

**P.K.R. ARTS COLLEGE FOR WOMEN
(AUTONOMOUS)**
(Re-Accredited with 'A' grade by NAAC - Affiliated to Bharathiar University,
Coimbatore)
GOBICHETTIPALAYAM – 638 476



SYLLABUS

**SCHOLASTIC COURSES
AND
CO-SCHOLASTIC COURSES**
*For the candidates admitted from the Academic Year
2026-2027 and onwards
Under CBCS PATTERN*

Prepared By

1. Curriculum Development Cell
2. OBE Monitoring Council

Approved By

1. Boards of Studies
2. Standing Committee on Academic Affairs
3. Academic Council



P.K.R ARTS COLLEGE FOR WOMEN
(Autonomous Institution, Re-Accredited by NAAC with 'A' Grade)
Gobichettipalayam-638476

BACHELOR OF SCIENCE IN PHYSICS
PROGRAMME STRUCTURE

Scholastic Courses:

CBCS Pattern: 2026-2027

Category	Component	No. of Courses	Credit(s) / Course	Total Credits	Proposed Semester
Part – I	Tamil / Hindi / French / Kannada / Malayalam / Sanskrit	4	3	12	I – IV
Part – II	English	4	3	12	I – IV
Part - III	Core Courses (Theory / Practical / Allied / Elective / Open Elective)	23	1 / 2 / 3 / 4 / 5	94	I-VI / I-II / I-IV / V-VI / V
	Institutional Training / Industrial Training / Mini Project	1	1	1	To be done in Summer Vacation of Semester IV, ESE in Semester V
Part –IV	Foundation Courses: i. Environmental Studies and Disaster management	1	2	4	I
	ii. Health and Wellness	1	2		II
	Ability Enhancement Courses: i. Information Security	1	2	4	III
	ii. Consumer Rights	1	2		IV
	Skill Enhancement Courses: i. C Programming	3	2	6	IV
	ii. Home Electrical Installation iii. Digital Photography				V VI
	Non-Major Elective: i. Indian Women and Society /Advanced Tamil	1	2	2	III

Part –V	Proficiency Enhancement	1	2		V
	i. Lasers (Self Study)				
	Competency Enhancement:	1	1		Sem I to VI
	i. NSS / YRC / RRC / CCC / PHY.EDU / OTHERS	1	1	5	Sem I to VI
	ii. Professional Grooming (Life Skills)				
	iii. Students Social Activity	1	1		Sem I to VI

Total: 3700 Marks & 140 credits



P.K.R ARTS COLLEGE FOR WOMEN (Autonomous)
Gobichettipalayam – 638476
BACHELOR OF SCIENCE IN PHYSICS
Programme Scheme and Scheme of Examinations
(For students admitted from 2026-2027 & onwards)

(For branches offering Part-I and Part-II for four semesters)

Scholastic Courses:

Category	Component	Course Code	Course Title	Hrs/ week	Exam Duration hrs	Max. Marks			Credits
						CIA	ESE	Total marks	
SEMESTER - I									
Part I	Language : I	26LTU01 / 26LHU01 / 26LFU01 / 26LKU01 / 26LMU01 / 26LSU01	Tamil – I / Hindi – I / French – I / Kannada – I / Malayalam – I / Sanskrit-I	6	3	25	75	100	3
Part II	English: I	26LEU01	English - I	6	3	25	75	100	3
Part III	Core : I	26PHU01	Mechanics	4	3	25	75	100	4
Part III	Core : II	26PHU02	Properties of Matter & Sound	4	3	25	75	100	4
Part III	Core : III Allied : I	26PHU03	Mathematics – I	5	3	25	75	100	5
Part III	****	****	Physics – Practical I	3	-	-	-	-	-
Part IV	Foundation : I	26FCU01	Environmental studies and Disaster management	2	3	50	--	50	2
			TOTAL	30				550	21
SEMESTER - II									
Part I	Language : II	26LTU02 / 26LHU02 / 26LFU02 / 26LKU02 / 26LMU02 / 26LSU02	Tamil- II / Hindi-II / French II / Kannada-II / Malayalam-II / Sanskrit-II	6	3	25	75	100	3
Part II	English : II	26LEU02	English: II	6	3	25	75	100	3
Part III	Core : IV	26PHU04	Heat and Thermodynamics	4	3	25	75	100	4
Part III	Core : V	26PHU05	Electricity and Magnetism	4	3	25	75	100	4
Part III	Core : VI Allied : II	26PHU06	Mathematics – II	5	3	25	75	100	5
Part III	Core :VII	26PHU07	Physics – Practical I	3	3	40	60	100	4

	Practical: I								
Part IV	Foundation : II	26FCU02	Health and Wellness	2	3	50	--	50	2
			TOTAL	30				650	25
SEMESTER - III									
Part I	Language : III	26LTU03 / 26LHU03 / 26LFU03 / 26LKU03 / 26LMU03 / 26LSU03	Tamil- III / Hindi-III / French-III / Kannada-III / Malayalam-III / Sanskrit-III	6	3	25	75	100	3
Part II	English : III	26LEU03	English: III	6	3	25	75	100	3
Part III	Core : VIII	****	Optics	4	3	25	75	100	4
Part III	Core : IX	****	Chemistry - I	4	3	25	75	100	4
Part III	Core : Allied :	****	Physics - Practical II	3	-	-	-	-	-
Part III	****	****	Allied Chemistry - Practical	3	-	-	-	-	-
Part IV	Ability Enhanceme nt : I	26AEU01	Information Security	2	3	50	-	50	2
Part IV	Non- Major Elective	26NMU01A / 26NMU01B	Indian Women and Society / Advanced Tamil	2	3	50	-	50	2
			TOTAL	30				500	18
SEMESTER - IV									
Part I	Language : IV	26LTU04 / 26HU04 / 26LFU04 / 26LKU04 / 26LMU04 / 26LSU04	Tamil- IV / Hindi-IV / French-IV / Kannada-IV / Malayalam-IV / Sanskrit-IV	6	3	25	75	100	3
Part II	English : IV	26LEU04	English: IV	6	3	25	75	100	3
Part III	Core : X	26PHU10	Mathematical Physics	4	3	25	75	100	4
Part III	Core : XI Allied : IV	26PHU11	Chemistry - II	4	3	40	60	100	4
Part III	Core : XII Practical : II	26PHU12	Physics - Practical II	3	3	40	60	100	4
	Core : XIII Allied : V	26PHU13	Allied Chemistry - Practical	2	3	40	60	100	2

Part IV	Skill Enhancement : I	26SEPHU01	C Programming	3	3	50	-	50	2
Part IV	Ability Enhancement : II	26AEU02	Consumer Rights	2	3	50	-	50	2
			TOTAL	30				700	24
SEMESTER - V									
Part III	Core : XIV	26PHU14	Solid State Physics	6	3	25	75	100	5
Part III	Core : XV	26PHU15	Electronics & Communication	6	3	25	75	100	5
Part III	Core : XVI	26PHU16A/ 26PHU16B/ 26PHU16C	Institutional Training / Industrial Training / Mini Project	-	3	100	-	100	1
Part III	****	****	Electronics- Practical III	3	-	-	-	-	-
Part III	****	****	Digital Electronics and Microprocessor - Practical IV	3	-	-	-	-	-
Part III	Core : XVII (Open Elective)	***	Opted by the students offered by other departments	4	3	25	75	100	2
Part III	Core : XVIII Elective : I	26PHU17A/ 26PHU17B/ 26PHU17C	Digital Electronics and Microprocessor / Soil Physics / Geo Physics	5	3	25	75	100	4
Part IV	Skill Enhancement : II	26SEPHU02	Home Electrical Installation	3	3	50	-	50	2
Part V	Proficiency Enhancement	26PEPHU01	Lasers (Self-Study)	--	3	--	100	100	2
			TOTAL	30				650	21
SEMESTER - VI									
Part III	Core : XIX	26PHU18	Quantum Mechanics and Relativity	6	3	25	75	100	5
Part III	Core : XX	26PHU19	Atomic and Nuclear Physics	6	3	25	75	100	5
Part III	Core : XXI	26PHU20	Introduction to Space Physics	4	3	25	75	100	4
Part III	Core : XXII Practical : III	26PHU21	Electronics - Practical III	3	3	40	60	100	4
Part III	Core : XXIII Practical :	26PHU22	Digital Electronics and Microprocessor - Practical IV	3	3	40	60	100	4

	IV								
Part III	Core : XXIV Elective : II	26PHU23A/ 26PHU23B/ 26PHU23C	Fiber Optic Communication Systems/ Applied Instrumentation / Smart Materials	5	3	25	75	100	4
Part IV	Skill Enhancement : III	26SEPHU03	Digital Photography	3	3	50	-	50	2
			TOTAL	30				650	28
Part V	Competency Enhancement	NSS/YRC/RRC/CCC/PHY.EDU/ Others		SEMESTER I – VI				1	
		Professional Grooming (Life Skills)		SEMESTER I – VI				1	
		Students Social activity (Related to the Curriculum)		SEMESTER I –VI				1	

NOTE: CREDIT TRANSFERABILITY FOR ALL COURSES FROM UGC REFERRED SWAYAM AND MOOC COURSES.

Total Marks: 3700

Total credits: 140

**Chair Person
Name, designation**

a) Part IV courses for Semester – I,II & III:

Course Code	Semester	Course	Hours per Week	Credits
26FCU01	I	Foundation : I Environmental studies and Disaster management	2	2
26FCU02	II	Foundation : II Health and Wellness	2	2
26NMU01A / 26NMU01B	III	Non- Major Elective Indian Women and Society / Advanced Tamil	2	2

b) List of elective courses for Semester – V & VI:

Course Code	Semester	Course	Hours per Week	Credits
26PHU17A/ 26PHU17B/ 26PHU17C	V	Digital Electronics and Microprocessor / Soil Physics / Geo Physics	5	4
26PHU23A/ 26PHU23B/ 26PHU23C	VI	Fiber Optic Communication Systems/ Applied Instrumentation / Smart Materials	5	4

c) Courses for Skill Enhancement:

Course Code	Semester	Course	Hours per Week	Credits
26SEPHU01	IV	C Programming	3	2
26SEPHU02	V	Home Electrical Installation	3	2
26SEPHU03	VI	Digital Photography	3	2

d) Courses for Ability Enhancement:

Course Code	Semester	Course	Hours per Week	Credits
26AEU01	III	Information Security	2	2
26AEU02	IV	Consumer Rights	2	2

e) Course for Proficiency Enhancement:

Course Code	Semester	Course	Hours per Week	Credits
26PEPHU01	V	Lasers	Self Study No instructional	2

			Hours	
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f) Courses for Competency Enhancement:

Semester	Course	Hours per Week	Credit
I - VI	NSS / YRC / RRC / CCC / PHY.EDU / Others	Self-Paced with	1
I - VI	Professional Grooming (Life Skills)	Faculty mentoring and Support	1
I - VI	Students Social activity (Related to the Curriculum)	Faculty mentoring and Support	1

Total Credits: 140 credits

Total Marks: 3700

**Chair Person
Name, designation**

SYLLABUS

(For those admitted from the academic Year 2026-27)

SEMESTER – I

Category	Course Type	Course Code	Course Title		Contact Hours	Credit (C)	
Part – III	Core: I	26PHU01	Mechanics		48	4	
Contact hours per week: 4							
Year		Semester	Internal Marks	External Marks	Total Marks		
FIRST		I	25	75	100		
Preamble: To provide the student’s deeper knowledge in motion of the particles & objects							
Course Outcome: After completion of the course, the learners will be able to							
Cos	Course Statement					Knowledge Level	
CO1	review the fundamental ideas of the arrangement of particles, Rigid bodies, statics and Hydrostatics					K1	
CO2	comprehend the fundamental parameters engaged with Dynamics and statics of a Rigid bodies					K2	
CO3	investigate the concept of moment of inertia, centre of mass, friction, laws of floatation and centre of gravity					K3	
CO4	measuring the dynamic prospects of different rigid bodies					K4	
CO5	estimate the vertex and base in the surface of the liquid, metacentric height of a ship					K5	
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	3	3	3	1
CO4	9	9	3	3	3	1	1
CO5	9	9	3	3	3	1	1
Total Contribution of COs to POs	45	45	33	27	15	11	9

Weighted Percentage of COs Contribution to POs	2.60	2.96	2.39	2.34	1.69	1.54	1.26
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							
COURSE CONTENT							
UNIT I - System of Particles (10 Hours) Dynamics of a system of particles and concept of rigid bodies – Centre of mass coordinates – Centre of mass of rigid body – Motion of centre of mass and linear momentum - Collision – Elastic collision – Inelastic collision – Co-efficient of restitution							
UNIT II - Dynamics of Rigid Bodies – I (10 Hours) Rotational kinetic energy – Moment of inertia and its physical significance – Angular acceleration – Angular momentum and torque – Angular momentum of system and centre of mass – Conservation of angular momentum – Torque – Work done by a Torque – Theorem of perpendicular axes - Theorem of parallel axes							
UNIT III - Dynamics of Rigid Bodies – II (10 Hours) Moment of inertia of thin uniform bar, rectangular lamina, ring, circular disc, solid sphere and hollow sphere – Kinetic energy of a body rolling on a horizontal plane – Acceleration of a body rolling down an inclined plane – Simple pendulum - Compound pendulum							
UNIT IV - Statics (9 Hours) Force of friction – Limiting friction – Laws of friction – Angle of friction and resultant reaction – Cone of friction – Motion of a body on a rough inclined plane - angle of inclination of the inclined plane is equal to angle of friction - Centre of gravity – Expressions for centre of gravity in the case of a solid cone, solid hemisphere and hollow hemisphere							
UNIT V - Hydrostatics (9 Hours) Definition and determination of centre of pressure – General case – Expression for centre of pressure of rectangular lamina with one side on the surface of the liquid – Laws of floatation – Definition for metacentre and metacentric height – Determination of metacentric height of a ship							
Text Books 1. Mechanics - D.S.Mathur, 1 st Edition, 2001, S.Chand &Co (Unit 1, 2, 3) 2. Mechanics – Subramaniam, Jayaraman, Rangarajan, 1990, S. Viswanathan Private Ltd., (Unit 4, 5)							
Web References UNIT I https://link.springer.com/chapter/10.1007/978-3-030-15195-9_6 https://cnx.org/contents/MymQBhVV@175.14:vnF5wOxO@4/Center-of-mass-and-rigid-bodies https://www.sparknotes.com/physics/linearmomentum/conservationofmomentum/section1/ http://hyperphysics.phy-astr.gsu.edu/hbase/elacol.html https://courses.lumenlearning.com/suny-osuniversityphysics/chapter/9-7-rocket-propulsion/							

UNIT II

<http://www.southampton.ac.uk › courses › chapter2>

<https://courses.lumenlearning.com/suny-osuniversityphysics/chapter/10-5-calculating-moments-of-inertia/>

UNIT III

<https://courses.lumenlearning.com/physics/chapter/16-4-the-simple-pendulum/>

<http://farside.ph.utexas.edu/teaching/301/lectures/node141.html>

UNIT IV

<https://en.wikipedia.org/wiki/Friction>

<http://ecoursesonline.iasri.res.in/mod/page/view.php?id=3630>

<http://ecoursesonline.iasri.res.in/mod/page/view.php?id=125339>

<https://semesters.in/co-efficient-of-friction-angle-of-friction-angle-of-limiting-friction-angle-of-repose-cone-of-friction/>

<https://www.youtube.com/watch?v=jEy00Kn2wTA>

<https://unacademy.com/lesson/com-of-hollow-and-solid-hemisphere-in-hindi/OL1V1WZW>

UNIT V

[https://en.wikipedia.org/wiki/Center_of_pressure_\(fluid_mechanics\)](https://en.wikipedia.org/wiki/Center_of_pressure_(fluid_mechanics))

<http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=95303>

[https://phys.libretexts.org/Bookshelves/Classical_Mechanics/Classical_Mechanics_\(Tatum\)/01%3A_Centers_of_Mass/1.02%3A_Plane_Triangular_Lamina](https://phys.libretexts.org/Bookshelves/Classical_Mechanics/Classical_Mechanics_(Tatum)/01%3A_Centers_of_Mass/1.02%3A_Plane_Triangular_Lamina)

