

Holy Cross College (Autonomous), Nagercoil
Kanyakumari District, Tamil Nadu.
Accredited with A⁺ by NAAC - IV cycle – CGPA 3.35

Affiliated to
Manonmaniam Sundaranar University, Tirunelveli



Semester I & II

Guidelines & Syllabus

DEPARTMENT OF PHYSICS



2023-2026

(With effect from the academic year 2023-2024)

Issued from
THE DEANS' OFFICE

Vision

Envisions training students for quality Physics education and holistic development empowered to meet challenges and embark on luxuriant careers.

Mission

- To produce competent graduates infused with professionalism, ethical values and social responsibility.
- To prepare students to accentuate learning for life.
- To foster a research environment, to keep up with global development in Science.
- To evolve strategies for the growth of the department towards excellence.

Programme Educational Objectives (PEOs)

PEOs	Upon completion of B.A/B.Sc. degree programme, the graduates will be able to	Mission addressed
PEO 1	apply appropriate theory and scientific knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.	M1& M2
PEO 2	inculcate practical knowledge for developing professional empowerment and entrepreneurship and societal services.	M2, M3, M4 & M5
PEO 3	pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.	M3, M4, M5 & M6

Programme Outcomes (POs)

POs	Upon completion of B.Sc. Degree Programme, the graduates will be able to:	Mapping with PEOs
PO1	obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science.	PEO1
PO2	create innovative ideas to enhance entrepreneurial skills for economic independence.	PEO2
PO3	reflect upon green initiatives and take responsible steps to build a sustainable environment.	PEO2
PO4	enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career.	PEO1 & PEO3
PO5	communicate effectively and collaborate successfully with peers to become competent professionals.	PEO2 & PEO3
PO6	absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality	PEO2 & PEO3

PO7	participate in learning activities throughout life, through self-paced and self-directed learning to improve knowledge and skills.	PEO1 & PEO3
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Programme Specific Outcome (PSOs)

PSOs	Upon completion of B.Sc. Physics Degree Programme, the graduates of Physics will be able to:	Mapping with POs
PSO - 1	understand the core theories and principles of physics which include mechanics, thermodynamics, electronics, material science etc.	PO1
PSO - 2	develop extensive comprehension of fundamental and diverse applications of Physics.	PO2 & PO3
PSO - 3	apply knowledge of principles, concepts in Physics and analyze their local, national and global impact. Apply the critical reasoning and computing skills to analyze and solve problems in physics.	PO4 & PO5
PSO - 4	analyze the observed experimental data and relate the results with theoretical expectations. Communicate appropriately and effectively, in a scientific context using present technology.	PO6
PSO - 5	develop entrepreneurial skills, empowered according to the professional requirement and become self-dependent. Understand the professional, ethical, legal, security, social issues and responsibilities.	PO5 & PO7

Mapping of PO'S and PSO'S

POs	PSO1	PSO 2	PSO3	PSO4	PSO5
PO 1	S	S	S	S	S
PO 2	M	S	S	S	S
PO 3	M	M	M	S	S
PO4	M	M	S	S	S
PO5	M	M	S	S	S
PO6	M	M	S	S	S
PO7	S	S	S	S	S

Eligibility Norms for Admission

Eligibility: 10 + 2 pattern

Those who seek admission to B.Sc. Physics Course must have passed the Higher Secondary Examinations conducted by the Board of Higher Secondary Examinations, Tamil Nadu with Physics and Mathematics subjects or examination recognized and approved by the Syndicate of Manonmaniam Sundaranar University, Tirunelveli.

Duration of the Programme: 3 years

Medium of Instruction: English

Passing Minimum

A minimum of 40% in the external examination and an aggregate of 40% is required. There is no minimum pass mark for the continuous internal assessment.

Components of the B.Sc. Physics Programme

Part III (Core and Elective)

Core Course	Core-Theory Papers	9x100	900
	Core Project	1x100	100
	Core Practical	6 x 100	600
	Discipline Specific Elective-Theory Papers	4x 100	400
	Total Marks		2000
Elective Course	Theory	4x 100	400
	Practical	2x 100	200
	Total Marks		600
	Total Marks		2600

- Core and Elective Lab Courses carry 100 marks each.
- Practical examination will be conducted at the end of each semester for Core and Elective Courses.

Course Structure

Distribution of Hours and Credits

Curricular Courses:

Course	S I	S II	S III	S IV	S V	S VI	Total	
							H	C
Part-I Language	6 (3)	6 (3)	6 (3)	6 (3)			24	12
Part-II English	6 (3)	6 (3)	6 (3)	6 (3)			24	12
Part-III								
Core Course	5 (5)+	5 (5)+	5 (5)+	5 (5)+	6 (5)+ 5 (4)+	6(5) + 5(3) + 5(3)	72	61
Core Lab Course	3 (3)	3 (3)	3 (3)	3 (3)	4 (3)	4(2)		
Core Project					5 (4)			

Elective /Discipline Specific Elective Courses	4 (3)+ 2 (2)	4 (3)+ 2 (2)	4 (3)+ 2 (2)	4 (3)+ 2 (2)	4 (3)+ 4 (3)	4 (3)+ 4 (3)	40	32
Part-IV								
Non-major Elective	2 (2)	2 (2)	-	-	-	-	4	4
Skill Enhancement Course	-	2(2)	1(1) 2(2)	1(1) 2(2)	-	-	8	8
Foundation Course	2(2)	-	-	-	-	-	2	2
Value Education	-	-	-	-	2(2)	-	2	2
Summer Internship /Industrial Training					(2)			2
Environmental Studies	-	-	1	1 (2)	-	-	2	2
Extension Activity	-	-	-	-	-	(1)	-	1
Professional Competency Skill						2(2)	2	2
Total	30 (23)	30 (23)	30 (22)	30 (24)	30 (26)	30 (22)	18 0	140

Co-curricular Courses

Course	S I	S II	S III	S IV	S V	S VI	Total
LST (Life Skill Training)	-	(1)	-	(1)			2
SDT (Certificate Course)	(1)						1
Field Project		(1)					1
Specific Value-added Course	(1)		(1)				2
Generic Value-added Course				(1)		(1)	2
MOOC		(1)		(1)		(1)	3
Student Training (ST): Clubs & Committees / NSS				(1)			1
Community Engagement Activity - RUN				(1)			1
Human Rights Education					(1)		1
Gender Equity Studies						(1)	1
Total							15

Total number of Compulsory Credits = Academic credits + Non-academic credits: 140 + 15

Courses Offered Semester I

Course	Course Code	Title of the Course	Credits	Hours /Week
Part I	TU231TL1 FU231FL1	Language: Tamil French	3	6

Part II	EU231EL1	English	3	6
Part III	PU231CC1	Core Course I: Properties of Matter and Acoustics	5	5
	PU231CP1	Core Lab Course I: General Physics Lab I	3	3
	PU231EC1	Elective Course I: Allied Physics for Mathematics – I	3	4
	PU231EP1	Elective Lab Course I: Allied Physics Practical for Mathematics – I	2	2
Part IV	PU231NM1	Non-Major Elective NME-I: Physics for Everyday Life	2	2
	PU231FC1	Foundation Course: Introductory Physics	2	2
Total			23	30

Semester II

Course	Course Code	Title of the Course	Credits	Hours/Week
Part I	TU232TL1 FU232FL1	Language: Tamil French	3	6
	Part II	EU232EL1	English	3
Part III	PU232CC1	Core Course II: Heat, Thermodynamics and Statistical Physics	5	5
	PU232CP1	Core Lab Course II: General Physics Lab II	3	3
	PU232EC1	Elective Course II: Allied Physics for Mathematics – II	3	4
	PU232EP1	Elective Lab Course I: Allied Physics Practical for Mathematics – II	2	2
Part IV	PU232NM1	Non-major Elective NME-II: Physics of Music	2	2
	PU232SE1	Skill Enhancement Course SEC I: Digital Photography	2	2
Total			23	30

