 - 2019 Onwards									
Course Content and Scheme of Examinations (CBCS & OBE Pattern)									
Semester I									
Part	Study Component	Subject Code	Title of the Paper	Inst. Hrs./ Week	Exam. Dur. Hrs.	Max. Marks			Credits
						CIA	ESE	Total	
I	Language I	18TAMU101/ 18HINU101	Tamil/Hindi	6	3	25	75	100	3
II	Language II	18ENLU101	English	6	3	25	75	100	3
III	Core	18PHUC101	Mechanics, Properties of Matter and Acoustics	3	3	25	75	100	3
		18PHUC102	Heat, Thermodynamics and Statistical Mechanics	3	3	25	75	100	3
		18PHUCP01	Core Practical I	3	-	-	-	-	-
	Allied I	18CHUA101	Allied Chemistry Paper I	4	3	20	55	75	4
		18CHUAP01	Allied Chemistry Practical	3	-	-	-	-	-
IV	Foundation Course - A	18FOCU1ES	Environmental Studies	2	3	-	100	100	2
									<b>18</b>
Semester II									
I	Language I	18TAMU202/ 18HINU202	Tamil/Hindi	6	3	25	75	100	3
II	Language II	18ENLU202	English	6	3	25	75	100	3
III	Core	18PHUC203	Electricity and Magnetism	3	3	25	75	100	3
		18PHUC204	Nuclear and Particle Physics	3	3	25	75	100	3
		18PHUCP01	Core Practical I	3	3	40	60	100	3
	Allied I	18CHUA202	Allied Chemistry Paper II	4	3	20	55	75	4
		18CHUAP01	Allied Chemistry Practical	3	3	20	30	50	2
IV	Foundation Course - B	18VEDU2HR	Value Education and Human Rights	2	3	-	100	100	2
									<b>23</b>
Semester V									
Part	Study	Subject code	Title of Paper	Inst.	Exam.	Max. Marks			Credits

	Component			Hrs./ Week	Dur. Hrs.	CIA	ESE	Total	
III	Core	16PHUC507	Mathematical Physics	5	3	25	75	100	5
		09PHUC508	Atomic and Solid State Physics	5	3	25	75	100	5
		09PHUC509	Electronic Circuits and Devices	6	3	25	75	100	6
		15PHUCP03	Core Practical III	3	3	-	-	-	-
		15PHUCP04	Core Practical IV	2	3	-	-	-	-
	Elective I	15PHUE501	Programming in C and C++	4	3	25	75	100	4
		15PHUEP01	Elective Practical	2	3	-	-	-	-
IV	Skill Based Subject III			3	3	25	75	100	3
									<b>23</b>
<b>Semester VI</b>									
III	Core	16PHUC610	Classical Mechanics and Relativity	6	3	25	75	100	6
		16PHUC611	Quantum Mechanics	6	3	25	75	100	6
		15PHUCP03	Core Practical III	3	3	40	60	100	3
		15PHUCP04	Core Practical IV	2	3	40	60	100	3
	Elective I	15PHUEP01	Elective Practical	2	3	40	60	100	3
	Elective II	16PHUE602	Microprocessor	4	3	25	75	100	4
	Elective III	16PHUE603	Communication Electronics	4	3	25	75	100	4
IV	Skill Based Subject IV			3	3	25	75	100	3
V	Extension Activity		-	-	-	-	-	100	1
									<b>33</b>
<b>Total (I - VI Semesters)</b>								<b>4000</b>	<b>140</b>

### Components of CIA

(Applicable to students admitted during the academic year 2018-19 and onwards)

**Components of CIA Marks (Theory –Core, Elective Subjects)**

Tests (I & II)	Assignment / Seminar / Subject Viva	Model Examination	Total
10	5	10	25

**Components of CIA Marks (Theory- Allied Papers)**

Tests (I & II)	Assignment / Seminar / Subject Viva	Model Examination	Total
8	4	8	20

**Bloom's Taxonomy Based Assessment Pattern**

CIA Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	30
K2	B	Either / Or	$2 \times 5 = 10$	
K2, K3	C	Open Choice (2 out of 3)	$2 \times 8 = 16$	

**Model and End Semester Examination (Core, Elective Subjects)**

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	75
K2	B	Either / Or	$5 \times 5 = 25$	
K2, K3	C	Open Choice(5 out of 8)	$5 \times 8 = 40$	

**Model and End Semester Examination (Allied Papers)**

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	55
K2	B	Either / Or	$5 \times 3 = 15$	
K2, K3	C	Open Choice(5 out of 8)	$5 \times 6 = 30$	

**Components of CIA Marks (Core, Elective Practicals)**

Tests (I & II)	Skill	Record	Model Examination	Total
10	15	5	10	40

#### Model and End Semester Examination (Core& Elective Practicals)

Experiment	Record	Total
50	10	60

#### Components of CIA Marks (Allied Practicals)

Tests (I & II)	Skill	Record	Model Examination	Total
5	7	3	5	20

#### Model and End Semester Examination (Allied Practicals)

Experiment	Record	Total
25	5	30

### SEMESTER - I

CODE	COURSE TITLE
18PHUC101	MECHANICS, PROPERTIES OF MATTER AND ACOUSTICS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	41	4	-	3

### Preamble

To understand the concepts of Mechanics, to get exposure in Properties of matter and to understand the applications of Acoustics.

### Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Learn the basic concepts of Rigid body dynamics, Gravitation, Properties of Matter and Acoustics	K1
CO2	Understand the concept of Radius of Gyration, Moment of Inertia, Elasticity, Surface tension and Types of Vibration	K2
CO3	Understand the principles of Low Pressure Gauges and their measurements	K2
CO4	Understand the applications of Acoustics and Ultrasonics	K2
CO5	Apply the basic concepts in real world problems.	K3

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

### Syllabus

#### UNIT I

(9 hrs.)

**Rigid Body Dynamics:**

Rigid Body-Rotational and Vibrational Motion - Torque Moment of Inertia- Radius of Gyration- Kinetic Energy of Rotation - M.I of a Fly Wheel - Experimental determination – Precession - The Gyrostat - Gyrostatic Applications - M.I of a Diatomic Molecule - its Rotational Energy States.

**UNIT II****(9 hrs.)****Gravitational Field & Potential:**

Nature of Motion Under Center Forces - Kepler's Laws - Newton's Law of Gravitation- Gravitational Potential and Field - Gravitational Potential and Field due to (i) Spherical Shell. (ii) Solid Sphere - Boy's Method of determining "G".

**UNIT III****(9 hrs.)****Elasticity:**

Elastic Constants of an Isotropic Solids - Relations Connecting them - Poisson's Ratio - Bending of Beams - Bending Moment of a Bent Beam - Cantilever - Static and Dynamic Method - Uniform and Non - Uniform Bending - Torsion in a Wire - Rigidity Modulus - Determination By Static and Dynamic Methods.

**UNIT IV****(9 hrs.)****Surface Tension, Production and Measurement of Low Pressures:**

Surface Tension and Surface Energy - Pressure on Curved Surface of a Liquid - Variation of Surface Tension with Temperature - Jaeger's Method - Laws of Diffusion - Diffusion Pump - Pirani and Knudsen Gauge.

**UNIT V****(9 hrs.)****Types of Vibration:**

Simple Harmonic Motion - Types of Vibrations - Undamped Vibrations - Damped Vibrations - l Vibrations - Resonance and Sharpness of Resonance.

**Acoustics of Buildings:**

Factors affecting the Acoustics of Buildings - Sabine's Reverberation Formula.

**Ultrasonics:**

Production by Piezo - Electric method - Applications.

**Text Books**

Sl.No.	Author Name	Title of the Book	Publisher	Year and
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				<b>Edition</b>
1	Murugeshan R	Properties of Matter	S.Chand& Company	2016, 1 <sup>st</sup> Edition
2	Brij Lal & Subrahmanyam	Properties of Matter	Eurasia Publishing House (Pvt) Ltd,	1989, 5 <sup>th</sup> Edition
3	Brij Lal & Subrahmanyam	A Text book of Sound	Vikas Publishing House	2015, 2 <sup>nd</sup> Edition

### Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Mathur D.S	Mechanics	S.Chand& Company	2015, 1 <sup>st</sup> Edition
2	Mathur D.S	Elements of Properties of Matter	Shyamlal Charitable Trust	2014, 11 <sup>th</sup> Edition
3	Saihgal R.L	A Text books of sound	S.Chand& Co	1987, 1 <sup>st</sup> Edition

### Web Resources

1. <https://www.khanacademy.org/science/physics/forces-newtons-laws>
2. <https://www.khanacademy.org/science/physics/fluids/fluid-dynamics/v/surface-tension-and-adhesion>

### Pedagogy

Lecture, PPT, Quiz, Assignment, Seminar, Demonstration

CODE	COURSE TITLE
18PHUC102	HEAT, THERMODYNAMICS AND STATISTICAL MECHANICS

Category	CIA	ESE	L	T	P	Credit
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Core	25	75	41	4	-	3
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### Preamble

To understand the fundamental laws, principles of thermodynamics and Statistical thermodynamics and to learn appropriate concepts about the Production of Low Temperature and Liquefaction of Gases.

### Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of Heat, Thermodynamics and Statistical Thermodynamics.	K1
CO2	Procure basic knowledge about real gas, specific heat and Entropy	K2
CO3	Get ideas about liquefaction of gases	K2
CO4	Understand the laws of thermal radiation.	K2
CO5	Acquire knowledge in classical and Quantum Statistics	K3

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	S
CO3	S	S	M	M	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

### Syllabus

#### UNIT I

(9 hrs.)

#### Entropy:

Principles of Increase of Entropy - Temperature-Entropy Diagram - Entropy of a Perfect Gas

Thermodynamic Potentials: Internal Energy (U), Helmholtz Function(F), Gibb's Function(G), and Enthalpy(H) - Maxwell's Thermodynamic Relations - (T-ds) Equations - Clausius Latent Heat Equation From Maxwell's Thermodynamic Relations.

**UNIT II** **(9 hrs.)**

**Production of Low Temperature and Liquefaction of Gases:**

Method of Production of Low Temperatures - Joule Thomson Effect - Porous Plug Experiment - Theory and Results - Joule Thomson Effect for Perfect and Real Gases – Super fluidity – Helium-I and Helium-II - Lamda Point -Adiabatic Demagnetization.

**UNIT III** **(9 hrs.)**

**Thermal Radiation:**

Quantum Theory of Radiation - Planck's Hypothesis - Average Energy of Planck's Oscillator - Planck's Radiation Law and its Experimental Verification - Wien's Law and Rayleigh- Jeans's Law in relation to Planck's Law - Stefan's Constant and Wien's Constant from Planck's Law.

**UNIT IV** **(9 hrs.)**

**Equation of State of a Real Gas:**

Van der Waal's Equation of State - Critical Constants.

**Quantum Theory of Specific Heat:**

Dulong and Petit's Law and the deduction - Failure of Dulong and Petit's Law - Einstein Theory and its limitations - Debye's Theory - Specific Heat of Di-Atomic Gases.

**UNIT V** **(9 hrs.)**

**Statistical Thermodynamics:**

Statistical Equilibrium - Probability Theorems in Statistical Thermodynamics - Maxwell - Boltzman Distribution Law - Maxwell - Boltzman Distribution Law in terms of Temperature - Quantum Statistics - Fermi - Dirac Distribution Law - Bose - Einstein's Distribution Law (Qualitative Study Only) - Comparison of Three Statistics.