<https://www.jagranjosh.com/general-knowledge/what-are-the-laws-of-floatation-1518096369-1>

https://en.wikipedia.org/wiki/Metacentric_height

<https://www.youtube.com/watch?v=ihWPnQsNCL4>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: II	26PHU02	Properties of Matter & Sound	48	4
Contact hours per week: 4					
Year	Semester	Internal Marks	External Marks	Total Marks	
FIRST	I	25	75	100	
Preamble: The aim is to identify the characteristics of matter in terms their properties and to know the basic principles of acoustics					
Course Outcome: After completion of the course, the learners will be able to					
COs	Course Statement				Knowledge Level
CO1	define the terms Elasticity, Stress, Strain, Poisson’s ratio, Cantilever, Rigidity modulus, Young’s modulus, Surface Tension, Viscosity				K1

	recall the concepts in Acoustics	
CO2	interpret the different kinds of moduli via experimental methods and fundamentals of surface tension discuss the theories related to viscosity understand the wave phenomena, in general and sound wave in particular	K2
CO3	work on the experimental design and studies on project topics such as • Young's modulus for different types of wood • variation of surface tension for different detergents • Viscosity of different types of ink and to arrive at knowledge of its fluidity • wide applications of Bernoulli's equation • variation of surface tension with temperature by Jaeger's method • find the depth of the sea using ultrasonic	K3
CO4	analyze and comprehend regarding the strength of the solid materials of different size differentiate between the streamline and turbulent flow of liquids and reason out the effects of liquid while flowing compare the viscosity and interfacial surface tension between the liquids analyze the characteristics of sound and requisites of good acoustics	K4
CO5	evaluate the connections between theory, experiment and applications	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	1	0	0
CO2	9	9	9	9	3	3	0
CO3	9	9	9	9	3	3	9
CO4	9	3	9	9	9	0	9
CO5	9	3	9	3	9	0	1

Total Contribution of COs to POs	45	33	45	39	25	6	19
Weighted Percentage of COs Contribution to POs	2.60	2.17	3.27	3.38	2.81	0.84	2.67

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I – Elasticity (10 Hours)

Hooke's law - Stress – strain diagram – Elastic Moduli - Poisson's Ratio - Relation between elastic constants - Torsion of a body – Expression for torque per unit twist – Work done in twisting a wire - Torsional pendulum – Determination of rigidity modulus of a wire - Dynamic torsion method - Static torsion method (Searle's apparatus - Scale and telescope)

UNIT II - Bending of beams (10 Hours)

Expression for bending moment - Cantilever – Expression for depression at the loaded end - Oscillations of a Cantilever - Expression for time period - Determination of Young's modulus by cantilever oscillations - Uniform bending - Expression for elevation – Determination of young's modulus using pin and microscope method - Non uniform bending - Determination of young's modulus by Koenig's method

UNIT III - Surface tension (10 Hours)

Definition and dimensions of surface tension - Surface energy - molecular theory - angle of contact - excess pressure inside a curved liquid surface - Synclastic and anticlastic surface - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaegar's method

UNIT IV - Hydrodynamics and Viscosity (9 Hours)

Equation of continuity – Energy of the liquid – Euler's equation for unidirectional flow – Bernoulli's theorem – Explanation and Applications of Bernoulli's theorem – Venturimeter - Coefficient of Viscosity – Poiseuille's formula for the flow of a liquid through a capillary tube – Corrections to Poiseuille's formula – Searle's viscometer – Modification of Poiseuille's formula for gases

UNIT V - Sound (9 Hours)

Laws of Transverse vibrations in strings - Determination of frequency by Melde's method - Acoustics - Reverberation - Sabine's Reverberation formula – Factors Affecting the Acoustics of Buildings – Sound distribution in an Auditorium – Ultrasonics – Production of Ultrasonic waves - Piezo-electric Oscillator - Applications of Ultrasonic waves

Text Books

1. Properties of matter - Brijlal & N. Subrahmanyam, 2001, S.Chand & Co. Ltd., (Unit 1, 2, 3, 4)

2. Properties of matter –Murugesan, 2004, S Chand & Co. Pvt. Ltd., (Unit 1, 2, 3, 4)
3. A Text Book of Sound - Brijlal& N. Subramanyam, 2008, Vikas Publishing.
Pvt.Ltd., (Unit 5)

Reference Books

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

Web References

1. www.khanacademy.org/science/physics/elasticity/surface_tension
2. <https://nptel.ac.in/courses/105/105/105105177/>
3. <https://nptel.ac.in/courses/103/102/103102016/>
4. <https://sites.google.com/brown.edu/lecture-demonstrations/home?authuser=0>
5. <https://nptel.ac.in/courses/112/104/112104176/>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: III Allied: I	26PHU03	Mathematics - I	60	5
Contact hours per week: 5					
Year	Semester	Internal Marks	External Marks	Total Marks	
FIRST	I	25	75	100	
Preamble: To enable the students to learn about matrices and determinants, different types of equations, Laplace transforms and Fourier series					
Course Outcome: After completion of the course, the learners will be able to					
COs	Course Statement				Knowledge Level (RBT)
CO1	recall the definitions of matrices, polynomial equations, Laplace, inverse Laplace transforms and Fourier series.				K1
CO2	explain the operations of matrix, roots of the equations, standard functions of Laplace , inverse Laplace transforms and Fourier series.				K2
CO3	apply the concepts of matrices, theory of equations , Fourier series of functions, Laplace and inverse Laplace transforms to solve the problems.				K3
CO4	analyze Cramer’s Rule, Irrational roots, complex roots , hyperbolic functions and Transform of $tf(t), f(t)/t$.				K4
CO5	evaluate the problems in Laplace transforms, inverse Laplace				K5

	transforms, Matrices, Reciprocal Equations and Fourier series.						
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	0	0	0
Total Contribution of COs to POs	45	45	39	39	10	10	10
Weighted Percentage of COs Contribution to POs	2.60	2.96	2.83	3.38	1.12	1.40	1.40
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							
COURSE CONTENT							
UNIT I - Matrices, Determinants (12 Hours) Definition of a matrix- Order of a matrix – Types of a matrix– Matrix operations I:A System of Linear Equations – Determinants- Cramer’s Rule – Matrix Operation II: Inverse of a matrix –Rank of matrix . UNIT II - Theory of Equations (12 Hours) Polynomial Equations with real coefficients - Irrational roots, complex roots - Reciprocal Equations - Newton’s method to find a root approximately. UNIT III - Laplace Transforms (12 Hours) Definition – Laplace Transform of Standard functions – Linearity property – First shifting theorem – Transform of $t f(t)$, $f(t)/t$. UNIT-IV - Inverse Laplace Transforms (12 Hours) Inverse Laplace transforms of standard functions – First shift theorem - Laplace Transform of derivatives and integrals. UNIT V - Fourier Series (12 Hours)							

Fourier series of functions in $(0, 2\pi)$ and $(-\pi, \pi)$.

NOTE: Distribution of Marks: Problem 100%.

Text Books

1. Navnitham. P.A.(2012) - "Business mathematics and statistics", Jai publishers, Trichy
2. Kandasamy. P, Thilagavathi. K(2012) - "ALLIED MATHEMATICS", Paper-I, S.Chand and Company Ltd, New Delhi.
3. Kandasamy. P, Thilagavathi. K "MATHEMATICS for B.Sc– Volume III(2004) and Volume IV(2005)", S. Chand and Company Ltd, New Delhi.

Reference Books

1. Manickavasagam Pillai.T.K.and Narayanan.S(2012) – "Trigonometry" - Viswanathan Publishers and Printers Pvt. Ltd.
2. Manickavasagam Pillai.T.K.and Narayanan.S., Hanumantha Rao.R(2011) - "Ancillary Mathematics", Volume-II Viswanathan Publishers and Printers Pvt.Ltd.

UNIT	BOOK	CHAPTER	VOLUME	PAGE NO
I	1	4	I	147-188
II	2	1,2,3	I	39-47,56-71
III	3	1	III	187-201
IV	3	1	III	202-225
V	3	1	IV	93-134

Web References

- 1.https://en.wikipedia.org/wiki/Inverse_Laplace_transform
- 2.https://youtu.be/5nNPf_EB7Es
- 3.<https://nptel.ac.in/courses/111/107/111107112/>

Category	Course Type	Course Code	Course Title		Contact Hours	Credit (C)
IV	Foundation Course: I	26FCU01	Environmental Studies & Disaster management		24	2
Contact hours per week: 2						
Year		Semester	Internal Marks	External Marks	Total Marks	
FIRST		I	50	--	50	
Preamble: To bring about an awareness of a variety of environmental concerns and disaster management to create a pro-environmental attitude and a behavioral pattern in society that is based on creating sustainable lifestyle.						

Course Outcome: After completion of the course, the learners will be able to

COs	Course Statement	Knowledge Level
CO1	Recall basic concepts of environment, natural resources, and their classification	K1
CO2	Understand the structure and functioning of ecosystems and ecological interactions.	K2
CO3	Apply knowledge of biodiversity and conservation methods to real-life situations.	K3
CO4	Analyze environmental pollution, its causes, effects, and control measures along with social issues.	K4
CO5	Evaluate disaster management strategies, risks, and mitigation practices.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	1	3
CO3	9	9	9	9	1	1	3
CO4	9	9	9	9	1	1	3
CO5	9	9	3	3	1	1	3
Total Contribution of COs to POs	45	45	39	39	9	7	15
Weighted Percentage of COs Contribution to POs	2.51	2.68	2.41	2.51	0.98	0.58	1.07

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Multidisciplinary Nature of Environmental Studies (4 Hours)
Environment: Definition, Components, Segments and Types. **Natural Resources:** Meaning, Components: (1. **Forest**-Meaning, Importance and Types 2. **Water**- Meaning, Types and Problems 3. **Mineral**- Meaning and Classification 4. **Food** -Meaning and

Problems 5. **Energy** - Meaning, Forms and Types 6. **Land** - Meaning, Structure and Functions, Components), **Classification:** Renewable and Non-Renewable Resources, Role of an Individual in Conservation of Natural Resources

UNIT II - Ecosystems (5 Hours)

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

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

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

UNIT III - Biodiversity and its Conservation (5 Hours)

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

UNIT IV - Environmental Pollution and Social Issues (5 Hours)

Definition, Causes, Effects, control measures and Prevention Acts for Air, Water, Soil, Noise Thermal Pollutions and Nuclear Hazards. **Solid Waste Management:** Meaning, Causes, effects and control measures of urban and industrial wastes. **Social Issues and the Environment:** From Unsustainable to Sustainable development- Urban problems related to energy- Water conservation, rain water harvesting, Watershed management.

UNIT V - Disaster Management (5 Hours)

Introduction to Disasters and Hazards, Vulnerability, Capacity and Risk in Disasters, Classification of Disaster: Natural and Man-made Disasters, Basic principles of Disaster Management, Disaster Management cycle, Impacts of Disasters, Policy and Guidelines.

Reference Books

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,
6. Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down to Earth, Centre for Science and Environment (R)
9. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,
10. Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
11. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural

12. History Society, Bombay (R)
13. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge Univ. Press 1140p.
14. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws, Himalaya Pub. House, Delhi 284 p.
15. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
16. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
17. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
18. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
19. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.
20. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
21. Survey of the Environment, The Hindu (M)
22. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
23. Andharia, J. (2008). Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Paper no. 8.
24. Carter, N. (1991). Disaster Management: A Disaster Manager's Handbook. Manila Philippines: Asian Development Bank

SEMESTER – II

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: IV	25PHU04	Heat & Thermodynamics	48	4
Contact hours per week: 4					
Year	Semester	Internal Marks	External Marks	Total Marks	
FIRST	II	25	75	100	
Preamble: The student acquires the extensive fundamental knowledge about transfer of thermal energy by different analysis and to provide the basic knowledge of thermodynamics					
Course Outcome: After completion of the course, the learners will be able to					
COs	Course Statement				Knowledge Level
CO1	recollect the basic definitions of thermocouple, Specific heat,Mean free path, Degree of freedom, Conduction, Radiation and laws of Newton cooling, Kirchhoff's, Stefan and Planck's, Wein's, Rayleigh-Jean's and Joule-Thomson Effect.				K1
CO2	summarize the terms of Thermometer, Calorimeter, Viscosity of gases,Thermal conductivity, Thermal diffusivity, Steady				K2

	state, Isothermal and Adiabatic, Entropy. Explain the Peculiar properties of He II	
CO3	demonstrate the various types of thermometers and apply the theories of heat in Liquefaction of air, hydrogen and helium, apply various thermodynamic laws in different relations and functions	K3
CO4	investigate the various experiments Seebeck and peltier effect, Thermal conductivity of bad and good conductors, Carnot cycle and otto cycle	K4
CO5	determine the specific heat capacity of solid, liquid and gas and Evaluate the critical constants Critical constants by using Van der Waals equation	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	1	3
CO4	9	9	9	3	3	1	1
CO5	9	9	3	3	3	1	1
Total Contribution of COs to POs	45	45	39	33	15	9	11
Weighted Percentage of COs Contribution to POs	2.60	2.96	2.83	2.86	1.69	1.26	1.54

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Thermometry & Calorimetry (10 Hours)
 Thermometry: Temperature coefficient of Resistance — Platinum Resistance Thermometer — Thermocouple — Seebeck Effect — Peltier Effect — Thermoelectric thermometer
 Calorimetry: Specific heat of solids – Radiation correction – Newton's law of cooling – Specific heat capacity of a liquid by cooling – Specific heat capacity of gases
UNIT II - Kinetic Theory of Gases (10 Hours)

Postulates – Mean free path – Degree of freedom –Maxwell's law of velocity distribution and Theorem of equipartition of energy – Viscosity of gases – Van der Waals equation – Critical constants and their determination Low Temperature Physics: Joule-Thomson Effect – Liquefaction of air, hydrogen and helium – Peculiar properties of He II

UNIT III - Thermal Conduction (10 Hours)

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

UNIT IV -Thermal Radiation (9 Hours)

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

UNIT V - Thermodynamics (9 Hours)

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

Text Book

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

Reference Books

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

Web References

1. <http://imran728fileswordpress.com>
2. <http://thermal-engineering.org>
3. <http://www.sfu.ca>
4. <http://topex.ucsd.edu>
5. <http://www.livescience.com>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: V	26PHU05	Electricity and Magnetism	48	4
Contact hours per week: 4					
Year	Semester	Internal Marks	External Marks	Total Marks	
FIRST	II	25	75	100	
Preamble: To acquire knowledge in electricity and magnetism, problem solving ability & also understand the laws and equations					

Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement						Knowledge Level
CO1	summarize the laws of electricity and magnetism						K1
CO2	recognize the techniques, principles of thermoelectricity, magnetic materials and dynamics of charged particles						K2
CO3	interpret the learned concepts of thermoelectricity, electrostatic principles in day to day life						K3
CO4	analyze the different formulae related to dynamics of charged particles, Helmholtz equation of varying current and thermoelectricity						K4
CO5	determine the motion of charged particles, magnetic properties of materials						K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	9
CO2	9	9	9	9	9	3	3
CO3	9	9	3	9	9	3	3
CO4	9	3	3	3	3	3	3
CO5	9	3	3	3	1	3	3
Total Contribution of COs to POs	45	33	27	33	25	21	21
Weighted Percentage of COs Contribution to POs	2.60	2.17	1.96	2.86	2.81	2.95	2.95
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							
COURSE CONTENT							
UNIT I - Electrostatics (10 Hours)							
Coulomb’s law, Electric Field and potentials, Electric field due to a point charge - Gauss theorem, application of gauss theorem - Energy stored in unit volume of an electric field – Electric field due to an infinite plane sheet							
Spherical capacitor, cylindrical capacitor, Force of attraction between charged plates of a							

capacitor – capacity of a parallel plate capacitor; effect of introducing a dielectric slab between the plates - polarization in dielectric materials

UNIT II - Magnetic Properties of materials (10 Hours)

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

UNIT III - Thermo Electricity (10 Hours)

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

UNIT IV- Helmholtz equation of varying current (9 Hours)

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

UNIT V - Dynamics of charged particles (9 Hours)

Charged particles in uniform and uniform electric field – Charged particles in a varying 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

