B.Sc., Physics

Outcome Based Education

Curriculum, Scheme & Syllabus

Batch: 2022-2025

Department of Physics

NGM College, Pollachi

Department of Physics

B.Sc. Programme

Vision

The ultimate goal of the Department of Physics is to bring Eminence and Excellence in Teaching and Learning processes, and to fetch ours as one of the Benchmark Departments with potential for academic excellence.

Mission

To execute the teaching profession to bring the students as an asset for a productive and fascinating career, successful in their life, and to realize the learning with real-world experience.

Program Educational Objectives:

PEO1	Ability to successfully pursue forefront research in their field of interest and engage themselves in lifelong learning process
PEO2	Demonstrate the ability to use skills in Physics and its related areas of technology for formulating and tackling Physics-related problems
PEO3	Acquire jobs in varies service domains like Government, teaching, information, banking and industry
PEO4	Uphold professional ethics, exhibit critical thinking and demonstrate innovative ideas to function as a leader in diverse fields
PEO5	Enhance the Analytical, technical, computational and experimental skills to solve physics related problems individually and collectively
PEO6	Empower the students to establish new identity by articulating their knowledge and understanding of modern digital tools to locate, present and retrieve information

Program Outcomes:

PO1	Acquire fundamental/systematic or coherent understanding of the academic field of Physics and procedural knowledge that creates different types of professionals related to the disciplinary/subject area of Physics. (K1/K2)
PO2	Demonstrate the ability to use skills in Physics and its related areas of technology. (K3)
PO3	Recognize the importance of mathematical modeling, simulation and computing, and the role of approximation and mathematical approaches to describe the physical world. (K4)
PO4	Plan and execute Physics-related experiments or investigations, analyze and interpret data/information collected using appropriate methods. (K5)
PO5	Demonstrate relevant generic skills and global competencies to tackle open-ended problems that belong to the disciplinary - area Boundaries to work individually and collectively. (K3)
PO6	Demonstrate professional behavior to promote safe learning and working environment. (K6)

Program Specific Outcomes:

PSO - 01	Acquire knowledge and understanding of the core concept of Physics and their applications.
PSO - 02	Inculcate relevant skills to succeed in higher education or fetch jobs in Government/Public sectors.

B.Sc. Physics

Curriculum and Scheme of Examination under CBCS & OBES (2022 - 2025)

Part	Subject Code	Subjects	Ins. Hrs Per Week	Examinations				Credits
				Dur. Hrs	CIA	ESE	Total	
SEMESTER – I								
I	22UTL101/ 22UHN101/ 22UFR101	Tamil /Hindi/French Paper I	6	3	50	50	100	3
II	22UEN101	Communicative English I	5	3	50	50	100	3
III	22UPS101	Core I: Gravitation, Properties of Matter and Sound	6	3	50	50	100	5
		Physics lab I	3		50	50		
	22UPS1A1	Allied I : Mathematics I	8	3	50	50	100	5
IV	22UHR101	Human Rights	1	2		50	50	2
	22HEC101	HE - (Personal values & SKY Yoga Practice - I)	2	2	25	25	50	1
V		Extension Activities - Annexure I						
	22VAD101	Fluency - I						Grade
Total							**500**	**19**
SEMESTER – II								
I	22UTL202/ 22UHN202/ 22UFR202	Tamil /Hindi Paper II	6	3	50	50	100	3
II	22UEN202	Communicative English II	5	3	50	50	100	3
III	22UPS202	Core II : Thermal Physics	5	3	50	50	100	5
	22UPS203	Core III : Physics lab I	3	3	50	50	100	3
	22UPS2A2	Allied I : Mathematics II	8	3	50	50	100	5
IV	22EVS201	Environmental Studies	2	2	-	50	50	2
	22HEC202	HE - (Family values & SKY Yoga Practice - II)	1	2	25	25	50	1
V		Extension Activities - Annexure I						
	22VAD201	Fluency – II						Grade
Total							**600**	**22**

SEMESTER – III								
Part	**Subject Code**	**Subjects**	**Ins. Hrs Per Week**	**Examinations**				**Credits**
				Dur. Hrs	**CIA**	**ESE**	**Total**	
I	22UTL303/ 22UHN303/ 22UFR303	Tamil / Hindi /French Paper III	5	3	50	50	100	3
II	22UEN303	Communicative English III	6	3	50	50	100	3
III	22UPS304	Core IV : Mathematical Physics	5	3	50	50	100	5
		Physics lab II	3		50	50		
	22UPS3A3	Allied II - Chemistry I	6	3	50	50	100	4
		Allied Practicals	2					
IV	22UPS3N1/ 22UPS3N2	Non Major Elective I: Principles of Physics – I /Renewable Energy Sources Paper – I	1	2	-	50	50	2
	22HEC303	HE - (Professional values & SKY Yoga Practice - III)	1	2	25	25	50	1
V		Extension Activities - Annexure I						
	22VAD301	Fluency - III						Grade
Total							**500**	**18**

SEMESTER – IV								
I	22UTL404/ 22UHN404/ 22UFR404	Tamil /Hindi /French Paper IV	5	3	50	50	100	3
II	22UEN404	Communicative English IV	6	3	50	50	100	3
III	22UPS405	Core V : Electricity & Magnetism	5	3	50	50	100	5
	22UPS406	Core VI : Physics lab II	3	3	50	50	100	3
	22UPS4A4	Allied II : Chemistry II	6	3	50	50	100	4
	22UPS4A5	Allied Practicals	2	3	50	50	100	2
IV	22UPS4N3/ 22UPS4N4	Non Major Elective II: Principles of Physics –II / Renewable Energy Sources Paper – II	1	2	-	50	50	2
	22HEC404	HE - (Social values & SKY Yoga Practice - IV)	1	2	25	25	50	1
V		Extension Activities - Annexure I				50	50	1
	22VAD401	Fluency - IV						Grade
Total							**750**	**24**

SEMESTER – V								
Part	**Subject Code**	**Subjects**	**Ins. Hrs Per Week**	**Examinations**				**Credits**
				Dur. Hrs	**CIA**	**ESE**	**Total**	
III	22UPS507	Core VII : Mechanics	5	3	50	50	100	5
	22UPS508	Core VIII: Optics & Spectroscopy	5	3	50	50	100	5
	22UPS509	Core IX: Relativity and Quantum Mechanics	5	3	50	50	100	5
	22UPS5E10 / 22UPS5E11/ 22UPS5E12	Core Elective - I : Basic Electronics & Circuit Systems/ Communication Electronics/ Material Science	5	3	50	50	100	5
	22UPS513	Summer Internship or Vocational traning/ Project	-	-	-	-	100	3
		Electronics Lab	3					
		Digital & Microprocessor Lab	3					
	22UPS5AL1	Advanced Learner Course - I (Optional) - Problem Solving - Self Study	-	-	50	50	100	5*
IV	22UPS5S1/ 22UPS5S2	Skill based Elective I: Mechanical measuements/Fundamentals of Bio-Physics	1	2	-	50	50	2
	22GKL501	General Knowledge & General Awareness	SS					Grade
	22HEC505	HE - (National values & SKY Yoga Practice - V)	1	2	25	25	50	1
	22VAD501	Fluency - V						Grade
Total							**600**	**26 + 5***

SEMESTER – VI								
Part	**Subject Code**	**Subjects**	**Ins. Hrs Per Week**	**Examinations**				**Credits**
				Dur. Hrs	**CIA**	**ESE**	**Total**	
III	22UPS614	Core X : Atomic & Nuclear Physics	5	3	50	50	100	5
	22UPS615	Core XI : Solid State Physics & Statistical Mechanics	5	3	50	50	100	5
	22UPS6E16/ 22UPS6E17/ 22UPS6E18	Core Elective II : Digital Circuit systems & Microprocessor / Biomedical Instrumentation/ Nanomaterials and applications	5	3	50	50	100	5
	22UPS6E19/ 22UPS6E20/ 22UPS6E21	Core Elective III: C Programming & Information Security / Industrial Instrumentation/ Python Programming	5	3	50	50	100	5
	22UPS622	Core XII : Electronics Lab	3	3	50	50	100	3
	22UPS623	Core XIII : Digital & Microprocessor Lab	3	3	50	50	100	3
	22UPS624	Core XIV : Computer lab in C	2	3	50	50	100	2
	22UPS6AL2	Advanced Learner Course - II (Optional) – Problem Solving - Self Study			50	50	100	5*
IV	22UPS6S3/ 22UPS6S4	Skill based Elective II:Environmental Instrumentation/Fundamentals of Astrophysics	1	2	-	50	50	2
	22HEC606	HE - (Global values & SKY Yoga Practice - VI)	1	2	25	25	50	1
	22VAD601	Fluency – VI						Grade
	22VAD603	PCB and Circuit Designing						Grade
Total							**800**	**31 + 5***
Grand Total							**3800**	**140+10***

* Extra credits for advanced learner course

Core Elective Offered by Physics Department

Semester	Elective		Course Code	Course
V	I	1	22UPS5E10	Basic Electronics & Circuit Systems
		2	22UPS5E11	Communication Electronics
		3	22UPS5E12	Material Science
VI	II	1	22UPS6E16	Digital Principles and application
		2	22UPS6E17	Biomedical Instrumentation
		3	22UPS6E18	Nanomaterials and applications
	III	1	22UPS6E19	Microprocessor & Programming in C
		2	22UPS6E20	Industrial Instrumentation
		3	22UPS6E21	Python Programming

Question Paper Pattern
(Based on Bloom's Taxonomy)

K1-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

1. Theory Examinations: 50 Marks (Part I, II, & III)

(i) Test- I & II, ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q 1 -10)	A (Q 1 – 5 MCQ) (Q 6–10 Define/Short Answer)	10 x 1 = 10	MCQ Define	50
K3 (Q 11-15)	B (Either or pattern)	5 x 3 = 15	Short Answers	
K4 & K5 (Q 16 – 20)	C (Either or pattern)	5x 5 = 25	Descriptive/ Detailed	

2. Theory Examinations: 50 Marks (Part IV except Self-study)

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q 1 -10)	A (Q 1 – 5 MCQ) (Q 6–10 Define / Short Answer)	10 x 1 = 10	MCQ Define	50
K3, K4 & K5 (Q 11-18)	B (Answer 5 out of 8)	5 x 8 = 40	Short Answers	

3. Practical Examinations: 100 Marks

Knowledge Level	Criterion	External/Internal Marks	Total
K3	Record work & Practical	50/50	100
K4			
K5			

Components of Continuous Assessment

THEORY

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Test 1	15	15+15+10+05+05	50
Test 2 / Model	15		
Assignment / Digital Assignment	10		
Seminar / Socratic Seminar	05		
Group Task : GD, Role Play, APS	05		

Maximum Marks: 50; CIA Mark: 25

Components		Calculation	CIA Total
Test / Model	10	10+5+5+5	25
Assignment / Digital Assignment	5		
Seminar / Socratic Seminar	5		
Group Task : GD, Role Play, APS	5		

PRACTICAL

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Test / Model	20	20+25+5	50
Skill	25		
Record	5		

PROJECT

Maximum Marks: 200; CIA Mark: 100

STUDENT SEMINAR EVALUATION RUBRIC

Grading Scale:

A	B	C	D
5	4	2 - 3	0 - 1

CRITERIA	A - Excellent	B - Good	C - Average	D - Inadequate
Organization of presentation	Information presented as interesting story in logical, easy to follow sequence	Information presented in logical sequence; easy to follow	Most of information presented in sequence	Hard to follow; sequence of information jumpy
Knowledge of subject & References	Demonstrated full knowledge; answered all questions with elaboration **&** Material sufficient for clear understanding **AND** exceptionally presented	At ease; answered all questions **but** failed to elaborate **&** Material sufficient for clear understanding **AND** effectively presented	At ease with information; answered most questions **&** Material sufficient for clear understanding **but** not clearly presented	Does not have grasp of information; answered only rudimentary Questions **&** Material not clearly related to topic **OR** background dominated seminar
Presentation Skills using ICT Tools	Uses graphics that explain and reinforce text and presentation	Uses graphics that explain text and presentation	Uses graphics that relate to text and presentation	Uses graphics that rarely support text and presentation
Eye Contact	Refers to slides to make points; engaged with audience	Refers to slides to make points; eye contact majority of time	Refers to slides to make points; occasional eye contact	Reads most slides; no or just occasional eye contact
Elocution – (Ability to speak English language)	Correct, precise pronunciation of all terms Voice is clear and steady; audience can hear well at all times	Incorrectly pronounces few terms Voice is clear with few fluctuations; audience can hear well most of the time	Incorrectly pronounces some terms Voice fluctuates from low to clear; difficult to hear at times	Mumbles and/or Incorrectly pronounces some terms Voice is low; difficult to hear

WRITTEN ASSIGNMENT RUBRIC

Grading Scale:

A	B	C	D	F
09 - 10	07- 08	05 - 06	03 - 04	01 - 02

CRITERION	A - Excellent	B - Good	C - Average	D - Below Average	F - Inadequate
Content & Focus	Hits on almost all content exceptionally clear	Hits on most key points and writing is interesting	Hits in basic content and writing is understandable	Hits on a portion of content and/or digressions and errors	Completely off track or did not submit
Sentence Structure & Style	* Word choice is rich and varies * Writing style is consistently strong * Students own formal language	* Word choice is clear and reasonably precise * Writing language is appropriate to topic * Words convey intended message	* Word choice is basic * Most writing language is appropriate to topic * Informal language	* Word choice is vague * Writing language is not appropriate to topic * Message is unclear	* Not adequate
Sources	Sources are cited and are used critically	Sources are cited and some are used critically	Some sources are missing	Sources are not cited	Sources are not at all cited
Neatness	Typed; Clean; Neatly bound in a report cover; illustrations provided	Legible writing, well-formed characters; Clean and neatly bound in a report cover	Legible writing, some ill-formed letters, print too small or too large; papers stapled together	Illegible writing; loose pages	Same as below standard
Timeliness	Report on time	Report one class period late	Report two class periods late	Report more than one week late	Report more than 10 days late

Syllabus

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS101			**Title**	**Batch:**	2022 – 2025
				Core I: Gravitation, Properties of Matter and Sound	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	6	**Tutorial Hrs./Sem.**	-		**Credits:**	3

Course Objective

To recognize the basic concepts of gravitation and to get exposure to the properties of liquids and solids

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge and understanding of dynamics and gravitation	K1/K2
CO2	Apply fundamental concepts on the applications of the elastic properties of solids	K3
CO3	Analyze the molecular theory of surface tension, viscosity and diffusion	K4
CO4	Evaluate the general terms in acoustics like intensity, loudness, reverberation etc, and study in detail about production, detection, properties and uses of ultrasonic waves	K5
CO5	Explore the impact of matter properties and gravitation on actual concerns.	K5

Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	L	-	M	-	H	-
CO2	M	H	M	L	H	L	M	-
CO3	L	M	H	M	L	M	-	L
CO4	-	L	M	H	M	L	-	M
CO5	-	M	H	H	M	M	-	H

H – High; M – Medium; L – Low

Gravitation, Properties of Matter and Sound

Units	Content	Hrs
Unit I	**GRAVITATION** Kepler's law- Newton's law of gravitation – Density of earth -Gravitational Constant by Boy's method –Gravitational potential and field: Spherical shell – Solid sphere (inside and outside)- Circular disc – infinite plane, Compound pendulum – Earth Quakes – Seismic waves – Seismology – Determination of epicenter and focus – Modern application of seismology.	15
Unit II	**ELASTICITY** Modulus of Elasticity –Relation between the elastic constants - Determination of rigidity modulus: Static torsion method (Searle's method - scale and telescope) – Twisting couple on a cylinder- Strain energy in twisted cylinder - Torsional oscillation of a body – Determination of Rigidity modulus by Torsional pendulum (Dynamic torsion method) – Expression for the bending moment –Depression of the loaded end of a cantilever – Measurement of Young's modulus: Cantilever depression –Measurement of Young's modulus by bending of beam (Non uniform and uniform bending)- Searle's method to determine the rigidity modulus	16
Unit III	**VISCOSITY** Bernoulli's theorem – Applications: Velocity of efflux of a liquid (Torricellis theorem), Velocity of efflux of a gas - Poiseuille's equation for flow of a liquid through a horizontal capillary tube – Experimental determination of a viscosity of a liquid by Poiseuille's method – Motion in a viscous medium – Stokes law – Determination of coefficient of viscosity of a liquid : Stokes falling body viscometer , rotation viscometer – Comparison of viscosities (Ostwald Viscometer) – Variation of viscosity with temperature – Viscosity of gases : Rankine's method for air	16
Unit IV	**SURFACE TENSION :** Properties of surface tension –Excess pressure inside a liquid drop and soap bubble - Experimental study of variation of surface tension with temperature –Determination of surface tension, Jaeger's experiment, drop weight method and capillary rise method – Experiment to determine the interfacial tension between water and kerosene – Applications of surface tension. **DIFFUSION AND OSMOSIS** Diffusion –Fick's law – Graham's law of diffusion of gases – Osmosis and osmotic pressure – Experimental determination of Osmotic pressure (Berkeley and Hartley method) – Laws of Osmotic pressure –Osmosis and vapour pressure of a solution – Osmosis and boiling point of a solution	15
Unit V	**SOUND** Classification of sound : Musical sound and noise – Speech - Human voice – Human ear – Characteristic of Musical sound- Intensity of sound – Measurement of intensity of sound – Decibel – Bel – Phon (Definiton only) -Laws of transverse vibration of strings –Melde's experiment – Resonance - Acoustics – Reverberation – Sabine's Reverberation formula (qualitative analysis) – Determination of Absorption coefficient – Factors affecting Acoustics of Buildings –Requisites for Good Acoustics – Ultrasonics – Production of Ultrasonics : Piezo electric oscillator method – Detection of Ultrasonics- Acoustic grating – Applications of Ultrasonics: Depth of the sea and medical applications	16
	Total Contact Hrs	**78**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Mathur D.S.	Elements of Properties of Matter (Units I - IV)	Shyam Lal Charitable Trust, S. Chand & company Ltd, New Delhi,	2003
2	Brijlal & Subramaniam.N	Textbook of Sound (Unit V)	Vikas Publications house, New Delhi.	2002