Co-curricular Courses

Part	Semester	Code	Title of the Course	Credit
Part V	I & II	UG232LC1	Life Skill Training I: Catechism	1
		UG232LM1	Life Skill Training I: Moral	
	I	UG231C01 UG231C--	Skill Development Training (SDT) Certificate Course	1
	II	PU232FP1	Field Project	1
	I & III	PU231V01- PU231V--/	Specific Value-added Course	1+1

		PU233V01 – PU233V--		
	II, IV & VI	-	MOOC	1+1+1
	III & IV	UG234LC1	Life Skill Training II: Catechism	1
		UG234LM1	Life Skill Training II: Moral	
	IV & VI	UG234V01- UG234V--/ UG236V01- UG236V--	Generic Value-added Course	1 +1
	I - IV	UG234ST1	Student Training Activity – Clubs & Committees / NSS	1
	IV	UG234CE1	Community Engagement Activity - RUN	1
	V	UG235HR1	Human Rights Education	1
	VI	UG236GS1	Gender Equity Studies	1
			Total	15

Specific Value-Added Course

S. No.	Course code	Title of the course	Total hours
I	PU231V01	Photoshop	30

Examination Pattern

Each paper carries an internal component.

There is a passing minimum for external component.

A minimum of 40% in the external examination and an aggregate of 40% is required.

Part I – Tamil, Part II – English, Part III - (Core/ Elective)

Ratio of Internal and External= 25:75

Continuous Internal Assessment (CIA)

Internal Components and Distribution of Marks

Components	Marks
Internal test (2) (40 marks)	10
Quiz (2) (20 marks)	5
Assignment: (Model Making, Exhibition, Role Play, Seminar, Group Discussion, Problem Solving, Class Test, Open Book Test etc. (Minimum three items per course should be included in the syllabus & teaching plan) (30 marks)	10
Total	25

Question Pattern

Internal Test	Marks	External Exam	Marks
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Part A 4 x 1 (No choice)	4	Part A 10 x 1 (No choice)	10
Part B 3 x 4 (Internal choice)	12	Part B 5 x 6 (Internal choice)	30
Part C 3 x 8 (Internal choice)	24	Part C 5 x 12 (Internal choice)	60
Total	40	Total	100

Lab Course:

Ratio of Internal and External= 25:75

Total: 100 marks

Internal Components and Distribution of Marks

Internal Components	Marks
Performance of the Experiments	10
Regularity in attending practical and submission of records	5
Record	5
Model exam	5
Total	25

Question pattern

External Exam	Marks
Major Practical	75
Minor Practical / Spotters /Record	
Total	75

Core Project

Ratio of Internal and External = 25:75

Components	Marks
Internal	25
External	
Report	40
Viva voce	35

Part - IV

- i. **Non-major Elective, Foundation Course, Skill Enhancement Course, Value Education, Professional Competency Skill**

Ratio of Internal and External = 25: 75

Internal Components and Distribution of Marks

Components	Marks
Internal test (2)	10
Quiz (2)	5
Assignment: (Model Making, Exhibition, Role Play, Album, Group Activity (Mime, Skit, Song) (Minimum three items per course)	10
Total	25

Question Pattern

Internal Test	Marks	External Exam	Marks
Part A 2 x 2 (No Choice)	4	Part A 5 x 2 (No Choice)	10
Part B 3 x 4 (Open choice Three out of Five)	12	Part B 5 x 5 (Open choice any Five out of Eight)	25
Part C 1 x 9 (Open choice One out of Three)	9	Part C 5 x 8 (Open choice any Five out of Eight)	40
Total	25	Total	75

ii. **Environmental Studies**

Internal Components

Component	Marks
Project Report	15
Viva voce	10
Total	25

Question Pattern

Internal Test	Marks	External Exam	Marks
Part A 2 x 2 (No Choice)	4	Part A 5 x 2 (No Choice)	10
Part B 3 x 4 (Open choice Three out of Five)	12	Part B 5 x 5 (Open choice any Five out of Eight)	25
Part C 1 x 9 (Open choice One out of Three)	9	Part C 5 x 8 (Open choice any Five out of Eight)	40
Total	25	Total	75

iii. **Summer Internship/Industrial Training:**

Components	Marks
Industry Contribution	50
Report & Viva-voce	50

Co-Curricular Courses:

i. **Life Skill Training: Catechism & Moral, Human Rights Education & Gender Equity Studies**

Internal Components

Component	Marks
Project - Album on current issues	25
Group Song/ Mime/ Skit	25
Total	50

External Components

Component	Marks
Quiz	20

Written Test: Open choice – 5 out of 7 questions (5 x 6)	30
Total	50

ii. **Skill Development Training (SDT) - Certificate Course:**

Components	Marks
Attendance & Participation	50
Skill Test	50

iii. **Field Project:**

Components	Marks
Field Work	50
Report & Viva-voce	50

iv. **Specific Value-Added Courses & Generic Value-Added Courses:**

Components	Marks
Internal	25
External	75

v. **Community Engagement Activity: Reaching the Unreached Neighbourhood (RUN)**

Components	Marks
Attendance & Participation	50
Field Project	50

vi. **Student Training Activity: Clubs and Committees**

Compulsory for all I & II year students (1 credit).

Component	Marks
Attendance	25
Participation	25
Total	50

Outcome Based Education (OBE)

(i) Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S. No	Level	Parameter	Description
1	K1	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or point of view

(ii) Weightage of K – Levels in Question Paper

Number of questions for each cognitive level:

Evaluation

- The performance of a student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points.
- Evaluation of each course shall be done by Continuous Internal Assessment (CIA) by the course teacher as well as by an end semester examination and will be consolidated at the end of the semester.
- There shall be examinations at the end of each semester, for odd semesters in October/November; for even semesters in April/ May.
- A candidate who does not pass the examination in any course(s) shall be permitted to reappear in such failed course(s) in the subsequent examinations to be held in October/ November or April/May. However, candidates who have arrears in practical examination shall be permitted to reappear for their areas only along with regular practical examinations in the respective semester.
- Viva-voce: Each project group shall be required to appear for Viva -voce examination in defence of the project.
- The results of all the examinations will be published in the college website.

Conferment of Bachelor's Degree

A candidate shall be eligible for the conferment of the Degree of Bachelor of Arts / Science / Commerce only if the minimum required credits for the programme thereof (140 + 18 credits) is earned.

Grading System

For the Semester Examination:

Calculation of Grade Point Average for End Semester Examination:

$$\text{GPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the course}}{\text{Sum of the credits of the courses (passed) in a semester}}$$

For the entire programme:

Programme	Assessment	Lower Order Thinking									Higher order thinking			Total number of questions
		K1			K2			K3			K4, K5, K6			
	Part	A	B	C	A	B	C	A	B	C	A	B	C	
I UG	Internal	2	2		1	1	1	1	-	2	-	-	-	10
	External	5	2	1	3	2	2	2	1	2	-	-	-	20
II UG	Internal	1	-	1	1	2		1	-	1	1	1	1	10
	External	5	1	1	4	1	1	-	3	1	1	-	2	20
III UG	Internal	1	1	-	-	1	-	1	-	1	2	1	2	10

$$\text{Cumulative Grade Point Average (CGPA)} = \frac{\sum_n \sum_i C_{ni} G_{ni}}{\sum_n \sum_i C_{ni}}$$

$$\text{CGPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

Where

C_i - Credits earned for course i in any semester

G_i - Grade point obtained for course i in any semester

n - semester in which such courses were credited

Final Result

Conversion of Marks to Grade Points and Letter Grade

Range of Marks	Grade Points	Letter Grade	Description
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
40-49	4.0-4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

Overall Performance

CGPA	Grade	Classification of Final Result
9.5-10.0	O+	First Class – Exemplary*
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction*
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
4.0 and above but below 5.0	C	Third Class
0.0 and above but below 4.0	U	Re-appear

*The candidates who have passed in the first appearance and within the prescribed semester are eligible for the same.