**Text Books**

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Brij Lal &Subrahmanyam	Heat and Thermodynamics	S.Chand& Company	2016, 1 <sup>st</sup> Edition.

2	Murugeshan&KiruthigaSivaprasath	Thermal Physics	S.Chand& Company	2016, 3 <sup>rd</sup> Edition
3	Singhal, Agarwal & Sathya Prakash	Heat Thermodynamics and Statistical Physics	Pragati Prakashan	1995, 1 <sup>st</sup> Edition

### Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Brij Lal, Subrahmanyam&P.S.Hemne	Heat Thermodynamics and Statistical Physics	S.Chand& Company	2007, Revised and Multicolour Edition
2	Mathur D.S	Heat and Thermodynamics	S. Chand & Company	2008, 5 <sup>th</sup> Edition
3	Sharma J.K & Sarkar K.K	Thermodynamics and Statistical Physics	Himalaya Publishing House	1991, 3 <sup>rd</sup> Edition

### Web Resources

1. <https://www.khanacademy.org/science/physics/thermodynamics>
2. <https://www.khanacademy.org/science/physics/thermodynamics/laws-of-thermodynamics/v/macrostates-and-microstates>

### Pedagogy

Lecture, PPT, Quiz, Assignment, Seminar

### SEMESTER - II

CODE	COURSE TITLE
18PHUC203	ELECTRICITY AND MAGNETISM

Category	CIA	ESE	L	T	P	Credit
Core	25	75	41	4	-	3

## Preamble

To acquire basic knowledge in Electricity & Magnetism and to understand the electrical behavior of charges and magnetic properties of materials.

## Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Know the basic concepts of Electricity and Magnetism	K1
CO2	Understand the various phenomenon in Electricity and Magnetism	K2
CO3	Understand Circuit analysis and network theorems	K2
CO4	Explain the Dynamics of Charged Particles	K2
CO5	Apply the acquired knowledge to solve the problems.	K3

## Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	M
CO3	S	S	M	S	S
CO4	S	S	M	M	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

## Syllabus

### UNIT I

(9 hrs.)

#### Electrostatics:

Gauss Theorem - Application of Gauss Theorems: An Insulated Conductor- Electric Field due to Uniformly Charged Sphere- Electric Field due to an Isolated Uniformly Charged Conducting Sphere- Electric Field due to uniformly Infinite Cylindrical Charge - Coulomb's Law: Proof - Mechanical

Force Experienced by unit area of a Charged Surface Energy Stored per unit Volume in an Electric Field.

**Principle of Capacitors:**

Parallel Plate Capacitor - Force of attraction between Plates of a Charged Parallel Plate Capacitor- Types of Capacitors: Guard Ring Capacitor - Electrolytic Capacitor - Variable Capacitor.

**UNIT II**

**(9 hrs.)**

**Helmholtz Equations of Varying Current:**

Growth and Decay of Current in an Inductive - Resistive Circuit - Charging and Discharging of a Capacitance through a Resistance - Charging and Discharging of a Capacitance through an Inductance and a Resistance - Discharge of a Capacitance through an Inductance - Oscillatory circuits - Force on a Current carrying Conductor - Theory of Ballistic Galvanometer.

**UNIT III**

**(9 hrs.)**

**AC Circuit Analysis and Network Theorems:**

LCR Series Resonance Circuit - LC Parallel and L, R and C Parallel Resonance Circuits - Power Consumed by the above Circuits - Q - Factor and Bandwidth of Response of a tuned Circuit - Sharpness of Resonance - Network Theorems: Thevenin and Norton theorems.

**UNIT IV**

**(9 hrs.)**

**Dynamics of Charged Particles:**

Charged Particles in a Uniform and Constant Electric Field - Charged Particle an Alternating Electric Field - Charged Particle in a Uniform and Constant Magnetic Field - Magnetic Focusing - Charged Particle in Combined Electric and Magnetic Field when the Fields are parallel and are in mutually perpendicular directions

**UNIT V**

**(9 hrs.)**

**Magnetic Properties Of Materials:**

Electron Theory of Magnetism - Langevin's Theory - Dia and Paramagnetism - Weiss Theory of Ferromagnetism - Magnetic Susceptibility and Magnetic Permeability - Hysteresis - Area of the Hysteresis Loop – Ferro Magnets – Determination of Susceptibility - Guoy's Method.

**Text Books**

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Murugesan R	Electricity and Magnetism	S.Chand& Company	2011, 9 <sup>th</sup> Edition
2	Brij Lal &SubrahmanyamN	Electricity and Magnetism	S.Chand& Company	1995, 9 <sup>th</sup> Edition

3	Nagaratnam N & Lakshmi Narayanan N	Electricity and Magnetism	The National Publishing Company	1997, 3 <sup>rd</sup> Edition
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### Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Tewari K.K	Electricity and Magnetism with Electronics	S.Chand& Company	2011, 1 <sup>st</sup> Edition
2	Seghal, D.C., Chopra, K.L &Seghal, N.K	Electricity and Magnetism	S.Chand& Company	2009, 5 <sup>th</sup> Edition

### Web Resources

1. <https://www.khanacademy.org/science/physics/discoveries/batteries/v/the-battery-electromagnetism>
2. <https://www.khanacademy.org/science/physics/magnetic-forces-and-magnetic-fields/magnets-magnetic/v/introduction-to-magnetism>

### Pedagogy

Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18PHUC204	NUCLEAR AND PARTICLE PHYSICS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	41	4	-	3

## Preamble

To acquire the knowledge of nuclear structure, nuclear models, nuclear reactors and elementary particles.

## Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basics concepts of atomic structure and general static properties of atomic nuclei	K1
CO2	Analyze different nuclear models knowing the properties of nuclei	K2
CO3	Analyze the various techniques of nuclear radiation detectors	K2
CO4	Apply the knowledge of radioactivity to realize the concept of artificial radioactivity	K3
CO5	Acquire knowledge on the kinematics of high energy collision of nuclear elementary particles.	K3

## Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	M
CO3	S	S	M	M	S
CO4	S	S	S	S	S
CO5	S	S	S	S	M

S- Strong; M-Medium; L-Low

## Syllabus

### UNIT I

(9 hrs.)

#### General Properties of Atomic Nuclei:

Introduction - Nuclear Forces - Meson's Theory of Nuclear Forces - Theories of Nuclear Composition - Proton Electron Hypothesis - Models of Nuclear Structure - Liquid Drop Model - Shell Model.



Particle Accelerators - Synchrocyclotron - Betatron - Electron and Proton Synchrotron.

## UNIT II

(9 hrs.)

### Radio Activity:

Introduction - Geiger Nuttal Experiment - Geiger Nuttal Law - Alpha Particle Disintegration Energy - Origin of Line and Continuous Spectrum - Neutrino theory of Beta Decay - K. Electron Capture - Origin of Gamma Rays - Absorption of Gamma Rays - Natural Radio Active Series - Law of Successive Disintegration - Radioactive Equilibrium - Radioactive dating.

## UNIT III

(9 hrs.)

### Artificial Transmutation of Elements:

Discovery of Artificial Transmutation - Rutherford's Experiment - Bohr's Theory of Nuclear Disintegration - Nuclear Reactions - Energy Balance in Nuclear Reactions and the Q - Value - Nuclear Transmutations - Transmutation by (i) Alpha Particle (ii) Protons (iii) Deuterons and Neutrons - The Scattering Cross Section and its determination – Production of Radioisotopes and their uses.

Detectors of Nuclear Radiations - Ionization Chamber - Geiger Muller Counter - Proportional Counter - Wilson's Cloud Chamber - Bubble Chamber - Basic Principles and Working.

## UNIT IV

(9 hrs.)

### Nuclear Fission, Fusion and Reactors:

Nuclear Fission - Energy Released in Fission - Bohr Wheeler Theory of Nuclear Fission - Chain Reaction - Multiplication Factor - Natural Uranium and Chain Reaction - Design of Nuclear Reactor - Breeder Reactor - Nuclear Reactor Programmes in India - Nuclear Fusion - Sources of Stellar Energy - Thermo Nuclear Reactions - Transuranic Elements.

## UNIT V

(9 hrs.)

### Elementary Particles:

Baryons - Leptons - Mesons - Particles and Antiparticles - Concept of Antimatter - Strong Interaction - Electro Magnetic Interaction - Gravitational Interaction - Elementary Particle Quantum Numbers - Conservation Laws and Symmetry - Charge Conjugation - Parity and Time Reversal – CPT - Quark Model.

## Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Murugesan R	Modern Physics	S.Chand& Company	2016, 18 <sup>th</sup> Edition
2	Seghal, Chopra and Seghal	Modern Physics	S.Chand& Company	2013, 7 <sup>th</sup> Edition

3	Goshal S.N	Nuclear Physics	S.Chand& Company	2016, 1 <sup>st</sup> Edition
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### Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Sharma R.C	Nuclear Physics	K.Nath& Company	2005, 1 <sup>st</sup> Edition
2	Kennath .S.Krane	Modern Physics	John Wiley & Sons	1998, 2 <sup>nd</sup> Edition
3	Arthur Beiser	Concepts of Modern Physics	Tata McGraw Hill	2008, 6 <sup>th</sup> Edition

### Web Resources

1. <https://www.khanacademy.org/science/chemistry/atomic-structure-and-properties/introduction-to-the-atom/v/atomic-number-mass-number-and-isotopes>
2. <https://www.khanacademy.org/science/cosmology-and-astronomy/universe-scale-topic/light-fundamental-forces/v/four-fundamental-forces>

### Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18PHUCP01	CORE PRACTICAL I

Category	CIA	ESE	L	T	P	Credit
Core	40	60	-	-	90	3

### Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Determine the various properties of materials	K4
CO2	Apply the knowledge of Physics fundamentals	K3
CO3	Find the errors and adjust it to get the nearer ideal readings using specific measurement techniques	K3
CO4	Quantify the measurement of the reflection or transmission properties of a material	K4
CO5	Determine the characteristics of the electronic devices	K5

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	S
CO3	S	S	M	S	S
CO4	S	M	M	S	S
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

### Syllabus

Any **SIXTEEN** of the following:

1. Young's Modulus - Non Uniform Bending - Pin and Microscope.
2. Young's Modulus - Uniform Bending - Optic Lever.
3. Young's Modulus - Cantilever - Static Method.
4. Young's Modulus - Cantilever - Dynamic Method.
5. Rigidity Modulus - Static Torsion.
6. Compound Pendulum - Acceleration due to gravity.
7. Surface Tension by Capillary Rise method
8. Coefficient of Thermal Conductivity - Lee's Disc.
9. Refractive Index of a Liquid - Hollow Prism - Spectrometer.
10. Refractive Index of the Material of a Solid Prism - Spectrometer.
11. Refractive Index of the Material of a Solid Prism - i-d Curve - Spectrometer.
12. Wavelength of Mercury Spectral Lines - Grating - Normal Incidence - Spectrometer.

13. Wavelength of Spectral Lines - Grating - Minimum Deviation - Spectrometer.
14. Calibration of Low Range Voltmeter - Potentiometer.
15. Calibration of Low Range Ammeter - Potentiometer.
16. Specific Resistance - Potentiometer.
17. Moment of a Magnet - Tan C position.
18. Characteristics of Junction Diode.
19. Sonometer - Frequency of A.C mains.
20. Temperature Coefficient of Resistance of a Thermistor - Post Office Box.