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Brijlal & Subramaniam.N	Properties of Matter	Vikas Publications house, New Delhi	2000
2	Murugesan R.	Properties of Matter	S.Chand & Company Ltd, New Delhi	1995
3	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** **https://youtube.com/playlist?list=PLCvpYrhOPdiXqLKDS50ahvk905ZITEbmR** **https://youtube.com/playlist?list=PLbRMhDVUMngcbhsZgRWuYCi2kKQwQ0Av1** **https://youtu.be/9Yi5O8ajlpI** **https://youtu.be/uLl4z0SgmFs** **https://youtu.be/0EZlA4eTuzI**			

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Dr. A. Sureshkumar Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	BSc	**Programme Title:**	Bachelor of Science	
Course Code:	22UPS202	**Title**	**Batch:**	2022-2025
		Core II: Thermal Physics	**Semester:**	II
Hrs/Week:	5		**Credits:**	5

Course Objective

- To understand of the fundamental laws and principles of thermodynamics and heat transfer

CO Number	CO Statement	Knowledge Level
CO1	Acquire the knowledge about the fundamental laws of thermodynamics and procure basic knowledge about real gas, specific heat and entropy	K1/K2
CO2	Apply the basic principles of heat transfer and theory of gases for various applications	K3
CO3	Categorize the various thermodynamic cycles used for energy productions	K4
CO4	Enumerate the theory behind low temperature physics and compare the working principles of various liquefaction process	K5
CO5	Design instruments to achieve low temperature environment for domestic applications and inculcate professional ethics to succeed even in diversified sectors	K6

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	-	L	-	-	H	H
CO2	H	H	-	M	L	-	H	H
CO3	H	H	-	H	L	-	H	H
CO4	H	M	-	H	L	-	H	H
CO5	H	H	-	H	H	H	H	H

Thermal Physics

Unit	Content	Hrs
I	**KINETIC THEORY OF GASES** Kinetic theory of gases – Concept of ideal or perfect gas – Kinetic model: Postulates of kinetic theory of gases – Expression for the pressure exerted by a gas- Estimation of rms speeds of molecules - Derivation of gas equation - Maxwell's law of distribution of velocities - Experimental verification - Degrees of freedom and Maxwell's law of equipartition of energy – Vander waal's equation of state - Critical constants-Quantum theory of specific heat : Specific heat of solids – Dulong and Petits law – Variation of specific heat of diatomic gases with temperature	13
II	**TRANSMISSION AND RADIATION OF HEAT** Conduction, convection and radiation – Coefficient of Thermal conductivity -Thermal diffusivity-Steady state- Lee's disc method of determining thermal conductivity of bad conductor-Searles method-Forbe's method - Radial and cylindrical flow of heat - Stefan's law and experimental verification - Determination of Stefan's constant - Blackbody - Properties of thermal radiation - Distribution of energy in the spectrum of a black body.	13
III	**LOW TEMPERATURE PHYSICS** Porous Plug experiment and theory - Cascade process - Liquefaction of Oxygen - Air (Linde's process) - Hydrogen (Cascade process) - Liquefaction of Helium (K.Onnes method) - Helium I and Helium II - Production of low temperature - Conversion of magnetic temperature to Kelvin temperature - Adiabatic demagnetization	13
IV	**THERMODYNAMICS I** Zeroth law of thermodynamics – Quasistatic process – Concept and comparison of heat and work - First law of thermodynamics - Isothermal and Adiabatic process -isochoric process- isobaric process - Work done during Isothermal and Adiabatic process - Reversible and Irreversible process - Second law of thermodynamics - Carnot's reversible engine - Carnot's theorem	13
V	**THERMODYNAMICS II** Entropy – Change in entropy during reversible and irreversible process - Third law of thermodynamics - Temperature-Entropy diagram- entropy of perfect gas and zero point energy – Maxwell's thermo-dynamical relations – Helmoltz function – Gibb's function – Enthalpy -T-ds equation	13
	Total contact hours	65

- *Italic font denotes self study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Brijlal and Subrahmanyam	Thermodynamics and Statistical Mechanics	Sultan & Chand & Co Ltd, NewDelhi, (Units I –V).	2000

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Kakani S.L.	Thermodynamics and Statistical Mechanics. Raj Publications, Jaipur.	Raj Publications, Jaipur.	2001
2	Singhal S.S.	Heat, Thermodynamics & Statistical Physics.	Pragathi Pragason, Meerut, 1st edition.	2003
3	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]**			

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Dr. S. Shanmuga Priya Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS203			**Title**	**Batch:**	2020-2023
				Core III: Physics Lab I	**Semester:**	I & II
Practical Hrs./Week	3	**Tutorial Hrs./Sem.**	-		**Credits:**	3

Course Objective

To develop the skill to gain knowledge in Physics Lab

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic principles in executing the simple experiments	K2
CO2	Apply the knowledge of theory to experiments	K3
CO3	Analyze the experiment results with theory	K4
CO4	Evaluate different physical parameters with maximum accuracy	K5
CO5	Create various experimental techniques to find the Young's Modulus	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	M	L	H	L	H	M
CO2	M	H	M	L	H	M	M	M
CO3	L	M	H	H	M	M	L	H
CO4	-	L	M	H	M	M	L	H
CO5	-	-	M	M	M	H	-	H

H-High; M-Medium; L-Low

Physics Lab I

List of Experiments (Any fifteen):

1. Young's Modulus - Non uniform Bending - Pin and Microscope
2. Young's Modulus - Non uniform Bending - Koenig's method
3. Young's Modulus - Cantilever - Pin and Microscope
4. Young's Modulus - Uniform Bending - Scale and Telescope
5. Rigidity Modulus - Static Torsion
6. Rigidity Modulus and Moment of Inertia – Torsional Pendulum
7. Acceleration due to Gravity and Moment of Inertia - Compound pendulum
8. Surface Tension and Interfacial Tension - Drop weight method
9. Coefficient of Viscosity - Stoke’s method
10. Coefficient of Viscosity - Searle’s Viscometer
11. Verification of Laws of Transverse Vibrations and Frequency of a Fork – Sonometer
12. Viscosity of a Liquid - Capillary Flow - Variable Pressure head
13. Comparison of Viscosities of Liquids and Radii of Capillary tubes
14. Frequency of a Tuning Fork and Density of Solid and Liquid - Melde’s String
15. Thermal Conductivity of a Bad Conductor - Lee’s Disc
16. Specific Heat Capacity of a Liquid - Newton’s Law of cooling
17. Specific Heat Capacity of a Liquid - Joule's Calorimeter
18. Refractive Index of a Prism - Spectrometer

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Arora C.L	Practical Physics	S.Chand & Co, 19th Edition.	2007
2	Srinivasan M. L. Balasubramanian S. Ranganathan R.	A Text book of Practical Physics	Sultan Chand. New Delhi.	2007

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Govindarajan S.R. Sundarajan S.	Practical Physics	Roc house & sons Pvt Ltd	1959
2	Dhanalakshmi A. Somasundaram S.	Practical Physics	Apsara Publishers	-
3	Gupta S.L. Kumar V.	Practical Physics	Pragati Prakashan, Meerut, 20th Edition	1999

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Dr. A. Sureshkumar Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS304			**Title**	**Batch:**	2022 – 2025
				Core IV: Mathematical Physics	**Semester:**	III
Lecture Hrs./Week	5	**Tutorial Hrs./Sem.**	-		**Credits:**	5

Course Objective

To apply the concepts of Mathematics in Physics and to acquire the basic knowledge about mathematical methods

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge on the mathematical concepts of Physics	K1
CO2	Relate mathematics and physics to understand nature	K2
CO3	Apply skills of mathematical modeling in applied fields	K3
CO4	Implement numerical methods in research fields	K4
CO5	Interpret mathematics to many problem in physics particularly in research Area.	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H
CO2	M	H	H	H	M	M	H	H
CO3	H	M	M	H	M	M	H	H
CO4	M	M	M	M	H	H	H	H
CO5	M	H	H	H	M	M	H	H

H – High; M – Medium; L – Low

Mathematical Physics

Units	Content	Hrs
Unit I	**VECTORS** Gradient of a scalar field – Line, Surface and Volume integrals – Divergence of a vector function – Curl of a vector function and its physical significance – Important vector identities – Gauss divergence theorem – Stokes theorem – Curvilinear co-ordinates – Cylinderical co-ordinates (r,θ) - Spherical polar co-ordinates (r,θ,Φ) – Grad, Divergence and curl in terms of curvilinear, cylindrical and spherical polar co- ordinates	13
Unit II	**MATRICES** Matrix – Definition – Types of matrices – Rank of matrix – transpose matrix and its properties – Conjugate of a matrix and its properties – Conjugate transpose and its properties – Symmetric and Anti symmetric matrices – Hermitian and skew Hermitian – Characteristic equation of a matrix - Eigen values, Eigen vectors - Cayley Hamilton theorem – *Dirac matrices*	13
Unit III	**LAPLACE TRANSFORM** Laplace transform – Properties of Laplace transforms – Problems – Inverse Laplace transform : Properties of Inverse Laplace transform – Convolution theorem – Evaluation of Inverse Laplace transforms by convolution theorem - Problems	13
Unit IV	**FOURIER SERIES** Introduction to Fourier series - Dirichlet's theorem and Dirichlet's conditions - Fourier coefficients - even and odd functions - complex form of Fourier series - change of interval - Perseval's relations - application of Fourier series **BETA AND GAMMA FUNCTIONS** Symmetry property of beta function – Evaluation of beta function – Transformation of beta function - Evaluation of Gamma function - Transformation of Gamma function – Relation between beta and gamma function.	13
Unit V	**NUMERICAL METHODS** Solution of algebraic and transcendental equations: The Bisection method -The iterative method - Method of false position - Newton-Raphson method - Solution of ODE: Taylor's series method - Euler's method - Runge Kutta II order method – Trapezoidal Rule - Simple problems	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Sathyaprakash	Mathematical Physics	Sultan Chand & Sons New Delhi	2005
2	Sastry S.S	Introductory Methods of Numerical Analysis	Prentice Hall Of India 3rd Edition	2003

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Gupta B.D	Mathematical Physics.	Vikas Publication House, Noida\ 3rd Edition,	1989
2	Louis A.Pipes, Lawrence R.Harvill	Applied Mathematics For Engineers And Physicists	Mc Graw Hill Kogakusha Ltd, New Delhi	1970
3	Chattopadhyay P.K	Mathematical Physics	Wiley Eastern Limited, New Delhi	1990
4	Venkataram M.K.	Numerical Methods in Science and Engineering	The National Publishing Company, New Delhi	1999
5	Raman K.V.	Group Theory	Tata McGraw - Hill publishing company Ltd, New Delhi	1990

Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]

https://youtu.be/OeENE7c9OaA
https://youtu.be/Ta_i89A-Nkk
https://youtu.be/c9NibpoQjDk
https://youtu.be/T7I_C_lL75I
https://youtube.com/playlist?list=PLbMVogVj5nJRhl_6TUGChpnt2Lg0AZvZu

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Ms. N. Revathi Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	BSc PHY	**Programme Title:**	Bachelor of Science	
Course Code:	22UPS3N1	**Title**	**Batch:**	2022-2025
		Non-Major Elective I: Principles of Physics – I	**Semester:**	III
Hrs/Week:	1		**Credits:**	2

Course Objective

- To create awareness and to develop basic skills about environment, energy resources and its application

Course outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Remember basic knowledge on renewable energy sources	K1/K2
CO2	Apply the concepts of Physics to construct devices	K3
CO3	Analyze the environmental impacts using the core concepts of Physics	K4
CO4	Create energy devices based on the required applications	K5
CO5	Design, construct, evaluate and troubleshoot the appliances using the acquired knowledge	K6

Mapping

PO/PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5	PO6	PSO1	PSO2
CO1	H	M	-	H	M	H	M	H
CO2	M	-	M	M	H	H	-	M
CO3	H	H	H	L	-	L	H	-
CO4	M	L	H	M	M	M	H	M
CO5	H	L	M	M	H	-	H	L

H – High; M – Medium; L – Low

Principles of Physics – I

Unit	Content	Hrs
I	**ATMOSPHERE** Cosmic Rays - Ozone Layer - CFCs role in depletion - Solar Wind and Earth – Lightning (conducting medium to Earth) - Fragmentary Rainbows - Measurement of Rain - Rain colour of clouds-Reason for continous stream-Cloud bursts-Artificial Rain - *Rainbows (Size, doubleness)*	3
II	**BASICS OF ELECTRONICS** Semiconductor-Types of Semiconductor – Diode – LED - Capacitor –-Rectifiers-Resistors – Transistors – Amplifiers -Integrated circuits	2
III	**APPLICATIONS OF SOLAR ENERGY** Introduction - Solar water heating- Space heating: Passive heating systems - Thermal storage wall – Roof storage - Solar cell principle – Solar cell modules - Applications of solar photovoltaic system	3
IV	**SPACE** Saturn rings - Measurement of temperature of planets and stars - Asteroids - Rotation of Earth - Shooting stars and comet s- Atmosphere of stellar bodies - Flat plane orbits of Planets	2
V	**HOME APPLIANCES** Microwave ovens - Pressure cooker - Richter scale - Humming sound in Tension wires - Curved Fan wings - Sodium vapour lamp in streets - Tube Lights: Role of chokes of Starter, Reason for no sharp shadows – Photocopier - *Thermostat*	3
Total contact hours		13

- *Italic font denotes self study*

Pedagogy and Assessment Methods:

Seminar, Assignment, Experience discussion, PPT

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	The Editor	The Hindu Speaks on Scientific Facts	Kasturi and Sons Ltd. Chennai	2006
2	Rai G. D	Non Conventional Sources of Energy	Khanna Publishers, NewDelhi	2002

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Richard P. Feynman, Robert B. Leighton, Matthew Sands	The Feynman Lecture on Physics	Narosa Publishing House, New Delhi	2008
2	David Halliday, Robert Resnick, Jearl Walker	Fundamentals of Physics	John Wiley Publications. 6th Edition	2000

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Name: Ms. S. Yogeswari Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	BSc	**Programme Title:**	Bachelor of Science	
Course Code:	22UPS3N2	**Title**	**Batch:**	2022-2025
		Non-Major Elective I: Renewable Energy Sources-I	**Semester:**	III
Hrs/Week:	1		**Credits:**	2

Course Objective

- To develop the basic skills about various energy resources and its applications

Course outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Remember the fundamental concept of various energy resources	K1/ K2
CO2	Apply the physical principles of conventional and non-conventional sources to study the device and make measurements.	K3
CO3	Analyze the harvested energy from various available sources and utilize it based on the requirements	K4
CO4	Create solar related devices and make measurements	K5
CO5	Design and construct energy related devices and apply based on the available needs	K6

Mapping

PO/PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5	PO6	PSO1	PSO2
CO1	H	M	H	H	M	H	M	H
CO2	M	-	M	M	H	H	-	M
CO3	H	H	M	L	-	L	H	-
CO4	M	L	H	H	M	H	H	M
CO5	H	M	M	M	H	-	H	L