SEMESTER – I
CORE COURSE -I: PROPERTIES OF MATTER AND ACOUSTICS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU231CC1	5	-	-	-	5	5	75	25	75	100

Pre-requisites:

Basic knowledge on Power, Force, Newton's Laws of Motion

Learning Objectives:

1. To Study the properties of matter leads to information which is of practical value to the physicists.
2. To provide an information about the internal forces which act between the constituent parts of the substance.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	relate elastic behaviour in terms of three moduli of elasticity and working of torsion pendulum.	K1 & K2
2	appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.	K2 & K3
3	explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering problems.	K2 & K3
4	analyze simple harmonic motions mathematically and apply them. understand the concept of resonance and use it to evaluate the frequency of vibration. Set up experiment to evaluate frequency of ac mains.	K1 & K3
5	understand the concept of acoustics, importance of constructing buildings with good acoustics. Also, to apply their knowledge of ultrasonics in real life, especially in medical field and assimilate different methods of production of ultrasonic waves.	K2 & K3

K1 - Remember; K2 - Understand; K3 - Apply

Units	Contents	No. of Hours
I	ELASTICITY: Hooke's law – stress-strain diagram – elastic constants – Poisson's ratio – relation between elastic constants and Poisson's ratio – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion– torsional pendulum (with and without masses)	15
II	BENDING OF BEAMS: Cantilever– expression for Bending moment – expression for depression at the loaded end of the cantilever– oscillations of a cantilever – expression for time period – experiment to find Young's modulus – non-uniform bending– experiment to determine Young's modulus by Koenig's method – uniform bending – expression for elevation – experiment to determine Young's modulus using microscope	15

III	FLUID DYNAMICS: Surface tension: definition – molecular forces– excess pressure over curved surface – application to spherical and cylindrical drops and bubbles – determination of surface tension by Jaegar’s method–variation of surface tension with temperature Viscosity: definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube – Poiseuille’s formula –corrections – terminal velocity and Stoke’s formula– variation of viscosity with temperature	15
IV	WAVES AND OSCILLATIONS: Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures- free, damped, forced vibrations – resonance and Sharpness of resonance. Laws of transverse vibration in strings –sonometer – determination of AC frequency using sonometer –determination of frequency using Melde’s string apparatus	15
V	ACOUSTICS OF BUILDINGS AND ULTRASONICS: Intensity of sound – decibel – loudness of sound –reverberation – Sabine’s reverberation formula (derivation) – acoustic intensity – factors affecting the acoustics of buildings. Ultrasonic waves: production of ultrasonic waves – Piezoelectric crystal method – magnetostriction effect –application of ultrasonic waves	15
Total		75

Self- study	Elastic constants; Oscillations of a cantilever; Molecular forces; Lissajous's figures; Properties of ultrasonic waves
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Text Books

1. Mathur, D, S. 2010. Elements of Properties of Matter, S.Chand& Co.
2. BrijLal, Subrahmanyam, N. 2003. Properties of Matter, S. Chand & Co
3. Khanna, D.R. Bedi, R.S. 1969. Textbook of Sound, Atma Ram & Sons
4. BrijLal and Subrahmanyam, N. 1995. A Text Book of Sound, Second revised edition, Vikas Publishing House.
5. Murugesan, R. 2012. Properties of Matter, S. Chand & Co.

Reference Books

1. Smith, C.J. 1960. General Properties of Matter, Orient Longman Publishers
2. Gulati, H.R. 1977. Fundamental of General Properties of Matter (Fifth edition), R. Chand & Co.
3. French, A.P. 1973. Vibration and Waves, MIT Introductory Physics, Arnold Herrmann India.

Web Resources

1. <https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-theywork>
2. <https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s>
3. <http://www.sound-physics.com/>
4. <https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-theywork>
5. <https://learningtechnologyofficial.com/category/fluid-mechanics-lab/6>
<http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
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CO1	3	3	2	2	3	2	2	3	2	2	1	1
CO2	2	3	3	3	2	2	3	3	3	2	1	1
CO3	3	2	3	2	3	3	2	3	2	2	1	1
CO4	3	3	3	3	3	2	3	3	2	3	2	1
CO5	2	2	3	3	2	3	3	3	2	2	3	2
TOTAL	13	13	14	15	13	12	13	15	11	11	8	6
AVERAGE	2.6	2.6	2.8	3	2.6	2.4	2.6	3	2.2	2.2	1.8	1.6

3 – Strong, 2- Medium, 1- Low

SEMESTER – I
CORE COURSE LAB – I: GENERAL PHYSICS LAB I

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU231CP1	-	-	3	-	3	3	45	25	75	100

Pre requisite:

Knowledge on basic Physics and Arithmetics

Learning Objectives:

1. To apply various physics concepts to understand Properties of Matter, set up experimentation to verify theories.
2. To do error analysis and correlate results

Course Outcomes

On the successful completion of the course, students will able to:		
1.	understand the strength of material using Young's modulus.	K2
2.	acquire knowledge of thermal behaviour of the materials.	K1
3.	analyze the physical principle involved in the various instruments	K4
4.	understand the scientific method and an ability to apply the scientific method in practice.	K2

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Contents

(Any Eight Experiments)

1. Determination of Young's modulus by uniform bending – load depression graph.
2. Determination of Young's modulus by non-uniform bending – scale & telescope.
3. Determination of rigidity modulus without mass using Torsional pendulum.
4. Determination of rigidity modulus with masses using Torsional pendulum.
5. Determination of surface tension & interfacial surface tension by drop weight method.
6. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
7. Determination of coefficient of viscosity by Variable Pressure Head - Burette method.
8. Comparison of coefficient of viscosity of two liquids by Burette method.
9. Determination of moment of inertia of an irregular body.
10. Verification of parallel axes theorem on moment of inertia.
11. Verification of perpendicular axes theorem on moment of inertia.
12. Determination of Young's modulus by stretching of wire with known masses.
13. Verification of Hook's law by stretching of wire method.
14. Determination of Young's modulus by cantilever – load depression graph.
15. Determination of Young's modulus by cantilever – oscillation method
16. Determination of rigidity modulus by static torsion.
17. Determination of Y, n and K by Searle's double bar method.
18. Determination of surface tension of liquid by Capillary rise method.
19. Determination of critical pressure for streamline flow.

20. Determination of Poisson's ratio of rubber tube.
21. Determination of radius of capillary tube by mercury pellet method.

Reference Books

1. Manual prepared by the department
2. Ouseph, C, C., Rao, U, J. and Vijayendran, V. 2007. Practical Physics and Electronics. S. Viswanathan, Pvt., Ltd. Chennai.