### **SEMESTER III**

#### **Core Paper V**

#### **OPTICS AND SPECTROSCOPY**

**Instructional Hrs. : 60**

**Sub. Code: 09PHUC305**

**Max. Marks: CIA-25; ESE-75**

**Credits: 4**

**Objective:** To provide an understanding of various phenomenon of light and principles of spectroscopy.

**UNIT I****12 Hrs.****Geometrical Optics:**

**Aberrations:** Spherical Aberration in a Lens – Reducing Spherical Aberration – Coma – Aplanatic Lens – Chromatic Aberration In a Lens – *Achromatism In Prisms – Achromatic Lenses.*

**Velocity Of Light:** Anderson’s Method – Houston’s Method.

**UNIT II****12 Hrs.****Physical Optics:**

**Interference:** Fresnel’s Biprism – Determination of Wavelength – Air Wedge – *Interferometry – Michelson Interferometer* – Types of Fringes – Visibility of Fringes – Determination of Wavelength of Monochromatic Light – Determination of Difference in Wavelength Between two Neighboring Spectral Lines – Standardization of the Meter – Holography.

**UNIT III****12 Hrs.**

**Diffraction:** Rectilinear Propagation of Light – Zone Plate – Fresnel & Fraunhofer Diffraction – Diffraction Pattern Due to a Straight Edge – Plane Diffraction Grating – Theory – Determination of Wavelength – Echelon Grating – Theory – *Resolving Power of a Plane Diffraction Grating.*

**B.Sc Physics 2009-10 onwards****UNIT IV****12 Hrs.**

**Polarization:** Double Refraction – Huygens’s Explanation of Double Refraction in Uniaxial Crystals – Production and Detection of Plane, Circularly and Elliptically Polarized Light – Optical Activity – Specific Rotation – *Laurent’s Half – Shade Polarimeter – Lippich Polarimeter.*

**UNIT V****12 Hrs.**

**Laser Spectroscopy:** Induced Absorption, Spontaneous Emission and Stimulated Emission – Population Inversion – Pumping – Ruby Laser – *Helium-Neon Laser – Gas Laser – Properties of Laser Beam.*

**Molecular Spectroscopy:** Pure Rotational Spectra – Vibrational – Rotational Spectra – Electronic Spectra – Raman Effect – Quantum Theory of Raman Effect – Experimental Study of Raman Effect – Applications.

**Note:** *Italics* denotes Self study Topics

### TEXT BOOKS

1. **Murugesan R.**, “*Modern Physics*”, S.Chand & Company., New Delhi, 2005 Edition, 2005.
2. **Subramaniam and Brijlal.**, “*Optics*”, S.Chand & Company., New Delhi, 22<sup>nd</sup> Edition, 1994.

### REFERENCE BOOKS

1. **Ajay Ghatak.**, “*Optics*”, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, First Reprint 1978.
2. **Dutta M K.**, “*Atomic and molecular Spectroscopy*”, IV Y Publishing House, New Delhi, First Edition, 2010.
3. **Vimal Kumar Jain**, “*Introduction to Atomic and Molecular Spectroscopy*”, Narosha Publishing House, New Delhi, First Edition 2007.

**B.Sc Physics 2009-10 onwards**

## SEMESTER IV Core Paper VI DIGITAL ELECTRONICS

**Instructional Hrs. : 60**  
**Max. Marks: CIA-25; ESE-75**

**Sub. Code: 11PHUC406**  
**Credits: 4**

**Objective:** To enable the students to learn Digital principles and their Applications.

### UNIT I

**12 Hrs.**

**Number system and Codes:** Decimal, Binary, Octal, Hexadecimal- Conversion of Number system- Binary Coded Decimal – Alphanumeric Codes - ASCII Code – EBCDIC Code – Error Detecting and Correcting Code – Parity – Even Parity and Old Parity Method.

**UNIT II****12 Hrs.**

**Logic gates and Boolean Algebra:** Positive and Negative logic – Logic Gates - NAND, NOR, XOR, XNOR – Action And Truth Table – Laws And Rules of Boolean Algebra and simplifications - *De Morgan's Theorem and Proof* – *K-map* – *Pairs, Quads, Octets, Don't care condition. Logic Diagram.*

**UNIT III****12 Hrs.**

**Arithmetic and Logic Circuits:** Half Adder – Full Adder – Half Subtractor – Full Subtractor – Parallel Binary Adder – Parallel Binary Subtractor Encoder Decoder D/A Converter – A/D Converter .

**UNIT IV****12 Hrs.**

**Sequential Circuits:** Introduction – R.S Flip Flop, Clocked Flip Flop, JK Flip Flop, D Flip Flop – *Master Slave JK Flip Flop* – *Construction Circuits* – *Working.*

**Counters:**

Ring Counter, Ripple Counter, Mod counters: Decade Counter.

**UNIT V****12 Hrs.**

**Magnetic Memory:** Magnetic Cores – Magnetic Core Logic – Coincident Current Memory – Memory Addressing.

**Semiconductor Memory:** MOS – RAM ROM, PROM, & EPROM.

**Note:** *Italics* denotes Self study Topics

**B.Sc Physics 2011-12 onwards****TEXT BOOKS**

1. **Malvin.**, “*Digital Computer Electronics*”, Tata McGraw Hill, New Delhi, 3<sup>rd</sup> Edition, 2003
2. **Malvino & Leach.**, “*Digital principles and applications*”, Tata McGraw Hill, New Delhi, 6<sup>th</sup> Edition. 2006.
3. **Thomas C Bartee.**, “*Digital computer fundamentals*”, Tata Mc Graw Hill, New Delhi, - 6<sup>th</sup> Edition, 2001.

**REFERENCE BOOKS**

1. **Jain.R.P.**, “*Modern Digital Electronics*”, Tata McGraw Hill, New Delhi, - 3<sup>rd</sup> Edition, 2006.
2. **Morris Mano.M.**, : “*Digital Logic & Computer Design*”, Prentice Hall India First **Edition**, Reprint 2000 New Delhi

3. **William H.Gothmann.**, “*Digital electronics*”, Prentice Hall India, New Delhi, 2<sup>nd</sup> Edition 2006.
4. **Anokh Singh, Chhabra A.K.**, “*Fundamentals of Digital Electronics and Microprocessors*”.S.Chand& Company Ltd., New Delhi. 2<sup>nd</sup> Revised Edition 2003.

**B.Sc Physics 2011-12 onwards**

**SEMESTER III& IV**

**Core Practicals II**

**Instructional Hrs. : 60**

**Sub. Code: 16PHUCPO2**

**Max. Marks: CIA-40; ESE-60**

**Credits: 3**

**Any SIXTEEN of the Following:**

1. Young’s Modulus – Uniform Bending – Koenig’s Method.
2. Young’s Modulus – Non Uniform Bending – Koenig’s Method.
3. Dispersive Power of Grating – Spectrometer.
4. Cauchy’s Constants and Dispersive Power of a Prism – Spectrometer.
5.  $\mu$  of a Prism – Stoke’s Formula.
6.  $\mu$  of a Lens – Newton’s Rings.
7. Thickness of Insulation – Air Wedge.



8. Calibration of High Range Voltmeter – Potentiometer.
9. Temperature Coefficient Of Resistance – Carey Foster’s Bridge.
10. Kater’s Pendulum – Determination of Acceleration due to Gravity ‘g’.
11. Spectrometer –  $i - i'$  Curve.
12. Characteristics of Zener Diode.
13. Figure of Merit of B.G.
14. Comparison of Mutual Inductance – B.G.
15. Transistor Characteristics – Common Emitter Configuration.
16. Transistor Characteristics – Common Base Configuration.
17. Verification of Truth Table of Logic Gates – AND, OR, NOT, NAND, NOR and EX-OR
18. Field Along The Axis of The Coil – Vibration of Magnetometer – Determination of Field.
19. Hysterisis – B.H. Curve.
20. Melting Point of Wax – Thermistor – Post Office Box

**B.Sc., Physics – 2016-2017 onwards**

**SEMESTER V  
Core Paper VII  
MATHEMATICAL PHYSICS**

**Instructional Hrs.:75**

**Sub. Code: 16PHUC507**

**Max. Marks: CIA-25; ESE-75**

**Credits: 5**

**Objective:** To enable the students to solve various mathematical problems and to understand how mathematics and physics are related.

**UNIT - I**

**17Hrs.**

**Vector Analysis:**

Meaning of dot products and vector products - Scalar valued function and vector valued function - Plotting scalar and vector fields - Examples from physics - Gradient of a scalar function - Directional derivative - Examples - Divergence of a vector function - Curl of a vector function - Physical meaning of gradient operation, divergence and curl.

Line integral - surface integral and volume integral - Stoke’s theorem - Gauss’s divergence theorem - Green’s theorem.

## Unit II

### Matrices:

15 Hrs.

Matrices - Symmetric matrix, anti-symmetric matrix - Hermitian matrix, skew - Hermitian matrix - Orthogonal matrix - Unitary matrix. Eigen value and Eigenvector of matrices - Cayley-Hamilton's theorem - Proof - Inverse of a matrix - Rank of a matrix - elementary row or column transformation.

## Unit- III

### Ordinary Differential Equations:

20 Hrs.

First and second order ordinary differential equations with constant coefficients - Initial value problem - Method of finding solutions - Superposition principle - Wronskian-Second order differential equations with variable coefficients - Definition of ordinary and singular points - Power Series Solution - Solutions about ordinary point and singular point.

## UNIT- IV

12 Hrs.

### Probability and Statistics:

**Probability:** Basic definition - Classical probability and empirical probability - Properties of probability - Conditional probability - Joint probability - Addition law and multiplication law of probability.

**Statistics:** Measures of central tendency - Mean, median and mode - Skewness and kurtosis.

**Probability distribution** – Random variables - Binomial distribution, Poisson's distribution, Normal (Gaussian) distribution and Standard normal distribution. Expectation values - Moments and moment generating functions - variance and standard deviation.

## UNITV

11 Hrs.

### Beta, Gamma Functions:

Definition of Gamma function - Fundamental property of gamma function and values of Gamma function - Definition of beta function - Different forms of beta function - Relationship between beta and gamma functions - Delta function - Basic properties.

### Text Books

1. **Zill D. G. and Cullen M. R.**, "Advanced Engineering Mathematics", (Unit I, II & III) Narosa, 2006.
2. **Kreyszig E.**, "Advanced Engineering Mathematics", (Unit I, II, III & IV) Wiley Eastern, 2015.
3. **Dass H.K.**, "Mathematical Physics", (Unit IV & V), S.Chand & Company, New Delhi, 2010.
4. **Satya Prakash**, "Mathematical Physics", (Unit IV), S.Chand & Company, New Delhi, 2014

### Reference Books

1. **Gupta B.D.**, "Mathematical Physics", S.Chand & Company, New Delhi, 4<sup>th</sup> Edition, 2009.
2. **Arfken, Weber and Harris**, "Mathematical Methods for Physicists A Comprehensive Guide", Elsevier Publication, 7<sup>th</sup> Edition.