Text Books

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

Reference Books

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

Web References

1. <https://www.askiitians.com/revision-notes/physics/current-electricity.html>
2. <https://www.askiitians.com/revision-notes/physics/electromagnetic-induction-and-alternating-current/>
3. <https://byjus.com/physics/electricity-and-magnetism/>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
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Part – III	Core: VI Allied: II	26PHU06	Mathematics - II		60	5	
Contact hours per week: 5							
Year		Semester		Internal Marks	External Marks	Total Marks	
FIRST		II		25	75	100	
Preamble: To enable the students to learn and gain the knowledge and ideas about curvature, multiple integrals, Ordinary and Partial differential equations							
Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement						Knowledge Level
CO1	recall the basic concepts of curvature ,differentiation and integration .						K1
CO2	express radius of curvature, double and triple integrals, beta and gamma functions, ordinary and partial differential equations.						K2
CO3	apply the formula for Beta - Gamma functions, radius and centre of curvature for finding the results.						K3
CO4	analyze the general of ordinary, partial differential equations , Beta - Gamma functions and change of order of integrations..						K4
CO5	Evaluation of multiple integrals and differential equations.						K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	3	3
Total Contribution of COs to POs	45	45	45	45	15	15	15
Weighted Percentage of COs Contribution	2.60	2.96	3.27	3.90	1.69	2.10	2.11

n to POs							
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							
COURSE CONTENT							
UNIT I - Curvature							(12 Hours)
Curvature – Radius of curvature – Center of curvature – Circle of curvature							
UNIT II - Integration							(12 Hours)
Evaluation of double integrals - Change of order of integration in double integrals -Evaluation of triple integrals .							
UNIT III - Beta and Gamma Functions							(12 Hours)
Beta and Gamma functions – Relations between Beta and Gamma functions – Evaluation of multiple integrals using Beta and Gamma functions.							
UNIT IV - Ordinary Differential Equations							(12 Hours)
Solving second order linear differential equations with constant coefficients whose R.H.S is of the form ve^{mx} , where v is any function of x-to find the meanings for $f(D^2)\sin(ax+b)$ and $f(D^2)\cos(ax+b)$.							
UNIT V -Partial Differential Equations							(12 Hours)
Formation of partial differential equations by elimination of arbitrary constants and functions -Definitions of general, particular and complete solutions - Solving standard forms $f(p, q) = 0$.							
Note: Distribution of Marks: Theory 20% Problem 80%							
Text Books							
1. Kandasamy. P, Thilagavathi.K.(2004) - “Mathematics for B.Sc. Branch I”, 1 st edition, Volume II and III, S.Chand and Company Ltd, New Delhi.							
2. Narayanan.S. and Manicavachasam Pillai.T.K (2017) – “ Calculus Volume II”- Viswanathan Publishers.							
UNIT	BOOK	CHAPTER	VOLUME	PAGE NO			
I	1	II	II	324-344			
II	1	VI	II	432-444			
III	2	VIII	II	278-295			
IV	1	II	III	16-35			
V	1	I	III	117-136			
Reference Book							
1. Narayan.S and Manicavachagam Pillay.T.K. (1993) - “Ancillary Mathematics”, Viswanathan Publishers and Printers Pvt. Ltd.							
Web References							
1. https://en.wikipedia.org/wiki/Beta_function							

2. <https://users.aber.ac.uk/ruw/teach/260/classification.php>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: VII Practical: I	26PHU07	Physics – Practical I	72	4

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	I & II	40	60	100

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

Course Outcome: After completion of the course, the learners will be able to

COs	Course Statement	Knowledge Level
CO1	recollect the modulus of different materials and give its value	K1
CO2	calibrate the voltmeter and ammeter, discuss the specific resistance of wire by using electronic circuits	K2
CO3	calculate the magnetic moment, gravitational force, frequency by using different methods	K3
CO4	examine the viscosities of different liquids and thickness of different wires	K4
CO5	determine the refractive index of Hollow prism and Solid prism using spectrometer	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	3	3	3
CO2	9	9	9	3	3	3	3
CO3	9	9	9	3	3	1	3
CO4	9	3	3	3	1	1	1
CO5	9	3	3	3	1	1	1

Total Contribution of COs to POs	45	33	33	15	11	9	11
Weighted Percentage of COs Contribution to POs	2.60	2.17	2.39	1.30	1.24	1.26	1.54

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT
ANY TWELVE (12) EXPERIMENTS ONLY

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

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Allied		Allied Physics – I	60	4
Contact hours per week: 5					
Year	Semester	Internal Marks	External Marks	Total Marks	
FIRST	I	25	75	100	
Preamble: To understand the fundamentals of physics, give the basic understanding of material properties and to acquire knowledge on magnetism and electricity					

Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement						Knowledge Level
CO1	remember the basic terms of universal law of gravitation and elastic properties of solids, sound propagation, solar energy electric and magnetic fields						K1
CO2	discuss the fundamentals of thermodynamic state properties for liquids and vapors, and for ideal gases						K2
CO3	examine the working principle of bending moment and conversions of Galvanometer concepts						K3
CO4	categorize techniques related with fabrication of solar cell, measurement of solar radiations.						K4
CO5	assess the acceleration due to gravity, Young’s modulus bending method, Frequency of AC circuits						K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	3	3
CO3	9	3	3	3	3	3	3
CO4	9	3	3	3	3	3	1
CO5	9	3	3	1	1	1	1
Total Contribution of COs to POs	45	33	33	25	25	19	11
Weighted Percentage of COs Contribution to POs	2.31	1.78	2.00	1.62	2.80	2.13	1.49
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							
COURSE CONTENT							
UNIT I (12 Hours)							
Gravitation: Newton’s law of Gravitation-Determination of G by Boy’s method- mass and density of earth – acceleration due to gravity- Determination of g by compound pendulum							

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

UNIT II (12 Hours)

Heat and Thermodynamics: Vanderwaal's equation of state-critical constants of a gas-derivation of critical constants in terms of Vanderwaal's constants – Theory of porous plug experiment – Joule-Kelvin effect: Temperature of inversion - Liquefaction of air (Linde's process) - Liquefaction of hydrogen - Liquefaction of Helium - Properties of liquid Helium I and Helium II - Second law of thermodynamics - Carnot's theorem and its proof

UNIT III (12 Hours)

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

UNIT IV (12 Hours)

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

UNIT V (12 Hours)

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

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

Text Books

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

Web References

1. <https://web.njit.edu/~vitaly/121/notes121.pdf><https://ncert.nic.in/textbook/pdf/iesc110>
2. [https://www.stcharlesprep.org/Elasticity\(statics\)](https://www.stcharlesprep.org/Elasticity(statics))
3. <https://books.google.co.in/books?id=0zP8wAEACAAJ&printsec=copyright>
4. <https://ncert.nic.in/ncerts/l/iesc112.pdf>
5. <http://science.sciencemag.org/content/245/4919/770.1.full.pdf>
6. <https://web.njit.edu/~vitaly/121/notes121.pdf>

Category	Course Type	Course Code	Course Title		Contact Hours	Credit (C)	
Part – III	Allied		Allied Physics – II		60	4	
Contact hours per week: 5							
Year		Semester		Internal Marks	External Marks	Total Marks	
FIRST		II		25	75	100	
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 Outcome: After completion of the course, the learners will be able to							
COs	Course Statement					Knowledge Level	
CO1	remember the basic concepts in Matter waves, Nuclear forces, principles of lasers, Semiconductor devices, Number system					K1	
CO2	explain the fundamentals of De Broglie’s matter wave, Binding energy, conditions for laser actions, characteristics of Semi-conductors, laws of Boolean algebra					K2	
CO3	discuss the working techniques of photoelectric cells, logic gate circuits, Semiconductor devices					K3	
CO4	determine the concepts of photoelectric equation, Nuclear structure, Raman effect					K4	
CO5	estimate the Particle accelerator, Lasers, Rectifiers circuits, various semiconductor devices					K5	
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	3
CO3	9	9	9	3	9	3	3
CO4	9	3	3	3	3	3	1
CO5	9	3	3	1	3	3	1
Total Contribution of COs to POs	45	33	33	31	33	27	17

Weighted Percentage of COs Contribution to POs	2.31	1.78	2.00	2.01	3.69	3.02	2.31
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							
COURSE CONTENT							
UNIT- I (12 Hours) Modern physics: Einstein's photo electric equation – verification of Einstein's photo electric equation by Millikan's experiment – photo electric cells – applications Wave mechanics: De Broglie concept of matter waves – Calculation of De Broglie wave length - Study of De Broglie matter wave by G.P.Thomson experiment							
UNIT- II (12 Hours) Nuclear physics: Nuclear forces – nuclear structure by liquid drop model – Binding energy –mass defect – particle accelerators – cyclotron – nuclear Fission and nuclearFusion – Nuclear Fission reactors – introduction to elementary particles – Leptons, Mesons and Baryons							
UNIT III (12 Hours) Laser physics: Principles of laser – population inversion – Meta stable state – Spontaneous and Stimulated Emission – conditions for laser actions – Ruby Laser – Helium – neon laser – applications of lasers – Raman Effect – Raman shift– stoke and anti stokes lines							
UNIT IV (12 Hours) Semiconductor Devices: Semi conductors – Energy band in Solids – Types of Semi conductors – PN junction Diode – Volt–Ampere Characteristics – Zener diode – Volt–Ampere Characteristics – Rectifiers – Half wave rectifier – Bridge Rectifier							
UNIT V (12 Hours) 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							
Text Books 1. Modern Physics – R. Murugesan, 2016, S.Chand& Company. Pvt. Ltd, New Delhi 2. Engineering physics–M. Arumugam, 1998, Anuradha Agencies, Educational Publishers 3. Laser Physics – Thiagaraja, 2013, Narosa Publishing House 4. Basic Electronics – B.L. Theraja, 2000, S. Chand & Company LTD, New Delhi							
Web References 1. http://www.ifsc.usp.br/~lavfis/images/BDApostilas/ApEfFotoeletrico/The%20Photoeletric%20Effect%20-%20m213.pdf 2. http://www.sfu.ca/~mxchen/phys1021003/P102LN34.pdf 3. https://ehs.msu.edu/_assets/docs/laser/laser-fu... 4. https://schools.aglasem.com/ncert/ncert-books-class-12-physics-chapter-14/ 5. https://www.shahucollegeatatur.org.in/Department/Studymaterial/sci/it/BCA/FY/digielec							

[.pdf](#)

Category	Course Type	Course Code	Course Title		Contact Hours	Credit (C)	
Part – III	Allied		Allied Practical		72	4	
Contact hours per week: 3							
Year		Semester		Internal Marks	External Marks	Total Marks	
FIRST		I & II		40	60	100	
Preamble: The aim of the course is to develop practical skills in mechanical, electrical, heat and optics experiments							
Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement					Knowledge Level	
CO1	identify the basic principle and working of Pendulum, Spectrometer, Potentiometer					K1	
CO2	demonstrate the construction and working model of different experiments					K2	
CO3	use the mathematical formulas to calculate the quantitative results obtained from various experiments					K3	
CO4	evaluate the different set of values from the experiments					K4	
CO5	interpret the values obtained from performed experiments					K5	
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	3	3
CO2	9	9	9	9	9	3	3
CO3	9	9	9	3	9	3	3
CO4	9	9	3	3	3	3	1
CO5	9	9	3	3	3	1	1
Total Contributio	45	45	33	27	33	13	11

n of COs to POs							
Weighted Percentage of COs Contribution to POs	2.31	2.43	2.00	1.75	3.69	1.45	1.49

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT ANY TWELVE (12) EXPERIMENTS ONLY
1. Acceleration due to gravity – Compound pendulum method 2. Moment of inertia – Torsional pendulum method 3. Young's modulus – Uniform bending – Optic lever method 4. Young's modulus – Non-uniform bending – Pin and microscope 5. Rigidity modulus – Static torsion method 6. Frequency of A.C - Sonometer 7. Thermal conductivity – Lee's disc method 8. Refractive index of a liquid prism - Spectrometer 9. Refractive index of a liquid prism - Spectrometer 10. (i-d) curve-solid prism - Spectrometer 11. Wavelengths of spectral lines – Grating – Normal incidence - Spectrometer 12. Wavelength of spectral lines – Grating – Minimum deviation – Spectrometer 13. Radius of curvature of lens – Newton's rings method 14. Viscosity of highly viscous liquid – Stoke's method 15. Surface tension – Drop weight method 16. Low range voltmeter calibration - potentiometer 17. Low range ammeter calibration - Potentiometer 18. Construction of IC regulated power supply 19. Characteristics of Pn junction diode 20. Characteristics of Zener diode 21. Construction of Hartley oscillator 22. Construction of Colpitt's oscillator 23. Verification of truth tables of logic gate

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
IV	Foundation Course: II	26FCU02	Health and Wellness	24	2
Contact hours per week: 2					
Year	Semester	Internal	External	Total Marks	

		Marks	Marks				
FIRST	II	50	--	50			
Preamble: To promote holistic well-being by enhancing knowledge, skills, and habits related to physical, mental, emotional, and social health.							
Course Outcome: On the successful completion of the course, students will be able to:							
COs	Course Statement			Knowledge Level			
CO1	Recollect the fundamental concepts of physical, mental, social, intellectual well-being, and substance-free living			K1			
CO2	Demonstrate understanding of the importance of yoga, value education, healthy living practices, and social bonding			K2			
CO3	Apply techniques of yoga, healthy habits, substance-free practices, and value-based actions in daily life			K3			
CO4	Classify the components of physical health, social well-being practices, mental exercises, and ethical values			K4			
CO5	Evaluate the role of health, wellness practices, yoga, and values in achieving holistic personal development			K5			
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	1	1	3
CO2	9	9	9	3	3	1	3
CO3	9	9	9	3	3	3	3
CO4	9	9	9	3	3	3	3
CO5	9	9	9	3	3	3	3
Total Contribution of COs to POs	45	45	45	15	13	11	15
Weighted Percentage of COs Contribution to POs	2.60	2.96	3.27	1.30	1.46	1.54	2.11
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							

COURSE CONTENT

UNIT I - Physical Well-being (5 Hours)

Definition and distinction between health and wellness, Components of physical well-being. Role of physical activity in health: Local, demographic, and societal factors affecting health and wellness. Balanced diet essentials: Carbohydrates, Proteins, Fats, Vitamins, Minerals, Nutritional disorders – malnutrition, under nutrition, over nutrition

UNIT II - Substance-Free Well-Being (5 Hours)

Introduction to Substance-Free Well-Being, Impact of Substance Misuse, Commonly Misused Substances, Consequences of Substance Misuse- Recognizing Signs of Addiction, Peer Pressure and Substance Use. Healthy Alternatives to Coping with Stress- The Role of Self-Care in Substance-Free Well-Being, Seeking Support for Substance Misuse- Benefits of a Substance-Free Lifestyle

UNIT III - Social Well Being (5 Hours)

Practicing Gratitude-Building relation with Family, Friends, relatives, mentors and colleagues- Cultivating Kindness and Compassion-, Practicing Forgiveness, Celebrating Differences, Digital Detox: Meaning and Concept, Need for Digital Detox, Digital addiction symptoms, Benefits of Digital Detox, Strategies for a Successful Digital Detox

UNIT IV - Mental Well Being (5 Hours)

Meaning and definition of yoga- Aims and objectives of yoga- Basic principles of yoga Importance of yoga in daily life, Yoga for mental attitude, Integration of mind, body, breath, and emotions.

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

UNIT V- Intellectual Well Being (4 Hours)

Meaning, need, and significance of ethical values- Types of values. Value education: aim and importance, Components of value education: self-discipline, self-confidence, self-initiative, empathy, compassion, forgiveness, honesty, sacrifice, sincerity, self-control, tolerance, courage.

Reference Books

1. Edlin, G., & Golanty, E. (2020). Health and Wellness (13th ed.). Jones & Bartlett Learning.
2. Thompson, J., & Manore, M. (2017). The Science of Nutrition (4th ed.). Pearson Education.
3. Fisher, G. L., & Harrison, T. C. (2013). Substance Abuse: Information for School Counsellors, Social Workers, Therapists, and Counsellors (5th ed.). Pearson Education.
4. Vethathiri Maharishi (2015), 'Yoga for human excellence'- Sri Vethathiri Publications
5. Value Education for human excellence- study material by Bharathiar University.
6. Value Education - Study Material by P.K.R Arts College for Women.