SEMESTER – I ELECTIVE COURSE –I: ALLIED PHYSICS FOR MATHEMATICS – I

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU231EC1	4				3	4	60	25	75	100

Pre-requisite:

Knowledge on basic Physics

Learning Objectives:

1. To impart basic principles of Physics
2. To incorporate concepts of Physics in day-to-day life

Course Outcomes

On the successful completion of the course, student will be able to:		
1	acquire knowledge on elementary ideas of waves, properties of matter, electricity and magnetism, electronics	K1 & K2
2	analyze the concepts of ultrasonics, surface tension and study their applications in the medical field.	K3
3	interpret the real-life solution using concepts of electricity, magnetism, and electronics in Digital India.	K2
4	apply their depth knowledge of Physics in day today life.	K3
5	develop their knowledge to carry out the practical by applying these concepts of Physics	K3

K1 - Remember; **K2** - Understand; **K3** - Apply

Unit	Contents	No. of Hours
I	Waves, Oscillations and Ultrasonics Simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonics: medical field – lithotripsy, ultrasonography – ultrasonic maging- ultrasonics in dentistry – physiotherapy, ophthalmology – advantages of noninvasive surgery – ultrasonics in green chemistry.	12
II	Properties of Matter Elasticity: elastic constants – bending of beam – theory of non-uniform bending – determination of Young's modulus by non-	12

	uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum Viscosity: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille’s formula – comparison of viscosities – burette method, Surface tension: definition – molecular theory – droplets formation– shape, size and lifetime – COVID transmission through droplets, saliva – drop weight method – interfacial surface tension.	12
III	Heat and Thermodynamics Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde’s process of liquefaction of air–liquid Oxygen for medical purpose– importance of cryocoolers – thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot’s cycle – efficiency – entropy – change of entropy in reversible and irreversible process.	12
IV	Electricity and Magnetism Potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart’s law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit – types of switches in household and factories– Smart wifi switches- fuses and circuit breakers in houses	12
V	Digital Electronics and Digital India logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan’s theorem – verification – overview of Government initiatives: software technological parks under MeitY, NIELIT- semiconductor laboratories under Dept. of Space – an introduction to Digital India	12
TOTAL		60

Self-Study	Application of ultrasonics; Streamline and turbulent motion; Reversible and irreversible process; Types of switches; Logic gates-Universal building blocks
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Textbooks

1. Ubald Raj, A. and Jose Robin, G. 2012. Allied Physics. Indira Publications. Marthandam.
2. Murugesan, R. 2001. Allied Physics. S. Chand & Co. New Delhi.

Reference Books

1. Brijlal and Subramaniam, N. 1994. Properties of Matter. S. Chand & Co. New Delhi.
2. Murugesan, R. 2017. Electricity and Magnetism. S. Chand & Co. New Delhi.
3. Ubald Raj, A. and Jose Robin, G. 2004. Basic Electronics. Indira Publications. Marthandam.

Web Resources

1. https://youtu.be/M_5KYncYNyc
2. <https://www.youtube.com/watch?v=9mXOMzUruMQ&t=1s>

3. <https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s>
4. <https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work>
5. <https://learningtechnologyofficial.com/category/fluid-mechanics-lab/>
6. <http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html>

**MAPPING WITH PROGRAMME OUTCOMES AND
PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	1	1	1	2	3	2	2	3	1
CO2	3	3	3	1	2	2	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	2	2	2	3	3	3	2	3
CO5	3	3	3	2	3	3	3	3	3	3	3	3
TOTAL	15	15	14	10	11	11	12	15	14	14	14	13
AVERAGE	3	3	2.8	2	2.2	2.2	2.4	3	2.8	2.8	2.8	2.6

3 – Strong, 2- Medium, 1- Low

SEMESTER – I
ELECTIVE LAB COURSE I: ALLIED PHYSICS PRACTICAL FOR
MATHEMATICS – I

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU231EP1			2		2	2	30	25	75	100

Pre-requisite:

Knowledge in basic Physics

Learning Objectives:

1. To make the students more innovative, in hands on experiments.
2. To elucidate theory through simple experiments in physics.

Course Outcomes

On the successful completion of the course, student will be able to:

1	understand the basic principles of Physics through experiments.	K2
2	measure and determine the various physical parameters.	K3
3	develop an idea about the handling of various instruments.	K2
4	get an idea about basic Scientific knowledge and implications of its broad working principle	K2 & K3
5	analyze, interpreting and evaluate data.	K3 & K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Minimum of Eight Experiments from the list:

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever, scale and telescope
3. Rigidity modulus by torsional oscillations without mass
4. Determination of AC frequency using sonometer
5. Surface tension and interfacial Surface tension – drop weight method
6. Comparison of viscosities of two liquids – burette method
7. Determination of co-efficient of viscosity-Variable pressure head
8. Calibration of low range voltmeter using potentiometer
9. Determination of thermo emf using potentiometer
10. Verification of truth tables of basic logic gates using ICs
11. Verification of De Morgan's theorems using logic gate ICs.
12. Use of NAND as universal building block.
13. Rigidity modulus by static torsion method.
14. Verification of laws of transverse vibrations using sonometer

Note: Use of digital balance is permitted

Reference Books

1. Manual prepared by the department
2. Ubald Raj, A. and Jose Robin, G. 2012. Allied Physics. Indira Publications. Marthandam.

SEMESTER – I
NON MAJOR ELECTIVE NME I: PHYSICS FOR EVERYDAY LIFE

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Externa l	Total
PU231NM1	2	-	-	-	2	2	30	25	75	100

Pre-requisite:

Students should know about basic knowledge regarding mechanical objects, laser, optical devices and solar energy.

Learning Objectives:

1. To introduce fundamental physics concepts and their applications in everyday life.
2. To comprehend where all physics principles have been applied in everyday life and to appreciate the concepts with a greater understanding, as well as to learn about Indian scientists who have made significant contributions to Physics.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	understand the knowledge of basic scientific principles and fundamental concepts in motion of bodies.	K2
2	understand the basic laws of physics in domestic appliances	K2
3	recall the physics notions applied in various optical instruments	K1
4	comprehend the utilization of solar energy in everyday life activities	K2
5	know about the various physicists contribution towards science and technology	K2

K1 - Remember; K2 - Understand; K3 - Apply

Units	Contents	No. of Hours
I	MECHANICAL OBJECTS Spring scales – bouncing balls –roller coasters – bicycles –rockets and space travel.	6
II	OPTICAL INSTRUMENTS AND LASER Vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – colour photography – holography and laser.	6
III	PHYSICS OF HOME APPLIANCES: bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners	6
IV	SOLAR ENERGY Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.	6

V	INDIAN PHYSICIST AND THEIR CONTRIBUTIONS C.V.Raman, Homi Jehangir Bhabha, Vikram Sarabhai, Subrahmanyam Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.	6
TOTAL		30

Self -Study	Brief description about bulb, fan, Applications of solar energy
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Text Books:

1. The Physics in our Daily Lives, Umme Ammara, Gugucol Publishing, Hyderabad, 2019.
2. For the love of physics, Walter Lawin, Free Press, New York, 2011.

Reference Books:

1. Gerardin Jayam. (2019). Physics in Everyday Life. Published by the Department of Physics, Holy Cross College (Autonomous), Nagercoil.

Web Resources:

1. <https://www.scientificworldinfo.com/2021/09/importance-of-physics-in-our-daily-life.html>
2. <https://www.britannica.com/technology/laser>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	1	1	2	2	3	2	2	2	2
CO2	3	3	2	1	1	2	2	3	3	3	2	2
CO3	3	2	2	1	2	2	2	3	3	3	3	3
CO4	3	3	3	1	1	3	3	3	3	2	2	2
CO5	2	1	1	3	2	2	2	2	2	2	2	2
TOTAL	14	12	10	7	7	11	11	14	13	12	11	11
AVERAGE	2.8	2.4	2	1.4	1.4	2.2	2.2	2.8	2.6	2.4	2.2	2.2

3 – Strong, 2- Medium, 1- Low

SEMESTER I
FOUNDATION COURSE: INTRODUCTORY PHYSICS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	Externa l	Total
PU231FC1	2	-	-	-	2	2	30	25	75	100

Pre-requisite:

Students should know the fundamentals of Physics.