## Core Paper VIII

### ATOMIC AND SOLID STATE PHYSICS

**Instructional Hrs. : 75**

**Sub. Code: 09PHUC508**

**Max. Marks: CIA-25; ESE-75**

**Credits:**

**Objective:** This syllabus provides a platform for the students to learn about the structure and properties of solids and their relation. It helps the students to appreciate the practical utility of the various fundamental principles. This paper leads to the study of subjects such as material science, nano science, condensed matter physics, solid state ionics, etc.

#### UNIT I

**15 Hrs.**

**Atomic Physics:** Introduction – The Vector Atom Model – Quantum Numbers Associated with the Vector Atom Model – Coupling Schemes – *Pauli's Exclusion Principle* – *Periodic Classification of Elements* – Electronic Configuration of Some Light Elements with Symbolic Representation – Magnetic Dipole Moments Due to Orbital And Spin Motion of Electrons – Fine Structure of Sodium Line – Hyperfine Structure - Zeeman Effect- Experimental Arrangement – Expression for Zeeman Shift.

#### UNIT II

**15 Hrs.**

**Crystal Structure:** Crystals and Crystal Lattice – Unit Cell – *Types of Crystal System – Tetragonal, Hexagonal, Orthorhombic, Rhombohedral, Monoclinic, Triclinic* – Bravais Lattices – Metallic Structure – Body Centered Cubic (BCC) Structure – Face Centered Cubic (FCC) Structure – Hexagonal Close Packed Structure- Miller Indices – Procedure to Find Miller Indices of Crystal Planes – Representation of Crystal Planes in a Cubic Unit Cell – Common Planes In a Simple Cubic Structure – Study of Crystal Structure – Powder Crystal Method – Laue’s Method – Rotating Crystal Method.

### UNIT III

15 Hrs.

**Crystal Defects & Crystal Growth:** Point Defects – Line Defects – Surface Defects – *Types of Dislocations*– Edge and Screw Dislocations – Crystal Growth – Nucleation Methods – Solution and Gel Techniques – U-Tube Method – Czochralski’s Crystal Growth.

## B.Sc Physics – 2009-10 onwards

### UNIT IV

15 Hrs.

**Electron Theory of Metals:** Drude – Lorentz Theory and its Applications – Sommerfield Theory – Fermi Dirac Distribution – Brillouin Zone Theory – Brillouin Zone - Relation Between Energy and Wave Number.

**Super Conductivity:** Super Conductivity – Occurrence of Super Conductivity - Experimental Facts of Super Conductivity - Persistent Currents - Effect of Magnetic Fields – Meissner Effect – *Type-I and Type II Super Conductors* – B.C.S. Theory of Super Conductivity.

### UNIT V

15 Hrs.

**Dielectric and Insulating Materials:** Polarisation – Temperature and Frequency Effects – Dielectric Loss – Piezo Electric and Ferro Electric Materials - Break Down Mechanisms – Classification of Insulating Materials – Testing Them – *Ceramic and Polymer Insulating Materials – Liquid Insulating Materials.*

**Note:** *Italics* denotes Self study Topics

### TEXT BOOKS

1. **Arumugam** ., “*Material Science*” ,Anuradha Agencies Publishers, Kumbakonam Revised

Edition 1990.

2. **Khurimi R.S, Sedha R.S.**, “*Material Science*”, S.Chand & Company Ltd., New Delhi

Sixth Edition, 1989.

3. **Murugesan R.**, “*Modern Physics*”, S.Chand & Company Ltd. New Delhi, Sixth Edition,

1998.

### REFERENCE BOOKS

1. **Mandal J.N.**, “*Concepts of Solid State Physics*”, Pragati Prakashan, New Delhi, First Edition

2001.

2. **Ragavan V.**, “*Material Science And Engineering*” , Prentice Hall of India Pvt. Ltd. New Delhi,

Third Edition, 1993.

**B.Sc Physics – 2009-10 onwards**

### SEMESTER V

### Core Paper IX

### ELECTRONIC CIRCUITS AND DEVICES

**Instructional Hrs. : 90**

**Max. Marks: CIA-25; ESE-75**

**Sub. Code: 09PHUC509**

**Credits: 6**

**Objective:** To provide the essential knowledge of semi conductors and enable the students to understand the basic principles, working and applications of semi conductor diodes, transistors, amplifiers and oscillator circuits.

#### UNIT I

**20 Hrs.**

**Semiconductor Diodes and Rectifiers:** Introduction to Semiconductor Theory– Special Diodes – Zener Diode, Tunnel Diode and Varactor Diode – Construction, Working, Equivalent Circuit and Applications. Opto Electronic Devices – LED, Photo Diode and LCD – Construction and Working – and Applications. DC Power Supply-Full Wave Rectifier- *Voltage Regulation – Zener, Transistor Regulators. Filters- Inductive and Capacitive.*

#### UNIT II

**18 Hrs.**

**Transistor Circuits:** Transistor Biasing and Stabilization – Leakage Currents and Total Currents In a

Common Emitter and Common Base Circuit – Load Line – Q-Point – *Factors Affecting Stability of Q-Point – Stability Factor.*

Field Effect Transistor – JFET – Construction – Operation – Characteristics – Comparison of JFET and BJT. MOSFET – Construction and Working of DE MOSFET and E-only MOSFET. *UJT – Construction – Operation – Silicon Controlled Rectifier-Basic Operation.*

### UNIT III

18 Hrs.

**Amplifiers:** Amplifiers- Single Stage and Multi Stage – Amplifiers- DC & AC Equivalent Circuits – Multistage Amplifier –RC- Transformer – Direct Coupled Amplifiers – Comparison – Transistor Power Amplifier – Difference Between Voltage and Power Amplifiers- Classification

### B.Sc Physics 2009-10 onwards

of Power Amplifier – Collector Efficiency- Class a Transformer Coupled Amplifier – Push Pull Amplifier – *Feedback Principle – Negative Feedback – Emitter Follower.*

### UNIT IV

17 Hrs.

**Oscillators:** Types of Oscillators – Undamped Oscillation- General Theory of Hartley and Colpitt's Oscillator– *Crystal Oscillator –Phase Shift Oscillator- Multi Vibrator-Astable, Mono Stable and Bi-Stable Multi Vibrator.*

### UNIT V

17 Hrs.

#### **Integrated Circuit Fabrication and Characteristics:**

Integrated Circuit Technology – Basic Monolithic ICs – Epitaxial Growth –Masking and Etching – *Diffusion of Impurities* – Integrated Resistors, Capacitors and Inductors –Monolithic Diodes –The Metal Semi-Conductor Contact - Operational Amplifier –Basic Features – Op. Amp As Adder, Subtractor , *Integrator and Differentiator.*

**Note: *Italics*denotes Self study Topics**

### TEXT BOOKS

1. Mehta, V.K., "*Principles Of Electronics*", S. Chand & Company., New Delhi, 10<sup>th</sup> Edition,

2007.

2. Theraja B.L., “Basic Electronics”, S. Chand & Company, New Delhi, 5<sup>th</sup> Edition, 2009.

### REFERENCE BOOKS

1. Gayakwad Ramakant, A ., “Linear Integrated Circuits” , PHI, New Delhi, 2007.

2. Millman Halkias., “Integrated Electronics”, Mcgraw Hill, New Delhi, 2003.

3. Sedha R.S., “Applied Electronics”, S.Chand& Company, New Delhi, 3<sup>rd</sup> Edition, 2009.

B.Sc Physics 2009-10 onwards

## SEMESTER V

### Elective I

#### PROGRAMMING IN ‘C’ AND ‘C++’

**Instructional Hrs. : 60**

**Sub. Code: 15PHUE501**

**Max. Marks: CIA-25; ESE-75**

**Credits: 4**

**Objective:** The general purpose, block structured, procedural computer programming language ‘C’ is compatible to a number of operating systems. ‘C’ as an intermediate language has greatly influenced other popular language like java, java script, unix etc... Including C++, originally designed as extension to ‘C’.

#### UNIT I

**12 Hrs.**

**Over View of C: Constants, Variables and Data Types:** Features of C Language – Keywords and Identifiers – Constants, Variables – Data Types – Declaration of Variables – Assigning Values to Variables.

**Operators and Expression:** Arithmetic Operators – Relational Operators – Logical Operators – Assignment Operators – Increment and Decrement Operators – Conditional Operators – Bit-Wise Operators – Special Operators – *Arithmetic Expressions- Evaluation of Expression.*

**Managing Input and Output Operations:** Reading a Character – Writing a Character – Formatted Input – Formatted Output.

#### UNIT II

**12 Hrs.**

**Control Structures in C:** Decision Making - Branching - and Looping – If, If-Else, Switch Statement

- Conditional Operator - Go To Statement – The WHILE, The DO and the FOR Statements.

**Object Oriented Programming With C++:** *Basic Concepts of OOP - Structure of C++ Program.*

**Tokens, Expressions and Control Structures:** Basic Data Types – Symbolic Constants – Operators in C++ - Manipulators – Type Casting – Expressions and Their Types.

**Functions in C++:** Functions Prototyping – Inline Functions – Default Arguments – Const Arguments.

**B.Sc. Physics – 2015-2016 onwards**

### UNIT III

**12 Hrs.**

**Classes and Objects:** Specifying a Class – Defining Member Functions – Nesting of Member Functions – Private Member Functions – Arrays Within a Class – *Static Data Members – Static Member Functions* – Array of Objects – Objects as Function Arguments – Friend Functions – Returning objects – Const Member Functions – Pointers to Members.

### UNIT IV

**12 Hrs.**

**Constructors and Destructors:** Constructors – Parameterized Constructors – Copy Constructor – Dynamic Constructor – Destructors.

**Inheritance:** Single Inheritance – Multiple Inheritance – Hierarchical Inheritance – Multi Level Inheritance – *Hybrid Inheritance.*

### UNIT V

**12 Hrs.**

#### **Polymorphism:**

Operator Overloading – Function Overloading – Overloading Unary and Binary Operator – This Pointer – Static and Dynamic Binding – Virtual Functions.

#### **Working With Files:**

Classes for File Stream Operations – Opening and Closing a File – *Error Handling During File Operations.*

**Note:** *Italics denotes Self study Topics*

### TEXT BOOKS

1. **Balagurusamy E.,** “*Programming In ANSI C*”, Tata McGraw Hill, New Delhi, 3<sup>rd</sup>Edition, 2005.
2. **Balagurusamy E.,** “*Object – Oriented Programming With C++*”, Tata McGraw Hill, New Delhi, 3<sup>rd</sup> Edition, 2008.

### REFERENCE BOOKS

1. **Bjarne Stroutstrup .,** “*The C++ Programming Language*”, Pearson Education, New Delhi, 3<sup>rd</sup>



Edition, 2001.

2. **Grady Booch.**, “*Object Oriented Analysis And Design*” , Pearson Education, New Delhi, 1<sup>st</sup> Edition, 2006.

3. **Khanitkar.**, “*Let Us C++*”, BPB Publications, New Delhi, 5<sup>th</sup> Edition, 2005.

## B.Sc. Physics – 2015-2016 onwards

### SEMESTER VI

#### Core Paper X

#### CLASSICAL MECHANICS AND RELATIVITY

**Instructional Hrs: 90**

**Sub. Code: 16PHUC610**

**Max. Marks: CIA-25; ESE-75**

**Credits: 6**

#### UNIT I

**12 Hrs**

##### **Newtonian Mechanics:**

Newton's Law of Motion - First Law - Second Law - Third Law.