Web References

1. <https://www.who.int/health-topics/nutrition>
2. <https://nida.nih.gov/drug-topics>
3. <https://greatergood.berkeley.edu/>
4. https://www.yogaalliance.org/About_Yoga/What_is_Yoga

5. <https://livingvalues.net/>

SEMESTER – III

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: VIII	26PHU08	Optics	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
SECOND	III	25	75	100

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

Course Outcome: After completion of the course, the learners will be able to

COs	Course Statement	Knowledge Level
CO1	identify the basic terms of aberrations and its types, dispersive power of prism, Interference, Diffraction, Polarization and laser its mechanisms	K1
CO2	discuss chromatic and achromatism in prism and lens, Fresnel's Biprism, Zone Plates, Fraunhofer diffraction at a Single light, Optical Activity explain about Huygen's and Fresnel's theory.	K2
CO3	demonstrate the concepts of laser, polarimeter, Michelson interferometer and Newton's Rings experiments	K3
CO4	Criticize Ruby, He-Ne, CO ₂ laser, the monochromatic light's wave length and aberrations of lens	K4
CO5	determine the dispersive power, resolving power, refractive index and specific rotation of liquid compare Fresnel and Fraunhofer diffraction and Circularly and Elliptically Polarized light	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3

CO3	9	9	9	9	3	3	3
CO4	9	3	3	3	3	1	3
CO5	9	3	3	3	1	1	1
Total Contribution of COs to POs	45	33	33	33	13	11	15
Weighted Percentage of COs Contribution to POs	2.60	2.17	2.39	2.86	1.46	1.54	2.11

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Geometrical Optics (10 Hours)

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

UNIT II - Physical optics - Interference (10 Hours)

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

UNIT III - Diffraction (10 Hours)

Fresnel's assumptions – rectilinear propagation of light – half period zone – Zone Plates – Action and Construction – comparison with a convex lens – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction at a Single light – Diffraction grating – Resolving power & Dispersive power of Grating

UNIT IV - Polarization (9 Hours)

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

UNIT V - Quantum Optics (9 Hours)

Light quanta and their origin – Resonance radiation– Metastable states – Population Inverse – Optical pumping – Spontaneous and Stimulated emission – Einstein's coefficient– Ruby, He-Ne, CO laser – Resonant cavities – elements of non linear optics – second harmonic

generation –threshold condition for laser – Laser applications in industry - Stimulated Raman scattering

Text Books

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

Reference Books

1. Modern Physics - R.Murugesan, KiruthigaSivaprasath, 2018, S.Chand and Company Limited
2. Optics and Spectroscopy - R.Murugesan, 5th Edition, 2005,S.Chand and Company Limited

Web References

1. <http://www.uou.ac.in>
2. <http://www.3.nd.edu>
3. <http://www.fisica.uniud.it>
4. <http://www.brown.edu>
5. <http://www.physics.utoronto.ca>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: IX Allied: III	26PHU09	Chemistry - I	48	4
Contact hours per week: 4					
Year	Semester	Internal Marks	External Marks	Total Marks	
II	III	25	75	100	
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 Outcome: After completion of the course, the learners will be able to					
COs	Course Statement				Knowledge Level
CO1	define the basic terms involved in extraction of metals, Fuels, Fertilizer, Water treatment. recall Organic reactions, Chemical kinetics & Photo Chemical reaction.				K1
CO2	summarize the basic concepts and methods involved in extraction of metals, Fuels, Water treatment, Organic reactions, Chemical kinetics & Photo Chemistry				K2

CO3	illustrate Water treatment principles in Water purification techniques & Chemical kinetics in laboratory reactions	K3
CO4	examine the mechanism of electrophilic substitution reactions, Compare Thermal & Photo chemical reactions calculate hardness of Water sample	K4
CO5	evaluate the problems related with Extraction of metals, Fertilizers, Fuels & Rate of Chemical reactions	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	3	9
CO2	9	9	9	9	9	3	9
CO3	9	9	3	3	3	3	3
CO4	9	9	3	3	3	3	1
CO5	9	9	3	3	3	3	1
Total Contribution of COs to POs	45	45	27	27	27	15	23
Weighted Percentage of COs Contribution to POs	2.60	2.96	1.96	2.34	3.03	2.10	3.23

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Metals and its Extraction (10 Hours)

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

UNIT II - Fuels and Fertilizers (10 Hours)

Fuels- Classification-Composition and uses of gaseous fuels like water gas, producer gas, liquefied petroleum gas, gobar gas, Compressed natural gas-Advantages of gaseous fuels over solid fuels - Fertilizers- Classification – Urea , Ammonium sulphate, superphosphate,

Triple super phosphate, potassium nitrate- manufacture and uses - Silicones - Preparation, properties and applications

UNIT III - Water Treatment (10 Hours)

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

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

UNIT IV - Fundamentals of Organic Chemistry (9 Hours)

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

UNIT V - Chemical Kinetics and Photochemistry (9 Hours)

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

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

Text Books

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

Reference Books

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

Web References

UNIT I

1. https://youtu.be/1XgIG65b8_4
2. <https://youtu.be/W4c7dOPG9OI>
3. <https://youtu.be/8oTdCGj334U>
4. <https://youtu.be/tKZiyg-mNeg>
5. https://youtu.be/ZAYAe_Oimlo
6. <https://youtu.be/fq-X0FvulQ8>
7. <https://youtu.be/uz5nyCu4WA0>
8. <https://www.slideshare.net/guest2082ec7/extraction-of-metals-1094182>

UNIT II

1. <https://www.slideshare.net/haseebmuhsin/gaseous-fuels>
2. <https://www.slideshare.net/krishnaSethi1/fertilizer-and-its-classification>
3. https://youtu.be/uXQg_hi2pHk
4. https://youtu.be/B-Ullir_QH8

UNIT III

1. <https://www.slideshare.net/ahsanshafiq90/hardness-of-water>
2. <https://youtu.be/BmpknJNDXfE>
3. https://youtu.be/4RDA_B_dRQ0
4. <https://youtu.be/4c31SbnEDTA>

UNIT IV

1. <https://www.slideshare.net/Ashokkumarziet/hybridization-sp-sp2-and-sp3>
2. <https://www.slideshare.net/jeevachem4198/basic-effects-in-organic-chemistry>

UNIT V

1. <http://www.slideshare.net/ShaktirupaPriyadarshani/photochemistry-by-shaktirupa-priyadarshani>
2. http://www.slideshare.net/shahzad_ali27/chemical-kinetics-32001888

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
IV	Ability Enhancement Course-I	26AEU 01	Information Security	24	2
Contact hours per week: 2					
Year	Semester	Internal Marks	External Marks	Total Marks	
SECOND	III	50	--	50	
Preamble: To learn about the basics of Information Security					
Course Outcome: To learn about the basics of Information Security					
COs	Course Statement				Knowledge Level
CO1	recall the fundamental concepts of Information Security, Risk and Security policies				K1
CO2	discuss the concepts of Risks, vulnerabilities, ethical and privacy issues				K2
CO3	apply the ideas in security planning and construct the policies				K3
CO4	categorize the Privacy, Ethical Issues, Laws, Software Issues and Crimes				K4
CO5	summarize Cryptography, cipher text and threats in				K5

	information security						
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	1	1
Total Contribution of COs to POs	45	45	45	45	27	25	19
Weighted Percentage of COs Contribution to POs	2.60	2.96	3.27	3.90	3.03	2.24	2.67
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							
COURSE CONTENT							
UNIT I - Introduction to Information Security (5 Hours) Introduction- Growing IT Security Importance and New Career-opportunities-Becoming an Information Security Specialist-Contextualizing Information Security							
UNIT II – Cyber Laws (4 Hours) Law, Investigations and Ethics: Introduction-Types of Computer Crime-How Cyber Criminals Commit Crimes-The Computer and the Law-Intellectual Property Law- Privacy and the Law- Computer Forensics							
UNIT III - Physical Security Control (5 Hours) Introduction- Understanding the Physical Security Domain-Physical Security Threats-Providing Physical Security							
UNIT IV - Access Control Systems and Methodology (5 Hours) Introduction- Terms and Concepts-Principles and Authentication-Biometrics-Single Sign-On-Remote User Access and Authentication							
UNIT V – Securing the future (5 Hours)							

Introduction-Continuous Monitoring and Constant Vigilance-Operation Eligible Receiver-Identity Theft and the U.S. Regulatory Environment-Growing Threats-Trends in Security Threats-The Rosy Future for InfoSec Specialists

Reference Books

1. "Information Security-Principles and Practices" Mark Merkow & Jim Breithaupt, Pearson Prentice Hall, 2007.

Chapters and Page Numbers: Unit I : Chapter I - 29-37, Unit II : Chapter 7 – 169-180, Unit III : Chapter 8 – 193-206, Unit IV : Chapter 10 – 233-248, Unit V : Chapter 14 – 345-352

Category	Course Type	Course Code	Course Title		Contact Hours	Credit (C)	
IV	Non-Major Elective	26NMU01A	Indian Women and Society		24	2	
Contact hours per week: 2							
Year		Semester	Internal Marks	External Marks	Total Marks		
SECOND		III	50	--	50		
Preamble: To familiarize students with the specific cultural contexts of women in India							
Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement					Knowledge Level	
CO1	know women status in Indian society as an academic discipline					K1	
CO2	interpret the various roles of women, challenges and issues faced by them in the society					K2	
CO3	find out solutions to their legal issues and product themselves from the violence against women emphasize on women entrepreneurship for their empowerment					K3	
CO4	critically analyze the lifestyle and challenges of women					K4	
CO5	discuss the importance of women health and issues related to women in general					K5	
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7

CO1	9	9	9	9	0	0	0
CO2	9	9	9	9	3	0	3
CO3	9	9	9	9	9	9	9
CO4	3	3	3	9	9	9	9
CO5	3	3	1	1	1	9	9
Total Contribution of COs to POs	33	33	31	37	22	27	30
Weighted Percentage of COs Contribution to POs	1.90	2.17	2.25	3.21	2.47	3.79	4.21

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Historical Background (5 Hours)

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

UNIT II - Role of Women (Challenges & Remedies) (5 Hours)

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

UNIT III - Women and Health (5 Hours)

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

UNIT IV - Issues of Women (5 Hours)

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

UNIT V - Women Empowerment (4 Hours)

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

Reference Books

S.No	Authors	Title	Publishers	Year of Publication
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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	TRowbotham, 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 Bookco.pvt ltd, New Delhi	1989

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
IV	Non-Major Elective	26NMU01B	Advanced Tamil	24	2

SEMESTER – IV

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: X	26PHU10	Mathematical Physics	48	4
Contact hours per week: 4					
Year	Semester	Internal Marks	External Marks	Total Marks	
SECOND	IV	25	75	100	
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: After completion of the course, the learners will be able to					
COs	Course Statement				Knowledge Level
CO1	state the types of matrices, Vector and Scalar functions, Mean, Median, Mode, Curve fitting, Definitions and Generalized Displacement, Velocity, Potential and force				K1
CO2	interpret Eigen values, Gradient of a scalar field, Moment generating function, Laws reducible to linear law, Generalized acceleration, momentum, Physical significance of H				K2

CO3	solve problems in Matrix, Divergence and Curl of a vector function, Mean, Median, Mode, Probability, Graphical method	K3
CO4	examine Eigen vectors, method of group averages, Stokes theorem, simple pendulum, Linear harmonic oscillator using Lagrangian and Hamiltonian function	K4
CO5	evaluate the principles of mechanics, solve problems in Cayley-Hamilton theorem, Gauss Divergence theorem, Standard Deviation, Equations involving three constants, Principle of least squares, Fitting a straight line and a parabola	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	3	3
CO2	9	9	9	9	9	3	3
CO3	9	9	3	3	3	3	1
CO4	9	9	3	3	1	1	1
CO5	9	3	1	1	1	1	1
Total Contribution of COs to Pos	45	39	25	25	23	11	9
Weighted Percentage of COs Contribution to POs	2.60	2.56	1.81	2.17	2.58	1.54	1.26

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I – Matrices (10 Hours)
Introduction – Special types of Matrices - Adjoint of a matrix – Rank of a Matrix-Eigen values and Eigen Vectors – Characteristic Equation of a Matrix- Cayley – Hamilton theorem -Problems

UNIT II - Vector Calculus (10 Hours)
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 - Statistics

(10 Hours)

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

UNIT IV-Empirical Laws and Curve Fittings

(9 Hours)

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

UNIT V- Lagrangian & Hamiltonian Formulation

(9 Hours)

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

Text Books

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

Reference Books

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

Web References

1. <https://byjus.com/jee/matrices/>
2. <https://www.esaral.com/matrices-notes-for-class-12-iit-jee/>.
3. https://en.wikipedia.org/wiki/Vector_calculus
4. <https://web.iitd.ac.in/courses/mcl704/BVC>
5. <https://sites.und.edu/timothy.prescott/apex/web/apex.Ch15.S7.html>
6. <https://byjus.com/maths/central-tendency/>
7. <https://revisionmaths.com/gcse-maths-revision/statistics-handling-data/standard-deviation>
8. <https://byjus.com/maths/probability/>
9. <https://www.slideshare.net/niravbvyas/curve-fitting-lecture-notes>
10. <https://www.youtube.com/watch?v=sOE8Slo3Pqw>
11. <https://www.physics.rutgers.edu/~shapiro/book3>

Category	Course	Course	Course Title	Contact	Credit (C)
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	Type	Code				Hours	
Part – III	Core: XI Allied: V	26PHU11	Chemistry - II			48	4
Contact hours per week: 4							
Year	Semester	Internal Marks	External Marks	Total Marks			
SECOND	IV	25	75	100			
Preamble: The aim is to provide the student to acquire knowledge about experimental techniques in chemistry & to apply chemistry in Batteries							
Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement					Knowledge Level	
CO1	define basic terms involved in Coordination Chemistry, Phase Rule, Electro Chemistry & Analytical techniques & Usage of bio molecules					K1	
CO2	elaborate the basic knowledge on Coordination Chemistry, bio molecules, Phase diagram, Electro Chemistry & Analytical techniques					K2	
CO3	illustrate Coordination compounds in various applications, Phase diagram for Alloy system, EMF series to construct Cell, Analytical techniques to determine the structure of Chemical compounds					K3	
CO4	examine the problems related with Cell construction, Alloy formation, Errors in Analytical techniques calculate EMF of the Cell					K4	
CO5	evaluate the importance of Coordination Compounds, Analytical techniques determine the structure of Glucose & Fructose					K5	
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	9
CO2	9	9	9	9	3	9	9
CO3	9	9	3	3	3	3	3
CO4	9	9	3	3	3	3	3
CO5	9	9	3	3	3	3	3

Total Contribution of COs to POs	45	45	27	127	15	21	27
Weighted Percentage of COs Contribution to POs	2.60	2.96	1.96	2.34	1.69	2.95	3.79

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT I - Co-ordination Chemistry (10 Hours)

Definition of terms - Classification of Ligands - Nomenclature - Chelation - EDTA and its application – Werner's Theory - Effective Atomic Number - Pauling's theory- Postulates - Applications to $\text{Ni}(\text{CO})_4$, $\text{Ni}(\text{CN})_4$, $\text{K}_4[\text{Fe}(\text{CN})_6]$ - 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 –Biomolecules (10 Hours)

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

UNIT III -Phase Diagram (10 Hours)

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

UNIT IV – Electrochemistry (9 Hours)

Galvanic cells – emf - standard electrode potential - reference electrodes - electrochemical series and its applications - Determination of pH using H_2 , Quinhydrone and glass electrodes - Electroplating process -Nickel and Chrome plating – Batteries- Primary and Secondary- Ni-Cd Battery- Lithium ion Battery- Fuel cells- H_2O_2 fuel cells- Advantages
Self study Topic: Batteries in future

UNIT V - Analytical Techniques (9 Hours)

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

Text Books

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

Reference Books

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

Web References**UNIT I**

1. <https://www.slideshare.net/mobile/chemsant/san-complex-1>
2. <https://courses.lumenlearning.com/introchem/chapter/coordination-number-ligands-and-geometries/>
3. <https://www.slideserve.com/uriah/nomenclature-of-coordination-compounds-iupac-rules>
4. <https://www.slideshare.net/mobile/MohammedIsmail251/theory-of-coordinationcompounds1>

UNIT II

1. <https://www.slideshare.net/drjayeshpatidar/carbohydrate-66452675>
2. <https://www.slideshare.net/shefalijaiswal2/carbohydrates-91702638>

UNIT III

1. <https://www.slideshare.net/jatingarg52/the-phase-rule>

UNIT IV

1. <https://www.slideshare.net/mobile/KALYANIPALANICHAMY/batteries-and-types>
2. <https://images.app.goo.gl/ADvXo628GHwd77ZK9>
3. <https://www.slideshare.net/mobile/Santachem/fuel-cells-26447935>
4. <https://www.slideshare.net/mobile/samiramohammadpour/lithium-ion-batteries-75379943>

UNIT V

1. <https://microbenotes.com/uv-spectroscopy-principle-instrumentation-applications/>
2. <https://www.slideshare.net/mobile/SAU84000/infrared-instrumentation>
3. https://youtu.be/SsIYDEma_cU
4. <https://youtu.be/Y7GbNd8mMHg>
5. <https://youtu.be/ZWwLCnuYRys>
6. <https://youtu.be/lj5OWzhZSac>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XII Practical: II	26PHU12	Physics - Practical II	72	4

Contact hours per week: 3							
Year	Semester	Internal Marks	External Marks	Total Marks			
SECOND	III & IV	40	60	100			
Preamble: The aim is to provide the students acquire practical knowledge of physics experiments to handling of experiments and comprehend about different equipment used							
Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement						Knowledge Level
CO1	find the various principles, procedures and methods through working in groups in performing the laboratory experiments and by compare the results						K1
CO2	realize the formation of spectrum with prism and grating						K2
CO3	calculate temperature coefficient by construct various Carey Foster bridge						K3
CO4	measure simple electrical and magnetic quantities such as voltage, current, and earth's magnetic field						K4
CO5	determine the young's modulus of materials by using Koenig's method						K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	3	3
CO2	9	9	9	9	9	3	3
CO3	9	9	9	9	3	1	1
CO4	9	9	3	3	3	1	1
CO5	9	3	3	3	1	1	1
Total Contribution of COs to POs	45	39	33	23	25	9	9
Weighted Percentage of COs Contribution	2.60	2.56	2.39	1.99	2.81	1.26	1.26

to Pos							
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos							
COURSE CONTENT ANY TWELVE (12) EXPERIMENTS ONLY							
1. Rigidity Modulus – Torsional Pendulum – with & without symmetrical masses 2. Quincke's method – Surface Tension and Angle of Contact of Mercury 3. Specific heat capacity – Newton's law of cooling – Spherical calorimeter 4. Spectrometer – Hollow prism – Refractive index of the Prism 5. Determination of M_H and B_H 6. Zener diode - Characteristics 7. Spectrometer – (i – i') curve 8. Newton's rings – Refractive index of a lens 9. Reduction factors of a Tangent Galvanometer - BG 10. Comparison of Mutual Inductance - BG 11. Spectrometer – Grating – Minimum deviation & Normal Incidence 12. Young's Modulus – Koenig's Method – Non Uniform bending 13. Young's Modulus – Koenig's Method – Uniform bending 14. Spectrometer – Cauchy's constant 15. Spectrometer – Dispersive Power 16. Spectrometer – Narrow Angled Prism 17. Carey Foster's Bridge – Temperature Coefficient 18. Potentiometer – Reduction factor of T.G in Primary 19. Potentiometer – EMF of a thermocouple 20. B.G - Absolute Capacity 21. B.G – Determination of High Resistance							