Learning Objectives:

1. To help students get an overview of Physics before learning their core courses.
2. To serve as a bridge between the school curriculum and the degree programme.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	apply concept of vectors to understand concepts of Physics and solve problems	K2 & K3
2	interpret different forces present in Nature while learning about phenomena related to these different forces.	K1 & K2
3	describe energy in different process and relate momentum, velocity and energy	K1 & K2
4	differentiate different types of motions they would encounter in various courses and understand their basis	K1 & K2
5	relate various properties of matter with their behavior and connect them with different physical parameters involved.	K2 & K3

K1 - Remember; **K2** - Understand; **K3** - Apply

Units	Contents	No. of Hours
I	Vector: Vectors, scalars, Examples for scalars and vectors from physical quantities, addition, subtraction of vectors, resolution and resultant of vectors, units and dimensions, standard physics constants	6
II	Force: Different types of forces, gravitational, electrostatic, magnetic, electromagnetic, nuclear, mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces	6
III	Energy: Different forms of energy, Conservation laws of momentum, energy, types of collisions, angular momentum, alternate energy sources, real life examples	6

IV	Motion: Types of motion, linear, projectile, circular, angular, simple harmonic motions, satellite motion, banking of a curved road, stream line and turbulent motions, wave motion, comparison of light and sound waves, Free, forced and damped oscillations	6
V	Surface tension and Viscosity: Surface tension, shape of liquid drop – angle of contact – viscosity – lubricants, capillary flow, diffusion, real life examples, properties and types of materials in daily use, conductors, insulators, thermal and electric	6
TOTAL		30

Self-study	Units and dimensions; Friction; Comparison of light and sound waves; Stream line and turbulent motions; Conductors
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Text Books

1. Mathur D.S. 2010, Elements of Properties of Matter, S.Chand & Co
2. BrijLal& N. Subrahmanyam. 2003, Properties of Matter, S.Chand & Co.

Reference Books

1. Gulati H.R, 1977, Fundamental of General Properties of Matter (Fifth edition), S.Chand& Co.

Web Resources:

1. <https://www.physicsclassroom.com/class/newtlaws/Lesson-2/Types-of-Forces>
2. <http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html><https://science.nasa.gov/ems/>
3. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/
4. <https://testbook.com/physics/types-of-motion>
5. [https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_\(Physical_and_Theoretical_Chemistry\)/Physical_Properties_of_Matter/States_of_Matter/Properties_of_Liquids/Surface_Tension](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Physical_Properties_of_Matter/States_of_Matter/Properties_of_Liquids/Surface_Tension)

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 4
CO1	3	3	3	3	2	3	3	2.5	2.5	3	3	3
CO2	3	3	3	3	3	2	2	2.5	2.5	2	3	3
CO3	3	3	3	3	3	2	2	2.5	2.5	2	3	3
CO4	3	3	3	3	2	2	2	2.5	2.5	2	3	3
CO5	3	3	3	3	3	2	2	2.5	2.5	2	3	3
TOTAL	15	15	15	15	13	11	11	12.5	12.5	11	15	15
AVERAGE	3	3	3	3	2.6	2.2	2.2	2.5	2.5	2.2	3	3

3 – Strong, 2- Medium, 1- Low

SEMESTER I
SPECIFIC VALUE-ADDED COURSE: PHOTOSHOP

Course Code	Credit	Total Hours	Total Marks
PU231V01	1	30	100

Learning Objectives

- (i) Students will be able to create images for web design, logos, graphics, layouts, image touch-ups, and colour enhancement.
- (ii) Students will be able to learn the principles of how different types of media can be processed and presented by computers.

Course Outcomes

On the successful completion of the course, student will be able to:		
CO 1	use photoshop confidently and effectively.	K3
CO 2	gain the skills and abilities to use photoshop that make them employable	K6
CO 3	create and edit images	K6
CO4	use a range of tools and filters in <i>photoshop</i>	K3

Units	Contents	No. of Hours
I	PHOTOSHOP Introduction - Features of Photoshop - Key Board practice – Creation of new file - saving document - Inserting of Images	6
II	GRAPHICS Creating Graphics: Combining Photos, Text, & Graphics - Replacing Backgrounds - Colour Correction Using Colour Balance - Colour Correction Using Curves - Preparing Digital Photos for Print -Exporting Files	6
III	SMART FILTERS Sharpening Photos - Layer Masking - Masking Smart Filters - Converting to Black & White - Adjustment Layers & Mask - Retouching	6
IV	MASKS Changing Colour with a Blending Mode - Clipping Masks: Filling Shapes with Images - Using Adjustment Layers as Clipping Masks - Camera Raw Fundamentals	6
V	PHOTOSHOP FOR DESIGN Camera Raw Fundamentals - Photoshop for Design: Adding a Title & Layer Styles - Photoshop for Design: Creating Digital Art in Photoshop - Photoshop for Design: Compositing into a Photo	6
TOTAL		30

Reference Books

1. Rafael Concepcion, Adobe Photoshop and Lightroom Classic Classroom in a Book 3rd Edition, Kindle Edition, Adobe Press, 2022
2. Tay Vaughan, “Multimedia making it work”, Tata McGraw-Hill, 2021.
3. Li & Drew, “Fundamentals of Multimedia”, Pearson Education, 2019.
4. Robin Nichols, “Mastering Adobe Photoshop Elements 2023”, Fifth Edition, Packet Publisher, Dec 2022.

SEMESTER – II
CORE COURSE -II: HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU232CC1	5	-	-	-	5	5	75	25	75	100

Pre-requisite:

Knowledge on Temperature in different Scales and Laws of thermodynamics

Learning Objectives:

1. To understand a basic in conversion of temperature in Celsius, Kelvin and Fahrenheit scales.
2. To Relate the laws of thermodynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its relation

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	acquires knowledge on how to distinguish between temperature and heat, and explain practical measurements of high temperature as well as low temperature physics.	K1 & K2
2.	derive the efficiency of Carnot's engine and discuss the implications of the laws of Thermodynamics in diesel and petrol engines	K1 & K3
3.	analyze performance of thermodynamic systems viz efficiency by problems and gets an insight into thermodynamic properties like enthalpy, entropy	K2 & K3
4.	study the process of thermal conductivity and apply it to good and bad conductors.	K2 & K3
5.	interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzmann distribution law, Bose-Einstein and Fermi-Dirac .	K2 & K3

K1 - Remember; **K2** - Understand; **K3** - Apply

Units	Contents	No. of Hours
I	CALORIMETRY: Specific heat capacity – specific heat capacity of gases C_p & C_v – Meyer's relation – Joly's method for determination of C_v – Regnault's method for determination of C_p LOW TEMPERATURE PHYSICS: Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect –Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation.	15
II	THERMODYNAMICS-I: Zeroth law and first law of thermodynamics – P-V diagram – heat engine –efficiency of heat engine – Carnot's engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines.	15

III	THERMODYNAMICS-II: Second law of thermodynamics –entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram –thermodynamical scale of temperature – Maxwell’s thermodynamical relations – Clasius-Clapeyron’s equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.	15
IV	HEAT TRANSFER: Modes of heat transfer: conduction, convection and radiation. Conduction: thermal conductivity – determination of thermal conductivity of a good conductor by Forbe’s method – determination of thermal conductivity of a bad conductor by Lee’s disc method. Radiation: black body radiation (Ferry’s method) – distribution of energy in black body radiation – Wien’s law and Rayleigh Jean’s law –Planck’s law of radiation – Stefan’s law – deduction of Newton’s law of cooling from Stefan’s law.	15
V	STATISTICAL MECHANICS: Definition of phase-space – micro and macro states – ensembles –different types of ensembles – classical and quantum Statistics – Maxwell Boltzmann statistics – expression for distribution function – Bose-Einstein statistics – expression for distribution function – Fermi-Dirac statistics –expression for distribution function – comparison of three statistics.	15
TOTAL		75

Self-study	Temperature of inversion ; Comparison of engines; Entropy of an ideal gas; Stefan’s law; Comparison of three statistics.
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Text Books

1. Brijlal , Subramaniam, N. Henne, P. S. 2008. Heat Thermodynamics and Statistical Physics, Revised Edition, S.Chand & Co., New Delhi.
2. Murugesan, R. Kiruthiga Sivaprasath. 2013, Thermal Physics, 2nd edn., Sulthan Chand & Sons, New Delhi.
3. Jauaraman, D. Ilangovan. K. 2009, Thermal Physics and Statistical Mechanics, 1st edn., S. Viswanathan Publishers and Printers, Chennai.