Applications: Simple Pendulum - Simple Pendulum as Linear Harmonic Oscillator - Physical Pendulum: Compound Pendulum

Cyclic coordinates and conservation laws - linear momentum, angular momentum and energy.

#### UNIT II

**20 Hrs**

##### **Constraints**

Holonomic and non-holonomic constraints - scleronomic and rheonomic constraints - degrees of freedom - generalized coordinate and generalized velocity - configuration space - virtual displacement - virtual work done D'Alembert's principle - Euler - Lagrangian equation of motion.

Applications of Lagrangian - simple pendulum, linear harmonic oscillator in one dimension, Atwood's machine, compound pendulum, double pendulum and a charged particle in an electromagnetic field.

#### UNIT III

**20 Hrs**

##### **Variational technique:**

Variational calculus - geodesics - Lagrangian equation of motion from Hamilton's principle - Newton's equation of motion from Hamilton's principle

##### **Hamiltonian:**

Phase space - Legendre transformation - Hamiltonian for simple pendulum, linear harmonic oscillator in one dimension and a charged particle in an electromagnetic field - Hamilton's equation of motion.

## UNIT IV

20 Hrs

### Central force:

Two body problem can be written as equivalent one body problem - central force properties - Kepler's second law - effective potential and classification of orbits - inverse square law problem.

Scattering theory - differential cross section and total cross section - Rutherford scattering (Qualitative Analysis).

## UNIT V

18 Hrs

### Relativity:

Frames of reference - Galilean transformation equations - Michelson - Morley experiment - postulates of special theory of relativity - Lorentz transformation equations - length contraction - time dilation - Illustration - meson decay - addition of velocities - Variation of Mass with Velocity - Mass - Energy Equivalence - Unified Mass Unit.

### Text Books

1. **Verma H.C.**, "Concept of Physics", Bharati Bhawan Publishers & Distributors, 2<sup>nd</sup> Edition, 1996.
2. **Helbert Goldstein., John Safko, Charles P. Poole.**, "Classical Mechanics", Pearson, 3<sup>rd</sup> Edition, 2011
3. **Upadhyaya J. C.**, "Classical Mechanics", Himalaya Publishing House, 2009.
4. **Murugesan R.**, "Modern Physics", S.Chand & Company., New Delhi, 18<sup>th</sup> Edition, 2016.

### Reference Books

1. **Gupta, Kumar, Sharma.**, "Classical Mechanics", Pragati Prakashan, Meerut, 21<sup>st</sup> Edition, 2004.
2. **Takwale R.G. and Puranik P. S.**, "Introduction to Classical Mechanics", Tata McGraw-Hill, New Delhi, 2006.

**SEMESTER VI**  
**Core Paper XI**  
**QUANTUM MECHANICS**

**Instructional Hrs. : 90**

**Sub. Code: 16PHUC611**

**Max. Marks: CIA-25; ESE-75**

**Credits: 6**

**Objective:** To provide an insight into the behavior of particles at micro level.

**UNIT I**

**18 Hrs.**

**Foundation of Quantum Mechanics:**

Inadequacy of classical mechanics - dual nature of matter - expression for de-Broglie wavelength - G.P. Thomson's experiment - wave packet - phase velocity - group velocity - relation between phase velocity and group velocity.

**Heisenberg's Uncertainty Principle:**

Statement and its physical significance - gamma ray microscope - diffraction of electron through a slit - application of uncertainty principle - size of the Hydrogen atom and energy in the ground state.

**UNIT II**

**18 Hrs.**

**Foundation of Quantum Mechanics:**

Postulates of quantum mechanics - Max Born's statistical interpretation of wave functions - Probability density - Schrodinger time dependent wave equation and time independent wave equation. Orthogonal and normalization conditions for wave functions.

**The operator formalism in Quantum Mechanics:**

Dynamical variables as operators - operators for position, momentum, kinetic energy in position representation and momentum representations - Hermitian operators and its properties - parity operator - expectation values of dynamical quantities.

**UNIT III**

**16 Hrs.**

**Stationary states:**

Probability current density and probability density - Ehrenfest's Theorem - Proof.

**Commutation Algebra:**

Canonical commutation relation between position, momentum, Hamiltonian operators - orbital angular

momentum commutation - commutation relation of  $L^2$  with components of angular momentum operators  $L_x$ ,  $L_y$  and  $L_z$  - Ladder operators  $L_+$  and  $L_-$ .

#### UNIT IV

20 Hrs.

##### Applications of Schrödinger's Equation and bound state problems :

Infinite square well potential - A particle inside an one dimensional box  $(0, L)$  and  $(-L, L)$  - two dimensional box  $(0, L)$  and three dimension  $(0, L)$  - concept of degeneracy; finite square well potential - potential step – rectangular potential barrier - application of barrier penetration - tunneling effect - Scanning Tunneling Microscope - theory of alpha decay in nuclear physics.

#### UNIT V

18 Hrs.

Linear harmonic oscillator in one dimension – analytical method and algebraic method - zero point energy - plotting of ground state, first excited state and second excited state wave functions using any software (C, C++, Matlab, Mathematica, etc.).

Schrodinger wave equation in spherical polar coordinates - Hydrogen atom - solution by variables separable method– azimuthal solution - spherical harmonics - radial differential equation and its solutions - energy eigen value - plot of ground state, first excited state and second excited wave function using any software (C,C++, Matlab, Mathematica, etc.).

#### Text Books

1. **Murugesan R.**, “Modern Physics”, S.Chand& Company., New Delhi, 18<sup>th</sup> Edition, 2016.
2. **Satya Prakash, Singh C K.**, “Quantum Mechanics”, Kedar Nath Ram Nath Publications , Merrut , 10<sup>th</sup> Edition, 1997.
3. **Singh S.P., Bagde M K., Kamal Singh.**, “Quantum Mechanics”, S.Chand& Company., New Delhi, 2<sup>nd</sup> Edition, 1996.
4. **Nouredine Zettili.**, “Quantum Mechanics - concepts and applications”, A John Wiley and Sons, Ltd., Publication, 2<sup>nd</sup> Edition, 2009.

#### Refernce Books

1. **Mathews P M., Venkatesan K.**, “A Text Book of Quantum Mechanics”, Tata Mc Hill New Delhi, 1997.
2. **Ghatak A K., Loganathan S.**, “Quantum Mechanics”, Tata Mc Hill New Delhi, 1977.
3. **Rajput B S.**, “Advanced Quantum Mechanics”, Pragati Prakashen Publishers, Merrut ,5th Edition, 2001.

**SEMESTER VI**  
**Elective Paper II**  
**MICROPROCESSOR**

**Instructional Hrs.: 60**

**Sub. Code: 16PHUE602**

**Max. Marks: CIA-25; ESE-75**

**Credits: 4**

**Objective:** The purpose is to understand the basics of 8085 Microprocessor and to provide an in-depth knowledge in programming.

**UNIT I**

**12 Hrs.**

**Introduction to Microprocessors and Architecture of 8085 Microprocessor:**

Evolution of Microprocessors - Microprocessor Based System (Micro computer) - 8085 Microprocessor - Pin functions of 8085 Microprocessor - Architecture of 8085 Microprocessor - ALU - Registers - Accumulator - Flag register - program counter - Stack pointer - Bus: Address Bus Data bus – Control bus.

**UNIT II**

**12 Hrs.**

**Instruction set of 8085:**

Computer languages - Machine language - Assembly language - High level language - Instruction format – Op code - Operand - Classification of instruction based on length - Classification of instruction based on function: Data transfer instructions - Arithmetic instructions - Logic instructions - Branch instructions - Machine control instructions - Stack - Subroutines - Addressing Modes.

**UNIT III**

**12 Hrs.**

**Microprocessor Timings:**

Timing and Control Unit - Instruction Cycle - Machine Cycle - T-State - Fetch operation - Execute Cycle - Instruction and Data Flow - Timings of Intel 8085 - OP Code Fetch Cycle - Memory And I/O Read Cycle - Memory And I/O - Write Cycles.

Address Space Partitioning - Memory mapped I/O scheme - I/O Mapped I/O scheme.

**UNIT IV**

**12 Hrs.**

**Assembly language programs:**

8 bit addition - 8 bit subtraction - 8 bit multiplication - 8 bit division - Square and Square root of a number - Sum of N numbers - Generating Fibonacci series - Transferring a block of data

## **UNIT V**

**12 Hrs.**

### **Assembly language programs:**

Finding greatest and smallest number in an array(Bubble sort method) - Arranging numbers in ascending and descending order - Code Conversion: BCD to Binary - Binary to BCD - A temperature monitoring system (Block Diagram) - Microcontroller 8051(Block Diagram)

### **Text Books**

1. **Ramesh Gaonkar.**, “Microprocessor, Architecture, Programming and Applications with the 8085”, PenramInternational Publishing (India)Private Limited, Mumbai, 5<sup>th</sup> Edition.
2. **Vijayendran V.**, “Fundamentals Of Microprocessor-8085”, Viswanathan Publication, Chennai, First Edition 2002.
3. **Ram B.**, “Fundamentals of Microprocessors and Microcomputers” ,Dhanpat Rai Publications (Pvt) Ltd.,New Delhi, 6<sup>th</sup> Edition, 2005.

### **Reference Books**

1. **Anokh Singh, Chhabra A.K.**, “Fundamentals of Microprocessor and its Applications” S.Chand & Company Ltd., New Delhi, First Edition, 2005.
2. **Aditya P Mathur.**, “Introduction To Microprocessors”, Tata McGraw – Hill Publishing Company Ltd., New Delhi, 3<sup>rd</sup> Edition.

**SEMESTER VI**  
**Elective Paper III**  
**COMMUNICATION ELECTRONICS**

**Instructional Hrs: 60**

**Sub. Code: 16PHUE603**

**Max. Marks: CIA-25; ESE-75**

**Credits: 4**

**Objectives:** The syllabus envisages in providing the necessary theory and analog and digital communication principles and applications. Communication techniques hold the key for development.

**UNIT I**

**12Hrs.**

**Modulation**

Modulation - Definition - Types of Modulation AM, FM, PM - Amplitude Modulated Voltage - Wave Form of Amplitude Modulated Wave - Balanced Modulator - SSB Generation - Suppression of Carrier - Frequency Modulation - Definition and Expression - Phase Modulation - Definition - Comparison of AM, FM And PM.

**UNIT II**

**10 Hrs.**

**Demodulation:**

Definition - Diode Detection of AM Signals - FM Detection - Foster Seely Discriminator - Radio Receivers: Straight Receivers - TRF Receivers - Super Heterodyne Receivers - Block Diagram- Explanation of Each Stage - FM Receivers - Block Diagram.

**UNIT III**

**14 Hrs.**

**Digital Communication:**

Introduction to Digital Communication System - Pulse Code Modulation - Amplitude Shift Keying (ASK) - Band Width and Frequency Spectrum of ASK - Binary ASK Modulator - Coherent ASK Detector- Non Coherent ASK Detector - Frequency Shift Keying (FSK)

Bandwidth of Binary FSK - Detection Of FSK Using PLL- Phase Shift Keying (PSK) - Generation of binary PSK-DPSK- Generator and Demodulator- Advantages and Disadvantages of Digital Modulation.

**UNIT IV**

**12 Hrs.**

**Broad Band Communication:**

TDM, FDM, Integrated Digital Network: ISDN - Broadband ISDN - Basic Concepts of LAN: BUS Topology - Star Topology - Ring Topology - Hybrid Topology - Private Branch Exchange (PVBX) - Modems Classification.