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XIII Allied: IV	26PHU13	Allied Chemistry - Practical	72	2
Contact hours per week: 3					
Year	Semester	Internal Marks	External Marks	Total Marks	
SECOND	III & IV	40	60	100	
Preamble: The aim is to provide the student to gain basic knowledge in Practical Chemistry & also to understand a basic concept in both qualitative & quantitative analysis					
Course Outcome: After completion of the course, the learners will be able to					

COs	Course Statement						Knowledge Level
CO1	define the concepts of aromaticity, acid-base neutralization reaction, properties of saturated compounds & principles of volumetric law						K1
CO2	estimate the amount of substances present in unknown sample by using volumetric analysis & discuss about organic reagents						K2
CO3	calculate normality of unknown solution & weight of unknown substances examine organic compounds						K3
CO4	categorize & identify organic compounds based on its functional group. distinguish qualitative & quantitative analysis						K4
CO5	evaluate organic compounds by organic qualitative analysis determine the chemical reactions						K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	3	9
CO3	9	9	9	9	9	3	3
CO4	9	9	3	3	9	3	3
CO5	9	9	3	3	3	3	3
Total Contribution of COs to POs	45	45	33	33	39	21	27
Weighted Percentage of COs Contribution to POs	2.60	2.96	2.39	2.86	4.38	2.95	3.79
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos							
COURSE CONTENT ANY TWELVE (12) EXPERIMENTS ONLY							

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 Books

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

Total Marks: 100

External - 50

Organic Qualitative Analysis – 20, Volumetric Estimation -20, Record - 10

Volumetric Analysis (mark split up)

i) Procedure 4 marks

ii) Results < 2 % - 16 marks 2-3 % -12 marks 3-4 % - 8 marks 4 > 4 % - 4 marks

Organic Qualitative Analysis (mark split up)

i) Identification of Nitrogen - 4 marks

ii) Saturated on unsaturated - 2 marks

iii) Aliphatic or Aromatic - 2 marks

iv) Preliminary reactions with Procedure - 4 marks

v) Functional group identified correctly - 8 marks

Internal - 50

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
IV	Skill Enhancement-I	26SEPHU01	C Programming	36	2
Contact hours per week: 3					
Year	Semester	Internal Marks	External Marks	Total Marks	
SECOND	IV	50		50	

Preamble To learn about the C programming language concepts.							
Course Outcomes On the successful completion of the course, students will be able to							
COs	Course Statement						Knowledge Level
CO1	Learning the basics of C Tokens, Input and Output functions and Operators						K1, K2
CO2	Summarize the concepts of Decision Making and Looping functions						K2, K4
CO3	Classifying Arrays and its Types						K3, K4
CO4	Analyze the concepts of Structures & Union and files						K4,K5
CO5	Determine the usage of pointers and files						K4,K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	9	3	1	3	3	1
CO2	1	9	3	1	3	9	1
CO3	1	3	3	3	9	3	3
CO4	1	3	3	3	9	9	3
CO5	1	3	3	1	3	1	9
Total Contribution of COs to POs	7	27	15	9	27	25	17
Weighted Percentage of COs Contribution to POs	0.40	1.77	1.09	0.78	3.03	3.51	2.39
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos							
COURSE CONTENT							

Unit I - Data Types & Control Statements I (8 hours)

Introduction- Compilation- Data Types- Variables- Declaration- Input and Output- Operators- Arithmetic and Bit Manipulations- Programs Based on Operators- Introduction to Decision Making and Control Statements- Syntax- Examples. Programs: [1-5].

Unit II - Control Statements II (7 hours)

Programs Based on Decision Making- Programs Based on Iterations- Pattern Programming. Programs: [6-10].

Unit III - Arrays and Pointers (7 hours)

Introduction to 1D Array- Programs Based on 1D Array- Pointers Introduction- Syntax and Declaration- Example Programs- 2D Arrays- Static and Dynamic Introduction- 2D Array Programs- Multi Dimensional Arrays Introduction- Syntax and Declaration- Examples. Programs: [11-15].

Unit IV - Functions (7 hours)

Functions – With and Without Reference- Recursion- Recursion Using Functions- Strings Introduction- String using Functions- String Programs. Programs: [16-20].

Unit V - Structures, Unions and Files (7 hours)

Structure- Union- Example Programs- Static and Dynamic Memory Allocation- Structure using Pointers- Macros- Files. Programs: [21-25].

Programs:

1. Write a C program to illustrate Relational operators.
2. Write a C program to illustrate Logical operators.
3. Write a C program to illustrate Bitwise operators.
4. Write a C program to find the largest of three numbers.
5. Write a C program to check whether the given year is leap year or not.
6. Write a C program to print Full half Pyramid. (star/ numbers/ alphabets)
7. Write a C program to print Rhombus Pattern. (star/ numbers/ alphabets)
8. Write a C program to print Hollow Square Pattern. (star/ numbers/ alphabets)
9. Write a C program to print Hollow Diamond Pattern. (star/ numbers/ alphabets)
10. Write a C program to print Floyd's Triangle. (star/ numbers/ alphabets)
11. Write a C program to print the largest and the second largest element of the 1D-array.
12. Write a C program to remove the duplicate elements in the given 1D-array.
13. Write a C program to insert an element in the given list of sorted 1 D-array.
14. Write a C program to transpose a given matrix. (2d-array)
15. Write a C program to access and to print the 1D array elements using pointers.
16. Write a C program to count the number of vowels in a string using null character.
17. Write a C program to access and to print the string using pointers.
18. Write a C program to copy the content of one string to another string using pointers.
19. Write a C program to add two numbers using function.
20. Write a C program to check whether the given string is palindrome or not.
21. Write a C program to sort the numbers in the descending order using functions.
22. Write a C program to find the factorial if given number using recursive method.
23. Write a C program to print the Fibonacci series using recursive method.
24. Define a structure that will describe the following information. Student name, Class, Roll number, Subject, Marks and Total. Using student declare an array student list with 30 elements. Write program in C to read the information about all the 30 students and to display the information.

25. Define a union that will describe the following information. Student name, Class, Roll number, Subject, Marks and Total. Using student declare an array student list with 30 elements. Write program in C to read the information about all the 30 students and to display the information.

Reference Books

S.No	Authors	Title	Publishers	Year of Publication
1.	Stephen G. Kochan	Programming in C	Sams Publishing	2004
2.	Greg Perry and Dean Miller	C Programming Absolute Beginner's Guide	Pearson Education, Inc	2014
3.	E. Balaguruswamy	Programming in ANSI C	McGraw Hill Education	2019
4.	Paul Deitel & Harvey Deitel	C How to Program	Phi Learning Pvt Ltd	2013
5.	Madhav M. Bokare & Nishigandha G. Kurale	C Programming For Beginners	Sankalp Publication	2021
6.	Greg Perry	C Programming Absolute Beginner's Guide	Pearson Education	2014

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
IV	Ability Enhance ment: II	26AEU02	Consumer Rights (Curriculum as recommended by UGC)	24	2
Contact hours per week: 2					
Year	Semester	Internal Marks	External Marks	Total Marks	
SECOND	V	50	--	50	
Preamble: This paper seeks to familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights					
Course Outcome: After completion of the course, the learners will be able to					
COs	Course Statement				Knowledge Level

CO1	memorize the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards	K1
CO2	explain the Consumer Protection Law in India	K2
CO3	impart sound practical grounding about the practice of consumer law and the procedure followed	K3
CO4	evaluate the regulations and legal actions that helps to protect consumers	K4
CO5	analyze the knowledge and skills needed for a career in this field	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	1	0	1
CO2	9	9	9	9	1	0	1
CO3	9	9	9	3	3	1	1
CO4	9	3	1	1	3	3	3
CO5	9	1	3	0	9	9	9
Total Contribution of COs to POs	45	31	31	21	17	13	15
Weighted Percentage of COs Contribution to POs	2.60	2.04	2.25	1.91	1.91	1.82	2.11

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and Pos

COURSE CONTENT

UNIT 1 - Conceptual Framework (8 Lectures)
Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws,

Legal Metrology.

Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite

UNIT II - The Consumer Protection Law in India (8 Lectures)

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

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

UNIT III - Grievance Redressal Mechanism under the Indian Consumer Protection Law (8 Lectures)

Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal; Offences and penalties.

Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices

UNIT IV - Role of Industry Regulators in Consumer Protection (6 Lectures)

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

UNIT V - Contemporary Issues in Consumer Affairs (6 Lectures)

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

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

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

Suggested Readings

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press.

2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
7. E-books: - www.consumereducation.in
8. Empowering Consumers e-book,
9. ebook, www.consumeraffairs.nic.in
10. The Consumer Protection Act, 1986 and its later versions. www.bis.org

Articles

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

Periodicals

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

Websites

www.ncdrc.nic.in
www.consumeraffairs.nic.in
www.iso.org.
www.bis.org.in
www.consumereducation.in
www.consumervoice.in
www.fssai.gov.in
www.cercindia.org

SEMESTER – V

Category	Course Type	Course Code	Course Title			Contact Hours	Credit (C)
Part – III	Core: XIV	26PHU14	Solid State Physics			72	5
Contact hours per week: 6							
Year	Semester	Internal Marks	External Marks	Total Marks			
THIRD	V	25	75	100			
Preamble: To acquire knowledge about solids materials and their bonds. To motivate the students in order to apply the principles of band theory in their research studies							
Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement					Knowledge Level	
CO1	outline the basic terms of crystal, unit cell, Meissner effect, Isotopes effect and Bragg’s law, Dulong and Pettit’s law, ohm’s law, hall effect know about the magnetic materials, conducting materials, dielectric materials and superconducting materials					K1	
CO2	summarize the types of crystals, Miller indices, Dielectric constant and displacement vector, Thermodynamic effect, Electrical conductivity – Thermal conductivity, Wide-Mann and Franz ratio					K2	
CO3	demonstrate the Bragg’s law and Dulong and Pettit’s law, Sommerfield model calculate the value of hall co-efficient using hall effect illustrate the free electron theory in conducting materials					K3	
CO4	classify the various types of magnetic materials (Dia, Para and ferro) and polarizability derive the Clausius mossotti relation for Dielectrics					K4	
CO5	determine Crystal structure for SC, HCP, BCC, FCC, NaCl					K5	
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	3	3
CO2	9	9	9	9	9	3	3

CO3	9	9	9	3	3	3	1
CO4	9	9	3	3	3	3	1
CO5	9	9	3	3	3	1	1
Total Contribution of COs to POs	45	45	33	27	27	13	9
Weighted Percentage of COs Contribution to POs	2.60	2.96	2.39	2.34	3.03	1.82	1.26

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I – Crystal Structure (15 Hours)

Crystalline and amorphous solids –Space lattice - Basis and crystal structure – Crystal translation vectors – Symmetry operations – Unit cell and primitive lattice cell - Lattice parameters of the Unit cell– Symmetry elements – Point groups and space groups – Bravais lattices – Number of atoms per unit cell – Coordination number – Atomic packing – Atomic radius – Simple cubic structure – Body centered cubic structure – Face centered cubic structure – Hexagonal close packed structure – Structure of NaCl and CsCl

UNIT II - Bonding in Solids (15 Hours)

Ionic Bonding – Energy of formation of NaCl molecule – Potential energy diagram of ionic molecules –Born-Haber cycle – Characteristics of ionic bond – Covalent bond – Characteristics of covalent bond –Metallic Bond – Characteristics of metallic crystals – Cohesive energy of metals – Molecular bond – Types– Vander Waal's bond – Dipole bond – Hydrogen bond – Characteristics of molecular bond – Comparison of bonds

UNIT III - Electron Theory of Metals (14 Hours)

Free electron gas – Drude-Lorentz electron theory – Electrical conductivity – Thermal conductivity –Wiedemann and Franz ratio – Electrical resistivity versus temperature – Sommerfeld model – Free electron gas in 3D – Fermi-Dirac statistics and distribution – Failure of the free electron model

UNIT IV - Semiconductors (14 Hours)

Semiconductors – Chemical bonds – Mechanism of current flow – Forbidden, valence & conduction bands – Intrinsic and extrinsic semiconductors – Mobility, drift velocity, conductivity and carrier concentration of intrinsic semiconductor – Impurity states – Energy band diagram – Fermi level

UNIT V- Dielectrics and Magnetic properties of materials (14 Hours)

Dielectric Polarisation - Dielectric constant and displacement vector - Polarizability - Clausius mossotti relation – Types of Polarizability – Orientational Polarizability - Ionic Polarizability – Electronic Polarizability – Total Polarizability

Dia, Para, Ferri and Ferromagnetic Materials, Classical Langevin Theory of dia and Paramagnetic Domains - Quantum Mechanical Treatment of Paramagnetism - Curie's law

Text Books

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

Reference Books

1. Introduction to Solid State Physics – Charles Kittel, 8th Edition, 2004, Wiley India Pvt.Ltd
2. Solid State Physics– A J Dekker, 1999, Macmillan India Pvt Ltd.,
3. Elements of Solid-State Physics – J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India
4. Introduction to solids –Leonid V.Azaroff, 2004, Tata Mc-Graw Hill
5. Solid State Physics – Neil W.Ashcroft and N.David Mermin, 1976, Cengage Learning
6. Solid State Physics –Rita John, 2014, McGraw Hill

Web References

1. <https://www.uou.ac.in › science › MSCPHY-17>
2. <https://ccsuniversity.ac.in › bridge-library › pdf>
3. <https://www.hansrajcollege.ac.in › elearning › Lec..>
4. <http://vskub.ac.in › wp-content › uploads › 2020/04>
5. https://en.wikipedia.org/wiki/Free_electron_model
6. http://engineeringphysics.weebly.com/uploads/8/2/4/3/8243106/unit_iii_electron_theory.pdf
7. <https://www.studocu.com/in/document/panjab-university/quantum-mechanics/free-electron-theory-lectures-with-examples/10891195>
8. https://www.youtube.com/watch?v=gXoH0_G8BvY
9. <https://slideplayer.com/slide/8038358/>
10. <https://www.slideshare.net/ALAMIN208/free-electron-theory>
11. <https://sites.google.com/site/puenggphysics/home/unit-5/hall-effect>
12. <https://www.arsdcollege.ac.in/wp-content/uploads/2020/05/Hall-Effect.pdf>
13. <https://www.slideshare.net/GyanraoPhysics/sommerfeld-model-maya-yadav-ppt>
14. https://hmmcollege.ac.in/uploads/Clausius_Mossotti_Debye_Equation.pdf
15. <https://opentextbc.ca/universityphysicsv3openstax/chapter/superconductivity/>
16. <https://www.britannica.com/science/superconductivity/Magnetic-and-electromagnetic-properties-of-superconductors#ref912874>
17. <https://www.slideshare.net/AkelRidha/superconductivity-a-presentation>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XV	26PHU15	Electronics & Communication	72	5
Contact hours per week: 6					

Year	Semester	Internal Marks	External Marks	Total Marks			
THIRD	V	25	75	100			
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 Outcome: After completion of the course, the learners will be able to							
COs	Course Statement			Knowledge Level			
CO1	recognize the concepts of basic electronic components			K1			
CO2	interpret about the essentials of AM and FM modulation and demodulation			K2			
CO3	illustrate the principle and functioning of basic electronic components like diodes, LED, transistors, FET and UJT			K3			
CO4	classify the need for transistor biasing, construction and operations of the electronic components			K4			
CO5	analyze, evaluate and to compare the concepts behind the working of amplifiers, oscillators, semiconducting diodes, rectifiers and filters			K5			
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	.3
CO2	9	9	9	3	3	3	3
CO3	9	3	9	3	3	3	1
CO4	9	3	9	3	9	3	3
CO5	9	3	3	1	3	1	3
Total Contribution of COs to POs	45	27	39	19	21	13	13
Weighted Percentage of COs Contribution to POs	2.60	1.77	2.83	1.65	2.36	1.82	1.83
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							

COURSE CONTENT

UNIT I - Diodes, Rectifiers and Filters

(15 Hours)

Characteristics of PN Junction diode – Half Wave Rectifier – Efficiency and Ripple Factor – Centre Tapped Full Wave Rectifier – Bridge Rectifier – Efficiency and Ripple Factor – 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 - Transistors and Transistor Biasing

