P.K.R. ARTS COLLEGE FOR WOMEN (AUTONOMOUS)

(Accredited with 'A' grade by NAAC - Affiliated to Bharathiar University, Coimbatore)

GOBICHETTIPALAYAM – 638 476

DEPARTMENT OF PHYSICS

BACHELOR OF SCIENCE IN PHYSICS

Syllabus

For the candidates admitted from the Academic Year 2021-2022 and onwards

Under CBCS PATTERN

B.Sc., PHYSICS PROGRAMME STRUCTURE
CBCS – 2021-2022 and onwards

CATEGORY	COMPONENTS	NO. OF COURSES	CREDIT(S) /COURSE	TOTAL CREDITS	PROPOSED SEMESTER
Part – I	Tamil/Hindi/French/Kannada/Malayalam/Sanskrit	4	4	16	I – IV
Part – II	English	4	4	16	I – IV
Part - III	Core Theory /Core Practical	15	5/3/1	85	I – VI
	Allied Theory/ Allied Practical	5	4/3/2		
	Elective	2	2		
	Institutional Training/ Articleship Training / Mini Project	1	1	1	V
	Open Elective	1	2	2	V
Part – IV	**A). Foundation Courses** i. Environment Studies ii. Yoga and Ethics	 1 1	 2 2	4	 I II
	B). Ability Enhancement Courses i. Information Security ii. Consumer Rights	 1 1	 2 2	4	 III IV
	C). Skill Enhancement Courses i. Energy Resources ii. Life Skills(Jeevan Kaushal) iii. Programming in C, C++ - Practical	 1 1 1	 2 1 2	5	 IV V VI
	D). Non-Major Elective i. Indian Women and Society / Advanced Tamil	1	2	2	III
Part - V	**A). Proficiency Enhancement** - Self Study Course	1	2	5	V
	B). Competency Enhancement i. NSS/YRC/RRC/CCC/PHY.EDU/Others ii. CompetencyEnhancement - ProfessionalGrooming iii. Competency Enhancement – Students Social activity (Related to Curriculum)	 1 1 1	 1 1 1		 SEMESTER I – VI SEMESTER I – VI SEMESTER I – VI
Total Marks: 3700			**Total Credits: 140**		

P.K.R ARTS COLLEGE FOR WOMEN
(Autonomous Institution, accredited by NAAC with 'A' Grade)
BACHELOR OF SCIENCE IN PHYSICS
Programme Scheme and Scheme of Examinations
(For students admitted from 2021-2022 & onwards)
(For branches offering Part-I and Part-II for Four semesters)

Scholastic Courses:

Category / Part	Components	Course Code	Title of the Course	Hrs/ week	Exam hrs.	CIA	ESE	Total marks	Credits
			SEMESTER – I						
I	Language: I	21LTU01/ 21LHU01/ 21LFU01/ 21LKU01/ 21LMU01/ 21LSU01	Tamil - I/ Hindi - I/ French - I/ Kannada - I/ Malayalam - I/ Sanskrit - I	6	3	50	50	100	4
II	English: I	21LEU01	English - I	6	3	50	50	100	4
III	Core: I	21PHU01	Mechanics	6	3	50	50	100	5
III	Core: II Allied: I	21PHU02	Mathematics – I	7	3	50	50	100	4
III	****	****	Physics – Practical I	3	--	--	--	--	--
IV	Foundation: I	21FCU01	Environmental studies (Curriculum as recommended by UGC)	2	3	--	50	50	2
			TOTAL	**30**				**450**	**19**
			SEMESTER – II						
I	Language: II	21LTU02/ 21LHU02/ 21LFU02/ 21LKU02/ 21LMU02/ 21LSU02	Tamil - II/ Hindi - II/ French - II/ Kannada - II/ Malayalam - II/ Sanskrit - II	6	3	50	50	100	4
II	English: II	21LEU02	English - II	6	3	50	50	100	4
III	Core: III	21PHU03	Heat and Thermodynamics	6	3	50	50	100	5
III	Core: IV Allied: II	21PHU04	Mathematics – II	7	3	50	50	100	4
III	Core: V Practical: I	21PHU05	Physics – Practical I	3	3	50	50	100	3