## UNIT V

12 Hrs.

### **Fiber Optics and Satellite Communication:**

Optical Communication - Basic Fiber Optic System; Advantages - Optical Fiber Construction Modes of propagation - Numerical Aperture - Losses in Optical Fiber - Optical Communication System. Introduction to Satellite Communication System - Basic Components - Telemetry Tracking and Command System (Block Diagram) - Satellite Links.

### **Text Books**

1. **Anokh Singh & Chabra A.K.**, “Principles Of Communication Engineering”, S.Chand & Company, New Delhi 2006.
2. **Deshponde N.D, Deshpande D.A & Rangole.**, “Communication Electronics” , TMG, New Delhi, 2002.
3. **Gupta & Kumar**, “Hand book of Electronics”, Pragati Prakhasan, Meerut (2012)
4. **Theraja B.L.**, “Basic Electronics”, S.Chand& Company, New Delhi, 5<sup>th</sup> Edition , 2009.

### **Reference Books**

1. **George Kennedy.**, “Electronic Communication System”, Tata McGraw Hill, New Delhi, 4<sup>th</sup> Edition, 2004.
2. **Kennedy and Davis** , “Electronics Communication Systems”, TMH, 6<sup>th</sup> Edition
3. **Robert M., Gagliarasi .**, “Satellite Communication”, CBS, New Delhi, 1994.



## **SEMESTER V & VI**

### **Core Practical III**

**Instructional Hrs . : 90**

**Sub. Code: 15PHUCP03**

**Max. Marks: CIA - 40; ESE – 60**

**Credits: 3**

**Any SIXTEEN of the following**

1. Hartmann's Interpolation Formula – Spectrometer.
2. Solar Spectrum – Wavelength Determination – Spectrometer.
3. Velocity and Compressibility of the given Liquids – Ultrasonic Interferometer.
4. Determination of Thermo EMF – Potentiometer.
5. High Resistance by Leakage – BG.
6. High Resistance by Charging – BG.
7. Characteristics of LED & Photodiode.
8. Characteristics of FET.
9. Characteristics of UJT.
10. UJT Relaxation Oscillator.
11. Regulated Low Range Power Supply.
12. Voltage Doubler.
13. RC Coupled Amplifier- Single Stage.
14. FET Amplifier.
15. Emitter Follower.
16. Hartley Oscillator.
17. Colpit's Oscillator.
18. AstableMultivibrator.
19. Monostable Multivibrator.

20. Bistable Multivibrator.

**B.Sc., Physics – 2015-2016 onwards**

**SEMESTER V & VI**

**Core Practical IV**

**Instructional Hrs. : 60**

**Sub. Code: 15PHUCPO4**

**Max. Marks: CIA-40; ESE-60**

**Credits: 3**

**Any Twelve of the Following:**

1. Integrator and Differentiator- Discrete Components.
2. Adder and Subtractor – Operational Amplifier.
3. Integrator and Differentiator – Operational Amplifier.
4. 4 bit Binary Adder
5. Amplitude Modulation and Demodulation.
6. Study of Logic Gates (AND, OR, NOT) Discrete Components.
7. Study of Logic Gates (NAND, NOR) – Discrete Components.
8. De-Morgan's Theorem – Verifications – Solving Problems Using Boolean Algebra.
9. Half and Full Adder – Verification of Truth Table.
10. Half and Full Subtractor – Verification of Truth Table.
11. NAND and NOR Gate as Universal Building Blocks.
12. S-R Flip Flop.
13. BCD to Seven Segment Display.
14. 8085 ALP for 8 Bit Addition, Subtraction.
15. 8085 ALP for one's Complement Masking off Most Significant 4 Bits and Setting Bits
16. 8085 ALP for Two's Complement Addition, Subtraction.
17. 8085 ALP for 8 Bit Multiplication and Division.
18. 8085 ALP for Multiplication, Addition and Sum of N Elements.

**B.Sc., Physics – 2015-2016 onwards**

**SEMESTER V& VI**

**Elective Practical**

**Instructional Hrs. : 60**

**Max. Marks: CIA-40; ESE-60**

**Sub. Code: 15PHUEPO1**

**Credits: 3**

**Any Twelve of the Following:**

**C Programming**

1. Write a Program that Inputs three Integers from the Keyboard and Prints the sum, average, product, smallest, and largest of Three Numbers.
2. Roots of a Quadratic Equation.
3. Matrix Addition.
4. Matrix Multiplication.
5. Arranging a Set of Numbers in Ascending Order.
6. Converting Integer in the Range 1 to 100 into Words.
7. Program to Check a Palindrome.
8. Comparison of Two Strings. The Program Should State Whether the First String is Lesser Than, Equal or Greater than the Second String.

**C++ Programming**

9. An Electricity Board Charges the Following Rates to Domestic Users.  
For the First 100 Units : 40 Paise per Unit  
For Next 200 Units : 50 Paise per Unit  
Beyond 300 Units : 60 Paise Per Unit  
All Users are charged a Minimum of Rs.100. If the Total Cost is more Than Rs. 250.00 then an Additional Surcharge of 15% is added. Write a Program to Read the Names of User and Number of Units Consumed and Display the Charge with Names.
10. Define a Class String. Using Overloaded == Operator to Compare two Strings.
11. Define a Class Complex to Represent a Complex Number. Use Overloaded + And – Operators to add and Subtract Tow Complex Objects, two Matrices.
12. Calculate the volume of cube, cylinder and Rectangle using Function overloading concept
13. Operations using operator overloading concept
14. Smallest and Biggest of two numbers using Friend Function
15. Multiply two numbers using inheritance concept

**B.Sc., Physics – 2015-2016 onwards**

## **Computational Programming – Sci Lab**

16. Arithmetic Operations
17. Logical Operations
18. Draw lines joining the following Points in 2D plot
19. Logarithmic Plot
20. Capacitor Charging and Discharging Curve

## SEMESTER III

### Part IV: SKILL BASED SUBJECT I – (Offered Under Cafeteria System)

#### ENERGY MANAGEMENT

**Instructional Hrs. : 45**

**Sub. Code: 15PHUS301**

**Max. Marks: CIA – 25; ESE – 75**

**Credits: 3**

**Objective:** The main goal is to achieve and maintain optimum energy procurement and utilisation for managing the energy consumption of household appliances. Also to create awareness to minimise energy costs without affecting production and quality.

**Unit I: 9 Hrs.**

#### **Conventional Energy Sources:**

Introduction – An initial idea of energy in science – *Types of conventional energy* – thermal energy – hydro thermal energy - Nuclear energy (Qualitative Analysis only).

**Unit II: 9 Hrs.**

#### **Need for Non-Conventional Energy Sources:**

Constraints in the conventional energy sources - Global energy trends – Global warming and the green house effect – Non-Conventional energy Sources – *Energy consumption as a measure of prosperity* – World energy futures.

**Unit III: 9 Hrs.**

#### **General introduction to Non-Conventional Sources:**

Introduction – Solar Energy – Wind Energy – Energy from Biomass and Bio Gas – Ocean thermal energy conversion – Tidal energy – *Geothermal energy*.

**Unit IV: 9 Hrs.**

#### **Solar energy applications:**

Solar Cooker – Solar water heater – *Solar distillation* – Solar space heater – Solar cell

**Unit V: 9 Hrs.**

#### **Energy Audit and Energy Security:**

Energy Conservation - Energy audit: Definition, Objectives – Calculation of energy audit

Energy Security: Meaning – Definition – Importance – Energy security threats – *short term security* – long term security.

*Italics indicates Self Study Topics*

**TEXT BOOKS:**

1. **John Andrews & Nick Jelley.**, “ *Energy Science Principles, Technologies and Impacts*”

Oxford University press ,Newyork 2010.

2. **G.D.Rai.**, “*Non – Conventional Energy Sources*” Khanna Publishers, Delhi, 1996.

3. **Satyesh C.Chakraborty.**, “ *Energy opportunities & social responsibility*” Jaico publishing

House, Mumbai, First Edition 2009.

4. **Unit V** – Study Material: Provided by the Department of Physics.

**REFERENCE BOOK:**

1. **Janet Ramage.**, “ *Energy, A Guide book*” Oxford University Press, Newyork, 1983

**SEMESTER – IV**  
**Skill Based Subject II**  
**MULTISKILL DEVELOPMENT PAPER**

**Instructional Hrs: 45**

**Sub Code: 13PHUS402**

**Max.Marks :100 (ESE – 60 CIA – 40)**

**Credits: 3**

**Aim:** To equip the students with knowledge on all topics as desirable from the point of view of brilliant success in the competitive examinations.

**Objective:** To familiarize the students with various types of tests that are employed by the diverse examining bodies.

**UNIT I**

**9 Hrs.**

**Communication:** Question tag – Gerund and Infinitives – Spotting the errors – Vocabulary – Synonyms – Antonyms - Prepositions – Articles – One word substitution – Sentence completion.

**UNIT II**

**9 Hrs.**

**Numerical Aptitude :**Problems on numbers - Problems on Ages – Percentage - Profit and loss - Ratio & Proportion - Time & Work - Time & Distance - *Simple Interest* - Compound Interest.

**UNIT III**

**9 Hrs.**

**Critical Reasoning :**Logical Inference Questions and Syllogism.

**Analytical Reasoning :**Arrangement problems – Family / Blood Relation Qualms – Sense of Directions – Age Doubts.

**Verbal Reasoning :**Verbal Analogy (Letter series and number series only) – Coding and Decoding.

**UNIT IV**

**9 Hrs.**

**Self Introduction**

- **Presentation Skills** - Presentation through PowerPoint in Physics.

**Soft Skills** - Interpersonal Skills – Employability Skills – Soft Skills Training – *Resume Preparation* – Interview Tips and Questions.

## UNIT V

9 Hrs.

**Group Discussion** – Importance – Types of GD – GD Skills – GD Etiquette(do's and don'ts) – Essential Elements of a GD – *Movements and Gestures to be avoided in a GD* -

**Online Services** –Reservation –Banking –Purchases –Passport application.

### REFERENCE BOOKS:

1. **Hari Mohan Prasad & Uma Rani Sinha. 2011.** Objective English for Competitive Examinations. New Delhi: Tata McGraw Hill Education Private Ltd. (Unit – I)
2. **R.S. Aggarwal, *Quantitative Aptitude*, S.Chand 2010.** (Unit - II)
3. **Edgar Thorpe, *Test of Reasoning for Competitive Examinations –4<sup>th</sup> edition*, Tata McGraw-Hill Publishing Company Limited, New Delhi.** (Unit – III)
4. **R.S. Agarwal, A Modern Approach to Verbal Reasoning(Fully Solved) –Revised Edition, S.Chand Company Limited, New Delhi, 2012.** (Unit – III)
5. **M. S. Rao, *Soft Skills Enhancing Employability-Connecting Campus with Corporate*, IK International Publishing House, NewDelhi, 2010.** (Unit – IV)
6. **Alex.K, *Soft Skills-Know Yourself and Know the World*, S.Chand Company Ltd., 2011.**(Unit V)
7. ***Group Discussions- Pass with Flying Colours*, G. K. Publications, NOIDA, 2012.**
8. **Jain T.S.Upkar's *SBI Clerical Cadre Recruitment Examination*. Agar Upkar Prakashan**



## SEMESTER V

### Part IV: SKILL BASED SUBJECT III

#### MATLAB

**Instructional Hrs: 45**

**Max. Marks: CIA – 25; ESE – 75**

**Sub.Code: 11PHUS503**

**Credits: 3**

**Objective:** To provide fundamental ideas of MATLAB which is one of the programming languages and is a simple and powerful tool used for scientific computing, interactive calculations, graphics and animation.