(15 Hours)

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 - Amplifiers and Oscillators

(14 Hours)

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

UNIT IV- FET, UJT and Multivibrators

(14 Hours)

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

UNIT V – Modulation and Demodulation

(14 Hours)

Modulation – Types – Amplitude Modulation – Modulation factor – Analysis of AM wave – Side band frequencies in AM wave – Transistor AM modulator – Power – Limitations of AM – Frequency Modulation – Demodulation – Essentials in demodulation – Phase Modulation – Demodulation- AM diode detector – AM radio receivers – Superheterodyne receiver – Advantages

Text Books

1. Basic Electronics (Solid State) - B.L. Theraja, 1995, S. Chand & Co. Ltd (Unit 1-3)
2. A textbook of Applied Electronics - R.S. Sedha, 1999, S. Chand & Co. Ltd (Unit 1-3)
- 3.. Electronic communications Modulations of Transmission, Prentice –Hall of India (Unit 5)
- 4.. Handbook of Electronics, Gupta and Kumar, Pragati Prakashan, Meerut (Unit 1-5)

Reference Books

1. Principles of Electronics – VK Mehta and Rohit Mehta, 2005, S. Chand & Co. Ltd., (Unit 1, 2, 3)

Web References

1. <https://nptel.ac.in/courses/122/106/122106025/>

2. <https://byjus.com/physics/modulation-and-demodulation/>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XVI	26PHU16A/ 26PHU16B/ 26PHU16C	Institutional Training/ Industrial Training/ Mini Project	--	1

Contact hours per week: --

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V	100	--	100

Preamble: To provide the students a deeper knowledge in Institutional training, Industrial Training, Mini Project – creating a opportunity for the students

Course Outcome: After completion of the course, the learners will be able to

COs	Course Statement	Knowledge Level
CO1	identify the problems & solutions related to Institutional Training, Industrial Training	K1
CO2	explain the principles involved in concerned Mini projects & Summarize the processes in various Industries	K2
CO3	solve the problems in concerned project works & also Produce excellent project report for both Institutional Training & Mini projects	K3
CO4	examine different types of problems, principles, Experimental techniques & applications of concerned project works	K4
CO5	design new machines, principles & applications for future generations& evaluate different issues related to Science & Technology	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	9	9	9
CO5	9	9	9	3	3	3	3

Total Contribution of COs to POs	45	45	45	39	39	39	39
Weighted Percentage of COs Contribution to POs	2.60	2.96	3.27	3.38	4.38	5.47	5.48
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XVII Open Elective	****	Physics in Day to Day Life (Offered for students of other Departments)	48	2
Contact hours per week: 4					
Year	Semester	Internal Marks	External Marks	Total Marks	
THIRD	V	25	75	100	
Preamble: To demonstrate knowledge and understanding of the fundamental concepts in Physics					
Course Outcome: After completion of the course, the learners will be able to					
COs	Course Statement				Knowledge Level
CO1	identify the measurements, Electric Current, Electricity, Magnetism, Electrolysis, Magnetic field effect and Natural Phenomena’s in Atmosphere				K1
CO2	explain the concepts in Electricity, standard units and Types of Motion, Electric power, Effects of current and Magnet, lightning, thunder, water harvesting, coal and petroleum				K2
CO3	perform different SI units in measurement, electricity and magnetism, electric potential, resistance, chemical effect of Electric current and magnetism				K3
CO4	criticize the measurements of different units, Electricity, Resistance, associate reaction of magnetic Poles, Protection against natural calamities,				K4
CO5	interpret the measuring, electric current, Laws in Physics, electricity and magnetism, Natural Resources				K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate					

CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	9	9	9	3	3	1	1
CO3	9	9	3	3	2	1	1
CO4	9	3	3	1	1	1	1
CO5	3	3	3	1	1	1	1
Total Contribution of COs to POs	39	33	27	17	10	7	5
Weighted Percentage of COs Contribution to POs	2.25	2.17	1.96	1.47	1.12	0.98	0.70
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							
COURSE CONTENT							
UNIT I - Motion and Measurements of Distances (10 Hours) History of Transportation-Measurement of Length – Distance-Conventional Methods of Measurement-Standard Units of Measurement-Types of Motion UNIT II - Electricity (10 Hours) Electric current-Electric circuit-Components of basic electric circuit: Cell, Switch, and Bulb Conductor-Insulator-Electric potential and potential difference-Circuit diagram-Ohm's law Factors on which the resistance of conductor depends-Resistance of a system of resistors-Heating effect of electric current-Electric power UNIT III - Chemical Effects of Electric Current and Magnetism (10 Hours) Conduction of Electricity-Conduction of Electricity in Liquids – Electrolysis-Electrolysis and Electroplating - Discovery of Magnets-Magnet-Poles of a magnet-Like poles repel and unlike poles attract Magnetic Field of Earth and Compass UNIT IV - Some Natural Phenomena (9 Hours) Lightning-Charging by rubbing-Transfer of Charge-The Story of Lightning-Lightning Safety Phenomena related to earthquakes-Protection against earthquakes UNIT V - Management of Natural Resources (9 Hours) Save the Environment from Environmental Pollution – Reuse– Recycle-Why do we need to manage our natural resources-Forest and wildlife-Sustainable management-Water for all : dam-Water harvesting-Coal and petroleum Reference Book							

1. Monograph – Department of Physics

Web reference

1. https://www.researchgate.net/publication/277130091_Energy_Resources_Indian_Scenario
2. https://www.aps.edu/energy-conservation/energy-lessons-and-games/energy-lessons-and-games/26_HS-IssueOfRenewableEnergy.pdf
3. <https://ncert.nic.in/textbook/pdf/hesc114.pdf>
4. <https://www.learnbse.in/motion-and-measurement-of-distances-class-6-notes/>
5. <https://web.njit.edu/~vitaly/121/notes121.pdf>

Category	Course Type	Course Code	Course Title		Contact Hours	Credit (C)	
Part – III	Core: XVIII Elective I	26PHU17A	Digital Electronics and Microprocessor		60	4	
Contact hours per week: 5							
Year	Semester		Internal Marks	External Marks	Total Marks		
THIRD	V		25	75	100		
Preamble: The aim is to provide basic knowledge of binary addition, combinations of logic circuits & microprocessor							
Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement					Knowledge Level	
CO1	identify different number systems, basic laws and properties in binary arithmetic recall De-Morgan’s theorems and memory devices describe basics of flip-flops and microprocessors					K1	
CO2	interpret binary arithmetic, Boolean algebra, Logic gates, arithmetic circuits and instructions in microprocessors					K2	
CO3	solve Boolean expressions and binary arithmetic. Apply Boolean algebra and logic gates for the construction of flip-flops and memory devices.					K3	
CO4	design shift registers and modulus counters from flip-flops. Analyze the architecture and working of microprocessor.					K4	
CO5	construct a circuit by analyzing the logic gate operations and flip-flops. Program the 8085 Microprocessor					K5	
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7

CO1	9	9	9	9	9	9	9
CO2	9	9	9	3	9	3	9
CO3	9	9	9	3	9	3	3
CO4	9	9	3	1	3	1	3
CO5	9	3	3	1	1	1	1
Total Contribution of COs to POs	45	39	33	17	31	17	25
Weighted Percentage of COs Contribution to POs	2.60	2.56	2.39	1.47	3.48	2.38	3.51

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Number System and Codes (12 Hours)

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

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

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

UNIT II - Boolean algebra and Arithmetic circuits (12 Hours)

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

A/D and D/A Converters and Memory Devices: A/D Converters- Successive Approximation Register ADC– D/A Converters- Binary Weighted DAC- DAC Memory Devices: Classification of memories –ROM-PROM, EPROM, EEPROM, RAM (Basic ideas only)

UNIT III - Flip-flops and their applications (12 Hours)

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

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

UNIT IV - Microprocessors (12 Hours)

8085 microprocessors – Microprocessor communication and bus timings – Demultiplexing

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

UNIT V- Programming the 8085

(12 Hours)

8085 programming model – Instruction classifications – Instruction and data format – 8085 Instructions: Data transfer operations – Logic operations – Branch operations – Programming techniques – Looping, counting and indexing – Additional data transfer and 16-bit arithmetic instructions – Counters and time delays – Simple programs – Addition, subtraction, multiplication, division, setting bits, masking bits

Text Books

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

Reference Books

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

Web References

- 1.https://www.tutorialspoint.com/computer_logical_organization/digital_number_system.htm (unit 1)
2. <https://www.allaboutcircuits.com/textbook/digital/chpt-7/boolean-arithmetic/> (unit 2)
3. www.electronicsforu.com/technology-trends/learn-electronics/flip-flop-rs-jk-t-d (unit 3)
- 4.https://www.tutorialspoint.com/microprocessor/microprocessor_8085_architecture.htm (unit 4)
- 5.https://www.technicalsymposium.com/microprocessor_lab.pdf&ved=2ahUKEwinnouv0qPzAhX8qJUCHc_rDzsQFnoECBIQAQ&sqi=2&usg=AOvVaw3_gyq42mqYnRkGBTvqYe1S (unit 5)

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XVIII Elective I	26PHU17B	Soil Physics	60	4
Contact hours per week: 5					
Year	Semester	Internal Marks	External Marks	Total Marks	
THIRD	V	25	75	100	

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 Outcome: After completion of the course, the learners will be able to							
COs	Course Statement						Knowledge Level
CO1	outline the importance of soil physics						K1
CO2	summarize the properties of soil and water flow in soil						K2
CO3	apply physics laws to study the properties of soil use mathematical models to quantify transfer processes for air, water, and solutes in saturated soils						K3
CO4	analyze the transfer processes for air, water, and solutes in water unsaturated soils						K4
CO5	estimate and measure the various properties of soil using various mathematical models						K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	3	9	3	9
CO3	9	9	9	3	9	3	3
CO4	9	9	3	1	3	1	3
CO5	9	9	3	1	1	1	1
Total Contribution of COs to POs	45	45	33	17	31	17	25
Weighted Percentage of COs Contribution to POs	2.60	2.56	2.39	1.47	3.48	2.38	3.51
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							
COURSE CONTENT							
UNIT I - Introduction (12 Hours)							
Soil Physics before the 70s-Soil Physics in relation to Natural Sciences and Soil Science-How to acquire Physics knowledge by Scientific Methods-Application of Physics laws in							

Soil Physics- Fundamental and derived physical quantities and System of units

UNIT II - Basic Physical Properties of Soils (12 Hours)

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

UNIT III - Soil Water (12 Hours)

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

UNIT IV - Water Flow in Saturated Soils (12 Hours)

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

UNIT V - Water Flow in Unsaturated Soils (12 Hours)

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

Text Books

1. Text book of soil physics -Arunkumarsaha Anuradha saha, 2012, Kalyani Publisher
2. Soil physics an introduction - Manoj K.Shukla, 2013, CRC press
- 3.Principles of soil physics - Rattan Lal, Manoj K. shukla, 2004, CRC press
4. Environmental Soil Physics, by Daniel Hillel, 1998. Academic Press, Inc. San Diego, California

Web References

1. <https://passel2.unl.edu/view/lesson/0cff7943f577/10> (Unit 1, 3 and 2)
2. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1996> (unit 4 and 5)
3. www.soilphysicsnotes.com

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XVIII Elective I	26PHU17C	Geo Physics	60	4
Contact hours per week: 5					
Year	Semester	Internal Marks	External Marks	Total Marks	
THIRD	V	25	75	100	
Preamble: The aim is to provide the student to gain deeper knowledge in geological Physics, earth structure & fossil animals					
Course Outcome: After completion of the course, the learners will be able to					

COs	Course Statement	Knowledge Level
CO1	recall the structure of earth recollect the Definition of earthquakes, seismographs, fossils	K1
CO2	discuss about the origin and structure of earth	K2
CO3	distinguish plateaus and plains. explain the importance of invertebrates and classifications of vertebrates	K3
CO4	infer the topography of earth	K4
CO5	criticize the evolution of man, elephant and horse and the flora of India	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	3	9	3	9
CO3	9	9	9	3	9	3	3
CO4	9	9	3	1	3	1	3
CO5	9	9	3	1	1	1	1
Total Contribution of COs to POs	45	45	33	17	31	17	25
Weighted Percentage of COs Contribution to POs	2.60	2.56	2.39	1.47	3.48	2.38	3.51

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Physical Geology I (12 Hours)

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

UNIT II - Physical Geology II (12 Hours)

Mountains: Origin - Types - Characteristics - Distribution - Types of Plateaus and Plains -

Weathering: Types - Products

UNIT III- Structural Geology (12 Hours)

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

UNIT IV- Paleontology I (12 Hours)

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

UNIT V- Paleontology II (12 Hours)

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

Text Books

1. Principles of Physical Geology - Arthur Holmes, Thomas Nelson and Sons Ltd., London, 1965
2. Elements of Structural Geology - 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, John Wiley and Sons, New York, 1976
4. Vertebrate Palaeontology - A.S. Romer, 1960, Chicago Press
5. Invertebrate Palaeontology - Henry Woods, 1967, Cambridge University Press, Cambridge

Web References

1. <https://www.google.com/url?sa=t&source=web&rct=j&url=https://www.britannica.com/science/earthquake-geology&ved=2ahUKEwj6e-o2qPzAhVixjgGHcDDBq4QFnoECBEQAQ&usg=AOvVaw0LdsfkYa1J-XldjcBK8wLW&cshid=1632902130394> (unit 1)
2. <https://www.clearias.com/major-landforms-mountains-plateaus-plains/> (unit 2)
3. <http://www.neotectonica.ufpr.br/geologia/1.pdf&ved=2ahUKEwj2rsmU26PzAhXx4jgGHT6RBSAQFnoECAMQAQ&usg=AOvVaw0HgFAdXaQoRMQTGutrzbyJ> (unit 3)
4. https://cohsem.nic.in/docs/subjects/34_Geology.pdf&ved=2ahUKEwi2nIHP26PzAhWc4zgGHdLdDc4QFnoECA0QAQ&usg=AOvVaw1b6t1aYjGNT1Jxp9S2mUol (unit 4)
5. https://www.bgs.ac.uk/discovering-geology/fossils-and-geological-time/brachiopods/&ved=2ahUKEwjHqdmw4KPzAhUX63MBHf6MCEcQFnoECCsQAQ&usg=AOvVaw0RTv6_h4-IBNSNMpFYKzJc (unit 5)

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
IV	Skill Enhancement Course: II	26SEPHU02	Home Electrical Installation	36	2

Contact hours per week: 3							
Year	Semester	Internal Marks	External Marks	Total Marks			
THIRD	V	50	--	50			
Preamble: The aim is to introduce the fundamentals of electrical circuits, components, transmission, wiring systems, power rating, and safety measures, enabling students to understand, apply, and implement electrical practices safely and efficiently.							
Course Outcomes On the successful completion of the course, students will be able to							
COs	Course Statement				Knowledge Level		
CO1	Recall fundamental concepts and terms related to electrical circuits, wiring, safety devices, energy units, and digital electronics.				K1		
CO2	Explain the working principles of AC/DC, transformers, meters, wiring systems, and safety protocols with appropriate technical terminology.				K2		
CO3	Apply formulas and principles to calculate electrical quantities such as power, energy, impedance, and evaluate electricity consumption and billing.				K3		
CO4	Analyze electrical systems including wiring configurations, load distribution, and fault conditions to improve performance and safety.				K4		
CO5	Evaluate and design safe, efficient electrical layouts and energy-saving strategies for domestic or small-scale industrial applications.				K5		
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	3	3	3
CO2	9	3	3	3	3	3	3
CO3	9	3	3	3	3	3	3
CO4	9	3	3	3	3	3	3
CO5	9	3	3	1	1	1	0
Total Contribution of COs to POs	45	21	21	13	13	13	12