IV	Foundation: II	21FCU02	Yoga and Ethics	2	3	--	50	50	2
			TOTAL	**30**				550	22
	SEMESTER – III								
I	Language: III	21LTU03/ 21LHU03/ 21LFU03/ 21LKU03/ 21LMU03/ 21LSU03	Tamil - III/ Hindi - III/ French - III/ Kannada - III/ Malayalam - III/ Sanskrit - III	6	3	50	50	100	4
II	English: III	21LEU03	English - III	6	3	50	50	100	4
III	Core: VI	21PHU06	Optics	5	3	50	50	100	5
III	Core: VII Allied: III	21PHU07	Chemistry - I	4	3	50	50	100	3
III	****	****	Physics - Practical II	3	-	-	-	-	-
III	****	****	Allied Chemistry - Practical	2	-	-	-	-	-
IV	Ability Enhancement: I	21AEU01	Information Security	2	3	--	50	50	2
IV	Non- Major Elective	21NMU01 A/ 21NMU01 B	Indian Women and Society/ Advanced Tamil	2	3	--	50	50	2
			TOTAL	**30**				**500**	**20**
	SEMESTER – IV								
I	Language: IV	21LTU04/ 21LHU04/ 21LFU04/ 21LKU04/ 21LMU04/ 21LSU04	Tamil - IV/ Hindi - IV/ French - IV/ Kannada - IV/ Malayalam - IV/ Sanskrit - IV	6	3	50	50	100	4
II	English: IV	21LEU04	English - IV	6	3	50	50	100	4
III	Core: VIII	21PHU08	Mathematical Physics	5	3	50	50	100	5
III	Core: IX Allied: IV	21PHU09	Chemistry - II	3	3	50	50	100	3
III	Core: X Practical: II	21PHU10	Physics - Practical II	3	3	50	50	100	3
III	Core: XI Allied: V	21PHU11	Allied Chemistry - Practical	2	3	50	50	100	2
IV	Skill Enhancement: I	21SEPHU01	Energy Resources	2	-	50	-	50	2

IV	Ability Enhancement : II	21AEU02	Consumer Rights (Curriculum as recommended by UGC)	3	3	--	50	50	2
			TOTAL	30				700	25
	SEMESTER – V								
III	Core: XII	21PHU12	Properties of Matter & Sound	5	3	50	50	100	5
III	Core: XIII	21PHU13	Solid State Physics	5	3	50	50	100	4
III	Core: XIV	21PHU14	Electronics & Communication	4	3	50	50	100	4
III	Core: XV	21PHU15A/ 21PHU15B/ 21PHU15C	Institutional training/ Articleship Training/ Mini Project	--	3	100	--	100	1
III	****	****	Electronics- Practical III	2	-	-	-	-	-
III	****	****	Digital Electronics and Microprocessor - Practical IV	2	-	-	-	-	-
III	Core: XVI Open Elective	****	Offered for students of other UG Programmes / Departments	4	3	50	50	100	2
III	Core: XVII Elective I	21PHU16A/ 21PHU16B/ 21PHU16C	Digital Electronics and Microprocessor / Soil Physics / Geo Physics	5	3	50	50	100	4
IV	Skill Enhancement: II	21SEU02	Life Skills (Jeevan Kaushal) (Curriculum as recommended by UGC)	3	3	50	-	50	1
V	Proficiency Enhancement	21PEU01	Lasers (Self-Study)	--	3	--	100	100	2
			TOTAL	30				750	23
	SEMESTER – VI								
III	Core: XVIII	21PHU17	Quantum Mechanics and Relativity	5	3	50	50	100	5
III	Core: XIX	21PHU18	Atomic and Nuclear Physics	5	3	50	50	100	5
III	Core: XX	21PHU19	Electricity and Magnetism	5	3	50	50	100	5
III	Core: XXI	21PHU20	Applied Instrumentation	4	3	50	50	100	4
III	Core: XXII Practical: III	21PHU21	Electronics - Practical III	2	3	50	50	100	2
III	Core: XXIII Practical: IV	21PHU22	Digital Electronics and Microprocessor - Practical IV	2	3	50	50	100	2
III	Core: XXIV Elective II	21PHU23A/ 21PHU23B/ 21PHU23C	Basic Concepts of C, C++/ Introduction to Space Physics/ Smart Materials	5	3	50	50	100	4
IV	Skill Enhancement: III	21SEPHU03	Programming in C, C++ - Practical	2	3	50	-	50	1

		TOTAL	30		750	28
V	Competency Enhancement	NSS/YRC/RRC/CCC/PHY.EDU/ Others		SEMESTER I – VI		1
		Professional Grooming		SEMESTER I – VI		1
		Students Social activity (Related to the Curriculum)		SEMESTER I – VI		1

Total Marks: 3700 **Total Credits: 140**

(Signature with Seal)

Head,
Department of Physics,
P.K.R. Arts College for Women,
Gobichettipalayam-638476.