Reference Books

1. Ubald Raj A. and Jose Robin G. 2001, Thermal Physics and Statistical Mechanics. 1st edn. Indira publication. Marthandam, Tamil Nadu.
2. Mathur, D.S. 2014. Heat and Thermodynamics, 5th Edition, Sultan Chand & Sons, New Delhi.
3. Gupta, Kumar, Sharma, 2013. Statistical Mechanics (Twenty-Sixth Edition), S. Chand & Co. Ltd., New Delhi.
4. Sears, Zemansky, Hugh D. Young, Roger, Freedman, A. 2021. University Physics with Modern Physics (Fifteenth Edition), Pearson, New Jersey.
5. Ubald Raj A. and Jose Robin G. 2005, Mechanics and Thermal Physics. 1st edn. Indira publication. Marthandam, Tamil Nadu.

Web Resources

1. https://www.youtube.com/watch?v=M_5KYncYNyc
2. <https://www.youtube.com/watch?v=pQWwP7YYH6o>

3. <https://www.youtube.com/watch?v=LUoUb4hGMH8>
4. <https://ocw.mit.edu/courses/5-60-thermodynamics-kinetics-spring-2008/resources/lecture-2-work-heat-first-law/>
5. <https://ocw.mit.edu/courses/5-60-thermodynamics-kinetics-spring-2008/resources/lecture-13-gibbs-free-energy/>

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	2	2	1	1
CO2	2	3	3	3	2	3	3	3	2	2	1	1
CO3	3	3	3	2	3	3	3	3	2	2	2	1
CO4	3	3	3	3	3	3	3	3	2	2	1	2
CO5	3	3	2	3	3	3	2	3	2	2	1	1
TOTAL	14	15	14	14	14	15	14	15	10	10	6	6
AVERAGE	2.8	3	2.8	2.8	2.8	3	2.8	3	2	2	1.6	1.6

3 – Strong, 2- Medium, 1- Low

SEMESTER – II

CORE LAB COURSE - II: GENERAL PHYSICS LAB II

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU232CP1	-	-	3	-	3	3	45	25	75	100

Prerequisites: Types of Modulus, Knowledge on thermal conductivity and specific heat capacity

Learning Objectives:

1. To apply their knowledge gained about the concept of heat and sound waves, resonance.
2. To do error analysis and correlate results

Course Outcomes

On the successful completion of the course, students will able to:		
1.	understand the strength of materials using physical experiments.	K2
2.	acquire knowledge of thermal behaviour of the materials.	K1
3.	analyze the physical principle involved in the various instruments such as sonometer and Melde's String.	K4
4.	understand the scientific method and an ability to apply the scientific method in practice.	K2

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze

Contents
<p style="text-align: center;">(Any Eight Experiments)</p> <ol style="list-style-type: none"> 1. Verification of Newton's law of cooling 2. Determination of specific heat by cooling – graphical method. 3. Determination of thermal conductivity of bad conductor by Lee's disc method. 4. Frequency of AC by using Sonometer. 5. To verify the laws of transverse vibration using sonometer. 6. Velocity of sound through a wire using Sonometer. 7. To verify the laws of transverse vibration using Melde's apparatus. 8. Determination of g using compound pendulum. 9. Determination of thermal conductivity of good conductor by Searle's method. 10. Determination of thermal conductivity of bad conductor by Charlton's method. 11. Determination of specific heat capacity of solid. 12. Determination of specific heat of liquid by Joule's electrical heating method (applying radiation correction by Barton's correction/graphical method), 13. Determination of Latent heat of a vaporization of a liquid. 14. Verification of Stefan's-Boltzmann's law. 15. Determination of thermal conductivity of rubber tube. 16. Helmholtz resonator. 17. Determination of velocity of sound using Kundt's tube. 18. Determination of frequency of an electrically maintained tuning fork 19. To compare the mass per unit length of two strings using Melde's apparatus. 20. Determination of moment of inertia and g using Bifilar pendulum.

Reference Books

1. Manual prepared by the department
2. Ouseph, C, C., Rao, U, J. and Vijayendran, V. 2007. Practical Physics and Electronics. S. Viswanathan, Pvt., Ltd. Chennai.

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3	3	3	3	3	3	3	2
CO2	2	3	2	3	2	3	3	3	2	2	3	2
CO3	3	3	2	2	3	3	3	3	2	2	2	2
CO4	3	3	2	3	3	3	3	3	2	2	2	2
TOTAL	11	12	8	11	11	12	12	12	9	9	10	8
AVERAGE	2.75	3	2	2.75	2.75	3	3	3	2.25	2.25	2.5	2

3 – Strong, 2- Medium, 1- Low

SEMESTER - II
ELECTIVE COURSE –II: ALLIED PHYSICS FOR MATHEMATICS – II

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU232EC1	4		-		3	4	60	25	75	100

Prerequisites:

Knowledge on basic Physics

Learning Objectives:

1. To impart basic principles of Physics
2. To incorporate concepts of Physics in day to day life

Course Outcomes

On the successful completion of the course, student will be able to:		
CO1	explain the concepts of interference, diffraction and rephrase the concept of polarization	K1 & K2
CO2	outline the basic foundation of different atom models and relate the importance of theoretical models	K1 & K2
CO3	understand the properties of nuclei, nuclear forces, structure of atomic nucleus and nuclear models and interpret nuclear processes like fission and fusion.	K2& K3
CO4	describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation.	K3 & K4
CO5	summarize the working of semiconductor devices like diodes, transistors, USB chargers and EV charging stations.	K4& K5

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

Unit	Contents	No. of Hours
I	OPTICS Interference – interference in thin films –colours of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – diffraction of light vs sound – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster’s law – optical activity – application in sugar industries	12
II	ATOMIC PHYSICS Atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli’s exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect –Zeeman effect (elementary ideas only) – photo electric effect – Einstein’s photoelectric equation – applications of photoelectric effect: solar cells, solar panels, optoelectric devices	12

III	NUCLEAR PHYSICS Nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses –controlled and uncontrolled chain reaction – nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – breeder reactor – importance of commissioning PFBR in our country – heavy water disposal, safety of reactors: seismic and floods –introduction to DAE, IAEA – nuclear fusion – thermonuclear reactions – differences between fission and fusion.	12
IV	INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES Frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence – introduction on gravitational waves, LIGO, ICTS opportunities at International Centre for Theoretical Sciences	12
V	SEMICONDUCTOR PHYSICS p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment) – USB cell phone charger –introduction to e-vehicles and EV charging stations	12
TOTAL		60

Self-study	Application in sugar industries; Zeeman effect; nuclear fusion; ICTS opportunities at International Centre for Theoretical Sciences; USB cell phone charger
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Textbooks

1. R.Murugesan (2001), Allied Physics,S. Chand &Co, New Delhi.
2. Ubald Raj, A. and Jose Robin, G. 2012. Allied Physics. Indira Publications. Marthandam.

Reference Books

1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt .Ltd., Singapore.
2. K.Thangaraj and D. Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai.
3. A.Beiser (2003), Concepts of Modern Physics, Tata McGraw Hill Publication, New Delhi.
4. R.Murugesan (2005), Modern Physics, S.Chand&Co, New Delhi.
5. A.Subramaniam (2001), Applied Electronics, 2nd Edn., National Publishing Co., Chennai.