Weighted Percentage of COs Contribution to POs	2.60	1.38	1.52	1.13	1.46	1.82	1.69
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							
COURSE CONTENT							
UNIT I - Simple Electrical Circuits (7 hours) charge, current, potential difference, resistance – simple electrical circuits – DC ammeter, voltmeter, ohmmeter – Ohm's law – difference between DC and AC – advantages of AC over DC – electromagnetic induction - transformers – inductors/chokes – capacitors/condensers – impedance – AC ammeter, voltmeter – symbols and nomenclature UNIT II - Transmission of Electricity (7 hours) Production and transmission of electricity – concept of power grid – Series and parallel connections – technicalities of junctions and loops in circuits – transmission losses (qualitative) – roles of step-up and step-down transformers – quality of connecting wires – characteristics of single and multicore wires UNIT III - Electrical Wiring (7 hours) Different types of switches – installation of two way switch – role of sockets, plugs, sockets - installation of meters – basic switch board – electrical bell – indicator – fixing of tube lights and fans – heavy equipment like AC, fridge, washing machine, oven, geyser, jet pumps – provisions for inverter – gauge specifications of wires for various needs. UNIT IV - Power Rating and Power Delivered (7 hours) Conversion of electrical energy in to different forms – work done by electrical energy – power rating of electrical appliances – energy consumption – electrical energy unit in kWh – calculation of EB bill – Joule's heating – useful energy and energy loss – single and three phase connections – Measures to save electrical energy – energy audit. UNIT V - Safety Measures (8 hours) Insulation for wires – colour specification for mains, return and earth – Understanding of fuse and circuit breakers – types of fuse: kit-kat, HRC, cartridge, MCB, ELCB – purpose of earth line – lighting arrestors – short circuiting and over loading – electrical safety – tips to avoid electrical shock – first aid for electrical shock – fire safety for electric current. Text Books 1. Wiring a House: 5th Edition by Rex Cauldwell, (2014). 2. Black & Decker Advanced Home Wiring, 5th Edition: Backup Power - Panel Upgrades – AFCI Protection - "Smart" Thermostats, by Editors of Cool Springs Press, (2018). Reference Book 1. Complete Beginners Guide to Rough in Electrical Wiring: by Kevin Ryan (2022). Web References 1. https://onlinecourses.nptel.ac.in/noc23_ee81/preview 2. https://onlinecourses.swayam2.ac.in/nou20_cs08/preview 3. https://onlinecourses.swayam2.ac.in/nou25_ec07/preview							

Category	Course Type	Course Code	Course Title			Contact Hours	Credit (C)
Part – V	Proficiency Enhancement	26PEPHU01	Lasers (Self-Study)			--	2
Contact hours per week: --							
Year	Semester	Internal Marks	External Marks	Total Marks			
THIRD	V	--	100	100			
Preamble: The aim is to provide the students to know the principles of laser light and also the applications of Lasers							
Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement					Knowledge Level	
CO1	define Absorption, Emission, Population Inversion, Coherence, LASER, Semiconductor, Diode					K1	
CO2	explain the phenomenon fluorescence, stimulated emission, working of Population inversion, optical pumping, Gas Laser, Q Switched operation of Laser					K2	
CO3	illustrate the properties of Laser light in Cavity dumping, Diode doped solid state laser, Organic dye lasers, chemical lasers.					K3	
CO4	investigate the Interaction of Radiation and Matter, working of Gas Laser and Semi-Conductor Laser, Resonant Cavity					K4	
CO5	compare the various forms of Diode, Stimulated emission and Absorption. discuss X ray Laser and Tunable Laser					K5	
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	3	3	9
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	3	3	3	3	3
Total Contribution of COs to	45	45	39	39	21	21	27

POs							
Weighted Percentage of COs Contribution to POs	2.60	2.96	2.83	3.38	2.36	2.95	3.79

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I -Fundamentals of Lasers

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

UNIT II – Physics of Laser

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

Text Books

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

Reference Books

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

SEMESTER – VI

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XIX	26PHU18	Quantum Mechanics and Relativity	72	5

Contact hours per week: 6							
Year	Semester	Internal Marks	External Marks	Total Marks			
THIRD	VI	25	75	100			
Preamble: To develop the problem-solving ability and to motivate the students to apply Schrodinger’s equation or solving problems in wave mechanics, nuclear physics etc.,							
Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement						Knowledge Level
CO1	evoke wave properties of matter, basic principles of wave equation of the quantum mechanics and theory of relativity						K1
CO2	realize the concept of uncertainty principle, schrodinger’s wave equation, operators in quantum mechanics						K2
CO3	impose schrodinger’s wave equation to solve one, two, three dimensional problems						K3
CO4	clarify the nature of De- Broglie relation, particle in a box, Lorentz transformation equation						K4
CO5	assess the dual nature of matter, normalization of wave function and orthogonality of energy Eigen function						K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	3	3
CO2	9	9	9	9	9	3	3
CO3	9	9	3	3	9	3	3
CO4	9	3	3	3	3	1	1
CO5	9	3	3	1	3	1	1
Total Contribution of COs to POs	45	33	27	25	33	11	11
Weighted Percentage of COs Contribution to POs	2.60	2.17	1.96	2.17	3.71	1.54	1.54
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							

COURSE CONTENT

UNIT I - Wave Properties of Matter

(15 Hours)

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

UNIT II - Uncertainty Principle

(15 Hours)

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

UNIT III - Schrödinger's Wave Equation

(14 Hours)

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

UNIT IV- Applications of Schrodinger's Equation

(14 Hours)

Particle in a box - Potential step – The barrier penetration problem – Linear harmonic oscillator - Significance of Quantum Numbers: Significance of various quantum numbers – n , l , m_l - Electron probability density

UNIT V - Special Theory of Relativity

(14 Hours)

Galilean Transformation equation – Ether Hypothesis – Michelson-Morley experiment – Explanation of the Negative results – special theory of Relativity – Lorentz transformation equation – Length contraction – Time dilation – Addition of Velocities – Variation of Mass with velocity – Mass energy equivalence.

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

Text Books

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

Reference Books

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

Web References

1. https://www.ks.uiuc.edu/Services/Class/PHYS480/qm_PDF/QM_Book.pdf

2. https://scholar.harvard.edu/files/david-morin/files/waves_quantum.pdf
3. <https://www-thphys.physics.ox.ac.uk/people/JamesBinney/qb.pdf>

Category	Course Type	Course Code	Course Title			Contact Hours	Credit (C)
Part – III	Core: XX	26PHU19	Atomic and Nuclear Physics			72	5
Contact hours per week: 6							
Year	Semester		Internal Marks	External Marks	Total Marks		
THIRD	VI		25	75	100		
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 Outcome: After completion of the course, the learners will be able to							
COs	Course Statement					Knowledge Level	
CO1	mention the properties of positive rays, Periodic classification of elements, Zeeman effect, Paschen - Back effect, Stark effect, Radioactivity					K1	
CO2	illustrate Thomson’s Parabola method, Dempster’s mass spectrograph, Aston’s mass spectrograph, The Bohr atom model, Vector model, The Stern and Gerlach experiment, Larmor’s theorem					K2	
CO3	determine e/m of positive rays, to demonstrate the Atom Models, Magneto Optical Properties of Spectrum, Radioactivity, Nuclear Detectors and accelerators					K3	
CO4	examine Positive rays, Periodic classification of elements, Fine Structure of the sodium D line, Alpha, Beta and Gamma rays, nuclear fission and fusion					K4	
CO5	criticize mass defect and packing fraction of positive rays, the Critical Potentials, Magnetic dipole moment due to spin, Half-life period, Mean life period					K5	
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9

CO3	9	9	9	9	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	1	3	3
Total Contribution of COs to POs	33	33	33	33	25	27	27
Weighted Percentage of COs Contribution to POs	1.90	2.17	2.39	2.86	2.81	3.79	3.79

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I -Positive Rays (15 Hours)

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

UNIT II - Atom Models (15 Hours)

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

UNIT III - Magneto Optical Properties of Spectrum (14 Hours)

Magnetic dipole moment due to orbital motion of the electron – Magnetic dipole moment due to spin – The Stern and Gerlach experiment – Optical spectra – Fine Structure of the sodium D line – Zeeman effect – Experiments – Lorentz classical theory – Expression for the Zeeman shift – Larmor's theorem – Quantum mechanical explanation of the normal Zeeman effect – Anomalous Zeeman effect – Paschen – Back effect – Stark effect

UNIT IV - Radioactivity (14 Hours)

Natural Radioactivity : Alpha, Beta and Gamma rays – Properties – Determination of e/m of Alpha particle – Origin of Gamma rays – Laws of Radioactivity – Law of Radioactive disintegration – Half life period – Mean life period (Definitions, Expression) – Units of Radioactivity – Artificial Radioactivity –Preparation of radio elements – Application of radio isotopes - Nuclear Fission and Fusion: Nuclear fission – Energy released in Fission – Bohr and Wheelers theory of Nuclear fission – Nuclear fusion

UNIT V - Nuclear Detectors (14 Hours)

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

Text Books

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

Reference Books

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

Web References

1. <https://www.britannica.com/science/atom>
2. <http://www.freebookcentre.net/physics-books-download/Nuclear-and-Particle-Physics-by-Axel-Maas.html>
3. https://pdfgoal.com/downloads/nuclear_physics_by_dc_tayal_pdf
4. <http://www.freebookcentre.net/physics-books-download/gotoweb.php?id=15436>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XXI	26PHU20	Introduction to Space Physics	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	VI	25	75	100

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

Course Outcome: After completion of the course, the learners will be able to

COs	Course Statement	Knowledge Level
CO1	develop the concepts of the Sun, Cosmic Rays, Galactic astronomy, stellar objects and age of stars	K1
CO2	explain about cosmic objects, milky way, Hubble telescope, Dwarf Galaxies, Composition of stars	K2
CO3	organize this learning about cosmic things in detecting about new forms and stars in astronomy and new finding of stars	K3
CO4	implement features of Sun temperature of corona, Hubble theory behind Hubble telescope, cosmic radiation time variation, classification of galaxies, luminous of stars, stellar revolution, nebula or supernova	K4
CO5	criticize the concepts of the Sun, Cosmic Rays, Galactic astronomy, stellar objects and age of stars, Neutron stars	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	3
CO2	9	9	9	9	9	3	3
CO3	9	9	9	9	9	3	3
CO4	9	9	9	9	3	3	1
CO5	9	9	3	3	3	1	1
Total Contribution of COs to POs	45	45	39	39	27	19	11
Weighted Percentage of COs Contribution to POs	2.60	2.96	2.83	3.38	3.03	2.66	1.54

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - The Sun (10 Hours)

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

UNIT II - Introduction to Cosmic rays (10 Hours)

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

UNIT III - Galactic astronomy (10 Hours)

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

UNIT IV - Stellar Objects (9 Hours)

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

UNIT V - Stellar Evolution and Space Applications (9 Hours)

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

Text Books

1. An Introductory Course on Space Science and Earth's Environment - S.S.Degaonker, Gujarat University Publication, Ahmedabad

2. Atomic and Nuclear Physics-An Introduction- Subrahmanayam
3. An introduction to Astro Physics-Saraswathy K.N

Web references

1. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjnxvve_aXzAhXR6XMBHY_BBg4QFnoECAQQA&url=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FGalactic_astronomy&usg=AOvVaw3qaSu3ienqdmAS9Bb5m_0
2. www.astronomynotes.com

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XXII Practical: III	26PHU21	Electronics- Practical III	48	4

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V & VI	40	60	100

Preamble: The aim is to provide the students better practical knowledge of core electronic experiments, to know about different equipment and to learn to handle them

Course Outcome: After completion of the course, the learners will be able to

COs	Course Statement	Knowledge Level
CO1	recite and demonstrate the construction of various electronic circuits using discrete electronic components and to study their performance	K1
CO2	contrast the working principles of the electronic circuits and various applications of the discrete electronic components	K2
CO3	use the various electronic circuits, components and express their function using their discrete components	K3
CO4	associate the various characters of constructed electronic circuits using diodes, IC'S, UJT, FET, amplifiers and transistors	K4
CO5	relate the difference between the use of various electronic circuits and analyze their waveform using CRO and AFO	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9

CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	3	3	3	1
Total Contribution of COs to POs	45	45	45	39	33	33	25
Weighted Percentage of COs Contribution to POs	2.60	2.96	3.27	3.38	3.71	4.63	3.51

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT 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							

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XXIII Practical : IV	26PHU22	Digital Electronics and Microprocessor - Practical IV	48	4

Contact hours per week: 3							
Year	Semester	Internal Marks	External Marks	Total Marks			
THIRD	V & VI	40	60	100			
Preamble: The aim is to provide the students better practical knowledge in digital electronics and microprocessor programs and to learn the execution of microprocessor programs and construction of circuits using discrete components							
Course Outcome: After completion of the course, the learners will be able to							
COs	Course Statement						Knowledge Level
CO1	remember the basic components of microprocessor and the images of logic gates and truth tables						K1
CO2	outline the microprocessor programs for primary arithmetic operations						K2
CO3	examine the working of microprocessor with flowchart and program						K3
CO4	analyze the various truth tables of universal building blocks and Demorgan’s theorem using gates						K4
CO5	show the performance of flip-flops, code converter, adder and subtractor using discrete components						K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate							
CO-PO MAPPING (COURSE ARTICULATION MATRIX)							
POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	3
CO4	9	9	9	9	9	9	3
CO5	9	9	9	3	9	9	3
Total Contribution of COs to POs	45	45	45	39	45	45	27
Weighted Percentage of COs Contribution to POs	2.60	2.96	3.27	3.38	5.06	6.31	3.79
Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs							

COURSE CONTENT	
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	

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XXIV Elective II	26PHU23A	Fiber Optic Communication Systems	60	4
Contact hours per week: 5					
Year	Semester	Internal Marks	External Marks	Total Marks	
THIRD	VI	25	75	100	
Preamble: To know the basic optical laws and properties of optical fiber.					
Course Outcome: After completion of the course, the learners will be able to					
COs	Course Statement				Knowledge Level
CO1	recall the terms light waves,optical terms				K1
CO2	understand the fiber classification.				K2

CO3	test the cables during installation of cable based on cable selection criteria	K3
CO4	analyze the attenuation and dispersion in an optical fibre.	K4
CO5	calculate the efficiency, modulation bandwidth and spectral emission of light sources	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	3	3	3
CO2	9	9	9	3	3	3	3
CO3	9	9	9	3	3	3	3
CO4	9	9	9	3	3	3	3
CO5	9	9	9	1	1	3	1
Total Contribution of COs to POs	45	45	45	13	13	15	13
Weighted Percentage of COs Contribution to POs	2.60	2.96	3.27	1.13	1.46	2.10	1.83

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Fiber Classification (12 hours)

Propagation of light waves in an optical fiber – Acceptance angle and Acceptance cone of a fiber – Numerical Aperture (NA) – NA of a graded Index Fiber – Mode of propagation. Fibers –classification – stepped index fiber – stepped index monomode fiber – Graded index multimode fiber – Comparison of step and graded index fibers.

UNIT II- Fiber Fabrication and Cables (12 hours)

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

UNIT III - Fiber Losses and Dispersion in Optics (12 hours)

Attenuation in optic fiber – Rayleigh Scattering losses – Absorption losses – Bending losses – Radiation induced losses – Inherent defect losses – Core and Cladding losses. Dispersion in an

Optical Fiber – Inter-modal dispersion – Material Chromatic Dispersion – Dispersion Power penalty – Total Dispersion delay.

UNIT IV - Light Sources For Optical Fibers (12 hours)

LED – The process involved in LEDs – Structures of LED – Fiber – LED Coupling – Modulation bandwidth and Spectral Emission of LEDs.

Unit V- Applications (12 hours)

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

Text Books

1. Optical Fibers and Fiber Optic Communication Systems, Subir Kumar Sarkar, S. Chand Limited, (2007).
2. Fiber Optics Communication, D.C.Agarwal, S.Chand (2010).
3. Optical fiber Communication, Keiser, McGraw Hill (2010).