#### UNIT I

**9 Hrs.**

**Introduction to MATLAB:** What is MATLAB?. - Basics of Matlab- Matlab windows- Matrices and vectors – Matrix Manipulation - Creating and using In-line functions – Using built in functions and *on-line help- Saving and loading data.*

#### UNIT II

**9 Hrs.**

**Programming on MATLAB:** Script files – function files – language specific features- Advanced data objects – *Examples.*

#### UNIT III

**9 Hrs.**

**Applications:** Linear algebra- Curve fitting – Interpolation-Data Analysis and Statistics – *Mat lab and the Internet*

#### UNIT IV

**9 Hrs.**

**Graphics:** Basic 2-D plots – Style options – Labels, Titles, Legends – Axis Control – *Zoom in and Zoom out*

#### UNIT V

**9 Hrs.**

**Simple Programmes:** Projectile motion – *Series and Parallel Resonance Circuits* – Amplitude Modulation – Basic Ideas of Image Processing.

**Note:** *Italics denotes self study topics.*

#### TEXT BOOK:

**1.Rudra Pratap.,** “*Getting started with Mat lab*” – version-7, Oxford University Press, First Edition, NewDelhi, 2007.

#### REFERENCE BOOK:

**1.Brian R.Hunt, Ronald Lipmann, Jonnathan Rosenberg.,** “*A Guide to MATLAB for Beginners and Experienced users*”, Cambridge University Press, UK, First Edition.2006.

## SEMESTER VI

### Part IV: SKILL BASED SUBJECT IV MOBILE COMMUNICATION

**Instructional Hrs: 45**

**Sub. Code : 11PHUS604**

**Max. Marks : CIA – 25; ESE – 75**

**Credits: 3**

**Objective:** To introduce the basic and emerging concepts in Mobile Communication.

#### UNIT I

**9 Hrs.**

**Wireless Communication Fundamentals:** Introduction - History of Cellular Mobile Communication - Important Terminologies- Mobile Computing Environment – Architectonics of Mobile Computing – Functions of Mobile Computing – Mobile and Wireless Devices

**Multiplexing:** Space Division Multiplexing – Frequency Division Multiplexing- Time Division Multiplexing - Code Division Multiplexing.

**Medium Access Control:** SDMA –FDMA –TDMA –CDMA – Features- Comparison.

#### UNIT II

**9 Hrs.**

**Telecommunication Systems:** GSM - Mobile Services- System Architecture- GPRS- Architecture- DECT-TETRA-UMTS & IMT.

#### UNIT III

**9 Hrs.**

**Cellular Wireless Network:** Overview of Mobile Telephone Service (MTS) - Operation of Cellular system- Adjacent channel Interference (ACI) – Methods of reducing ACI- Basic idea of Spectrum Allocation – Frequency reuse – Improving coverage- working of a cell phone. 3G block schematic diagram and functions.

#### UNIT IV

**9 Hrs.**

**Wireless LAN:** Wireless Local Area Network in (WLAN) Wireless Network: Definition- Advantages and Disadvantages of LAN – Applications of WLAN- Basics ideas of HYPERLAN and Blue tooth.

#### UNIT V

**9 Hrs.**

**Mobile Network Layer:** Mobile IP, Dynamic Host Configuration Protocol, Ad hoc Networks.

**Wireless Application Protocol:** Introduction – Main Objectives- WAP Components and Interface Architecture- Advantages of WAP.

### **TEXT BOOKS**

1. **Naseer Hussain.**, Shresht Series “*Mobile Computing*”, Rajalaxmi Publication, Hyderabad, 2003.
2. **Thiyagarajan,V.**, “*Telecommunications systems*” A.R.Publication, Chennai, 2006.

### **REFERNCE BOOKS**

1. **Jochen, M.Schiller.,**” *Mobile Communication*”, Pearson Education, India 2000.
2. **WCY Lee.**, “*Mobile Cellular Telecommunication*”, New Delhi, McGraw Hill, Edition 2006.

## SEMESTER III

### Part IV Non Major Elective – I Offered Under Cafeteria System

#### PHYSICS IN EVERYDAY LIFE

**Instructional Hrs. : 30**

**Sub. Code: 15PHUN301**

**Max. Marks: ESE- 100**

**Credits : 2**

**Objective:** To create interest in Science and provide explanation for the phenomena that we witness in day today life. To facilitate the spread of scientific spirit. To develop an insatiable curiosity in Science.

#### **Topics:**

Physics

#### **TEXT BOOKS**

1. “*The Hindu Speaks on Scientific Facts*” Volume I, Kasturi & Sons Ltd, Chennai, 6<sup>th</sup> Print 2004.
2. “*The Hindu Speaks on Scientific Facts*” Volume II, Kasturi & Sons Ltd, Chennai, 6<sup>th</sup> Print 2008

**B.Sc., Physics – 2015-2016 onwards**

Department of Physics

Non Major Elective I

Subject Code : 15PHUN301

Physics in Everyday Life

UNIT I

1. Why does a refrigerator produce sounds periodically?
2. Automatic wrist watches stop functioning if not worn even for a day. How does wearing them on our hand make them function?
3. How do microwave ovens cook food?
4. How does a pressure cooker work?
5. Why does milk boil and expand so rapidly at a low temperature though some quantity of water is present in it?
6. Why do electrical appliances draw more current during low voltage?
7. Why is the earthling pin in 3 pin electrical plugs bigger than the other two pins?
8. Why do high tension wires produce a humming sound?
9. How does an electric line tester glow?
10. Why does a bird not get electrocuted on sitting on a live wire?

UNIT – II

11. Why do we have sodium vapor lamp in the streets and not mercury vapor lamp?
12. What is the role on chokes and starters in tube lights? Why do they make noise?
13. Why do street lights and head lights of vehicles look like stars when viewed through glass?
14. Why is the shadow bigger than the object?
15. How do hearing aids work?
16. Is there any significance in using gravel on railway tracks?
17. How does audible sound pass through hard material such as a wall and be audible on other side?
18. Why do we not hear sound while sleeping or meditating?
19. Why does not sound travel in vacuum but light does?
20. Why does the flow of ink increase when pens are about to run out of ink?

### **UNIT – III**

21. Why do metals shine?
22. Why do metallic vessels lose their initial shine after use?
23. Why does boiling milk overflow but boiling water does not?
24. Why does a steel ball pitch higher than a rubber ball?
25. How is information stored in audio and video tapes?
26. Is it true that television, fridge and other electrical and electronic gadgets should not be switched on immediately after switching off?
27. Can we use TV monitor for a computer monitor and the vice versa?
28. How does remote control of TV Work?
29. How does lighting affect TVs?
30. How does electric current cause death?

### **UNIT – IV**

31. Can a fridge left open in a closed room be used to cool the room?
32. Why does it seem difficult to cycle up to steep hill than to push the bike up at the same speed?
33. Why does not the cycle travel backwards when we pedal in the reverse direction?
34. Why are fan wings slightly curved?
35. When viewed under the tube light why does a table fan appear to rotate backwards and forwards?
36. Can we reduce power consumption by running fans at slow speeds?
37. Will the life of florescent lamps decrease with frequent switching on and switching off?
38. Why does the boiling point of a liquid increase with pressure? Also why does the heat required for vaporization decrease and increase in the former and latter case respectively?
39. Why is it difficult to balance a stationary two wheeler?
40. How does the speed (of vehicles) measuring device used by the traffic police work?

### **UNIT – V**

41. How does a photocopier work?
42. Why is it difficult to photograph a TV picture?
43. Why is it possible to hear noises from far away clearly on cool damp evenings? Is it because

sound travels better in cool damp air than in the air?

44. How does a thermostat work?
45. While light from a candle illuminates a room, the gas(LPG) flames do not at the same time the gas stoves help cook faster. Can anyone explain?
46. How does an electric train work?
47. How does a dish antenna receive signals?
48. How is electricity produced from nuclear materials?
49. Why is it easier to pull than to push a lawn roller?
50. How does a sim card function in a cell phone?

### **Instruction to the question paper settings**

- Three different questions from the same unit may comprise in one main question
- Two questions have to be taken from Unit I, Unit II & Unit III
- One question each from Unit IV & Unit V

## SEMESTER IV

### Part IV Non Major Elective – II Offered Under Cafeteria System

#### ENVIRONMENTAL POLLUTION: PHYSICAL ASPECTS

**Instructional Hrs. : 30**

**Sub.Code: 15PHUN402**

**Max.Marks : 100**

**Credits : 2**

**Objective :** To create awareness about the hazards of pollution and hence to learn the ways to prevent and control it to live in harmony with nature.

**UNIT – I** **6 Hrs**

Introduction : Pollution – Effects of pollution – Different types of pollution – Prevention.

**UNIT – II** **6 Hrs**

Air pollution – Thermal pollution

**UNIT – III** **6 Hrs**

Water pollution – Ocean pollution

**UNIT – IV** **6 Hrs**

Soil and land pollution – Radioactive pollution

**UNIT – V** **6 Hrs**

Noise pollution – Light pollution – Other pollution

#### **Study Material:**

Prepared by the Department of Physics.



## **SEMESTER I**

### **Part IV: Foundation Course**

#### **ENVIRONMENTAL STUDIES**

**Instructional Hrs. : 30**

**Sub. Code: 09FOCU1ES**

**Max. Marks: 100**

**Credits: 2**

#### **UNIT I**

The Multidisciplinary Nature Of Environmental Studies – Definition, Scope And Importance, Need For Public Awareness, Nature Resources And Associated Problems- Forest Resources, Water Resources, Mineral Resources, Food Resources, Energy Resources, Land Resources, Role Of And Individual In Conservation Of Nature Resources, Equitable Use Of Resources For Sustainable Life Style.

#### **UNIT II**

Concept Of An Ecosystem, Structure And Function Of An Ecosystem – Producers, Consumers And Decomposers, Energy Flow In The Ecosystem- Food Chain , Food Webs And Ecological Pyramids, Ecological Succession.

#### **UNIT III**

Biodiversity And Its Conservation – Introduction- Definition Genetic, Species And Ecosystem Diversity, Conservation Of Biodiversity – In- Situ And Ex-Situ Conservation Of Biodiversity.

#### **UNIT IV**

Definition, Causes, Effects And Control Measures Of Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, And Thermal Pollution. Disaster Management- Floods, Earthquake, Cyclone And Landslides.

#### **UNIT V**

Global Warming, Ozone Layer Depletion, Acid Rain, Nuclear Accidents And Holocaust (Case Studies) Consumerism And Waste Products, Environmental Protection Act-Air, Water, Wildlife, Forest, Issues Involved In Enforcement Of Environmental Legislations Public Awareness.

**FIELD WORK:**

Visit To A Local Area To Document Environmental Assets – River/Forest/Grass Land/ Hill/ Mountain

Visit To A Local Polluted Site- Urban/Rural/Industrial/Agricultural.