H- High; M- Medium; L- Low

Renewable Energy Sources-I

Unit	Content	Hrs
I	**GEOLOGY** Age of Fossil - Measurement of depth of ocean - Lava from Volcano - Monsoons – Seebergs - Radiation from Granites and Marbles - Earth's Magnetic properties	3
II	**HYDROLOGY** Coolness of mud pot water - Colour of Waterfall - Measurement of Quality of water in dams - Purity of Rain water - *Purity of mineral water in the Market*	3
III	**SOLAR RADIATION AND ITS MEASUREMENTS** Solar Constant - Solar Radiation at the earth's surface: Beam and diffuse solar radiation – Air mass – Attenuation of beam radiation – Solar radiation geometry: Latitude of location – Declination – Hour angle – Angstrom compensation Pyrheliometer	3
IV	**SOLAR ENERGY COLLECTORS** Physical principles of the conversion of solar radiation into heat - Flat plate liquid collector - Solar concentrators and receiver geometries (Basic types) - *Advantages and disadvantages of concentrating collectors over flat plate type collectors*	2
V	**SOLAR ENERGY STORAGE** Types of energy storage – Thermal storage - High temperature latent heat storage - Electrical storage - Storage in the form of fuel – Storage in the form of potential hydrogen energy	2
Total contact hours		13

- *Italic font denotes self study*

Pedagogy and Assessment Methods:

Seminar, Assignment, Experience discussion, PPT

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1.	Rai G. D	Non Conventional Sources of Energy	Khanna Publishers, NewDelhi	2002

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Rai G. D.	Solar Energy Utilization	Khanna Publishers NewDelhi	
2	Garg H.P. Prakash J	Solar Energy Fundamentals And Applications	Tata McGraw Hill Publications, New Delhi	

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Ms. S. Yogeswari Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS405			**Title**	**Batch:**	2022 – 2025
				Core V: Electricity & Magnetism	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	-		**Credits:**	5

Course Objective

To familiarize the students with the fundamental concepts and laws in electricity & magnetism and establish a foundation in electromagnetism

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire the knowledge on fundamental concepts of electric and magnetic fields, potentials and electromagnetic induction	K1 / K2
CO2	Apply knowledge of electricity and magnetism to explain natural physical processes and related technological advances	K3
CO3	Analyze the problems in electromagnetism that establishes the conceptual understanding	K4
CO4	Evaluate the basic and advanced problems in the field of static and dynamic fields	K5
CO5	Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	-	-	M	-	H	-
CO2	M	H	-	-	H	-	M	-
CO3	-	M	H	M	M	-	M	M
CO4	-	-	M	H	-	L	-	H
CO5	-	-	-	M	-	M	-	H

H – High; M – Medium; L – Low

Electricity & Magnetism

Units	Content	Hrs
Unit I	**ELECTRIC FIELD AND POTENTIAL** Concept of charge - Electric Field (E) - Electric potential and Potential difference (V) - Electric potential energy (U) - Relation between E and V - Equipotential surfaces - Poisson's and Laplace equations - Potential and field due to an electric dipole - Potential and field due to a quadruple - Potential and field due to uniformly charged disc - Potential due to two concentric spherical shells of charge - Potential energy due to charge distribution – dipole in an electric field	13
Unit II	**CAPACITORS AND DIELECTRICS** Capacitors - Parallel plate capacitor - Cylindrical capacitor - Spherical capacitor - Guard ring capacitor - Energy stored in a capacitor - Force of attraction between capacitor plates - Dielectric constant - Polar and nonpolar molecules - Polarization of dielectric - Capacity of a parallel plate capacitor partially and completely filled with dielectric - Electric polarization vector P - Electric displacement vector D - Relation between D, E and P - Dielectric susceptibility and permittivity - Physical meaning of polarization – Mechanism of polarization	13
Unit III	**MAGNETOSTATICS** Magnetic effect of current - Definition of magnetic field vector - Lorentz force - Force on a current carrying wire - Magnetic flux - Gauss law in magnetostatics - Torque on a current carrying coil in uniform magnetic field - Potential energy of a current loop - Ballistic galvanometer - Deadbeat condition - Comparison of emfs and capacitances – Biot-Savart's law - field due to steady current in a long straight wire - Interaction between two long parallel wire carrying currents - Magnetic field along the axis of a circular coil - Field along the axis of a solenoid - Magnetic dipole - Ampere's law - Applications of ampere's law: long wire – parallel conductors – solenoid - *toroid*	13
Unit IV	**ELECTROMAGNETIC INDUCTION** Faraday's laws of Electromagnetic induction - Deduction of Faraday's laws from Lorentz's force - Self-inductance - Calculation of self-inductance for a solenoid - Energy stored in magnetic field - Mutual inductance - Energy stored in two interacting circuits - DC circuits : Simple RL circuit - Growth and decay of current - RC circuit - Charging and discharging of a condenser - Ideal LC circuit - Series LCR circuit - *Discharge of a condenser through inductance and resistance*	13
Unit V	**MAXWELL'S EQUATIONS AND ELECTROMAGNETIC WAVES** Basic equations - Types of current - Vacuum displacement current - Maxwell's equations - Maxwell's equations in free space - Electromagnetic waves in free space - Electromagnetic waves in isotropic non - conducting media - Refractive index - Impendence of dielectric media - Energy density of electromagnetic wave - Poynting theorem - Energy per unit volume	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Dr. K.K.Tewari	Electricity and Magnetism	S Chand and Co Ltd, New Delhi	2017 (Reprint)

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Tayal T.C.	Electricity and Magnetism	Himalaya publication house, Mumbai	2001
2	Murugesan R	Electricity and Magnetism	S Chand and Co Ltd, New Delhi	2016 (Reprint)
3	David J Griffiths	Introduction to Electrodynamics	PHI Learning Pvt. Ltd., New Delhi	2009
4	A.S.Mahajan & A.A.Rangwala	Electricity and Magnetism	Tata McGraw Hill Publishing Company	2007 (Reprint)
5	Edward M. Purcell & David J. Morin	Electricity and Magnetism	Cambridge University Press	2016 (Reprint)
6	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://nptel.ac.in/courses/122/106/122106034/			

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Name: Dr. T. Ponraj Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	BSc PHY	**Programme Title:**	Bachelor of Science	
Course Code:	22UPS4N3	**Title**	**Batch:**	2022 - 2025
		Non-Major Elective II: Principles of Physics –II	**Semester:**	IV
Hrs/Week:	1		**Credits:**	2

Course Objective

To develop the scientific interests on the portable electronic devices for day to life

Course outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Remember the basic knowledge about portable devices	K1/K2
CO2	Apply the central concepts of electric and optical devices	K3
CO3	Analyze the basic physical phenomena on the operating features of scientific devices	K4
CO4	Evaluate the applications of the physical quantities	K5
CO5	Create equipment for measuring	K6

Mapping

PO/PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5	PO6	PSO1	PSO2
CO1	H	M	H	M	M	H	H	H
CO2	M	H	M	M	M	H	-	M
CO3	H	H	-	H	L	L	H	-
CO4	H	L	H	H	M	H	M	M
CO5	H	M	-	M	H	M	H	M

H – High; M – Medium; L – Low

Principles of Physics –II

Unit	Content	Hrs
I	Battery –Types of Battery–Hot air balloons – Remote control in TV –Superconductor – *Nuclear reactors*	3
II	Photochromic glasses – Exhaust silencer – Optical fibers – Radar and Sonar – Fluorescent Lamps – Holograms – Touch screens	2
III	Earthquake measurement – Splitting of white light – GPS – Origin of Gravity – Use of Infrared spectroscopy – Static electricity – Three pin electric plugs – Electric line tester- Artificial teeth –Purity of Honey - Breath analyzers	2
IV	Introduction – Laser – Principle - Characteries – Elements of laser – Types of laser – Applications – Advantages – Disadvantages.	3
V	TFM on soap - Cell phones - Refrigerants and their use in refrigerators - Frost formation - Air Cooler & Conditioner - Black box in Planes - Speech synthesizers - Bullet proof glass - - Aeroplane not affected by lightning- Lie detector-Biological Weapon – Basics of computers- Super Computers - Computers Simulation- *Oil with Petrol for two wheelers*	3
	Total contact hours	13

- *Italic font denotes self study*

Additional activities

Seminar, Assignment, Experience discussion, PPT

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	The Editor	The Hindu Speaks on Scientific Facts	Kasturi and Sons Ltd. Chennai	2006

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Richard P. Feynman, Robert B. Leighton, Matthew Sands	The Feynman Lecture on Physics	Narosa Publishing House, New Delhi	2008
2	David Halliday, Robert Resnick, Jearl Walker	Fundamentals of Physics	John Wiley Publications. 6th Edition	2000

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Ms. S.Yogeswari Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	BSc PHY	**Programme Title:**	Bachelor of Science	
Course Code:	22UPS4N4	**Title**	**Batch:**	2022 - 2025
		Non-Major Elective II : Renewable Energy Sources - II	**Semester:**	IV
Hrs/Week:	1		**Credits:**	2

Course Objective

To enrich the fundamental scientific skills in inexhaustible sources of energies

Course outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Remember and understand various energy sources like wind energy, bio mass energy and hydrogen energy	K1/ K2
CO2	Apply the basic physical concepts to develop devices based on the conversion technologies	K3
CO3	Analyze the different forms of energy utilizing the basic concepts for various applications	K4
CO4	Design and develop the various energy related devices	K5
CO5	Evaluate and make measurements of the constructed devices	K6

Mapping

CO \ PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	M	M	H	L	H	L	H	M
CO2	M	M	H	M	H	M	L	H
CO3	H	H	L	H	H	H	H	L
CO4	M	H	H	M	M	M	M	H
CO5	H	M	H	M	L	H	L	M

H- High; M- Medium; L- Low

Renewable Energy Sources - II

Unit	Content	Hrs
I	**WIND ENERGY** Introduction- Nature of the wind – The power in the wind- Basic components of wind energy conversion system- Classification of WEC systems- *Direct heat applications.*	3
II	**ENERGY FROM BIOMASS** Introduction- Biomass conversion technologies- Wet processes – Dry processes - Photosynthesis – Classification of biogas plants.	3
III	**GEOTHERMAL ENERGY** Introduction- Estimates of geothermal power – Geothermal sources – Hydrothermal resources – Applications of geothermal energy.	2
IV	**ENERGY FROM OCEANS** Introduction- Ocean thermal electric conversion by open and closed cycles- Energy from tides- Basic principle of tidal power- Advantages and limitations of small scale hydroelectric.	3
V	**HYDROGEN ENERGY** Introduction – Properties of hydrogen – Electrolysis or the electrolytic production of hydrogen – Hydrogen storage – *Utilization of hydrogen gas.*	2
Total contact hours		13

- *Italic font denotes self study*

Pedagogy and Assessment Methods:

Seminar, Assignment, Experience discussion, PPT

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Rai G. D	Non Conventional Sources of Energy	Khanna Publishers, NewDelhi	2002

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Rai G.D	Solar Energy Utilization	Solar Energy Utilization	
2	Sulchatme S.P	Principles of Thermal Collection and Storage	Tata McGraw Hill Publication, New Delhi.	

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Ms. S.Yogeswari Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	BSc PHY	**Programme Title:**	Bachelor of Science	
Course Code:	22UPS406	**Title**	**Batch:**	2022-2025
		Core VI: Physics Lab II	**Semester:**	III & IV
Hrs/Week:	3		**Credits:**	3

Course objective

- To understand the theory with hands-on experience.

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic principles of optics and electromagnetic field	K1/K2
CO2	Apply the knowledge of fundamentals of physics to execute experiments and to get appropriate results	K3
CO3	Analyse the theory of optics and electromagnetic field by verifying with obtained data	K4
CO4	Calibrate the devices using error correction methods	K5
CO5	Design instruments by using the principles behind every experiment and develop skills to work collectively	K6

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	-	M	-	-	H	H
CO2	H	H	-	H	-	-	H	H
CO3	H	H	M	H	-	-	H	H
CO4	H	M	H	H	-	-	H	H
CO5	H	H	-	H	H	H	H	H

Physics Lab II

List of Experiments (Any fifteen):

1. Calibration of Voltmeter (Low & High Range) – Potentiometer
2. Calibration of Ammeter(High Range) and Reduction Factor of T.G – Potentiometer
3. Temperature Coefficient & Resistance of a coil of wire - Potentiometer
4. E.M.F of a Thermocouple - Potentiometer
5. Figure of merit - Current & Voltage Sensitivity – Ballistic Galvanometer
6. Comparison of Resistances - Specific Resistance - Ballistic Galvanometer
7. Absolute capacity of a Condenser - Ballistic Galvanometer
8. Mutual Inductance of a Coil & Comparison of Mutual Inductance – Ballistic Galvanometer
9. Determination of H - Circular Coil carrying current –Vibration Magnetometer
10. Determination of M - Field along the axis of a Circular coil carrying current
11. Thickness of a Wire - Air wedge
12. Radius of curvature and Refractive index of a lens - Newton's Rings
13. Refractive Index of a Liquid - Spectrometer - Hollow Prism
14. Refractive Index of a Prism - Spectrometer - i-d curve
15. Refractive Index of a Prism - Spectrometer - i-i' curve
16. Wavelength of different colours of Mercury spectrum and Dispersive power of a Grating – Normal Incidence-Spectrometer
17. Refractive Index - Spectrometer - Small Angle Prism
18. Cauchy's Constants and Dispersive Power of a Prism - Spectrometer

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Govindarajan S.R. Sundarajan S.	Practical Physics	Roc house & sons Pvt Ltd	1959

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Dhanalakshmi A. Somasundaram S.	Practical Physics	Apsara Publishers, Book II.	

Designed by	Verified by HOD	Checked by CDC	Approved by COE
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Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Science	
Course Code:	22UPS507			**Title**	**Batch:**	2022 – 2025
				Core VII: Mechanics	**Semester:**	V
Lecture Hrs./Week	5	**Tutorial Hrs./Sem.**			**Credits:**	5

Course Objective

To acquire a complete knowledge about mechanics and classical dynamics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the laws involved in Rigid body dynamics and classical mechanics	K1
CO2	Gain a deeper insight into the physical concepts and its application to various physical systems	K2
CO3	Apply these formalisms to obtain equations of motion for simple systems	K3
CO4	Analyze the problem and frame equations of motion	K4
CO5	Ability to Use the necessary skills and tools to write equations for real time problems	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	H	H	M	L	H	H
CO2	H	M	H	H	M	H	H	H
CO3	H	M	H	H	H	H	M	M
CO4	H	M	M	H	H	H	M	M
CO5	H	M	M	H	H	H	M	H

H – High; M – Medium; L – Low

Mechanics

Units	Content	Hrs
Unit I	**NEWTON'S LAWS OF MOTION AND CONSERVATION LAWS** Newton's Laws of motion - forces and equations of motion - motion of a particle in a uniform gravitational field - Newtonian law of universal gravitation - Conservation laws - conservation of energy - Work - kinetic and potential energy - Examples - Conservative Forces - Potential energy and conservation of energy in gravitational and electric field – Examples - Conservation of Linear and angular momentum: Internal forces and momentum conservation - center of mass – Examples.	13
Unit II	**ELEMENTARY RIGID BODY DYNAMICS** The equation of motion - angular momentum and kinetic energy - Moment of inertia - parallel axis theorem - Perpendicular axis theorem - examples - Rotation about fixed axis: time dependence of motion - Examples - Rolling without slipping - Torque about center of mass - Example - Rotation about fixed axes: Behavior of angular momentum vector.	13
Unit III	**MECHANICS OF SYSTEM OF PARTICLES** Conservation theorem for a system of particle: Conservation theorem for linear momentum, angular momentum and energy - Constrained motion - Types of constraints with examples - Forces of constraints - Degrees of freedom - Generalized coordinates - Generalized notation for Displacement, Velocity, Acceleration, Momentum, Force and Potential - Limitations of Newton's Law.	13
Unit IV	**LAGRANGIAN FORMULATION** Delta-Variation process - Hamilton's principle - Deduction of Lagrange's equations of motion from Hamilton's principle - Principle of virtual work - D'Alembert's principle - Deduction of Lagrange's equations by D'Alembert's principle for both conservative system and non-conservative system - Deduction of Hamilton's principle from D'Alembert's principle - Deduction of Newton's second law of motion from Hamilton's principle - Applications of Lagrange's equation: Linear harmonic oscillator, Simple pendulum, *Compound pendulum.*	
Unit V	**HAMILTONIAN FORMULATION OF MECHANICS** View points of the new development - Phase space and the motion of systems - Hamiltonian - Hamilton's canonical equations of motion - Cyclic coordinates - Physical significance of H - Advantages of Hamiltonian approach - Deduction of canonical equations from variational principle - Applications of Hamilton's equations of motion; Simple Pendulum, Compound pendulum, Linear harmonic oscillator.	
	Total Contact Hrs	**65**

Pedagogy and Assessment Methods:

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, power point presentation

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Murugeshan. R	Mechanics and Mathematical Methods	S.Chand & Co Ltd, New Delhi \ Reprint	2006
2	Mathur D.S	Mechanics	S. Chand &Co Ltd, New Delhi \ 2nd Edition	2012
3	Narayanamurthi. M and Nagarathinam. M	Dynamics	National Publishing Company \ Revised Edition	1988
4	Gupta, Kumar & Sharma	Classical Mechanics	Pragati Prakashan \ 19th edition	2010
5	Murugeshan. R	Modern Physics	S. Chand & Co Ltd \ Ninth revised edition	2001

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Bhargava& Sharma	A Text Book of Mechanics	Ratan Prakshan Mandir \ 7th edition	1990
2	Arthur Beiser	Concepts of Modern Physics	TMH-\ 6th edition	2003
3	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://www.youtube.com/watch?v=83QCm3LkuEg https://nptel.ac.in/courses/115105098 https://www.youtube.com/watch?v=ApUFtLCrU90			

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Dr. A. G. Kannan Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Science	
Course Code:	22UPS508			**Title**	**Batch:**	2022 – 2025
				Core VIII: Optics & Spectroscopy	**Semester:**	V
Lecture Hrs./Week	5	**Tutorial Hrs./Sem.**	-		**Credits:**	5

Course Objective

To understand the mechanism of energy transfer and to impart knowledge in electromagnetic spectrum

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate the characteristics of light and interaction of electromagnetic radiations with matter	K1
CO2	Apply the principle of molecular spectroscopy in identification of properties of materials and applications	K2
CO3	Categorize the spectra from vibrational and rotational motion of atoms or molecules	K3
CO4	Explain the theoretical models of spectroscopy that are suitable for each phenomena related to radiations	K4
CO5	Plan and design the instruments based on electromagnetic radiations by using the tools and methodologies of optics and spectroscopy	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	L	M	M	L	H	H
CO2	H	H	L	H	M	M	H	H
CO3	H	M	M	M	L	L	M	M
CO4	H	M	H	L	M	H	H	M
CO5	H	M	L	H	H	H	H	H

H – High; M – Medium; L – Low

Optics & Spectroscopy

Units	Content	Hrs
Unit I	**GEOMETRICAL OPTICS** Fermat's Principle - 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.	13
Unit II	**INTERFERENCE & DIFFRACTION** Theory of interference - Fresnel's biprism experiment - Determination of wavelength - Interference due to reflected light – Air wedge - Newton's rings - Determination of wavelength and refractive index of a liquid - Fresnel's explanation of rectilinear propagation of light - Fresnel's diffraction at a circular aperture - Fraunhofer diffraction at a single slit - Theory of the plane transmission grating - Determination of wavelength.	13
Unit III	**POLARISATION** Polarization of transverse waves - Plane of polarization - Brewster's law and Brewster's window - Polarization by refraction - Double refraction - Principal section and principal plane - Nicol prism - Nicol prism as an analyzer - Theory of circularly and elliptically polarized light - Optical activity - Fresnel's explanation of rotation - Specific rotation - *Laurent's half shade Polarimeter.*	13
Unit IV	**MOLECULAR SPECTRA** Rotation of molecules - Rotational spectra of rigid diatomic molecule - Techniques and Instrumentation of Microwave Spectroscopy - Energy of a Vibrating diatomic molecule - Simple harmonic oscillator - Techniques and Instrumentation of Infrared Spectroscopy - Applications of Microwave & Infrared Spectroscopy (Basic ideas) - Raman effect and characteristics - Experimental study - Quantum theory of Raman effect.	13
Unit V	**LASER & FIBER OPTICS** Laser characteristics - Einstein's coefficients - Population inversion - Pumping methods - Essential elements and Action of laser system - Ruby laser – He-Ne laser – *Applications: Holography and Lasers in medicine.* Construction and types of optical fiber - Critical angle - Acceptance angle, Acceptance cone and Numerical aperture - Propagation of light through optical fiber - Optical fiber configurations - Fiber optic communication system.	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, power point presentation

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Subramanyam N. Brijlal	Waves and Oscillations	S.Chand & Co, New Delhi	
2	Subrahmanyam. N. Brijlal, Avathanulu M.N.	A Textbook of Optics	S.Chand and Co Ltd., New Delhi	2008
3	Colin N .Banwell, Elaine M. Mc Cash	Fundamentals of Molecular Spectroscopy	Tata McGraw-Hill, New Delhi	2004
4	Gupta S.L. Kumar V. Sharma R.C.	Elements of Spectroscopy	Pragati Prakashan, Meerut	2001

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Halliday, Resnick	Physics Part I & II	Wiley Eastern Ltd, New Delhi	1994
2	Jenkins, White	Fundamentals of Optics	McGraw-Hill., New York	1981
3	Manas Chanda	Atomic Structure and Chemical Bond	Tata McGraw Hill, New Delhi	1982
4	Gurdeep Chatwal, Sham Anand	Spectroscopy	Himalaya Publishers, Mumbai	1987
5	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://www.youtube.com/watch?v=ML7HcZo6IaE https://nptel.ac.in/courses/115107095 https://nptel.ac.in/courses/104106122			

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Dr. A. G. Kannan Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS509			**Title**	**Batch:**	2022 – 2025
				Core IX: Relativity & Quantum Mechanics	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	-		**Credits:**	5

Course Objective

To develop the skill to gain knowledge in Relativity & Quantum Mechanics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the limitations of classical mechanics and acquire the knowledge of Wave nature of matter	K1/K2
CO2	Illustrate Heisenberg uncertainty principle and obtain the wave equation for time dependent and time independent systems	K3
CO3	Analyze the wave equation and use it to solve physical problems	K4
CO4	Establish Schrodinger equation for hydrogen atom and outline the significance of Quantum numbers	K5
CO5	Understand the concepts and consequences of special theory of relativity	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	M	H	H	H	H	H	H	H
CO2	H	H	H	H	H	M	H	H
CO3	M	H	H	H	M	M	H	H
CO4	H	M	H	H	H	H	H	H
CO5	H	H	H	H	M	H	H	H

H – High; M – Medium; L – Low

Relativity & Quantum Mechanics

Units	Content	Hrs
Unit I	**SPECIAL THEORY OF RELATIVITY** Galilean transformations and their limitations - Search for an absolute frame of reference: Michelson Morley experiment - Einstein's postulates and Lorentz transformations – Length contraction - Time dilation - Simultaneity – Variation of Mass with velocity – Mass-energy equivalence with experimental evidence	16
Unit II	**ORIGIN OF QUANTUM THEORY & WAVE PROPERTIES OF PARTICLES** Inadequacy of Classical mechanics - Matter waves – Expression for de-Broglie wavelength – Phase velocity – Group velocity – Expression for group velocity – Experimental study of matter waves : G. P. Thomson's experiment	10
Unit III	**UNCERTAINTY PRINCIPLE & SCHRÖDINGER'S EQUATION** Heisenberg's Uncertainty principle and its illustrations: Gamma ray microscope & Diffraction of a beam of electrons by a slit – Time dependent and Time independent forms of Schrodinger equation – Statistical interpretation of wave function – Postulates of wave mechanics	13
Unit IV	**EIGEN VALUE PROBLEMS** Infinite square well potential – *Square well in three dimensions* - Potential Step - The barrier Penetration problem - Linear Harmonic oscillator (Qualitative Study only)	13
Unit V	**QUANTUM THEORY OF HYDROGEN ATOM** Schrödinger's equation for the Hydrogen atom - Separation of variables- Solution of polar wave equation – *Solution of Radial equation* - Expression for the energy of the electron in the ground state – Significance of Quantum numbers : Principal Quantum number , Orbital Quantum number & Magnetic Quantum number	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Arthur Beiser	Concepts of Modern Physics	Tata McGraw Hill	2009
2	R.Murugesan, Kiruthiga Sivaprasath	Modern Physics	S. Chand	2019

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	David J. Griffiths, Darrel F Schroeter	Introduction to Quantum Mechanics	Cambridge University Press	2018
2	Kamal Singh, S.P. Singh	Elements of Quantum Mechanics	S.Chand	2008
3	G.Aruldas	Quantum Mechanics	PHI Learning Private Limited	2009
4	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://nptel.ac.in/courses/115101107 https://archive.nptel.ac.in/courses/115/101/115101011/			

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Name: Dr. M. Karthika Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS5E10			**Title**	**Batch:**	2022 – 2025
				Core Elective - I : Basic Electronics & Circuit System	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	-		**Credits:**	5

Course Objective

To provide fundamental skill to analyze electronic circuit systems and introduce basic semiconductor devices, their characteristics, operations and applications

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental concepts of electronic circuits with semiconductor devices	K1 / K2
CO2	Apply the knowledge of circuits to investigate PN junctions in semiconductor devices under various conditions	K3
CO3	Demonstrate familiarity with basic electronic components and use them to design simple electronic circuits	K4
CO4	Recognize a variety of exciting high-tech products and systems enabled by electronics	K5
CO5	Design, develop and simulate the new electronic circuits for applications in various fields	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	-	-	M	-	H	-
CO2	M	H	-	-	H	-	M	M
CO3	L	M	H	M	M	L	M	H
CO4	-	L	M	H	L	M	-	H
CO5	-	-	-	M	-	M	-	H

H – High; M – Medium; L – Low

Basic Electronics & Circuit System

Units	Content	Hrs
Unit I	**DC CIRCUITS AND ALTERNATING CURRENTS** DC Circuits: Current, Voltage, Resistance, Ohm's Law, Joule's Law, Resistors and Batteries - Series and Parallel Circuits - Networks - Kirchoff Rules - Thevenin's Theorem - Norton's Theorem - Maximum power transfer theorem – Proportional Voltage and Current formula - Ammeter, Voltmeter, Ohmmeter and Multimeter (Basic ideas) - Alternating currents: Frequency, Amplitude and Phase - RMS value and Power - Capacitance and Inductance - *Transformer*	13
Unit II	**SEMICONDUCTOR DEVICES AND CIRCUITS** Semiconductor and Energy bands - Doped Semiconductor - PN Junction diode and Zener diode - Characteristics - Half wave, Full wave and Bridge rectifiers – Capacitance filter-Two pin regulated power supply - Voltage doublers - Clippers and Clampers - Transistor and action - Common base and Common emitter Configurations - Relations between α and β - Load line and Operating point - Stability - Voltage divider Self bias - JFET and its characteristics	13
Unit III	**AMPLIFIERS & OSCILLATORS** Principle of amplification - Classification of amplifiers - Common emitter single stage amplifier and frequency response - Multistage amplifiers (Basic ideas) - Concept of feedback and Effect of negative feedback (qualitative) - Barkhausen criterion - Basic Oscillatory circuit and Classification of oscillators - Hartley, Colpitts and Phase shift Oscillators (Circuit operations)	13
Unit IV	**OPERATIONAL AMPLIFIER** Typical stages of an Op Amp - Ideal Op Amp and characteristics - Input offset voltage, Offset current, Bias current and Slew rate (Definitions) - Inverting Op Amp - Noninverting Op Amp - Differential Op Amp - Scale and Phase changers - Adder and Averager – Subtractor, Differentiator and Integrator	13
Unit V	**OPTOELECTRONIC DEVICES** Optical radiation - Flux and illumination - Structure, variation of resistance & speed response of a Photo detector - Photovoltaic cells - Photodiodes - Phototransistors - Light beam detector - Electronic slave flash control - Window detector - LED: Bar graph display, drivers and LED arrays - *Optically coupled isolator (Basic ideas)*	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	James J.Brophy	Basic Electronics for Scientists	McGraw Hill Publishing Company, New York	1990
2	Sadasiva Biswal	Basic Electronics (Vol. I)	Atlantic Publishers and Distributors	2001
3	Swaminathan Mathu	Electronics: Circuits and Systems	Howard W.Sams & Co. Inc, New York	1985
4	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://nptel.ac.in/courses/122/106/122106025/ https://nptel.ac.in/courses/117/103/117103063/ https://nptel.ac.in/courses/108/101/108101091/			

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Narayana Rao B.V.	Principles of Electronics (Vol. I & II)	Wiley Eastern Limited & New Age International Limited, New York	1994
2	Norman Lurch	Fundamentals of Electronics	John Wiley & Sons	2010 (Reprint)
3	Ramakant A.Gayakwad	Op-Amps & Linear Integrated Circuits	PHI Learning Pvt. Ltd., New Delhi	1997

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Dr. T. Ponraj Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS5E11			**Title**	**Batch:**	2022 – 2025
				Core Elective I: Communication Electronics	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	-		**Credits:**	5

Course Objective

To provide fundamental knowledge of digital modulation techniques with the concepts of communication system and their applications

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental theories of electronic systems involved in communication	K1 / K2
CO2	Apply the knowledge of mathematical methods to resolve the components of digital communication system	K3
CO3	Analyze basic wireless transmission circuits using electronic devices and instruments	K4
CO4	Explain clearly the importance of transformation equations to convert signals from one domain to another in the field of digital communication	K5
CO5	Design and analyze the electronic circuit systems that are responsible for digital transmission using various simulation techniques	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	-	-	M	-	H	-
CO2	M	H	L	M	H	-	M	M
CO3	M	M	H	H	M	L	M	M
CO4	-	-	M	L	-	M	-	H
CO5	-	-	-	-	-	M	-	H

H – High; M – Medium; L – Low

Communication Electronics

Units	Content	Hrs
Unit I	**SIGNAL ANALYSIS** Fourier transform of gate functions, delta functions at the origin – Two delta function and periodic delta function – properties of Fourier transform – Frequency shifting – Time shifting – Convolution theorem – Frequency convolution theorem – Sampling theorem	13
Unit II	**PULSE MODULATION AND COMMUNICATION** Pulse amplitude modulation – Natural sampling -Instantaneous sampling Transmission of PAM signals – Pulse width modulation – Time division multiplexing and frequency division multiplexing – Band width requirements for PAM signals – Pulse code modulation – Principles of PCU – Quantizing noise – Generation and demodulation of PCM – Effects of noise – Advantages and application of PCM – Differential PCM (DPCM) – *Delta modulation*	13
Unit III	**BROAD BAND COMMUNICATION** Coaxial cable circuit -Parallel wire line circuit – Computer communication – Digital data communication – Modems – Microwave communication links – LOS links – Tropospheric scatter microwave links – Integrated Service Digital Network (ISDN) – Architecture – Broadband ISDN – Local Area Network (LAN) – LAN topologies – Private Branch Exchange (PBX)	13
Unit IV	**SATELLITE COMMUNICATION** Introduction – Communication satellite systems – Transmitting and receiving earth station – Satellite orbits – Satellite frequency bands – Satellite multiple access formats – FDMA – CDMA – Satellite channel, Power flow – Polarization antenna gain – Parabolic dish antenna – Power loss – Rainfall effect – Receiver noise –satellite system power budget: EIRP, received power Carrier to noise ratio, G/T ratio. – Satellite link analysis – Up link – Down link – Cross link – Direct Home TV broadcasting – *Satellite transponders*	13
Unit V	**RADAR SYSTEMS AND OPTICAL FIBER** Introduction, Basic Radar systems, Radar systems – Radar range – Pulsed radar system – A Scope – Plan Position Indicator (PPI) – Search Radar – Tracking Radar – Moving Target Indicator (MTI) – Doppler Effect – MTI principle – Digital MTI – Radar Beacons. Optical Fiber: Introduction to light, optical fiber and fiber cables, optical fiber characteristics and classification, losses, Fiber optic components and systems, Installation, testing and repair	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Anokh singh & Chhabra A.K	Principle of communication engineering	S Chand and Co Ltd, New Delhi	2006

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Robert M.Ganliardi	Satellite Communication	CBS Publication New Delhi	2010
2	Arumugam M	Semiconductor Physics and Opto electronics	Anuradha Agencies, Kumbakonam	2006
3	Subir Kumar Sarkar	Optical Fibers and Fiber optical communication systems	S Chand and Co Ltd, New Delhi	2007
4	Lathi B.P	Communication systems	B.S.Publication	2001
5	Dennis Roddy and John Coolen	Electronic communications	Prentice Hall of India Pvt. Ltd, New Delhi	1998
6	Related online contents [MOOC, SWAYAM, NPTEL, Websites etc] https://nptel.ac.in/courses/117/101/117101051/ https://nptel.ac.in/courses/117/105/117105077/ https://nptel.ac.in/courses/106/106/106106129/			

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Dr. T. Ponraj Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS5E12			**Title**	**Batch:**	2022 – 2025
				Materials Science	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**			**Credits:**	5