Reference Books

1. Optical Fibers and Fiber Optic Communication Systems, R.K.Puri and V.K.Babbar, S
2. Introduction to Fiber Optics, Ajoy Ghatak, K. Thyagarajan, Cambridge (2009)

Web References

1. <https://nptel.ac.in/courses/115/107/115107095/>
2. [https://www.youtube.com/playlist?list=PLq-Gm0yRYwTgr7v3HhdrI_Kcc38369fw /](https://www.youtube.com/playlist?list=PLq-Gm0yRYwTgr7v3HhdrI_Kcc38369fw/)

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XXIV Elective II	26PHU23B	Applied Instrumentation	60	4
Contact hours per week: 5					
Year	Semester	Internal Marks	External Marks	Total Marks	
THIRD	VI	25	75	100	
Preamble: To provide a good foundation in measurements, knowledge of the behavior of instruments and to inspire interest for the knowledge of concepts regarding measurements					
Course Outcome: After completion of the course, the learners will be able to					
COs	Course Statement				Knowledge Level
CO1	recite the concepts of basic measuring temperature, pressure, thermal and nuclear measurements, X-ray spectrum and data acquisition systems				K1
CO2	restate about the essentials of calibrating an instrument, measuring radiations, oscilloscopes and digital converters and also to explain x-ray spectra				K2

CO3	use the principle and functioning of thermistors, thermometers, pressure measuring devices, GM counter and Coolidge tube	K3
CO4	associate the need for problem analysis of measuring devices, signal display devices and Compton effect	K4
CO5	analyze, evaluate and to compare the concepts behind the different types of thermometers, pressure measuring and radiation measuring devices, data conversion and display devices and analyzing the expression for change of wave length	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	3	3	3
CO2	9	9	9	3	3	3	3
CO3	9	9	9	3	3	3	3
CO4	9	9	9	3	3	3	3
CO5	9	9	9	1	1	3	1
Total Contribution of COs to POs	45	45	45	13	13	15	13
Weighted Percentage of COs Contribution to POs	2.60	2.96	3.27	1.13	1.46	2.10	1.83

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Basic Concept of Measurement (12 Hours)

Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices – Calibration - Measurement of Temperature: Temperature scales – The ideal gas thermometer -Thermistors – Thermoelectric effects – quartz crystal thermometer – liquid crystal thermography

UNIT II – Pressure Measurement (12 Hours)

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

UNIT III - Thermal and Nuclear Radiation Measurements (12 Hours)

Introduction – Detection of thermal radiation – Measurement of emissivity – Reflectivity

and Transmitting measurements – Solar radiation measurements – Detection of Nuclear radiation – The Geiger Muller counter

UNIT IV- Data Acquisition and Conversion (12 Hours)

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

UNIT V - X-ray Spectra (12 Hours)

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

Text Books

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

Web References

1. <https://nptel.ac.in/courses/108/105/108105064/>

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XXIV Elective II	26PHU23C	Smart Materials	60	4
Contact hours per week: 5					
Year	Semester	Internal Marks	External Marks	Total Marks	
THIRD	VI	25	75	100	
Preamble: To gain deeper knowledge of smart materials, sensors, actuators &the advances in smart materials					
Course Outcome: After completion of the course, the learners will be able to					
COs	Course Statement				Knowledge Level
CO1	assemble the different types of polymer materials, smart actuators, smart composites				K1
CO2	explain polycrystalline systems, Piezoelectric strain sensors, the knowledge about low strain smart sensors - Matteuci Effect and Nagoka-Honda Effect				K2

CO3	discuss Magneto strictive Actuation, Composites based on Classical Laminated Plate Theory	K3
CO4	sketch about the composite beams, Composites based on Classical Laminated Plate Theory	K4
CO5	criticize Intelligent System Design, Wiedemann Effect about the advances in smart structures	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	3	3	3
CO2	9	9	9	3	3	3	3
CO3	9	9	9	3	3	3	3
CO4	9	9	9	3	3	3	3
CO5	9	9	9	1	1	3	1
Total Contributio n of COs to POs	45	45	45	13	13	15	13
Weighted Percentage of COs Contributio n to POs	2.60	2.96	3.27	1.13	1.46	2.10	1.83

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Overview of Smart Material (12 Hours)

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

UNIT II - High-Band Width, Low Strain Smart Sensors (12 Hours)

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

UNIT III - Smart Actuators (12 Hours)

Modelling Piezoelectric Actuators - Amplified Piezo Actuation – Internal and External

Amplifications - Magnetostrictive Actuation - Joule Effect - Wiedemann Effect - Magnetovolume Effect - Magnetostrictive Mini Actuators - IPMC and Polymeric Actuators - Shape Memory Actuators - Active Vibration Control - Active Shape Control - Passive Vibration Control - Hybrid Vibration Control

UNIT IV - Smart Composites (12 Hours)

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

UNIT V - Advances In Smart Structures & Materials (12 Hours)

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

Text Book and Reference Books

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

Web references

1. <https://www.iberdrola.com/innovation/smart-materials-applications-examples>
2. www.smartmaterials.com

Category	Course Type	Course Code	Course Title		Contact Hours	Credit (C)
IV	Skill Enhance ment: III	26SEPHU03	Digital Photography		36	2
Contact hours per week: 3						
Year		Semester	Internal Marks	External Marks	Total Marks	
THIRD		VI	50	--	50	
Preamble: The aim is to equip students with the fundamental principles and practical skills in image formation, camera functions, digital imaging, and postproduction techniques.						
Course Outcome: On the successful completion of the course, students will be able to						
COs	Course Statement					Knowledge Level
CO1	Recall the fundamental concepts of image formation, camera components, light behavior, and image editing tools.					K1
CO2	Explain the working principles of photographic lenses, film-based and digital cameras, light sensitivity, and post-processing techniques.					K2
CO3	Apply knowledge of lens parameters, exposure settings, and					K3

	basic editing techniques to capture and enhance digital images effectively.	
CO4	Analyze image quality in terms of megapixel resolution, noise, lighting conditions, and lens settings for various photography tasks.	K4
CO5	Design and execute a complete photographic workflow—from capturing images using various cameras to final digital post-production and printing.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	9
CO2	9	9	3	9	3	9	9
CO3	9	9	3	3	9	9	9
CO4	9	3	3	3	3	3	3
CO5	9	3	3	3	1	3	3
Total Contribution of COs to POs	45	33	21	27	19	33	33
Weighted Percentage of COs Contribution to POs	2.60	2.17	1.52	2.34	2.13	4.63	4.63

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs

COURSE CONTENT

UNIT I - Photography and Basic Principle of Image Formation (8 Hours)
Principle –chemical route and digital route –light, wavelengths, colours – shadows – light intensity and distance – making light form images –pin-hole images – practical limitations to pin-hole images – lens instead of pin-hole – focal length and image size – imaging of closer subjects.

UNIT II - Lenses – Controlling the Images (7 Hours)
Photographic lens – focal length and angle of view (*problems*) – focusing movement –

aperture and f-numbers (*problems*) – depth of field– depth of focus – image stabilization – lenses for digital cameras – lens and camera care.

UNIT III - Camera Using Films and its Types (7 Hours)

Camera and its essential components– shutter – aperture – light measurement – film housing – camera types: view camera– view finder camera – Reflex camera– single lens reflex (SLR) camera

UNIT IV - Digital Cameras Principle and Types (7 Hours)

Principle of digital image capturing –comparison of digital and analog picture information – megapixel – grain, noise and pixel density – optical and digital zooming – image stabilizer – bit depth – white balance – colour modes – file formats (TIFF, RAW & JPEG) – storage cards and types – digital cameras: camera phones – compact camera – hybrid camera – digital SLR.

UNIT V - The Digital Image – Postproduction (7 Hours)

Hardware: computer and its peripherals – software: saving digital file – basic editing: navigating the image – undo/redo/history – crop – rotate – brightness &contrast – colour balance – hue/saturation – dodge/burn – cloning &retouching – removing an element in an image – advanced editing: histogram/levels – curves – selection tools: magic wand – printing digital images: inkjet printer – laser printer – dye sub printer – lambda/light jet printers.

Text Books

1. Michel J.Langford , Anna Fox & Richard Sawdon Smith, Basic photography, 9th Edition, 2010-NL, Focal press, London
2. Henry Carroll, Read this if you want to take great photographs of people, Laurence King Publishing

Reference Books

1. Mark Galer, Digital Photography in Available Light essential skills, 2006, Focal press, London
2. Paul Harcourt Davies, The Photographer's practical handbook, 2005, UK PRESS.

Web References

1. [Basics of Photography – SWAYAM/NPTEL](#)
2. [Digital Image Processing – NPTEL](#)

Co-Scholastic Courses:

Certificate Course

Categ ory	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
	Certificate Course	26PHCCU1	BASIC ELECTRONICS		
Contact hours per week: 2 Hrs - SEM III / 2 Hrs – SEM IV					
Year	Semester	Internal Marks	External Marks	Total Marks	
Preamble: The aim is to provide the students to gain knowledge and understanding the basic concepts of Electronics					
COURSE CONTENT					
UNIT I Network Theorem: Circuit – Series resistive – parallel –Thevenin’s theorem – Norton’s theorem – Maximum power transfer theorem					
UNIT II Semiconducting Devices: PN Junction diode – Formation of depletion layers – Forward biased PN junction – V/I characteristics – Reverse biased PN junction – V/I characteristics – Combined Forward and Reverse V/I characteristic – Junction Breakdown – Equivalent circuit PN junction					
UNIT III Diode: PN Junction diode – Clipper and Clamper – Special diode –Varactor–Schotky–Thermistor					
UNIT IV Optoelectronic devices – Photovoltaic devices – PIN diode – Avalanche – Photoconductive cells					
UNIT V Transistor: Bipolar junction Transistor – Transistor biasing – Important biasing rule – Transistor currents					
Text Book 1. Basic Electronics Solid state - B.L Theraja , 2016 , Fifth edition , S.Chand& Co Ltd. (unit 1-5)					
Reference Books 1. A textbook of Applied Electronics – R.S Sedha , 1999 , S.Chand& Co Ltd 2. Principles of Electronics – V.K. Mehta and Rohit Mehta , 2005 ,S.Chand& Co Ltd					

Extra Credit Courses

Courses offered by the department for ADVANCED LEARNERS

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
		26PHALU1	DIGITAL LITERACY		
Contact hours per week:					
Year	Semester	Internal Marks	External Marks	Total Marks	
	I – VI				
Preamble: By undergoing the Digital Literacy Course, one should be able to acquire basic knowledge on computer & its usage					
Course Outcome: After completion of the course, the learners will be able to					
COs	Course Outcome				Knowledge Level
CO1	recall the basic operations of a computer				K1
CO2	interpret the concepts of Online Banking and understand the available e-Governance Services				K2
CO3	register for a web-based e-mail account and using it, Opening of e-mail attachments				K3
CO4	access the Internet and finding information of interest				K4
CO5	create, edit and format documents using a word processor				K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate					
Unit	Course Content				Instructional Hours
I	Operating a Computer System Introduction - Operating System and its usage - Basic Operations: Mouse (click, click and drag, double click, right click (for the context menu)), Keyboard (some of the more common letters, enter, Delete, backspace, shift, tab and arrows) - Starting and Shutting Down a Computer - User Interface for Desktop and Laptop - Task Bar - Icons & Shortcuts - Running an Application - Scroll Bars - Using Help - File and Folder Management - Types of File Extensions				-
II	Create, Edit and Format documents using Word Processor Introduction - Word Processing Basics - Opening Word Processing Package - Title Bar, Menu Bar, Toolbars & Sidebar - Creating a New Document - Opening and Closing Documents - Opening Documents - Save and Save As - Closing Document - Using The Help - Page Setup - Print Preview - Printing of Documents - PDF file and Saving a Document as PDF file - Document manipulation & Formatting				-

	- Text Selection - Cut, Copy and Paste - Font, Color, Style and Size selection - Alignment of Text - Undo & Redo - Spelling & Grammar - Shortcut Keys	
III	Introduction to Internet and finding information on Internet Introduction - Internet - Concept of Internet & WWW - Website Address and URL - Applications of Internet - Modes of Connecting Internet (Hotspot, Wi-Fi, LAN Cable, Broadband, USB Tethering) - Popular Web Browsers (Internet Explorer/Edge, Chrome, Mozilla Firefox) - Exploring the Internet - Surfing the web - Popular Search Engines - Searching on Internet	-
IV	Working with e-mail Introduction - Structure of E-mail - Using E-mails - Opening Email account - Mailbox: Inbox and Outbox - Creating and Sending a new E-mail - Replying to an E-mail message - Forwarding an E-mail message - Access email with attachments - Delete an e-mail	-
V	Understanding Financial Literacy and e-Governance Services Introduction - Digital Financial Tools - Understanding OTP [One Time Password] and QR [Quick Response] Code - UPI [Unified Payment Interface] - AEPS [Aadhaar Enabled Payment System] - USSD[Unstructured Supplementary Service Data] - Card [Credit / Debit] - eWallet- PoS [Point of Sale] - Internet Banking - National Electronic Fund Transfer (NEFT) - Real Time Gross Settlement (RTGS) - Immediate Payment Service (IMPS) - Online Bill Payment - Overview of e-Governance Services like Railway Reservation, Passport, eHospital [ORS] - Accessing e-Governance Services on Mobile Using "UMANG APP"	-
Test Book 1.Expert Computer Course –Prof. Satish Jain, Geetha, 2017, BPB Publications (Unit 1-5)		

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
		26PHALU2	PYTHON PROGRAMMING		
Contact hours per week:					
Year	Semester	Internal Marks	External Marks	Total Marks	
	I – VI				
Preamble: The aim is to make the students to understand the concepts of Python Programming					
Course Outcome: After completion of the course, the learners will be able to					

COs	Course Outcome	Knowledge Level
CO1	recite the Variables, Reserved Words and Basic Syntax of python programming list out Standard Data Types and operators in python programming recall control statements, expressions and the definition of functions in python programming	K1
CO2	explain the variables, commands and data types in python programming summarize the operators, control statements, expressions and functions in python programming interpret single input and output in python programming	K2
CO3	Edit Python Files compare and apply different types of data types, operators, control statements and expressions in python programming apply the appropriate operations expressions to loop the program	K3
CO4	Execute Python from the command Line analyze the control statements relate built-in functions of python programming	K4
CO5	criticize Passing parameters to a Function choose the particular type of operators and data types for different applications of python programming	K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate		
Unit	Course Content	Instructional Hours
I	Basics Python-Variables-ExecutingPythonfromtheCommandLine- EditingPythonFiles- Python Reserved Words - Basic Syntax- Comments	--
II	Standard Data Types – Relational Operators - Logical Operators - Bit Wise Operators - Simple Input and Output.	--
III	Control Statements Control Flow and Syntax - Indenting - if Statement - statements and expressions	--
IV	String operations- Boolean Expressions -while Loop - break and continue - for Loop	--
V	Functions Definition - Passing parameters to a Function - Built-in functions- Variable Number of Arguments	--
Text Books 1. Mark Summerfield - Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009 2.Martin C. Brown - PYTHON: The Complete Reference, McGraw-Hill, 2001		

Category	Course Type	Course Code	Course Title		Contact Hours	Credit (C)
		26PHALU3	ACOUSTICS			
Contact hours per week:						
Year		Semester	Internal Marks	External Marks	Total Marks	
		I – VI				
Preamble: The aim is to make the students understand the basics of Acoustics Theory, experimental explanation and to learn information about their principles and methods						
Course Outcome: After completion of the course, the learners will be able to						
COs	Course Outcome					Knowledge Level
CO1	know the basic concepts, principles of Acoustics.					K1
CO2	verify the methods to produce different types of sounds.					K2
CO3	identify the techniques for particular application.					K3
CO4	appreciate Magnetostriction method and its applications.					K4
CO5	realize the practical applications in different fields of sound energy					K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate						
Unit	Course Content					Instructional Hours
I	Waves and Oscillations Simple Harmonic Motion- Free vibration of a body – amped Vibrations – forced vibrations- Fourier Theorem –Fourier series- intensity of sound –measurement of intensity of sound- Decibel and Bel					-
II	Ultrasonics Introduction – Piezo electric effect – production of ultrasonic waves –Piezoelectric crystal method- production of ultrasonic waves-Magnetostriction method-Detection of ultrasonic waves –properties of ultrasonic waves-applications of ultrasonic wave					-
III	Acoustics of Buildings Reverberation –derivation of Sabine’s formula for reverberation time- absorption coefficient – Acoustics of Buildings –a factors affecting the Acoustics of buildings-Sound distribution in an auditorium					-
IV	Reflection, Refraction and Diffraction Reflection of sound- Reflection of plane wave at a plane surface, experimental demonstration of reflection of sound-Refraction of a plane wave front at a plane surface – Experimental Demonstration of refraction of sound- diffraction					-

	of sound- Explanation of diffraction of sound	
V	Practical Applications Gramophone- microphone and loud speaker- tape recording – sound ragging – locating the direction of aircraft – wave front at supersonic speed flight of a bullet	-
Text Books 1. Properties of matter and Acoustics – R. Murugesan, KiruthigaSivaprasath, S. Chand company Pvt Ltd. (Unit 1,2,3) 2. A text book of sound – N. Subrahmanyam Brijlal Second revised edition – Vikas publishing house pvt ltd.,		

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
		26PHALU4	THEORY OF RELATIVITY		
Contact hours per week:					
Year	Semester	Internal Marks	External Marks	Total Marks	
	I - VI				
Preamble: The aim is to provide the students to develop appropriate knowledge about relativity and to learn information about their transformation equations and special theory of relativity					
Course Outcome: After completion of the course, the learners will be able to					
COs	Course Outcome				Knowledge Level
CO1	know the various basic theories of relativity				K1
CO2	recognize the importance of Ether hypothesis, variations of Mars with velocities				K2
CO3	interpret Michelson Morley Experiments mars energy equivalence				K3
CO4	categorize the various transformation equations, length contraction				K4
CO5	communicate simple concepts in relativity, gravitational Red shift				K5
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate					
Unit	Course Content				Instructional Hours
I	Basics of Relativity Introduction – Frame of Reference – Newtonian Principle of Relativity – Galilean transformation Equations				--

II	General Relativity Galilean transformation Equations – The Ether hypothesis- The Michelson Morley Experiment- Predictions of General Relativity- Photons and Gravity	--
III	Special Theory Special Theory of Relativity – The Lorentz Transformation Equations – length contraction	--
IV	Mars and Velocities Time Dilation – Relativity of simultaneity – addition of velocities – variation of mass with velocity - Gravitational Red shift	--
V	Energy Equivalence Mass Energy Equivalence – Minkowski's four-Dimensional space – Time continuum – The General Theory of Relativity	--
Text Book 1. Modern Physics, R. Murugesan (2013), S.Chand and Company pvt.Ltd (Unit 1-5)		