Study Of Common Plants, Insects, Birds

Study Of Simple Ecosystems- Pond, River, Hill Slope, Etc.

**TEXT BOOK:**

1. “*Environmental studies*”. Published By Bharathiar University, Coimbatore.

**REFERENCE BOOKS:**

1. **Arumugam N., Kumarasen V.**, “*Environmental Studies*” Saras Publications, Nagercoil, First Edition Rep., 2008.
2. **Mukherjee S., Ghosh A.**, “*Environmental Studies*” , Books And Allied (P) Ltd., Kolkata. 3<sup>rd</sup> Edition, 2002.

## SEMESTER II

### Part-IV: Value Education

#### HUMAN RIGHTS

Instructional Hrs. : 30

Sub. Code: 09VEDU2HR

Max. Marks: 100

Credits: 2

#### UNIT I

Concepts And Theories Of Human Rights - Legal And Constitutional Rights - *UDHR* (Universal Declaration Of Human Rights UN Conventions).

#### UNIT II

Indian Constitution And Human Rights - Fundamental Rights And Duties - Protection Of Human Rights Act 1993- National HR Commissions – *State HR Commission*.

#### UNIT III

Right To Information - Freedom Of Press – Hindu Marriage Act- *Right To Inheritance*.

#### UNIT IV

Contemporary Issues: Child Labour - *Bonded Labour* – Female Infanticide.

#### UNIT V

Amnesty International – PUCL (People Union For Civil Liberties) - *PUDR (Peoples Union For Democratic Rights)*.

**Note:***Italics*denotesSelf study Topics

#### TEXT BOOKS:

1. **Jayabalan N.**, “*Studies In Human Rights*”, Mohan Pathippagam, Chennai, First Edition, 2000.

#### REFERENCE BOOKS:

1. **Mishra R.**, “*Human Rights*”, Sumit Enterprises, New Delhi, First Edition, 2005.
2. **NaoremSanajaoba**, “*Human Rights- Principles, Practices, And Abuses*”, Omsons Publications, New Delhi, First Edition, 1994.
3. **SivagamiParamasivam**, “*Human Rights – A Study*”, Sriram Computer Prints & Offset, Salem, First Edition, 1998.

CODE	COURSE TITLE
18PHUA101	ALLIED PHYSICS PAPER I - MECHANICS, HEAT, SOUND, SOLAR PHYSICS, ELECTRICITY AND MAGNETISM

Category	CIA	ESE	L	T	P	Credit
Allied	20	55	56	4	-	4

### Preamble

To procure the basic knowledge of physical laws and principles to the students of other branches of science.

### Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts in mechanics, Solar energy, electricity and magnetism.	K1
CO2	Investigate the effects of gravity and elasticity	K2
CO3	Explore the concepts of heat and thermodynamics	K2
CO4	Provide the opportunity to integrate theory and the application of it in everyday experience	K3
CO5	Understand the Fundamental properties of electricity and magnetism	K3

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	M	M	S
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	S	S	M	M	S

S- Strong; M-Medium; L-Low

## Syllabus

### UNIT I

(9 hrs.)

#### **Gravitation:**

Newton's law of Gravitation - Definition of G - 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 of Cantilever - Determination of Y by Uniform and Non Uniform Bending Method - Torsion in a wire - Determination of Rigidity Modulus by Torsional Pendulum - I section of Girders

### UNIT II

(9 hrs.)

#### **Heat and Thermodynamics:**

Vander Waal's Equation of State - Critical Constants of a Gas - Derivation of Critical Constants in terms of Van der Waals Constant - Joule - Thomson Effect - Theory of J-K Effect - Liquefaction of Hydrogen and Helium - Properties of Liquid - He I and II

#### **Sound:**

Doppler Effect - Derivation and Applications - Frequency of A.C by Sonometer - Ultrasonics – Production, Properties and Applications

### UNIT III

(9 hrs.)

#### **Solar Physics:**

Measurement of Solar Radiations by Pyroheliometer and Pyrometer - Solar Constants - General Applications of Solar Energy - Flat Plate Collector - Box Type Cooker - Solar Water Heater - Solar Photovoltaic Cells- Applications of Solar Cells

### UNIT IV

(9 hrs.)

#### **Electricity:**

Conversion of Galvanometer into Ammeter and Voltmeter - Ballistic Galvanometer: Theory - Charge Sensitiveness - Measurement of Capacitance - Potentiometer - Theory - Measurement of Current, Voltage and Resistance - Electromagnetic Induction: Transformer and its Applications.

### UNIT V

(9 hrs.)

#### **Magnetism:**

Basic Concepts of Magnetic Materials - Magnetic Properties of Dia, Para and Ferro Magnetic Materials - Area of (B-H) Loop - Curie Temperature - Applications of Ferities in Computer Memory

## Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Murugesan R	Properties of Matter	S.Chand& Company	2017, 5 <sup>th</sup> Edition
2	Brij Lal &Subrahmanyam.N	Heat and Thermodynamics	S.Chand& Company	2016, 1 <sup>st</sup> Edition
3	Subrahmanyam.N& Brij Lal	Sound	Vikas Publising House	2015, 2 <sup>nd</sup> Edition
4	Sukhatme S P	Solar Energy Utilization	Tata Mc Graw Hill	1987, 2 <sup>nd</sup> Edition
5	Murugesan R	Electricity and Magnetism	S.Chand& Com	2016, 9 <sup>th</sup> Edition

## Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Brij Lal &Subrahmanyam.N	Properties of Matter	Eurasia Publication House	1989, 5 <sup>th</sup> Edition
2	JayaPrakash N	Allied Physics I	JP Publications	1993

## Web Resources

1. <https://www.khanacademy.org/science/physics/centripetal-force-and-gravitation/gravity-newtonian/v/introduction-to-gravity>
2. <https://www.khanacademy.org/science/physics/mechanical-waves-and-sound/doppler-effect/v/introduction-to-the-doppler-effect>

## Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18PHUA202	ALLIED PHYSICS PAPER II –MODERN PHYSICS, ELECTRONICS AND DIGITAL ELECTRONICS

Category	CIA	ESE	L	T	P	Credit
Allied	20	55	56	4	-	4

### Preamble

To perceive ideas about various fields in Physics and their applications in day to day life.

### Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand new types of Lasers for commercial applications	K2
CO2	Understand the concepts in nuclear and particle Physics	K2
CO3	Procure knowledge in electronic devices and systems	K2
CO4	Understand the principles of modern communication systems	K2
CO5	Analyze and construct various digital circuits.	K3

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	M
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

## Syllabus

### UNIT I (9 hrs.)

#### **Structure of the Atom:**

The Vector Atom Model - Pauli Exclusion Principle - Coupling Schemes.

#### **Laser:**

Induced Absorption, Spontaneous and Stimulated Emission - Principle of Laser - Population Inversion - Ruby Laser - Helium and Neon Laser - Semiconductor Laser - Properties and Applications.

### UNIT II (9 hrs.)

#### **Nuclear Physics:**

Characteristics of Nuclear forces - Model of Nuclear Structure - Liquid Drop Model - Shell Model - Synchrocyclotron - Betatron - Discovery of Artificial Transmutation - Transmutations by Alpha Particles - Transmutation by Protons - Elementary Particles - Leptons - Mesons - Baryons.

### UNIT III (9 hrs.)

#### **Electronics:**

Construction and Characteristics of Zener Diode, Photo Diode, Light Emitting Diode (LED)- Transistor Characteristics (CE) - Qualitative Analysis of a Common Emitter Amplifier - Phase Reversal of the output Voltage - Advantages of Common Emitter Amplification Circuit.

### UNIT IV (9 hrs.)

#### **Operational Amplifier:**

Circuit Symbol, Polarity Conventions and Virtual Ground or Summing Point of an Operational Amplifier- Characteristics of an Ideal Operational Amplifier- Amplifier as an Adder - Subtractor - Differentiator and Integrator

#### **Communication Electronics:**

Definition of Frequency Modulation - Modulation Index - Block Diagram of a Superheterodyne Receiver - Principle of Picture Transmission and Reception - Block Diagram of a Monochrome TV Receiver - Basic Principle and Applications of Radar.

### UNIT V (9 hrs.)

#### **Digital Electronics:**

Digital Computers - Organization of Digital Computers - Number System - Binary Octal - Hexadecimal - ASCII and EBCDIC - Basic Logic Design using Digital Integrated Circuits, Truth Tables, Boolean Algebra - Simple Arithmetic Circuits - Half Adder - Full Adder- Half Subtractor - Full Subtractor. NAND and NOR as a Universal Building Block - De Morgan's Theorems and Proof- Basic Ideas of Memory Elements.



## Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Murugaeshan R	Modern Physics	S.Chand& Co	2016, 18 <sup>th</sup> edition
2	Thereja B.L	Basic Electronics- Solid State	S.Chand& Co	2015, 1 <sup>st</sup> Edition
3	Mehta V.K	Principles of Electronics	S.Chand& Co	2008, 11 <sup>th</sup> Edition
4	Albert P.Malvino& Ronald P. Leach	Digital Principles and Applications	Tata McGraw Hills	2006, 6 <sup>th</sup> Edition

## Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Jayaprakash N	Allied Physics- II	J.P.Publications	1993
2	William H.Gothmann	Digital Electronics	Prentice- Hall of India	2006, 2 <sup>nd</sup> Edition

## Web Resources

1. <https://www.khanacademy.org/science/physics/circuits-topic/circuits-resistance/v/circuits-part-1>
2. <https://www.khanacademy.org/science/electrical-engineering/ee-amplifiers/ee-opamp/v/ee-opamp-intro>

## Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18PHUAP01	ALLIED PHYSICS PRACTICALS

Category	CIA	ESE	L	T	P	Credit
Allied	20	30	-	-	90	2

### Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Determine the various properties of materials	K4
CO2	Apply the knowledge of Physics fundamentals	K3
CO3	Find the errors and adjust it to get the nearer ideal readings using specific measurement techniques	K3
CO4	Quantify the measurement of the reflection or transmission properties of a materials	K4
CO5	Determine the characteristics of the electronic devices	K5

### Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	M	S
CO3	S	S	S	S	S
CO4	S	M	S	S	S
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

### Syllabus

Any SIXTEEN of the Following:

1. Young's Modulus - Non Uniform Bending - Pin and Microscope.
2. Young's Modulus - Uniform Bending - Optic Lever.
3. Rigidity Modulus - Static Torsion.
4. Acceleration Due to Gravity - Compound Pendulum
5. Moment of Inertia - Torsional Pendulum
6. Surface Tension by Capillary Rise Method
7. A.C Frequency - Sonometer

8. Refractive Index of a Liquid - Hollow Prism - Spectrometer.
9. Refractive Index of a Solid Prism - Spectrometer.
10. Refractive Index of the Material of a Solid Prism -  $i$ - $d$  Curve - Spectrometer.
11. Wavelength of Spectral Lines - Grating - Minimum Deviation - Spectrometer.
12. Radius of the Curvature - Newton's Experiment
13. Calibration of Voltmeter - Low Range - Potentiometer.
14. Calibration of Ammeter - Low Range - Potentiometer.
15. Specific Resistance - Potentiometer.
16. Moment of a Magnet - Tan C position.
17. Characteristics of Junction Diode.
18. Characteristics of Zener Diode.
19. Verification of Truth Tables of the gates OR, AND, NOT, NOR, NAND and EX- OR
20. Verification of De Morgan's Theorems