Web Resources

1. <https://www.berkshire.com/learning-center/delta-p-facemask/>
2. <https://www.youtube.com/watch?v=QrhxU47gtj4>
3. <https://www.validyne.com/blog/leak-test-using-pressure-transducers/>
4. <https://www.atoptics.co.uk/atoptics/blsky.htm> -
5. <https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects>
6. <https://www.berkshire.com/learning-center/delta-pfacemask/https://www.youtube.com/watch?v=QrhxU47gtj4>
7. https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_log

**MAPPING WITH PROGRAMME OUTCOMES AND
PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	2	2	2	2	2
CO2	2	3	3	2	3	2	3	2	3	2
CO3	2	2	2	2	2	3	3	3	2	2
CO4	3	3	2	2	3	2	2	2	2	2
CO5	2	3	2	3	2	2	3	2	2	2
TOTAL	12	14	11	11	13	11	13	11	11	10
AVERAGE	2.4	2.8	2.2	2.2	2.6	2.2	2.6	2.2	2.2	2.0

3 – Strong, 2- Medium, 1- Low

SEMESTER – II
ELECTIVE LAB COURSE - II : ALLIED PHYSICS PRACTICAL FOR
MATHEMATICS II

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU232EP1	-	-	2	-	2	2	30	25	75	100

Prerequisites:

Basic Knowledge in physics experiments

Learning Objectives:

1. To apply various Physics concepts to understand concepts of Light, electricity and magnetism and waves, set up experimentation to verify theories, quantify and analyze,
2. To able to do error analysis and correlate results

Course Outcomes

On the successful completion of the course, students will able to:		
1.	understand the nature of monochromatic light and its diffraction and interference phenomenon.	K2
2.	able to design simple logic circuits	K3
3.	analyze the physical principle involved in the various instruments	K4
4.	understand the scientific method and an ability to apply the scientific method in practice.	K2

K1 - Remember; **K2** – Understand; **K3** - Apply; **K4** - Analyze

Contents
<p>(Any Eight Experiments)</p> <ol style="list-style-type: none"> 1. Radius of curvature of lens by forming Newton's rings 2. Thickness of a wire using air wedge 3. Wavelength of mercury lines using spectrometer and grating 4. Refractive index of material of the lens by minimum deviation 5. Refractive index of liquid using liquid prism 6. Thermal conductivity of poor conductor using Lee's disc 7. Determination of Earth's magnetic field using field along the axis of a coil 8. Determination of AC frequency using sonometer 9. Characterization of Zener diode 10. Construction of Zener/IC regulated power supply

- | |
|--|
| 11. Construction of AND, OR, NOT gates using diodes and transistor
12. NOR gate as a universal building block |
|--|

Reference Books

1. Ubald Raj, A. and Jose Robin, G. 2012. Allied Physics. Indira Publications. Marthandam.

**MAPPING WITH PROGRAMME OUTCOMES AND
PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	3	2	2	2	2	2	3
CO2	2	3	3	2	3	2	3	2	3	2	3
CO3	2	2	2	2	2	3	2	3	2	2	3
CO4	3	3	2	2	3	2	3	2	2	3	3
TOTAL	9	11	9	8	11	9	10	9	9	9	12
AVERAGE	2.25	2.75	2.25	2.0	2.75	2.25	2.5	2.25	2.25	2.25	3.0

3 – Strong, 2- Medium, 1- Low

SEMESTER – II
NON MAJOR ELECTIVE: NME II: PHYSICS OF MUSIC

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU232NM1	2	-	-	-	2	2	30	25	75	100

Pre-requisite:

Students should know about the basic knowledge regarding sound, vibrating systems and musical instruments.

Learning Objectives:

1. To educate and instruct students on the significance of physics in music.
2. To gain understanding of musical notes and instruments.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	understand the principles and basic scientific concepts in sound waves	K2
2.	understand the various phenomena of simple vibrating systems.	K1
3.	comprehend the various musical notes and its production	K2
4.	apply the knowledge of recording music in day to day life activities.	K3
5.	know the scientific concepts of music	K2

K1 - Remember; **K2** - Understand; **K3** - Apply

Units	Contents	No. of Hours
I	UNIT I: SCIENTIFIC STUDY OF MUSIC: vibrations of atoms of matter– vibrations coupling to air – propagation of sound waves in air, other media, fluids & solids – velocity, frequency, wavelength, time period, intensity: definition and unit fs – classification of sound on frequency and velocity– human & animal sound perception– mechanism of ear and hearing – psychoacoustics	6
II	UNIT II: SIMPLE VIBRATING SYSTEMS: Simple harmonic motion – tuning fork– amplitude, phase, energy, energy loss/damping/ dissipation – power – travelling waves and standing waves– laws of vibration in stretched strings– one-dimensional medium – open and closed organ pipes – over tones, harmonics – quality of sound: pitch, timber, loudness – octaves, musical notes	6

III	UNIT III: MUSICAL TONE: pure/simple tones – sine/cosine waves– well-defined frequencies, wavelengths, amplitudes & phases– partial tones – assembly of pure tones– mix of different frequencies & amplitudes– complex tone – superposition of simple tones – complex waveform– periodic complex waveform – formants – resonances– sound envelope	6
IV	UNIT IV: PRODUCTION OF MUSICAL SOUNDS: human voice,mechanism of vocal sound production – larynx (sound box) – stringed Instruments:plucked & bowed, guitar, mandolin, violin, piano, etc. – wind instruments: whistles, flute, saxophone, pipe organ, bag pipes,etc – percussion instruments:plates, membranes,drums, cymbals, xylophone etc. – electronic instruments: keyboards, electric guitars, rhythm pads, etc. – analog and digital sound synthesizers,–MIDI instrument– computer generated music	6
V	UNIT V: RECORDING OF MUSIC & SOUND Edison phonograph – cylinder & disk records – magnetic wire and tape recorders – digital recording (e.g. to CD, DVD, etc.)– analog transducers, condenser, dynamic microphones, loudspeaker – complex sound fields – near & far fields of acoustic– spectral analysis techniques – continuous & discrete Fourier transforms, digital signal processing – digital filtering – specifications of recording studios	6
TOTAL		30

Self -Study	Simple tones, frequencies, wavelength, Musical Instruments
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Text Books:

1. Harvey White, 2014, Physics and Music: The Science of Musical Sound. Dover Publications Inc, New York.
2. Barry Parker, 2009, Good Vibrations – The Physics of Music. John Hopkins University Press, Baltimore
3. Curt Sachs, 2006, The History of Musical Instruments. Dover Publications Inc, New York
4. Kinko Tsuji and Stefan C. Müller, 2021, Physics and Music: Essential Connections and Illuminating Excursions, Springer Nature, Switzerland.
5. Panos Photinos, 2017, Musical Sounds, Instruments and Equipment, Morgan Claypool Publishers, USA

Reference Books:

1. Gerardin Jayam. 2019. Physics in Everyday Life. Published by the Department of Physics, Holy Cross College (Autonomous), Nagercoil.
2. Ian Johnston, 2009, Measured Tones, 3rd edition, CRC Press, Taylor and Francis Group, New York.