Course Objective

To acquire basic knowledge of atomic structure and binding conditions of atom in the materials.
To acquire enveloping knowledge of physics, chemistry, metallurgy and mathematics to know wider field of materials science
To provoke the students to pursue research in the field of materials science.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the physics behind the material formation and different properties of the solids.	K1, K2
CO2	Tailor the properties of solids materials with the adequate knowledge.	K3
CO3	Develop a new materials based on the fundamental understanding of the properties	K3
CO4	Evaluate the materials properties for the cutting-edge applications	K4
CO5	Design and analysis the experimental/materials strategies	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	H	M	H	L	H	M
CO2	H	H	H	L	M	L	H	M
CO3	H	M	M	M	M	L	M	M
CO4	M	H	M	H	M	L	L	M
CO5	H	M	H	M	M	M	M	H

H-High; M-Medium; L-Low;

Materials Science

Units	Content	Hrs
Unit I	**Atomic Structure and Structure of Solids:** Fundamental concepts- electrons in atoms-atomic models-Bohr atomic model-wave-mechanical model-quantum numbers-electron configurations-the periodic table: element classification and characteristics-atomic bonding in solids, Force - interatomic distance curve, structure - crystallographic directions, crystallographic planes, linear and planar densities, close-packed crystal structures, density computations—metals.	13
Unit II	**Imperfection and diffusion of solids:** Imperfections: vacancies and self-interstitials-impurities in solids-specification of composition. diffusion: definition- impurity diffusion, diffusion mechanisms- vacancy diffusion- interstitial diffusion- steady-state diffusion- non-steady-state diffusion- factors that influence diffusion- diffusion in semiconducting materials- dislocations—linear defects.	13
Unit III	**Classifications of materials:** Crystalline and non-crystalline materials: single crystals-polycrystalline materials- anisotropy- non-crystalline solids, classification of metal alloys: ferrous and non ferrous alloys, ceramics: structural features – types of ceramics–industrial ceramics like tungsten carbide, silica-alumina, zirconia, silicon carbide and sialons, composites: definition of composites - continuous and discontinuous fiber composites-polymer and matrix-based composites, classification of polymers: structure – property correlation – molecular weight – crystallinity in polymers.	13
Unit IV	**Properties of materials:** Mechanical properties: concepts of stress and strain, elastic deformation-plastic deformation, electrical properties: electrical and ionic conductivity, energy band structures in solids, electron mobility, electrical resistivity of metals-ferroelectricity-piezoelectricity, thermal properties: heat capacity-thermal expansion-thermal conductivity, magnetic properties: magnetic dipoles-magnetic hysteresis – magnetic domain – magnetostriction – par magnetism, optical properties: light interactions with solids-refraction-reflection-absorption-transmission-color.	13
Unit V	**characterization of materials:** Introduction, Structural characterization-X-ray diffraction, Laue's method, Bragg's law, determination of crystal structure with principle, construction and working. Microstructural characterization – electromagnetic lens system, determination of surface morphology by Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Atomic Force Microscope (AFM) with principle, construction, working. Microhardness testing –Determination of microhardness by Vickers hardness test and knoop hardness test with principle construction, working and formula.	13
	Total Contact Hrs	**65**

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	William D. Callister, Jr., David G. Rethwisch	Materials science and engineering: an introduction	Wiley/Eight edition	2009
2	Dr. M. Arumugam	Material Science	Anuradha Publications, Chennai	1990

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	William D. Callister, David G. Rethwisch	Fundamentals of materials science and engineering : an integrated approach	Wiley/ third edition	2008
2	Sabar D. Hutagalung	Materials Science and Technolog	InTech	2012
3	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://nptel.ac.in/courses/113102080 https://nptel.ac.in/courses/112106293			

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Science	
Course Code:	22UPS5AL1			**Title**	**Batch:**	2022 – 2025
				Advanced Learner Course - I - Problem Solving Skills in Physics I	**Semester:**	V
Lecture Hrs./Week		**Tutorial Hrs./Sem.**			**Credits:**	5

Course Objective

Student will be introduced to solve problems in core physics. Every unit must contain minimum 20 problems based on various principles of Physics.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Get motivated to acquire problem solving skills in Physics	K1/K2
CO2	Apply the skills to solve in Mechanics, Thermal Physics and Electricity	K3
CO3	Select and use appropriate concepts and methods to solve problems effectively and creatively	K4
CO4	Identify, evaluate and synthesize information and engage the imagination to explore new possibilities	K5
CO5	Crack problems confidently in competitive examinations like JEST, JAM& TIFR	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	H	M	M	L	H	H
CO2	H	H	M	M	M	L	H	H
CO3	H	H	M	M	M	L	H	H
CO4	H	M	M	M	H	L	H	H
CO5	H	M	M	L	H	L	H	H

H – High; M – Medium; L – Low

Problem Solving Skills in Physics I

Units	Content	Hrs
Unit I	**MECHANICS** Newton laws of motion for various systems (1, 2 and 3 dimension), Conservation laws and collisions, Rotational mechanics, central force, Harmonic oscillator, special relativity	20
Unit II	**THERMAL PHYSICS** Kinetic theory- MB distribution-Laws of thermodynamics–Ideal Gas law-Various Thermodynamic process- Entropy calculation for various process-Heat engine-TS and PV diagram-Free energies various relations	15
Unit III	**ELECTRICITY & MAGNETISM** Electrostatics- calculation of Electrostatic quantities for various configurations-Conductors	10
	Total Contact Hrs	**45**

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Charles Kittel, Walter D knight (in SI units)	Mechanics (in SI units)	Tata McGraw Hill publication \ second edition	2017
2	S.C. Garg, RM Bansal & CK Ghosh	Thermal Physics	Tata McGraw Hill Publications\ first edition	1993
3	E.M.Purcell	Electricity & magnetism (in SI units)	Tata McGraw hill Publication\ second edition	1984

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	H.C. Verma	Concepts of Physics Vol 1 & 2	Bharathi Bhavan Publications	2017
2	Halliday & Resnick	Fundamentals of Physics	Wiley Publications\ 8th edition	2007
3	Nelkon and Parker	Advanced level Physics	CBS publishers\ 7th edition	1995
4	AmithAgarwal	Play with Graphs	Arihant Publications\ 10th edition	2018

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Dr. T.E. Manjulavalli Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS5S1			**Title**	**Batch:**	2022 – 2025
				Skill based Elective I: Mechanical Measurements	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	1	**Tutorial Hrs./Sem.**	-		**Credits:**	3

Course Objective

To enrich the basic foundation and inspire interest for the knowledge in Mechanical measurements

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the operational features, limitations and difficulties inherent in the instruments	K2
CO2	Classify and select proper measuring instrument for pressure and flow measurement	K3
CO3	Implement the operation and construction to infer the instrument characteristics	K4
CO4	Evaluate the accuracy, error and calibration of an instrument	K5
CO5	Design and use simple instrumentation for a measurement of mechanical properties.	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	-	M	-	-	H	-
CO2	H	M	-	H	-	H	H	M
CO3	M	M	L	H	L	-	M	-
CO4	-	H	-	-	M	-	-	M
CO5	-	M	M	H	L	M	-	H

H – High; M – Medium; L – Low

Mechanical Measurements

Units	Content	Hrs
Unit I	**INSTRUMENT CHARACTERISTICS** **STATIC TERMS AND CHARACTERISTICS:** Range and span - Accuracy, error and correction – Calibration - Hysteresis - Dead zone- Drift – Sensitivity – Stability - Linearity - Back lash – Stiction **DYNAMIC TERMS AND CHARACTERISTICS:** Speed of response and measuring lag - Fidelity and dynamic error – Overshoot – Dead time and Dead zone - *Frequency response*	3
Unit II	**TRANSDUCERS** Transducer description - Variable resistance transducer - Capacitance transducer - Photoelectric transducer - Piezo electric transducer	3
Unit III	**PRESSURE MEASUREMENT** Terms - Piezometer - U tube double column monometer – Bourdon gauge – McLeod gauge - CRO for varying pressure measurement	3
Unit IV	**FLOW MEASUREMENT** Nature of flow - Cup and Vane anemometers - Hotwire anemometer - Ultrasonic flow meter - Thermal flow meter – *Shadograph*	2
Unit V	**FREQUENCY AND ACCELERATION MEASUREMENT** Frequency and time period – Lissajous figures- Vibration amplitude and acceleration - Piezoelectric accelerator.	2
	Total Contact Hrs	**13**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \EDITION	YEAR OF PUBLICATION
1	Kumar, D. S	Mechanical Measurements And Control	Metropolitan, Third Edition, New York	1997

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Sawhney A. K. Puneet Sawhney	A Course in Mechanical Measurements and Instrumentation.	Dhanpat Rai & Co, New Delhi	2004 (12^{th} Edition)

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Ms. M. Gayathri Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS5S2			**Title**	**Batch:**	2022 – 2025
				Skill based Elective I: Fundamentals of Biophysics	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	1	**Tutorial Hrs./Sem.**	-		**Credits:**	3

Course Objective

To develop the basic knowledge about Biophysics and its Applications

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire the knowledge on the key principles of physics toward evaluating and analyzing the biological phenomenon.	K2
CO2	Apply the separation and physico-chemical techniques to study biological Structure	K3
CO3	Implement the characteristics of a biological system using the concept of physics and chemistry	K4
CO4	Explain the techniques and underlying concept of physics of Bio mechanics and Neuro- Biophysics	K4
CO5	Evaluate the physical and chemical properties of biological applications	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	-	L	-	-	M	-
CO2	H	M	L	M	-	M	M	-
CO3	-	-	-	-	M	-	-	L
CO4	H	H	L	M	-	-	M	M
CO5	-	-	-	-	M	L	-	-

H – High; M – Medium; L – Low

Fundamentals of Biophysics

Units	Content	Hrs
Unit I	**LAWS OF PHYSICS AND CHEMISTRY** Quantum Mechanics – Electronic structure of Atom – Molecular orbitals and Covalent bonds – Molecular Interactions – Strong and Weak interaction – Thermodynamics – Entropy and Enthalpy – *Free energy of a system*	3
Unit II	**MOLECULAR ALPHABETS OF LIFE** Introduction to the molecular structure and function of Proteins, Nucleic acids, Carbohydrates and Lipids.	2
Unit III	**BIOMOLECULAR SEPARATION TECHNIQUES** Chromatography: Column, Thin Layer, Ion exchange, Molecular exclusion and Affinity Chromatography – Electrophoresis – Gel Electrophoresis.	2
Unit IV	**PHYSIOCHEMICAL TECHNIQUES** Ultra centrifugation – Viscosity – Light scattering measurements – Different types of Light microscopy – Basics of TEM, SEM – Introduction to X-ray crystallography and NMR	3
Unit V	**BIOMECHANICS AND NEURO-BIOPHYSICS** Mechanical properties of muscles – Biomechanics of cardiovascular system – The nervous system – Physics of membrane potentials – Sensory mechanisms – The Eye – *Physical aspects of hearing.*	3
	Total Contact Hrs	**13**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Vasantha Pattabhi, Gautham N	Biophysics	Narosa Publishing House. New Delhi	2002

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Rodney Cotterill	Biophysics an Introduction	John Wiley &Sons Ltd, England.	

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Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS614			**Title**	**Batch:**	2022 - 2025
				Core X: Atomic & Nuclear Physics	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**			**Credits:**	5

Course Objective

To comprehend the structure and properties of electron and the nucleus

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire fundamental knowledge about the electronic and nuclear structure of atoms	K1
CO2	Understand the influence of X-rays, atomic and nuclear physics on modern scientific developments	K2
CO3	Apply the key strategies to investigate the atomic and nuclear physics that affects our everyday living	K3
CO4	Analyze techniques to examine and understand the processes within material industry and medical applications of nuclear phenomena	K4
CO5	Evaluate properties of elementary particles, associated symmetries, conservations and models	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	L	-	M	-	H	-
CO2	H	M	M	M	M	L	H	-
CO3	L	H	M	L	M	-	M	L
CO4	-	M	H	M	M	L	M	M
CO5	-	L	M	H	M	H	-	M

H-High; M-Medium; L-Low

Atomic & Nuclear Physics

Units	Content	Hrs
Unit I	**STRUCTURE OF THE ATOM** Introduction to Atom Models - Sommerfeld's Relativistic Atom Model - Sommerfeld's Relativistic Theory - Fine Structure of H_α line - The Vector atom Model - Quantum Numbers associated with the vector atom model - Coupling Schemes **ATOMIC SPECTRA** Zeeman Effect - Lorentz classical theory of Zeeman Effect- Expression for the Zeeman Shift - Larmor's Theorem - Quantum Mechanical explanation of the Normal Zeeman Effect - Paschen-Back Effect	13
Unit II	**X -RAYS** Origin of X rays - Production & detection - Properties - Diffraction of X rays (Laue spots) - Bragg's Law - Bragg's X ray Spectrometer - Determination of crystal structure by Powder crystal method - Continuous and Characteristic X ray spectrum - Mosley's Law and significance - Theory of Compton Scattering - Experimental verification - Applications of X rays (Basic ideas) **PHOTOELECTRIC EFFECT** Introduction- Experimental investigations - Einstein's photoelectric equation - Millikan's experiment	13
Unit III	**NUCLEAR MODELS** Properties of nucleus - Binding energy of the nucleus and packing fraction - Nuclear stability - Nuclear models: Liquid drop model and Semi empirical mass formula - Shell model (Qualitative ideas). **RADIOACTIVITY** Natural radioactivity- The law of radioactive decay and decay rate - Half life and Mean life - Alpha decay: Determination of charge of the α particle- Range of α particles- Geiger – Nuttal law- Beta decay: Beta ray spectrum – Pauli's neutrino hypothesis -Non conservation of parity in Beta decay- Gamma decay: Origin of Gamma rays- Internal conversion.	13
Unit IV	**NUCLEAR REACTIONS, DETECTORS AND ACCELERATOR** Nuclear reaction energy - Reaction cross section - Nuclear fission - Energy released in fission of U235 - Chain reaction - Fission reactor - Nuclear fusion - Fusion reaction - Advantages and problems of fusion. Ionization chamber: Simple Ionization chamber - Proportional counter - GM counter - Scintillation counter - Linear accelerator – Cyclotron.	13
Unit V	**ELEMENTARY PARTICLES AND COSMIC RAYS** Fundamental forces in nature - Classification of elementary particles based on interactions - Conservation laws - Strange particle and Strangeness - Quarks - Quark model - Cosmic rays - Primary and Secondary cosmic rays - Cosmic ray showers - Positron - Pair production - Annihilation of matter - Mesons - Origin of cosmic rays.	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Murugeshan R,	Modern Physics	S. Chand and Company Ltd, 14th edition, New Delhi,	2009
2	Raymond A. Serwey, Clement J. Moses & Curt Moyer,	Modern Physics	. 2nd edition, Saunders College Publishers	-
3	Atam P.Arya,	Elementary Modern Physics	Addition – Wesley publishing Company,	-
4	Rajam J.B. Prof.Louis De Broglie,	Atomic Physics	Sultan Chand & Sons, New Delhi,	2000

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Atam P.Arya,.	Elementary Modern Physics	1st edition, Addision Wesley	1974
2	Sehgal Chopra,.	Modern Physics	9th edition Sultan Chand & Sons, New Delhi	2004
3	Pandya M.L. YadAv R.P.S,	Elements of Nuclear Physics	5th editions, KedarNath RamNath Publications	2008
4	Tayal D. C.	Nuclear Physics	4th edition, Himalaya Publishing House Publishers, New Delhi	1987
	Related online contents [MOOC, SWAYAM, NPTEL, Websites etc] **https://youtu.be/josqjcH79PE** **https://youtu.be/3lTQqEehEhI** **https://youtu.be/IsaTx5-KLT8**			

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Name: Dr. T.E. Manjulavalli Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS615			**Title**	**Batch:**	2022 - 2025
				Core XI: Solid State Physics & Statistical Mechanics	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**			**Credits:**	5

Course Objective

To study the basic theory of crystal structure, composition and physical properties of crystalline materials.Study the electrical and magnetic properties of solids through classical and quantum statistics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic structural parameters, characteristics and behavior of matter in whichever phase they are in	K1/K2
CO2	Apply theoretical insights on the external application of force and torque and also understanding the underlying theory in it	K3
CO3	Analyze the conceptual understanding of the facts through implications of Quantum statistical concept.	K4
CO4	Evaluate the application aspects of above-mentioned behavior in innovative research work	K5
CO5	Create experimental insights into material design and property evaluation using classical and quantum principles	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	L	-	M	-	H	-
CO2	M	H	M	L	H	-	H	L
CO3	L	M	H	M	M	L	M	M
CO4	-	L	M	H	M	M	-	H
CO5	-	L	M	M	M	H	-	H