SYLLABUS

(For those admitted from the academic Year 2021-22)

SEMESTER – I

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: I	21PHU01	MECHANICS	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	I	50	50	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	2.27	2.54	2.08	2.01	1.40	1.24	1.10

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 **(15 Hours)**

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

UNIT II - Dynamics of Rigid Bodies – I **(15 Hours)**

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

UNIT III - Dynamics of Rigid Bodies – II **(15 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 **(15 Hours)**

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

UNIT V - Hydrostatics **(12 Hours)**

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

and metacentric height – Determination of metacentric height of a ship

Text Books

1. Mechanics - D.S.Mathur, 1st Edition, 2001, S.Chand &Co (Unit 1, 2, 3)
2. Mechanics – Subramanium, 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)

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://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 Allied: I	21PHU02	MATHEMATICS - I	84	4

Contact hours per week: 7

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	I	50	50	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 transforms, Matrices, Reciprocal Equations and Fourier series.	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	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	2.27	2.54	2.46	2.91	0.94	1.12	1.22

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 (**15 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 **(20 Hours)**

Polynomial Equations with real coefficients - Irrational roots, complex roots - Reciprocal Equations - Newton's method to find a root approximately**.**

UNIT III: LAPLACE TRANSFORMS **(20 Hours)**

Definition – Laplace Transform of Standard functions – Linearity property – First shifting theorem – Transform of $tf(t), f(t)/t$.

UNIT-IV: INVERSE LAPLACE TRANSFORMS **(15 Hours)**

Inverse Laplace transforms of standard functions – First shift theorem - Laplace Transform of derivatives and integrals.

UNIT V: FOURIER SERIES **(14 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.

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

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.

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	21FCU01	Environmental studies (Curriculum as recommended by UGC)	24	2
Contact hours per week: 2					

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	II	--	50	50

Preamble: To bring about an awareness of a variety of environmental concerns and to create a pro-environmental attitude and a behavioural 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	define environment, ecosystem, biodiversity, environmental pollution and social issues	K1
CO2	explain the natural resources, types of ecosystem, geographical classification of India, causes of environmental pollution and the problems related to the society	K2
CO3	identify the information related to environment and the resources to protect it	K3
CO4	analyze the classification of natural resources, energy flow in the ecosystem, threats to biodiversity, disaster management and the role of information technology in environment and human health	K4
CO5	assess the environmental issues with a focus on sustainability	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	2.27	2.54	2.46	2.91	0.84	0.79	1.83

of COs Contribution 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 **(4 Hours)**

Multidisciplinary Nature of Environmental Studies:

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

UNIT II **(5 Hours)**

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

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

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

UNIT III **(5 Hours)**

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

UNIT IV **(5 Hours)**

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

UNIT V **(5 Hours)**

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

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

Reference 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, BlackwellScience (TB)

SEMESTER – II

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: III	21PHU03	HEAT & THERMODYNAMICS	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	II	50	50	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 state, Isothermal and Adiabatic, Entropy. Explain the Peculiar properties of He II	K2
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	2.27	2.54	2.46	2.46	1.40	1.01	1.34

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 (15 Hours)

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

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

UNIT II - Kinetic Theory of Gases (15 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 (15 Hours)

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

UNIT IV -Thermal Radiation (15 Hours)

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

UNIT V - Thermodynamics **(12 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, 3 rd 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: IV Allied: II	21PHU04	MATHEMATICS - II	84	4

Contact hours per week: 7

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	II	50	50	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 to Pos	2.27	2.54	2.84	3.35	1.40	1.69	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:CURVATURE **(20 Hours)**

Curvature – Radius of curvature – Center of curvature – Circle of curvature

UNIT II: INTEGRATION **(20 Hours)**

Evaluation of double integrals - Change of order of integration in double integrals -Evaluation of triple integrals .