3. Michael J Morovcsik, 2002, Musical Sound, A Solomon Press Book, Kluwer Academic/Plenum Publishers, Moscow.
4. Curt Sachs, 2022, The Rise of Music in the Ancient World: East And West, Gyan Publishing House, New Delhi
5. Panos Photinos, 2021, The Physics of Sound Waves: Music, Instruments, and Sound Equipment, 2nd Edition, IOP Publishing Ltd, UK

Web Resources:

1. <https://www.britannica.com/science/musical-sound>
2. <https://blog.landr.com/sound-recording/>
3. <https://www.britannica.com/topic/music-recording/The-development-of-musicalrecording>
4. https://ccrma.stanford.edu/CCRMA/Courses/152/vibrating_systems.html

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	1	2	2	3	2	2	2	2
CO2	3	2	1	1	1	2	2	3	2	2	2	2
CO3	3	2	1	1	1	1	2	2	2	2	2	2
CO4	3	3	2	1	1	2	3	3	2	2	2	2
CO5	2	2	2	1	1	2	2	2	2	2	2	2
TOTAL	14	11	7	5	5	9	11	13	10	10	10	10
AVERAGE	2.8	2.2	1.4	1	1	1.8	2.2	2.6	2	2	2	2

3 – Strong, 2- Medium, 1- Low

SEMESTER – II

SKILL ENHANCEMENT COURSE SEC-I - DIGITAL PHOTOGRAPHY

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU232SE1	2	-	-	-	2	2	30	25	75	100

Prerequisites:

Basic Knowledge in optics and imaging.

Learning Objectives:

1. To understand the principles of photography and image formation and the science and arts behind it.
2. To understand the essential components of conventional and digital cameras and also the different image processing techniques.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	describe the principle of image formation in Photography	K2
2	apply the parameters for controlling the images	K3
3	identify different types of camera	K4
4	explain the image formation in Digital Photography	K2
5	illustrate the digital image – postproduction procedures	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze

Units	Contents	No. of Hours
I	PHOTOGRAPHY AND BASIC PRINCIPLE OF IMAGE FORMATION: Principle –chemical route and digital route –light, wavelengths, colours – shadows – light intensity and distance – making light form images –pin-hole images – practical limitations to pin-hole images – lens instead of pin-hole – focal length and image size – imaging of closer subjects.	6
II	LENSES – CONTROLLING THE IMAGES: Photographic lens – focal length and angle of view (problems) – focusing movement – aperture and f-numbers (problems) – depth of field– depth of focus – image stabilization – lenses for digital cameras – lens and camera care	6
III	CAMERA USING FILMS AND ITS TYPES: Camera and its essential components– shutter – aperture – light measurement – film housing – camera types: view camera– view finder camera – Reflex camera– single lens reflex (SLR) camera	6

IV	DIGITAL CAMERAS PRINCIPLE AND TYPES Principle of digital image capturing – comparison of digital and analog picture information – megapixel – grain, noise and pixel density – optical and digital zooming – image stabilizer – bit depth – white balance – colour modes – file formats (TIFF, RAW & JPEG) – storage cards and types – digital cameras: camera phones – compact camera – hybrid camera – digital SLR.	6
V	THE DIGITAL IMAGE – POSTPRODUCTION Hardware: computer and its peripherals – software: saving digital file – basic editing: navigating the image – undo/redo/history – crop – rotate – brightness & contrast – colour balance – hue/saturation – dodge/burn – cloning & retouching – removing an element in an image – advanced editing: histogram/levels – curves – selection tools: magic wand – printing digital images: inkjet printer – laser printer – dye sub printer – lambda/ light jet printers.	6
TOTAL		30

Self-study	Imaging of closer subjects; Lens and camera care; Camera and its essential components; Digital cameras: camera phones; Laser printer
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Textbooks:

1. Michel J.Langford, Anna Fox & Richard Sawdon Smith, 2010, Basic Photography, 9th Edition, Focal press, London
2. Henry Carroll. 2014, Read this if you want to take great photographs of people, Laurence King Publishing House.

Reference Books:

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

Web Resources:

1. https://www.accessengineeringlibrary.com/binary/mheaeworks/27573c8a4e04bc1a/1ae690cdd3d5711fdbe6463f02945caf923faf161b30f99e05e9d8f1d5932641/principles-of-photography-and-imaging.pdf?implicit-login=true&sigma-token=AibpD1dgOcmXs4X3fz1ok4_1xmSXEQOFzoGKqkIE
2. <https://www.masterclass.com/articles/basic-photography-101-understanding-camera-lenses>
3. <https://blog.magnasonic.com/different-film-types-formats-sizes/>
4. <https://av.jpn.support.panasonic.com/support/global/cs/dsc/knowhow/knowhow01.html>
5. https://en.wikibooks.org/wiki/Digital_Photography/Post_Processing

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	3	3	3	2	3	3	3	3
CO3	3	3	3	2	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	2	3	3	3	3	3	3	2	3	3	3
TOTAL	14	14	15	14	15	15	15	14	14	15	15	15
AVER AGE	2.8	2.8	3	2.8	3	3	3	2.8	2.8	3	3	3

3 – Strong, 2- Medium, 1- Low

SEMESTER I & II

Life Skill Training I: Catechism

Course Code: UG232LC1

Hours	Credit	Total Hours	Total Marks
1	1	30	100

Objectives:

1. To develop human values through value education
2. To understand the significance of humane and values to lead a moral life
3. To make the students realize how values lead to success

Course Outcome	Upon completion of this course the students will be able to
CO-1	understand the aim and significance of value education
CO-2	develop individual skills and act confidently in the society
CO-3	learn how to live lovingly through family values
CO-4	enhance spiritual values through strong faith in God
CO-5	learn good behaviours through social values

Unit I

Value Education:

Human Values – Types of Values – Growth – Components – Need and Importance

Bible Reference: Matthew: 5:3-16

Unit II

Individual Values: Esther

Vanishing Humanity – Components of Humanity – Crisis – Balanced Emotion – Values of Life

Bible Reference: Esther 8:3-6

Unit III

Family Values: Ruth the Moabite

Respecting Parents – Loving Everyone – Confession – True Love

Bible Reference: Ruth 2:10-13

Spiritual Values: Hannah

Faith in God – Wisdom – Spiritual Discipline – Fear in God – Spiritually Good Deeds

Bible Reference: 1 Samuel 1:24-28

Unit IV

Social Values: Deborah

Good Behaviour – Devotion to Teachers – Save Nature – Positive Thoughts – The Role of Youth in Social Welfare

Bible Reference: Judges 4:4-9

Unit V

Cultural Values: Mary of Bethany

Traditional Culture – Changing Culture – Food – Dress – Habit – Relationship – Media – The Role of Youth

Bible Reference: Luke 10:38-42

Text Book

Humane and Values. Holy Cross College (Autonomous), Nagercoil

The Holy Bible

SEMESTER I & II
Life Skill Training I: Moral
Course Code: UG232LM1

Hours	Credit	Total Hours	Total Marks
1	1	30	100

Objectives:

1. To develop human values through value education
2. To understand the significance of humane and values to lead a moral life
3. To make the students realize how values lead to success

Course Outcome	Upon completion of this course the students will be able to
CO-1	understand the aim and significance of value education
CO-2	develop individual skills and act confidently in the society
CO-3	learn how to live lovingly through family values
CO-4	enhance spiritual values through strong faith in God
CO-5	learn good behaviours through social values

Unit I

Value Education:

Introduction – Limitations – Human Values – Types of Values – Aim of Value Education – Growth – Components – Need and Importance

Unit II

Individual Values:

Individual Assessment – Vanishing Humanity – Components of Humanity – Crisis – Balanced Emotion – Values of Life

Unit III

Family Values:

Life Assessment – Respecting Parents – Loving Everyone – Confession – True Love

Unit IV

Spiritual Values:

Faith in God – Wisdom – Spiritual Discipline – Fear in God – Spiritually Good Deeds

Unit V

Social Values:

Good Behaviour – Devotion to Teachers – Save Nature – Positive Thoughts – Drug Free Path – The Role of Youth in Social Welfare

Unit VI

Cultural Values:

Traditional Culture – Changing Culture – Food – Dress – Habit – Relationship – Media – The Role of Youth

Text Book

Humane and Values. Holy Cross College (Autonomous), Nagercoil