H-High; M-Medium; L-Low

Solid State Physics & Statistical Mechanics

Units	Content	Hrs
Unit I	**BASICS OF CRYSTALLOGRAPHY:** Crystalline solids: Periodic array of atoms – symmetry operations – unit cell and primitive lattice cell- symmetry elements: rotation axis of symmetry, Mirror plane, inversion centre – twenty three symmetry elements in a cube crystal – Roto-inversion axis, Roto-reflection axis- Basics of point groups- Bravais lattice (2D and 3D), PF for SC,BCC,FCC and HCP)- other cubic structures – Lattice plane and Miller Indices – interplanar distance of lattice planes – Reciprocal lattice – Experimental method in X-ray diffraction (Laue method, Rotating crystal method)	13
Unit II	**BONDING AND LATTICE VIBRATIONS** Ionic bonding –Energy of formation of NaCl molecules –PE diagram of ionic molecules – Cohesive energy- Characteristics of ionic bond – covalent bond – Characteristics of covalent bond – Directional nature of covalent bond – Hybridization – Metallic bond – characteristics of Metallic bond – Molecular bond – Characteristics of molecular bond- Hydrogen bonding. Elastic vibration of continuous media – Group velocity of harmonic wave trains – wave motion in one dimensional atomic lattice(qualitative)-Lattice with two atoms per primitive cell (Qualitative) – Phonons – Classical theory of lattice specific heat – thermal expansion	13
Unit III	**ELECTRICAL CONDUCTION IN SOLIDS:** Drude Lortenz free electron theory – Electrical resisitivity vs temperature, Fermi-Dirac Distribution – Few parameter of electron gas – Energy spectra in atoms, molecules and solids – Kronig –Penney model (qualitative) – Motion of electron in periodic potential – physical meaning of effective model- Construction of Brillouin Zone in 2D and 3D lattice – Distinction between metal, insulator and semiconductor- Hall effect.	13
Unit IV	**MAGNETIC PROPERTIES OF SOLIDS AND SUPERCONDUTIVITY:** Langevins classical theory of diamagnetism – Paramagnetism – origin of permanent magnetic moment – Weiss theory of paramagnetism – classical theory of ferromagnetism – Ferromagnetic domains – origin of domains – Structure of ferrites: Effect of critical field – Meissner effect – Penetration depth of magnetic field – Type I and II superconductors – isotope effect – Thermodynamics effects – Energy gap – BCS theory of superconductors – Josephson effect (simple ideas only)	13
Unit V	**STATISTICAL THERMODYNAMICS** Probability - Basic rules of probability theorem – Macro state and micro state – thermodynamic probability – constraints on a system – static and dynamic states Most probable state – Life time of a macro and micro state – concept of a cell in a compartment - Statistical equilibrium – Probability theorem in statistical thermodynamics– Maxwell's Boltzmann distribution law- Maxwell's Boltzmann distribution in terms of temperature – Maxwell quantum statistics – phase space – Fermi-Dirac distribution law – Bose Einstein distribution law –Comparison of three statistics.	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods: Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Gupta S.L. Kumar V.	Solid State Physics	9th Revised Edition, K.Nath & Co., Meerut	2016
2	Pillai S.O.	Solid State Physics. (Units I - III)	New age international (P) Ltd, New Delhi, \6th Edition,	2005
3	Kamal Singh, Singh S.P.	Elements Of Statistical Mechanics (Units IV &V).	1st Edition, S.Chand & Company Ltd, NewDelhi,	1985
4	Brijlal N Subrahmanyam P.S. Hemne	Heat Thermodynamics and Statistical Physics and applications	S. Chand	2012
5	R. Murugeshan Er. Kiruthiga Sivaprasath	Thermal Physics	S. Chand	2012

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Agarwal B.K. Melvin Eicher,	Statistical Mechanics.	Wiley Eastern Ltd, Bangalore,	1975
2	Serway R. Moses C. Moyer C.A.	*Modern Physics*. (Unit III).	2nd edition, Saunders college publishers,	1997
3	M.A Wahab	Solid State Physics	Narosa Publishing House	1999
4	C. Kittel	Introduction to solid state physics	Wiley Indina	2019
5	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://youtube.com/playlist?list=PLFW6lRTa1g83HGEihgwcy7KeTLUuBu3WF https://youtube.com/playlist?list=PLbMVogVj5nJRjLrXp3kMtrIO8kZl1D1Jp https://youtube.com/playlist?list=PL090DAFDD7A36E27B https://youtube.com/playlist?list=PLgMDNELGJ1CYJka07lYfNgSgno3OES8Wt https://youtu.be/x9nbogX1Ie0 https://youtu.be/na6mYwzIuhM			

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Name: Dr. A. Sureshkumar Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R. Muthukumaran Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS6E16			**Title**	**Batch:**	2022 – 2025
				Core Elective II: Digital Circuit systems & Microprocessor	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	-		**Credits:**	5

Course Objective

To study the number system, Logic circuits and its application and to understand the architecture and instruction set of 8085 microprocessor

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understanding the operations of BCD numbers and memory allocation in computers	K2
CO2	Develop effective problem solving abilities	K3
CO3	Analyze electronic circuits	K4
CO4	Apply the concept of basic electronic devices to design various circuits	K5
CO5	Understand and to implement digital electronics and Microprocessor.	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	M	M	L	H	H	M
CO2	M	H	H	H	H	M	H	M
CO3	M	H	H	H	H	H	H	M
CO4	M	M	H	M	M	H	H	M
CO5	H	H	M	H	M	M	H	M

H – High; M – Medium; L – Low

Digital Circuit systems & Microprocessor

Units	Content	Hrs
Unit I	**NUMBER SYSTEMS AND CODES** Binary numbers - 1's and 2's complement - Addition - Subtraction - Multiplication – Division - Binary to Decimal conversion and vice versa - Octal numbers - Octal to Binary conversion and vice versa - Hexadecimal numbers - Hexadecimal to Binary conversion and vice versa - BCD - ASCII **LOGIC GATES** Basic gates (OR, AND and NOT gates) - Universal building blocks (NAND and NOR gates) - XOR and XNOR gates	13
Unit II	**THEOREMS OF BOOLEAN ALGEBRA & KARNAUGH MAP** Demorgan's theorems - Laws and theorems of Boolean algebra - Simplification of Boolean expressions using Boolean laws and theorems - Karnaugh map – Simplification of expressions using pairs, quads and octets - Sum of product method and simplifications - Don't care conditions - Product of sum method and simplifications	13
Unit III	**ARITHMETIC PROCESSING CIRCUITS** Half and full adders - Half and full subtractors - Parallel binary adder and subtractor data Processing circuits. **DATA PROCESSING CIRCUITS** Multiplexers - Demultiplexers - 1 - of - 16 decoder - BCD to decimal decoder – Seven segment decoders - Encoders	13
Unit IV	**FLIP FLOPS , SHIFT REGISTERS** RS Flip Flop - D Flip Flop - Edge triggering - JK and Master slave Flip Flop - Serial in serial out - Serial in parallel out - Parallel in serial out - Parallel in parallel out shift register **COUNTERS** Asynchronous Mod 8 up and down counters - Decoding gates - Synchronous Mod 8 up and down counters - Mod 3, Mod 5 counters	13
Unit V	**MICROPROCESSOR ARCHITECTURE AND PROGRAMMING** Organization of a Microcomputer system – Architecture of the 8085 - Microprocessor instruction set and computer languages - Overview of the 8085 instruction set: Data transfer, Arithmetical, Logical, Branch, Stack, I/O & Machine control groups – Addressing modes - Programming the 8085: The programming process - The stack and subroutines - Simple programming examples	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \EDITION	YEAR OF PUBLICATION
1	Malvino A.P, Leach D.P.	Digital Principles and Applications	Tata Mc Graw Hill Publishing Company Ltd., New Delhi \ 4th Edition	2000
2	Swaminathan Madhu	Electronic Circuits and Systems	Howard W. Sams & Co., Inc-A publishing subsidary of ITT \ 1st Edition	1985

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \EDITION	YEAR OF PUBLICATION
1	Jacob Millman, Halkias C.	Integrated Electronics	Mc Graw Hill Publishing Company \ 1st Edition	1985
2	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://nptel.ac.in/courses/117106114 https://nptel.ac.in/courses/108105113			

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Name: Dr.A.G.Kannan Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Science	
Course Code:	22UPS6E17			**Title**	**Batch:**	2022 – 2025
				Core Elective II : Biomedical Instrumentation	**Semester:**	VI
Lecture Hrs./Week	5	**Tutorial Hrs./Sem.**	-		**Credits:**	5

Course Objective

To familiarize with the use of medical instruments and gain the knowledge in operation of modern biomedical instruments

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the structure of cell, physiology of different biological systems and their functions.	K1
CO2	Illustrate the types of electrodes and measurements of biological parameters.	K2
CO3	Explain the working of diagnostic instruments, therapeutic instruments and imaging systems.	K3
CO4	Analyse the different methods of measurements of biological parameters.	K4
CO5	Compare the different techniques of measurement in medical field.	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	L	M	M	L	H	H
CO2	H	M	L	H	M	H	H	H
CO3	H	M	M	L	H	H	M	M
CO4	H	M	M	M	H	M	H	M
CO5	H	M	L	H	H	H	M	H

H – High; M – Medium; L – Low

Biomedical Instrumentation

Units	Content	Hrs
Unit I	**ELECTRO PHYSIOLOGY** Cell-and Its Structure - Electrical, Mechanical and Chemical Activities - Action and Resting Potential- Organization of Nervous System - CNS - PNS - Neurons - Axons- Synapse - Propagation of Electrical Impulses along the Nerve-Sodium Pump - *Cardio Pulmonary System - Physiology of Heart, Lung, Kidney*.	13
Unit II	**BIO POTENTIAL ELECTRODES AND TRANSDUCERS** Design of Medical Instruments - Components of Biomedical Instrument-System - Electrodes: Micro Electrodes, Needle Electrodes, Surface Electrodes - Instrumentation amplifier - Biomedical Measurements Like pH, PCO2, PO2 of Blood, Isolation Amplifier, Preamplifier, Current Amplifier, Chopper Amplifier.	13
Unit III	**INSTRUMENTS USED FOR DIAGNOSIS** ECG, Einthoven Triangle, Leads, Electrodes, Vector Cardiograph, Measurement of Cardiac Output, EEG, EMG, Plethysmography, Blood Flow Measurements, Holter Monitor - Respiratory Rate Measurement - Oximeter, Bone Density Measurement, Patient Monitoring System, ICCU.	13
Unit IV	**MODERN IMAGING SYSTEM** Ultrasonic Diagnosis, Ultrasonic Scanning, Isotopes in Medical Diagnosis- Pace Makers, Defibrillators, Doppler Monitor(colour), Medical imaging - X-ray generation, DXA, Radiographic & Fluoroscopic Techniques - Image Intensifiers- Computer Aided Tomography, PET, SPECT - Laser Applications - Echocardiography - CT Scan Qualitative and Quantitative - *MRI/ NMR - Endoscopy*.	13
Unit V	**RECENT TRENDS AND INSTRUMENTS FOR THERAPY** Dialysers - Surgical Diathermy - Electro Anaesthetic and Surgical Techniques. Sources of Electric Hazards and Safety Techniques. Single Channel Telemetry, Multi channel Telemetry, Implantable Telemetry, Wireless Telemetry, Telemedicine, Telemedicine Applications.	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, power point presentation

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Khandpur	Handbook of Biomedical Instrumentation	Tata McGraw Hill	2003
2	Arumugam M.	Biomedical Instrumentation	Anuradha Publications	2009
3	Tompkins W.J. Webster J.G.	Design of Microcomputer Based Medical Instrumentation	Prentice Hall	1991

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Geddes L.A. Baker L.E	Principle of Applied Biomedical Instrumentation	Wiley	1989
2	Hill D.W.	Principle of Electronics for Medical Research	Butterworths	1965
3	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://nptel.ac.in/courses/102105090			

Designed by	Verified by HOD	Checked by CDC	Approved by COE
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Programme Code:	B.Sc. PHY			Programme Title:	Bachelor of Physics	
Course Code:	22UPS6E18			Title	Batch:	2022 – 2025
				Core Elective II : Nanomaterials and applications	Semester:	VI
Lecture Hrs./Week or Practical Hrs./Week	5	Tutorial Hrs./Sem.			Credits:	5

Course Objective

To lay foundation of Nano science and Nanotechnology.
To provide the fundamental knowledge of nano materials, their synthesis and fabrication, properties and applications.
To provoke the students to pursue research in the field of nanomaterials

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental of nanomaterials and nanotechnology	K1,K2
CO2	Synthesize nanomaterials using various physical and chemical methods	K3
CO3	Tune the size and shape of the nanomaterials for diverse applications	K4
CO4	Evaluate the properties of nanomaterials and defects nature of the materials	K4
CO5	Design nano materials-based devices and analysis their performance	K4,K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	L	M	M	L	M	L
CO2	M	H	M	M	L	H	H	M
CO3	H	H	H	H	M	H	H	H
CO4	M	M	M	H	H	M	M	H
CO5	M	M	L	M	H	L	L	M

H-High; M-Medium; L-Low

Nanomaterials and applications

Units	Content	Hrs
Unit I	**Basic Concepts of Nanoscience:** Nanoscience- Nanotechnology-Nanomaterials definitions - Classification of carbon nanostructures- Allotropes, dimensions (one, two, three, and zero dimension), confinement-Surface to volume ratio-Energy at bulk and nano scale- Nature Nanophenomena- types of nanotechnology – Molecular Nanotechnology – Molecular and atomic size – Surface and dimensional space.	13
Unit II	**Nano Materials:** Classification of Nano structured materials – Present and potential with significant technological impact – Industrial in nano materials – Fullerenes and nano tubes – Metals and inorganic – Fundamental issues in nano materials. Introduction to polymer nanocomposites: Basic materials for polymer nanocomposite	13
Unit III	**Nano Properties:** Forces between atoms and molecules, particles and grain boundaries – Vander Waals and electrostatic forces between surface – Nano and Mesopores – size dependent variation in magnetic, electronic transport, resistivity, optical and etc – Misnomers and misconception of Nanotechnology	13
Unit IV	**Nano Materials Synthesis:** Basic approaches of synthesis nanomaterials – Bottom up and top down process – fundamental of sol – gel process – Mechanical milling – thermal evaporation– Liquid solid reactions – Gas phase synthesis of nano materials – Chemical vapour condensation (CVC) – Microwave plasma processing – Laser ablation – vapour liquid – solid growth .	13
Unit V	**Application of Nanomaterials**: Implications of Drug delivery – Polymeric Nanoparticles as Drug carriers and controlled release implant devices – Magnetic Data Storage – Magneto optics and magneto – optic recording – Nano Sensors – Physical sensor and chemical sensors.	13
	Total Contact Hrs	**65**

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Robert W. Kelsall, Ian W. Hamley, Mark Geoghegan	Nanoscale Science and Technology	John Wiley & Sons Ltd,	2005
2	T. Pradeep,	NANO:The Essentials-Understanding Nanoscience and Nanotechnology,	McGraw Hill Education (India) Private Limited,	2018
3	M.F.Ashby, P.J. Ferreira, Daniel L.,	Nanomaterials, Nanotechnologies and Design	Elsevier Publications	2009

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Masuo Hosokawa, Kiyoshi Nogi, Makio Naito, ToyokazuYokoyama,	Nanoparticle Technology Handbook,	Elsevier Publications,	2007
2	K K Chattopadhyay, Arghya Narayan Banerjee,	Introduction to Nanoscience and Nanotechnology,	PHI Learning	2009
3	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://youtu.be/S-SOEBTplOM https://youtu.be/Ds_rzoyyfF0 https://youtu.be/M8d3pxVb4c4 https://youtu.be/ebO38bbq0_4			

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Dr. T.E. Manjulavalli Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS6E19			**Title**	**Batch:**	2022 – 2025
				Core Elective III: C Programming & Information Security	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**			**Credits:**	5

Course Objective

To develop the skill to gain knowledge in Programming in C & Information Security

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of C programming and information security	K1/K2
CO2	Apply the concepts of C programming to solve problems in Physics	K3
CO3	Analyze the importance of operators, control statements, functions, structures and pointers in problem solving	K4
CO4	Evaluate the impact of various types of attacks on information leakage and security	K5
CO5	Create the advance perspectives on prevention through cyber-crime of wireless digital communications including internet and e-commerce	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	H	H	H	H	H	H
CO2	M	H	H	H	H	M	H	H
CO3	M	H	H	H	M	M	H	H
CO4	-	M	M	H	M	M	M	H
CO5	-	L	M	M	M	H	-	H