UNIT III:BETA AND GAMMA FUNCTIONS **(20 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 **(10 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 (14 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", 1st 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	Allied	21MAU04	ALLIED PHYSICS – I	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	I	50	50	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	45	33	33	25	25	19	11

Pos							
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 POSs

COURSE CONTENT

UNIT I **(10 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 **(10 Hours)**

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

UNIT III **(10 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 **(9 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 **(9 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.pdfhttps://ncert.nic.in › textbook › pdf › iesc110
2. 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	21MAU09	ALLIED PHYSICS – II	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	II	50	50	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 **(10 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 **(10 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 **(10 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 **(9 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 **(9 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%20Photoelectric%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.shahucollegelatur.org.in/Department/Studymaterial/sci/it/BCA/FY/digielec.pdf

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Allied	21MAU05	ALLIED PRACTICAL	72	4

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	I & II	50	50	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 Contribution of COs to POs	45	45	33	27	33	13	11
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. Chcracteristics of Pn junction diode
20. Characterstics 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	21FCU02	Yoga and Ethics	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	II	--	50	50

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

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

COs	Course Statement	Knowledge Level
CO1	recollect the basic terminologies in yoga and value education	K1
CO2	demonstrate the importance of yoga, mental exercises, principles of life and components of values.	K2
CO3	apply the techniques of dynamic & mental exercises and philosophical values in real life	K3
CO4	classify the different types of asanas, stages of mind, analysis of thought, ethical values and social values.	K4
CO5	evaluate how the yoga and value education make a person strong both physically and mentally	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	2.27	2.54	2.84	1.12	1.22	1.24	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 **(5 Hours)**

Yoga and Health

Theory:

Yoga-Meaning- Importance of Yoga – Pancha Koshas - Benefits of Yoga-General Guidelines

Practice:

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

UNIT II **(5 Hours)**

Art of Nurturing the Mind

Theory:

Ten Stages of Mind-Mental Frequency – Methods for Concentration

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

Practice: - Worksheet

UNIT III **(5 Hours)**

Philosophy and Principles of Life

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

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

Practice - Worksheet

UNIT IV **(5 Hours)**

Value education (Part-I)

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

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

Practice - Worksheet

UNIT V **(4 Hours)**

Value education (Part-II)

Family Values

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

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

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

Religious values – Tolerance, wisdom, character.

Practice - Worksheet

Reference Books

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

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: V Practical : I	21PHU05	PHYSICS – PRACTICAL I	72	3

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
FIRST	I & II	50	50	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	K2

	resistance of wire by using electronic circuits	
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	2.27	1.86	2.08	1.12	1.03	1.01	1.34

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

SEMESTER – III

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: VI	21PHU06	OPTICS	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
SECOND	III	50	50	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	2.27	1.86	2.08	2.46	1.22	1.24	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 - Geometrical Optics **(12 Hours)**

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

UNIT II - Physical optics - Interference **(12 Hours)**

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

UNIT III - Diffraction **(12 Hours)**

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

UNIT IV - Polarization **(12 Hours)**

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

UNIT V - Quantum Optics **(12 Hours)**

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

Book for Study

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

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: VIII Allied: III	21PHU07	Chemistry - I	48	3

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
II	III	50	50	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	2.27	2.54	1.71	2.01	2.53	1.69	2.80

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, Friedal crafts alkylation and acylation)

UNIT V - Chemical Kinetics and Photochemistry (9 Hours)

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

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

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	21AEU01	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 information security	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	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	16	19
Weighted Percentage of COs Contribution to POs	2.27	2.54	2.84	3.35	2.53	1.80	2.32

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)**

Information Security: Principles, Concepts and Definitions - The need for Information

Security - Benefits of Information Security. The Security Problem in Computing: The Meaning of Computer Security - Computer Criminals

UNIT II - Information Risk (4 Hours)

Information Risk: Threats and Vulnerabilities of Information Systems – Introduction to Risk Management. Information Security Management Policy, Standards and Procedures

UNIT III - Security Planning (5 Hours)

Administering Security: Security Planning - Security Planning Team Members - Assuring Commitment to a Security Plan - Business Continuity Plan - Incident Response Plan - Organizational Security Policies, Physical Security

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

Legal Privacy and Ethical Issues in Information Security: Protecting Programs and Data - Information and the Law - Rights of Employees and Employers - Software Failures - Computer Crime - Ethical Issues in Information Security

UNIT V – Cryptography (5 Hours)

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

Text Books

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

Reference Books

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

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
IV	Non-Major Elective	21NMU01A	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	1.67	1.86	1.96	2.76	2.06	3.04	3.66

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
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 Fightagainst 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	21NMU01B	Advanced Tamil	24	2

SEMESTER – IV

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: VIII	21PHU08	Mathematical Physics	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
SECOND	IV	50	50	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	2.27	2.20	1.58	1.86	2.15	1.24	1.10

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

COURSE CONTENT

UNIT I – Matrices **(12 Hours)**

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

UNIT II - Vector Calculus **(12 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 **(12 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 **(12 Hours)**

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

UNIT V- Lagrangian & Hamiltonian Formulation **(12 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.google.com/search?q=emprirical+laws+and+curve+fittings+notes+pdf&sxsrf=AOaemvIaer08gnxqVZhL04v9eXoDJpo05w%3A1632820151577&ei=t9tSYanTIq_Mz7sPzPCTOA&oq=emprirical+laws+and+curve+fittings+notes+pdf&gs_lcp=Cgdnd3Mtd2l6EAMyBQgAEM0COgcIABBHELADOgcIIxCwAhAnOgcIIRAKEKABSgQIQRgAUPoTWJYwYOc3aAFwAXgAgAGlA4gB3AqSAQkwLjMuMi4wLjGYAQCgAQHIAQjAAQE&sclient=gws-wiz&ved=0ahUKEwjpiveIqaHzAhUv5nMBHUz4BAcQ4dUDCA0&uact=5
11. https://www.youtube.com/watch?v=sOE8Slo3Pqw
12. https://www.physics.rutgers.edu › ~shapiro › book3

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: IX Allied: V	21PHU09	Chemistry - II	48	3

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
SECOND	IV	50	50	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	2.27	2.54	1.71	2.01	1.40	2.36	3.29

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 $Ni(CO)_4$,$Ni(CN)_4$, $K_4[Fe(CN)_6]$- Merits and Demerits of Werner's and Pauling's theory - Biological Role of haemoglobin and Chlorophyll (elementary idea only) - Applications of coordination compounds in qualitative analysis and Quantitative analysis like Separation of copper and cadmium ions; Nickel and cobalt ion; Identification of metal ions like cu, Fe and Ni. Estimation of Ni using DMG and Al using Oxine

UNIT II –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_2-O_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. Seperation 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: X Practical : II	21PHU10	Physics - Practical II	72	4

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
SECOND	III & IV	50	50	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 to Pos	2.27	2.20	2.08	1.71	2.34	1.01	1.10

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

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XI Allied: IV	21PHU11	Allied Chemistry - Practical	48	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
SECOND	III & IV	50	50	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	2.27	2.54	2.08	2.46	3.65	2.36	3.29

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	21SEPHU01	Energy Resources	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
SECOND	IV	50	--	50

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

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

COs	Course Statement	Knowledge Level
CO1	reminisce the basic concepts of conventional energy sources and non-conventional energy sources	K1

CO2	realize the principles of different types of renewable energy sources	K2
CO3	utilize the learned concepts of renewable energy in its applications	K3
CO4	identify and evaluate the reasons behind the use of different renewable energy sources	K4
CO5	assess the performance of renewable energy 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	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	2.27	1.86	1.33	2.01	1.78	3.71	4.02

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

COURSE CONTENT

UNIT I - Conventional Energy Sources **(5 Hours)**

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

UNIT II - Solar Energy **(5 Hours)**

Renewable energy sources – solar energy – nature and solar radiation – components – solar

heaters – crop dryers – solar cookers – water desalination (block diagram) Photovoltaic generation – merits and demerits - Hydrogen production

UNIT III - Biomass energy fundamentals **(5 Hours)**

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

UNIT IV - Biomass Utilization **(5 Hours)**

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

UNIT V - Other forms of energy sources **(4 Hours)**

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

Text Books

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

Reference Books

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

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

Web References

1. https://www.conserve-energy-future.com/different-energy-sources.php

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
IV	Ability Enhancement: II	21AEU02	Consumer Rights (Curriculum as recommended by UGC)	36	2