H – High; M – Medium; L – Low

C Programming & Information Security

Units	Content	Hrs
Unit I	**INTRODUCTION TO C** Basic Structure of C Programs - Character set - Key words and Identifiers - Constants - Variables - Data types – Declaration of variables – Assigning values to variables – Defining symbolic constants - Arithmetic operators - Relational operators - Logical operators - Assignment operators - Increment and decrement operators - conditional operators - Precedence of operators - *Formatted input & output statements*	13
Unit II	**CONTROL STRUCTURES, ARRAYS & STRINGS** Simple if - if…else - Nesting of if...else - else if ladder - Switch - while - do…while - for statements - Declaration and initialization of one & two dimensional arrays - Declaring and initializing string variables - String handling functions	13
Unit III	**FUNCTIONS, STRUCTURES AND POINTERS** Definition of functions - Return values and their types - Category of functions**:** No arguments and no return values - Arguments but no return values - Arguments with return values - Recursion - Defining a structure - Declaring structure variables - Accessing structure members - Structure initialization - Declaring and initializing pointers - Pointers as function arguments - Pointers and structures	13
Unit IV	**INFORMATION SECURITY - I** Components of Communications System – Transmission Media. Protocol – Definition – Introduction to TCP / IP – Wireless Network – Basics of Internet. Types of Attack: Phishing, Spoofing, Impersonation, Dumpster diving – Information Security Goals. Information Security Threats and Vulnerability: Spoofing Identity, Tampering with data, Repudiation, Information Disclosure, Denial of Service, Elevation of Privilege.	13
Unit V	**INFORMATION SECURITY - I** Authentication – Password Management – E-Commerce Security – Windows Security. Network Security: Network Intrusion and Prevention Systems – Firewalls – Software Security. Web Security: User authentication, Authentication – Secret and Session Management, Cross Site Scripting, Cross Site Forgery, SQL Injection. Computer Forensics – *Steganography*.	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	E.Balagurusamy	Programming in Ansi C (Units I-III)	Tata McGraw Hill	2017
2	Michael E. Whitman, Herbert J. Mattord	Principles of Information Security (Units IV & V)	Course Technology 20 Channel Center Boston, MA 02210	2017

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ravichandran.D	Programming In C	New Age International Publishers	2011
2	Yashvant Kanetkar	Let Us C	BPB Publications	2016
3	Jason Andress	The Basics of Information Security	Syngress; 1st edition	2011
4	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** https://nptel.ac.in/courses/106104128 https://nptel.ac.in/courses/106106129			

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Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Science	
Course Code:	22UPS6E20			**Title**	**Batch:**	2022 – 2025
				Core Elective III : Industrial Instrumentation	**Semester:**	VI
Lecture Hrs./Week	5	**Tutorial Hrs./Sem.**	-		**Credits:**	5

Course Objective

To make the student familiar with measurement techniques of physical quantities and analyze the data

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the principles of instruments used in different industrial sectors	K1
CO2	Elucidate the construction and working of various industrial devices in measuring physical quantities	K2
CO3	Analyze the performance and characteristics of each instrument	K3
CO4	Make the new models for calibration and configuration of instruments	K4
CO5	Formulate the instruments for specific applications in industries	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	M	H	M	L	H	H
CO2	H	H	L	H	M	H	H	H
CO3	H	M	M	H	H	H	M	M
CO4	H	H	M	H	M	H	M	M
CO5	H	M	L	M	H	H	M	H

H – High; M – Medium; L – Low

Industrial Instrumentation

Units	Content	Hrs
Unit I	**INDUSTRIAL MEASUREMENTS** Measurement of straightness, flatness, roundness and roughness. Force Measurement - Load cell, different types of load cells - elastic load cell-strain gauge load cell. Torque measurement-Using strain gauge and magneto elastic principle, Speed Measurement - Revolution counter-capacitive tacho-drag up type tacho, D.C and A.C tacho generators – stroboscopic methods. Acceleration Measurement- *Elementary accelerometer, Seismic accelerometer, Practical accelerometers.*	13
Unit II	**TEMPERATURE MEASUREMENT & APPLICATION** Definition & Standards, Temperature scales, Calibration of thermometers, Bimetallic thermometer, filled- in Thermometers, Vapour pressure thermometers, Resistance thermometers, Thermistors- color code testing and installation procedure, Thermostat, Thermocouples - types and ranges, characteristics, laws of thermocouples, cold junction compensation, IC temperature sensors AD 590, *Pyrometers - radiation and optical pyrometers.*	13
Unit III	**PRESSURE MEASUREMENT** Manometers - different types of manometers, Elastic pressure transducers, Dead weight Tester, Electrical types, Vacuum gauges - McLeod gauge, Knudsen gauge, Thermocouple gauge, Ionization gauge, Differential pressure Transmitter - electrical & pneumatic types, Complete air supply system for pneumatic control equipment and the different components and their function.	13
Unit IV	**MEASUREMENT OF FLOW & LEVEL** Orifice, Venturi, Pitot tube, flow nozzle rotameter, Dahltube, Positive displacement meter, Turbine flow meter, Electromagnetic flow meter, Ultrasonic flow meter, Open channel flow measurement, Solid flow measurement. Level: Sight glass, float gauge, displacer, torque tube, bubble r tube, diaphragm box, Differential Pressure methods, electrical methods resistance type, capacitance type, ultrasonic level gauging.	13
Unit V	**MEASUREMENT OF DENSITY, VISCOSITY, HUMIDITY** Hydrometer - continuous weight measurement, liquid densitometer - float principle, air pressure balanced method, using gamma rays - gas density measurements – gas specific gravity measurements - Viscosity terms, saybolt viscometer, rotometer type viscometer, Industrial consistency meters. Humidity terms - dry & wet bulb psychrometers - hot wire electrode type hygrometer, electrolytic hygrometer, Dew point hygrometer.	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Chalk and Talk lectures, Group Discussion, Seminar, Interaction, power point presentation

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Patranabis D.	Principles of Industrial Instrumentation	Tata McGraw Hill, New Delhi	2009
2	Singh. S.K.	Industrial Instrumentation & Control	Tata McGraw Hill, New Delhi	2009
3	Krishnaswamy. K Vijayachitra. S	Industrial Instrumentation	New age International	2008

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ernest O. Doebelin, Dhanish. N. Manik	Measurement Systems Application & Design	TMH	2004
2	Jain R.K	Mechanical & Industrial Measurements	Khanna Publishers	2004

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Dr. A. G. Kannan Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS6E21			**Title**	**Batch:**	2022 – 2025
				Core Elective III: Python Programming	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	-		**Credits:**	5

Course Objective

To provide fundamental knowledge of Python programming and create the ability to interpret physics oriented problems using Python

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basics, structure and functions of Python programming as useful scripting language	K1 / K2
CO2	Plan to write the algorithm of a program with the knowledge of mathematical operators, logical operators, conditional and looping statements	K3
CO3	Categorize various statements of Python programming into the lists and tuples	K4
CO4	Explain clearly the importance of different function statements and pass the arguments between functions	K5
CO5	Implement and compile the python programming for application in the field of Physics	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	-	-	M	-	H	-
CO2	H	H	L	-	H	-	M	M
CO3	M	M	H	M	M	L	M	M
CO4	-	L	M	H	L	M	-	H
CO5	-	-	-	M	-	M	-	H

H – High; M – Medium; L – Low

Python Programming

Units	Content	Hrs
Unit I	**INTRODUCTION TO PYTHON LANGUAGE** History of Python – features – command Line Arguments - Parsing Command Line Arguments - Python basics – statement and syntax – Identifiers – comments in Python - Basic style guidelines	13
Unit II	**VARIABLE TYPES AND BASIC OPERATORS** Assigning Values to Variables – Standard Data Types - Python Numbers – Python Strings - Python Lists - Python Tuples - Python Dictionary - Data Type Conversion - Types of Operator - Arithmetic Operators - Comparison Operators - Assignment Operators - Bitwise Operators - Logical Operators - Membership Operators - Identity Operators - Operators Precedence	13
Unit III	**STRING OPERATORS** Sequences: Strings, Lists and Tuples – Sequences – Strings and strings operators – String built-in methods – Lists – List type Built in Methods – Tuples	13
Unit IV	**CONDITIONAL AND LOOPING STATEMENT** Conditionals and loops – if statement – else Statement – elif statement – conditional expression – while statement – for statement – break statement – continue statement – pass statement – Iterators and the iter( ) function	13
Unit V	**PYTHON FUNCTIONS** Functional Programming – Functions – calling functions – creating functions – passing functions – Built-in Functions: apply( ), filter( ), map( ) and reduce( ) – Programming using functions	13
	Total Contact Hrs	**65**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Wesley J. Chun	Core Python Programming	Pearson Education Publication	2012

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Nageshwara Rao	Core Python Programming	Wiley Publication	2018
2	John V Guttag	Introduction to Computation and Programming Using Python	Prentice Hall	2013
3	Kenneth A. Lambert	Fundamentals of Python – First Programs	CENGAGE Publication	2016
4	**Related online contents [MOOC, SWAYAM, NPTEL, Websites etc]** www.python.org			

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Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Science	
Course Code:	22UPS6AL2			**Title**	**Batch:**	2022 – 2025
				Advanced Learner Course - II - Problem Solving Skills in Physics II	**Semester:**	VI
Lecture Hrs./Week		**Tutorial Hrs./Sem.**			**Credits:**	5

Course Objective

Student will be introduced to solve problems in core physics. Every unit must contain minimum 20 problems based on various principles of Physics.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Get motivated to acquire problem solving skills in Physics	K1/K2
CO2	Apply the skills to solve in Magnetism, Quantum Mechanics, General Physics etc	K3
CO3	Select and use appropriate concepts and methods to solve problems effectively and creatively	K4
CO4	Interpret and use written, quantitative, and visual text effectively in presentation of solutions to problems	K5
CO5	Crack problems confidently in competitive examinations like JEST, JAM & TIFR	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	H	M	M	L	H	H
CO2	H	H	M	L	M	L	H	H
CO3	H	H	M	M	M	L	H	M
CO4	H	M	M	M	H	L	H	H
CO5	H	M	M	L	H	L	H	H

H – High; M – Medium; L – Low

Problem Solving Skills in Physics II

Units	Content	Hrs
Unit I	**MAGNETISM** Magneto statics- Calculation of Magnetic quantities for various configurations, Electromagnetic induction, Poynting vector, Electromagnetic waves.	10
Unit II	**QUANTUM MECHANICS** Origin of Quantum mechanics- Fundamental Principles of Quantum mechanics- potential wells and harmonic oscillator- Hydrogen atom.	20
Unit III	**GENERAL PHYSICS & MATHEMATICS** Plotting the graphs for various elementary and composite functions-Elasticity-Viscosity and surface tension- fluids-Buoyancy-pressure-Bernoulli's theorem-applications-waves and oscillations, Errors and propagation of errors.	15
	Total Contact Hrs	**45**

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	E.M. Purcell	Electricity & magnetism (in SI units)	Tata McGraw hill Publication\ second edition	1984
2	N. Zettili	Quantum mechanics	Wiley Publishers\ second edition	2009
3	David. J. Griffith	Introduction to quantum mechanics	Pearson Publications\ second edition	2015
4	D.S. Mathur	Properties of matter	S. Chand Publications\ 11th Edition	2010

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	H.C. Verma	Concepts of Physics Vol 1 & 2	Bharathi Bhavan Publications	2017
2	Halliday & Resnick	Fundamentals of Physics	Wiley Publications\ 8th edition	2007
3	Nelkon and Parker	Advanced level Physics	CBS publishers\ 7th edition	1995
4	Amith Agarwal	Play with Graphs	Arihant Publications\ 10th edition	2018

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Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS6S3			**Title**	**Batch:**	2022 – 2025
				Skill based Elective II: Environmental Instrumentation	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	1	**Tutorial Hrs./Sem.**	-		**Credits:**	2

Course Objective

To get adequate knowledge in thermal measurements and to understand the operational features, limitations and difficulties faced in the instrumentation

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Use the concept of measurement	K1
CO2	Understand the design and operation of instruments for measurements of various environmental factors.	K2
CO3	Use adequate equipment to determine the state of pollution in the environment	K3
CO4	Apply the technical and analytical skill for interpretation of environmental data	K4
CO5	Understand the living conditions in industrial areas	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	M	L	-	-	-	-	L	-
CO2	H	H	L	H	-	M	M	-
CO3	M	M	-	M	M	H	-	M
CO4	M	H	M	H	-	-	M	H
CO5	-	M	-	M	M	-	M	-

H – High; M – Medium; L – Low

Environmental Instrumentation

Units	Content	Hrs
Unit I	**TEMPERATURE MEASUREMENTS** Temperature scales - The ideal gas - Thermometer - Temperature measurement by mechanical effects - Temperature measurements by electrical effects : Electrical resistance thermometer - Thermistors - Thermoelectric effects - Quartz-crystal thermometer - *Liquid crystal thermography*	3
Unit II	**RADIATION MEASUREMENTS** Radiation pyrometers – Blackbody conditions – Radiation reactive elements – Total radiation pyrometers - Infrared pyrometers – Optical pyrometers	3
Unit III	**THERMAL MEASUREMENTS** Detection of thermal radiation – Measurement of emissivity – Reflectivity and Transmissivity measurements – Solar radiation measurements	2
Unit IV	**NUCLEAR RADIATION MEASUREMENTS** Detection of Nuclear radiation – Geiger Muller Counter – Ionization chambers – The Scintillation counter – *Neutron detection.*	2
Unit V	**AIR POLLUTION SAMPLING AND MEASUREMENTS** Units of pollution measurements – General air sampling train- gas sampling techniques – Sulfur dioxide measurements – Combustion products measurements – Opacity measurements	3
	Total Contact Hrs	**13**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Sawhney A. K. Puneet Sawhney	A Course in Mechanical Measurements and Instrumentation,	Dhanpat Rai & Co Pvt Ltd,	2004
2	Jack P. Holman	Experimental Methods for Engineers	Tata McGraw Hill, New Delhi	2000

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Rangan C. S. Sharma G. R. Mani V.S.V	Instrumentation Devices and Systems	Tata McGrawHill, New Delhi	1983

Designed by	Verified by HOD	Checked by CDC	Approved by COE
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Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS6S4			**Title**	**Batch:**	2022 – 2025
				Skill based Elective II: Fundamentals of Astrophysics	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	1	**Tutorial Hrs./Sem.**	-		**Credits:**	2

Course Objective

To explore the basic knowledge and recent aspects of Space science, Quasars and Cosmology

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recollect the origin and destiny of universe, astronomy, stars, quasars, cosmology	K1
CO2	Acquire the fundamental ideas of observational astronomy, stars, white dwarfs, nature of black holes and big bang theory	K2
CO3	Implement the phenomena and processes associated with galaxy, stellar and formation of planetary systems, dark matter and energy	K3
CO4	Figure out the concept of red shift, expansion of universe, accelerating universe is essential for scientific and research applications	K4
CO5	Elucidate the origin of universe and various models based on cosmological principles	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	M	-	-	-	-	H	-
CO2	H	M	-	L	L	-	M	-
CO3	M	M	M	-	M	-	M	-
CO4	-	-	M	M	M	M	-	M
CO5	-	M	-	-	-	L	-	-

H – High; M – Medium; L – Low

Fundamentals of Astrophysics

Units	Content	Hrs
Unit I	**OUR PLACE IN THE UNIVERSE** A tour of the Universe – Scale and Contents: Planets, Stars, Galaxies, Light years and the Interstellar medium	2
Unit II	**OBSERVATIONAL ASTRONOMY** The Electromagnetic spectrum - Geometrical Optics: Ray Diagrams, Focal length, Magnification – Diffraction: Resolving Power, Airy Disc, Diffraction Limit – Telescopes: Reflecting, Refracting, Multi-wavelength.	3
Unit III	**STARS** Properties of stars – Stellar structure and Evolution – Introduction to supernovae – Stellar remnants – White dwarfs – Neutron stars – *Black holes*	2
Unit IV	**QUASARS** Constituents of Galaxies - General structure – Mass of the Galaxy – Cosmic Rays – External Galaxies: Classification and Spectra of Galaxy – *Active Galaxies and Quasars.*	3
Unit V	**COSMOLOGY** Red shift and Expansion of the Universe – Hubble's Law – The Age of the Universe – The Big Bang – Introductory to Cosmology: The Cosmological Principle, Homogeneity and Isotropy, Olber's Paradox – Introductory to Cosmological Models: Critical Density, Geometry of Space, The fate of the Universe – Dark energy and the Accelerating Universe.	3
	Total Contact Hrs	**13**

- *Italic font denotes self-study*

Pedagogy and Assessment Methods:

Seminar, Power Point Presentation, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Baidyanath Basu, Tanuka Chattopadhyay, Sudhindra Nath	An Introduction to Astrophysics	PHI Learning Private Limited. New Delhi	2010

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Abhyankar, K.D.	Astrophysics of the Solar System	University Press Limited. Hyderabad	1999

Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name: Ms. M. Gayathri Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS622			**Title**	**Batch:**	2022 – 2025
				Core XII: Electronics Lab	**Semester:**	V & VI
Lecture Hrs./Week or Practical Hrs./Week	3	**Tutorial Hrs./Sem.**	-		**Credits:**	3