Contact hours per week: 3

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	2.27	1.75	1.96	1.64	1.59	1.46	1.83

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. Chakravarthy, S. (2014). MRTP Act metamorphoses into Competition Act. CUTS Institute for Regulation and Competition position paper. Available online at www.cuts-international.org/doc01.doc.
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: XII	21PHU12	Properties of Matter & Sound	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V	50	50	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 recall the concepts in Acoustics	K1
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	K4

	the liquids analyze the characteristics of sound and requisites of good acoustics	
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	2.27	1.86	2.84	2.91	2.34	0.67	2.32

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

COURSE CONTENT

UNIT I – Elasticity **(12 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 – Twisting couple on a wire – Work done in twisting - 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 **(12 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 Non uniform bending - Determination of young's

modulus by Koenig's method - Uniform bending - Expression for elevation – Determination of young's modulus using pin and microscope method

UNIT III - Surface tension (12 Hours)

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

UNIT IV - Hydrodynamics and Viscosity (12 Hours)

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

UNIT V - Sound (12 Hours)

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

Text Books

1. Properties of matter - Brijlal& N. Subrahmanyam, 2001, S.Chand& Co. Ltd., (Unit 1, 2, 3, 4)
2. A Text Book of Sound - Brijlal& N. Subramanyam, 2008, Vikas Publishing. Pvt.Ltd., (Unit 5)

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. Properties of matter –Murugeshan, 2004, S Chand & Co. Pvt. Ltd.,
5. 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: XIII	21PHU13	Solid State Physics	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V	50	50	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	2.27	2.54	2.08	2.01	2.53	1.46	1.10

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 **(12 Hours)**

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

UNIT II- Crystallography & Thermal Properties of solids **(12 Hours)**

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

Dulong and Pettit's law – Einstein's theory of specific heat of solids –Debye theories of specific heat of solids

UNIT III- Magnetic Properties of Materials **(12 Hours)**

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

UNIT IV - Free Electron Theory **(12 Hours)**

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

UNIT V- Dielectrics and Superconductivity **(12 Hours)**

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

Text Books

1.Solid State Physics– Gupta and Kumar, 9 th 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 – CharlesKittel, 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.DavidMermin, 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-mechaniccs/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: XIV	21PHU14	Electronics & Communication	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V	50	50	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	2.27	1.52	2.46	1.42	1.96	1.46	1.59

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 **(10 Hours)**

Characteristics of PN Junction diode – Half Wave Rectifier – Efficiency and Ripple Factor

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

UNIT II - Transistors and Transistor Biasing (10 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 (10 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, UJTand Multivibrators (9 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 (9 Hours)

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

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: XV	21PHU15A/ 21PHU15B/ 21PHU15C	Institutional training/ Articleship 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	2.27	2.54	2.84	2.91	3.65	4.39	4.76

of COs Contribution to Pos							
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: XVI Open Elective	****	PHYSICS IN DAY TO DAY LIFE (Offered for students of other UG Programmes / Departments)	48	2

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V	50	50	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	1.97	1.86	1.71	1.27	0.94	0.79	0.61

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.learncbse.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: XVII Elective I	21PHU16A	Digital Electronics and Microprocessor	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V	50	50	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	2.27	2.20	2.08	1.27	2.90	1.91	3.05

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– D/A Converters- 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: XVII Elective I	21PHU16B	Soil Physics	60	4
Contact hours per week: 5					

Year	Semester	Internal Marks	External Marks	Total Marks

THIRD	V	50	50	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	2.27	2.20	2.08	1.27	2.90	1.91	3.05

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: XVII Elective I	21PHU16C	Geo Physics	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V	50	50	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	2.27	2.20	2.08	1.27	2.90	1.91	3.05

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)**

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

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=2ahUKEwjq6e-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: II	21SEU02	Life Skills (Jeevan Kaushal) (Curriculum as recommended by UGC)	36	1

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V	50	--	50

Preamble: To inculcate both personal and professional skills in the students in the areas of understanding of self and others, interpersonal skills, high performance teams, leadership potential, communication & presentation skills, techniques of problem solving, decision making, fostering creativity and innovation for personal and professional excellence, stress management, time management and conflict management and inculcation of human values

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

COs	Course Statement	Knowledge Level
CO1	identify the common communication problems, what good communication skills are and what they can do to improve their abilities	K1
CO2	demonstrate communication through the digital media	K2
CO3	prepare themselves to situations as an individual and as a team	K3
CO4	analyse various leadership models, strengths and abilities to create their leadership vision	K4
CO5	appraise their potential as human beings and conduct themselves properly in the ways of the world	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	0.35	1.52	0.95	0.67	2.53	2.81	2.07

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

COURSE CONTENT

UNIT I **(8 Hours)**

Communication Skills: Listening, Speaking, Reading, Writing and different modes of writing

UNIT II **(7 Hours)**

Digital Communication and Presentation Skills: Digital Literacy, Effective use of Social Media, Non-verbal communication, Presentation Skills

UNIT III **(5 Hours)**

Team Skills: Trust and Collaboration, Listening as a Team Skill, Brainstorming, Social and Cultural Etiquettes, Internal Communication

UNIT IV **(8 Hours)**

Leadership and Management Skills: Leadership Skills, Managerial Skills, Entrepreneurial Skills, Innovative Leadership and Design Thinking

UNIT V **(8 Hours)**

Universal Human Values:

Ethics and Integrity, Love & Compassion, Truth, Non-Violence, Righteousness, Peace, Service, Renunciation (Sacrifice)

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

Text Books

1. Sen Madhucchanda (2010), An Introduction to Critical Thinking, Pearson, Delhi
2. Silvia P. J. (2007), How to Read a Lot, American Psychological Association, Washington DC
3. Sinek S. (2009). Start with Why: How Great Leaders Inspire Everyone to Take Action. Penguin
4. Kelly T., Kelly D. (2014). Creative Confidence: Unleashing the Creative Potential Within Us

Reference Books

1. Elkington, J., & Hartigan, P. (2008). The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World. Harvard Business Press

Web References

1. Developing Soft Skills and Personality

:https://www.youtube.com/playlist?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
2. Course on Leadership - https://nptel.ac.in/courses/122105021/9
3. https://www.ugc.ac.in/e-book/SKILL%20ENG.pdf
4. Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - . "A Leader Should Know How to Manage Failure" – www.youtube.com/ watch?v=laGZaS4sdeU
5. Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, *85*(6): 60.
6. Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019-02-15
7. How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – V	Proficiency Enhancement	21PEU01	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 POs	45	45	39	39	21	21	27
Weighted Percentage of COs Contribution to POs	2.27	2.54	2.46	2.91	1.96	2.36	3.29

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, 3 rdEdition - 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: XVIII	21PHU17	Quantum Mechanics and Relativity	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	VI	50	50	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	2.27	1.86	1.71	1.86	3.09	1.24	1.34

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 (12 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 (12 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 inthe ground state of Hydrogen atom

UNIT III - Schrödinger's Wave Equation (12 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'stheorem – Statement and proof

UNIT IV- Applications of Schrodinger's Equation (12 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 (12 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: XIX	21PHU18	Atomic and Nuclear Physics	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	VI	50	50	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	1.67	1.86	2.08	2.46	2.34	3.04	3.29

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 **(12 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 **(12 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 (12 Hours)

Magentic 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 (12 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 (12 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, 5 th 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: XX	21PHU19	Electricity and Magnetism	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	VI	50	50	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	2.27	1.86	1.71	2.46	2.34	2.36	2.56

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

COURSE CONTENT

UNIT I - Electrostatics **(12 Hours)**

Gauss theorem and its applications: Coulomb's law, Electric Field and potentials, Electric field due to a point charge. Normal electric induction Gauss theorem, application of gauss

theorem - Energy stored in unit volume of an electric field – Electric field due to an infinite plane sheet

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

UNIT II - Magnetic Properties of materials (12 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 (12 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 (12 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 (12 Hours)

Charged particles in uniform and constant electric field – Charged particles in an alternating electric field – Charged particles in a uniform and constant magnetic field – charged particles in combined electric and magnetic field when the fields are parallel and are in mutually perpendicular direction. A conducting rod moving through a uniform magnetic field – inductance in series – in parallel – self inductance of coaxial cylinders – self inductance of toroidal coil of rectangular cross section – circular cross section – Grassot flux meter – comparison with Ballistic galvanometer – rotating 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, 4 th 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)
Part – III	Core: XXI	21PHU20	Applied Instrumentation	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	VI	50	50	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	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	2.27	2.54	2.46	2.91	2.53	2.14	1.34