Course Objective

To provide a basic knowledge in the field of Electronics and to familiarize their operations

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic principles of Electronics	K1/K2
CO2	Apply the principle in circuit designing	K3
CO3	Analyze the characteristics of transistor, FET and Op-amp	K4
CO4	Evaluate the working of Electronic devices	K5
CO5	Design circuits and verify its operation	K6

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	M	H	M	M	H	H
CO2	M	H	M	H	H	H	H	H
CO3	M	M	H	H	H	H	H	H
CO4	M	H	M	M	H	H	H	H
CO5	M	H	M	M	H	H	H	H

H – High; M – Medium; L – Low

Electronics Lab

List of Experiments (Any fifteen):

1. Verification of Thevenin's theorem
2. Verification of Norton's theorem
3. Verification of Maximum power transfer theorem
4. Rectifier diode and Zener diode characteristics
5. Rectifiers and Filters
6. Voltage doubler
7. Two pin regulated power supply
8. Measurement of Band gap energy of Semiconductors
9. Transistor characteristics - Common Base mode
10. Transistor characteristics - Common Emitter mode
11. UJT – characteristics
12. Transistor voltage amplifier - Single stage
13. Hartley Oscillator
14. Square wave generator using 555 IC
15. Astable Multivibrator
16. Inverting and Non-inverting Operational amplifiers
17. Adder and Subtractor using Operational amplifiers
18. CRO Familiarization

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Paul B.Zbar, Malvino, Miller,	Electronics: A Text- Lab Manual	Mc.Graw Hill	2001
2	Woollard G	Practical Electronics	Mc.Graw Hill	1984
3	Bhargowa N.N	Basic Electronics and Linear Circuits	Tata Hill Publishing Co. Ltd.	1984

Designed by	Verified by HOD	Checked by CDC	Approved by COE
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Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Physics	
Course Code:	22UPS623			**Title**	**Batch:**	2022 – 2025
				Core XIII: Digital & Microprocessor Lab	**Semester:**	V &VI
Lecture Hrs./Week or Practical Hrs./Week	3	**Tutorial Hrs./Sem.**	-		**Credits:**	3

Course Objective

To be acquainted with the basics and working of Electronic Digital circuits and Microprocessor.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the working conditions of logic circuits and its applications	K2
CO2	Construct and demonstrate of flip flop and digital circuits	K3
CO3	Determine the behavior of a digital logic circuit	K4
CO4	Translate the Boolean equations/expressions to efficient combinational and sequential circuits.	K5
CO5	Execute simple programmes using 8085 microprocessor	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	H	H	M	H	M	H	H	M
CO2	H	H	M	H	M	H	H	-
CO3	H	M	M	H	L	H	H	M
CO4	M	H	M	H	L	H	M	M
HCO5	H	H	H	H	M	H	H	H

H – High; M – Medium; L – Low

Digital & Microprocessor Lab

List of Experiments (Any fifteen):

1. Study of Various logic gates using ICs and basic logic gates using discrete components
2. Study of NAND and NOR as Universal building blocks
3. Microprocessor - Addition and Subtraction
4. Construction and Study of Half and Full adders
5. Verification of Demorgan's theorems and problem solving through logic circuits
6. Microprocessor - 1's and 2's complement
7. Construction and Study of Half and Full Subtractors
8. Construction and Study of RS, D and JK flip-flops
9. Microprocessor - Multiplication
10. Construction and Study of Parallel binary adder
11. Construction and Study of Multiplexers and Demultiplexers
12. Microprocessor - Ascending and Descending orders
13. Construction and Study of Parallel binary Subtractor
14. Construction and Study of Shift registers
15. Microprocessor - Addition of an array of numbers and comparison of two numbers
16. Construction and Study of MOD 3 and MOD 5 up counters
17. Construction and Study of BCD to decimal decoder
18. Microprocessor - Division

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Albert Paul Malvino, Donald P. Leech	Digital Principle And Applications	Mc.Graw Hill\3rd Edition	1987
2	Paul B.Zbar, Malvino, Miller	Electronics: A Text- Lab Manual	Mc.Graw Hill, New York	1983

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Leech	Experiments In Digital Principles	Mc.Graw Hill, New York\ 3rd Edition	1986
2	Paul B.Zbar, Malvino, Sloop	Electricity & Electronics Fundamentals: A Text-Lab Manual	Mc.Graw Hill	1997
3	Woollard G	Practical Electronics	Mc.Graw Hill\ 2nd Edition	1984
4	Subramaniyan S.V	Experiments In Electronics	Macmillan India Ltd, New Delhi	1983
5	Bhargowa N.N	Basic Electronics And Linear Circuits	Tata Hill Publishing Co Ltd, New Delhi.	1984

Designed by	Verified by HOD	Checked by CDC	Approved by COE
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Programme Code:	B.Sc. PHY			**Programme Title:**	Bachelor of Science	
Course Code:	22UPS624			**Title**	**Batch:**	2022 – 2025
				Core XIV : Computer lab in C	**Semester:**	VI
Lecture Hrs./Week	2	**Tutorial Hrs./Sem.**	-		**Credits:**	2

Course Objective

To develop the skill to gain knowledge in C language

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand and become familiar with C programs	K1
CO2	Apply the statements to write the programs	K2
CO3	Demonstrate the use of functions and arguments in C language	K3
CO4	Explain the concepts of conditional and looping statements	K4
CO5	Write new programs for application in various field of Physics	K5

Mapping

PO /PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
CO1	L	M	M	L	H	L	M	H
CO2	L	L	H	L	H	M	M	H
CO3	L	L	H	L	M	M	M	H
CO4	M	M	H	L	H	M	M	H
CO5	M	M	H	M	H	H	H	H

H – High; M – Medium; L – Low

Computer lab in C

List of Programs:

1. Temperature Conversion
2. Largest /Smallest of three numbers
3. Quadratic equation
4. Fibonacci number
5. Armstrong number
6. Electric Power Consumption
7. Sum of n numbers
8. Ascending/Descending order
9. Matrix Addition/ Subtraction
10. Matrix multiplication
11. Sorting of names
12. Multiplication Table
13. Swapping of two numbers using function
14. Factorial of any number using recursion function
15. Pointer as function arguments

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Balagurusamy E.	Programming In Ansi C	Tata McGraw Hill Publishing Company, New Delhi	2004

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ravichandran D.	Programming In C	New Age International (P) Limited Publishers	1998
2	Yashvant Kanetkar	Let Us C	BPB Publications, New Delhi	1995

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Programme Code:	BSc PHY	**Programme Title:**	Bachelor of Science	
Course Code:	21UMS3A3/ 21UCY3A3	**Title**	**Batch:**	2022 - 2025
		Physics for Mathematics and Chemistry - I	**Semester:**	III
Hrs/Week:	5		**Credits:**	4

Course Objective

To acquire the knowledge in concepts of applied physics

Course outcomes

CO Number	CO Statement	Knowledge Level
CO1	To remember the basic principles in mechanics	K1/K2
CO2	To apply knowledge in estimating the mechanical parameters	K3
CO3	To analyze the knowledge in applications	K4
CO4	To evaluate the principles of physics in mathematics and chemistry	K5
CO5	To create a different types of lasers and fibers related this studies	K6

Mapping

PO/PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5	PO6	PSO1	PSO2
CO1	H	M	H	H	M	H	H	H
CO2	M	H	M	M	H	H	-	M
CO3	H	H	M	H	L	L	H	-
CO4	M	L	H	H	M	H	M	M
CO5	H	M	-	M	H	M	H	L

H – High; M – Medium; L – Low

Physics for Mathematics and Chemistry - I

Unit	Content	Hrs
I	**ELASTICITY** Stress and Strain – Different moduli of Elasticity – Poisson's ratio – Relation between angle of shear and linear strain – Work done in a strain – Relation between the elastic moduli- Determination of Poisson's ratio for rubber – Torsion of a cylinder – Expression for torque per unit twist – Work done in twisting a wire – Torsion oscillations of a body – Rigidity modulus by torsion pendulum (Dynamic torsion) – Bending of beam – Expression for bending moment – Uniform bending of a beam- *Measurement of Young's Modulus*	13
II	**GRAVITATION AND MOMENT OF INERTIA** Newton's law of gravitation - Kepler's laws of planetary motion - Gravitational potential and field – Potential and field due to a spherical shell – Potential and field due to a solid sphere – Variation of g with altitude – Variation of g with depth – Compound Pendulum - Variation of g with compound pendulum – Moment of inertia – Perpendicular axes and Parallel axes theorem – Moment of inertia of a circular disc.	13
III	**ACOUSTICS AND SOUND** Types of sound - Reverberation- Sabine's formula – Factors affecting the acoustics of building - Ultrasonics – Piezoelectric effect - Production of Ultrasonic waves - magnetostiction method – Piezoelectric crystal method – Properties of ultrasonics – Determination of velocity of ultrasonic waves in liquid – Sonar – Industrial applications – *Medical applications.*	13
IV	**LASERS** Characteristics of lasers – Absorption and Emission – Einstein's coefficients – Population inversion – Pumping methods – Components of laser - Production of laser: CO_2 laser – He-Ne laser – Nd: YAG laser – Semiconductor laser - Industrial and Medical applications.	13
V	**FIBER OPTICS** Optical fibre –Optical fibre system - Optical fibre cable -Total internal reflection – Propagation of light through an optical fibre – Critical angle – Acceptance angle – Numerical aperture – Classification of optical fibres – Types of fibres – Fibre optic communication system – fiber optic sensors – Temperature sensors – Displacement sensor.	13
Total contact hours		65

- *Italic font denotes self study*

Pedagogy and Assessment Methods:

Seminar, Assignment, Experience discussion, PPT

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Murugesan R	Properties of Matter	S. Chand & Company Ltd, New Delhi	2016
2	Subrahmanyam and Brijlal, Avadhanulu	A Test Book of Optics	S. Chand & Company Ltd, New Delhi	2016

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Mathur D.S.	Elements of Properties of Matter	Shyam Lal Charitable Trust, New Delhi	2003
2	Pedrotti L. & Pedrotti S	Introduction to Optics	Prentice Hall International Edition, New Delhi	2008
3	Wayne Tomasi and Vincent F. Alisouskas	Telecommunications	Prentice Hall International Edition, New Delhi	1998

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Programme code:	BSc PHY	**Programme Title :**	Bachelor of Science	
Course Code:	21 UMS 4A4 / 21 UCY 4A4	**Title**	**Batch :**	2022 - 2025
		Physics For Mathematics & Chemistry- II	**Semester**	IV
Hrs/Week:	5		**Credits:**	4

Course Objective

To develop the basic concepts of physics applied in chemistry and mathematics

Course outcomes

CO Number	CO Statement	Knowledge Level
CO1	To remember the basic concepts of physics in electricity, semiconductors, optics and digital electronics	K1/K2
CO2	To apply analog and digital systems	K3
CO3	To analyze knowledge on number systems and logical expressions	K4
CO4	To evaluate the expressions into useful circuits	K5
CO5	To create logic gates circuits	K6

Mapping

PO/PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5	PO6	PSO1	PSO2
CO1	H	M	H	H	M	H	M	H
CO2	M	-	M	M	H	H	-	M
CO3	H	H	M	M	L	L	H	-
CO4	M	L	H	H	M	H	M	M
CO5	H	M	-	M	H	-	H	L

H-High; M-Medium; L-Low

Physics for Mathematics & Chemistry- II

Unit	Content	Hrs
I	**ELECTRICITY AND MAGNETISM** Electric field, Intensity & Potential - Potential due to a charged conducting sphere - Capacitance - Parallel plate capacitor - Energy stored in a charged capacitor - Kirchoff's law - Wheatstone's bridge - Potentiometer - Measurement of Resistance & EMF - Calibration of Ammeter & Voltmeter - *Biot Savart law* - Field along the axis of a circular coil – Magnetic induction at a point due to straight conductor carrying current.	13
II	**WAVE OPTICS** Interference - Theory of interference - Young's double slit experiment – Condition for bright and dark fringes - Newton's rings - Condition for bright and dark rings – radius of dark fringes – spacing between fringes - Theory of plane transmission grating – Dispersive power of grating – prism and grating spectra – polarization – unpolarized and polarized light – types of polarization.	13
III	**SEMICONDUCTOR PHYSICS** Semiconductor - Intrinsic and Extrinsic semiconductors - Junction diode and Zener diode characteristics - Half & Full wave Rectifiers - Regulated power supply - Transistor and its action – Characteristics of common base, common emitter and common collector configurations - Relations between α and β	13
IV	**NUMBER SYSTEMS** Binary, octal, decimal, hexadecimal number systems, Binary Addition and Subtraction, Multiplication & Division – Conversion of number systems - one's complement and two's complement subtraction - BCD number system - Gray code - gray to binary and binary to gray conversion - Excess 3 code – *ASCII codes*	13
V	**LOGIC GATES AND CIRCUITS** OR, AND & NOT gates using Discrete components and ICs - NOR & NAND gates - Universal building blocks - Demorgan's theorems - XOR & XNOR gates - Laws and theorems of Boolean algebra - Simplification of Boolean expression - Half & full adders - Half & full subtractors	13
Total contact hours		65

- *Italic font denotes self study*

Pedagogy and Assessment Methods:

Seminar, Assignment, Experience discussion, PPT

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Murugesan R	Electricity and Magnetism	S. Chand & Company Ltd, New Delhi	2008
2	Brijlal and Subramaniam	A Test Book of Optics	S. Chand & Company Ltd, New Delhi	1999
3	Theraja B.L	Basic Electronics Solid state	S.Chand & Company Ltd, New Delhi	1998
4	Murugeshan R & Kiruthiga sivaprasath	Modern Physics	S.Chand & Company Ltd, New Delhi	2016

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Brijlal and Subramaniam	Electricity and Magnetism	S.Chand & Company Ltd, New Delhi	1987
2	Sadasiva Biswal	Basic Electronics.	Atlantic Publishers and Distributors	2001
3	Narayana Rao B.V	Principles of Electronics	Wiley Eatern Limited New Age International Limited	1994
4	Malvino and Leech	Digital Principles and Applications	Tata Mc Graw Hill Publishing Company, New Delhi	1986

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Name: Ms. S. Yogeswari Signature:	Name: Dr. T.E. Manjulavalli Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr. R.Manicka Chezian Signature:

Programme Code:	BSc PHY	Programme Title:	Bachelor of Science	
Course Code:	21UMS4A5 / 21UCY4A5	Title	Batch:	2022 - 2025
		Physics Lab For Mathematics & Chemistry	Semester:	III & IV
Hrs/Week:	3		Credits:	4

Course Objective

To enable the student to gain practical knowledge in Physics instruments

Course Outcomes

CO Number	CO Statement	Knowledge Level
CO1	To remember depth knowledge in Elasticity of rigid materials	K1/K2
CO2	To analyze the concepts of physics on measurements and instrumentations of physical experiments	K3
CO3	To apply practical skills in analog and digital measurements	K4
CO4	To evaluate concepts of logic gates	K5
CO5	To create various logic gates using Ics	K6

Mapping

PO/PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5	PO6	PSO1	PSO2
CO1	H	M	H	M	M	H	M	H
CO2	M	-	M	M	H	H	-	M
CO3	H	H	M	-	M	-	H	-
CO4	M	L	H	H	H	H	M	H

H-High; M-Medium; L-Low

Physics Lab for Mathematics & Chemistry

List of Experiments:

1. Young's modulus – Uniform bending - Pin and Microscope
2. Young's modulus – non-Uniform bending - Pin and Microscope
3. Rigidity Modulus and Moment of Inertia – Torsional Pendulum
4. Acceleration due to Gravity and Moment of Inertia - Compound pendulum
5. Wavelength of Mercury source – Grating - Normal incidence – Spectrometer
6. Refractive index of a Prism - Spectrometer
7. Refractive index of a Lens - Newton's Rings
8. Calibration of Low range Voltmeter and Ammeter - Potentiometer
9. Specific resistance of a Wire - Potentiometer
10. Horizontal Component of Earth's Magnetic Field (H) - Field along the axis of a Circular coil carrying current
11. Characteristics of PN Junction Diode
12. Characteristics of Zener Diode
13. Basic Logic Gates using ICs
14. NAND as Universal building block
15. NOR as Universal building block
16. Demorgan's Theorem verification using logic gate ICs and problem solving using Boolean algebra
17. Half & Full Adder
18. Half & Full Subtractor

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Govindarajan S.R. Sundarajan S	Practical Physics	Roc house & sons Pvt Ltd.	1959

Reference Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS /EDITION	YEAR OF PUBLICATION
1	Paul B.Zbar, Malvino, Miller	Electronics	A Text-Lab Manual. Mc.Graw Hill, New Delhi	1983

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