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 (10 Hours)

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

UNIT II – Pressure Measurement (10 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 (10 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 (9 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 (9 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: XXII Practical : III	21PHU21	Electronics- Practical III	48	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V & VI	50	50	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	2.27	2.54	2.84	2.91	3.09	3.71	3.05

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	21PHU22	Digital Electronics and Microprocessor - Practical IV	48	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V & VI	50	50	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	2.27	2.54	2.84	2.91	4.21	5.06	3.29

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	21PHU23A	Basic Concepts of C, C++	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	VI	50	50	100

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

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

COs	Course Statement	Knowledge Level
CO1	assemble basic knowledge about Programming in C, Conditional statements, different arrays, OOPs and Inheritance	K1

CO2	explain if statements, else if and break statements, OOPS and inheritance types	K2
CO3	examine these structures of C and C++ in programming various programs in mathematical and physics usage, arrays and OOPs values	K3
CO4	design the mathematically useful programs and apply in computer field	K4
CO5	estimate the programming in C and C++ and OOPs	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	2.27	2.54	2.84	0.97	1.22	1.69	1.59

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 C **(12 Hours)**

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

UNIT II - Conditional Statements **(12 Hours)**

If statement- switch statement- go to statement- while statement- do statement-for statement- continue statement- break statement

UNIT III – Arrays **(12 Hours)**

One dimensional array- Two dimensional array- Multidimensional array

UNIT IV – Principles of Object Oriented Programming **(12 Hours)**

Object Oriented Programming Paradigms- basic concept of OOPS- benefits of OOP what is

C++-simple C++ program-structure of C++ program

UNIT V –Inheritance **(12 Hours)**

Single inheritance-multilevel-multiple inheritance-hierarchical-hybrid

Text Books

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

Reference Books

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

Web reference

1. https://www.ikbooks.com/home/samplechapter?filename=280_9789385909306.pdf
2. https://fac.ksu.edu.sa/sites/default/files/ObjectOrientedProgramminginC4thEdition.pdf
3. https://www.cs.cmu.edu/~mrmiller/15-110/Handouts/conditionals.pdf
4. https://www.google.com/search?q=inheritance+pdf+notes&ie=utf-8&oe=utf-8&client=firefox-b-ab

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XXIV Elective II	21PHU23B	Introduction to Space Physics	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	VI	50	50	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 and	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 starts	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	2.27	2.54	2.84	0.97	1.22	1.69	1.59

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 **(12 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 **(12 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 **(12 Hours)**

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

UNIT IV - Stellar Objects **(12 Hours)**

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

UNIT V - Age of Stars **(12 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

Text Book and Reference 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_BBg4QFnoECAQQAw&url=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FGalactic_astronomy&usg=AOvVaw3qaSu3ienqdmoAS9Bb5m_0
2. www.astronomynotes.com

Category	Course Type	Course Code	Course Title	Contact Hours	Credit (C)
Part – III	Core: XXIV Elective II	21PHU23C	Smart Materials	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	VI	50	50	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 Contribution of COs to Pos	45	45	45	13	13	15	13
Weighted Percentage of COs Contribution to POs	2.27	2.54	2.84	0.97	1.22	1.69	1.59

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 Piezoelectricty - Perovskyte 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)**

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

UNIT III - 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)
Part – IV	Skill Enhancement Course: III	21SEPHU03	Programming in C, C++ - Practical	24	1

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
THIRD	V	50	--	50

Preamble: The aim of the course is to develop the skill to gain knowledge in programming in C and C++

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

Cos	Course Statement	Knowledge Level
CO1	acquire basic knowledge about Programming in C and C++, and Recall program coding	K1
CO2	perform the Arithmetic Operation through C &C ++ Programs and like addition subtraction division both in integers and matrix type using Do-While loop	K2
CO3	compare two files, Characters and Strings using C++ and Check whether they are identical or Different. And perform mathematical function	K3
CO4	calculate Matrix addition and matrix Inverse functional program	K4

CO5	converting Number to Words and Day name using C &C++ Program	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	2.27	1.19	1.33	0.97	1.22	1.46	1.46

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

Programming in C

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

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

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

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