

B.Sc., PHYSICS

Syllabus

Program Code: UPH

2023-2024 onwards



MANNAR THIRUMALAI NAICKER COLLEGE

(AUTONOMOUS)

Re-accredited with “A” Grade by NAAC

PASUMALAI, MADURAI – 625 004

**GUIDLINES FOR OUTCOME BASED EDUCATION WITH CHOICE BASED
CREDIT SYSTEM**

(FOR UG PROGRAM FROM 2023 -2024 ONWARDS)

ELIGIBILITY FOR ADMISSION

Candidates seeking admission to the UG Degree program must have passed the Higher Secondary Education (respective groups – Arts / Science) of the Government of Tamil Nadu or any other state or its equivalent qualification.

DURATION OF THE COURSE

The duration of the course shall be three academic years comprising six semesters with two semesters in each academic year.

Subjects of Study

Part I : Tamil / Hindi /

Part II : English

Part III:

- 1.Core Subjects
- 2.Allied Subjects
- 3.Electives

Part IV:

- 1.Non Major Electives (I Year)
- 2.Skill Based Subjects
- 3.Environmental Studies - Mandatory Subject
- 4.Value Education - Mandatory Subject

Part V :

Extension Activities

ARTS & SCIENCE

CBCS COURSE STRUCTURE FOR UG PROGRAMS

Sem I	Credit	Sem II	Credit	Sem III	Credit	Sem IV	Credit	Sem V	Credit	Sem VI	Credit
1.1. Language - Tamil	3	2.1. Language - Tamil	3	3.1. Language - Tamil	3	4.1. Language - Tamil	3	5.1 Core Course - \CC IX	4	6.1 Core Course - CC XIII	4
1.2 English	3	2.2 English	3	3.2 English	3	4.2 English	3	5.2 Core Course - CC X	4	6.2 Core Course - CC XIV	4
1.3 Core Course - CC I	4	2.3 Core Course - CC III	4	3.3 Core Course - CC V	4	4.3 Core Course - CC VII Core Industry Module	4	5.3. Core Course - CC -XI	4	6.3 Core Course - CC XV	4
1.4 Core Course - CC II	4	2.4 Core Course - CC IV	4	3.4 Core Course - CC VI	4	4.4 Core Course - CC VIII	4	5.3. Core Course - / Project with viva-voce CC - XII	4	6.4 Elective -VII Generic/ Discipline Specific	3
1.5 Elective I Generic/ Discipline Specific	3	2.5 Elective II Generic/ Discipline Specific	3	3.5 Elective III Generic/ Discipline Specific	3	4.5 Elective IV Generic/ Discipline Specific	3	5.4 Elective V Generic/ Discipline Specific	3	6.5 Elective VIII Generic/ Discipline Specific	3
1.6 Skill Enhancement Course SEC-1 (NME)	2	2.6 Skill Enhancement Course SEC-2 (NME)	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	4.6 Skill Enhancement Course SEC-6	2	5.5 Elective VI Generic/ Discipline Specific	3	6.6 Extension Activity	1
1.7 Ability Enhancement Compulsory Course (AECC) Soft Skill-1	2	2.7 Skill Enhancement Course - SEC-3(NME)	2	3.7 Skill Enhancement Course SEC-5	2	4.7 Skill Enhancement Course SEC-7	2	5.6 Value Education	2	6.7 Professional Competency Skill	2
1.8 Skill Enhancement - (Foundation Course)	2	2.8 Ability Enhancement Compulsory Course (AECC) Soft Skill-2	2	3.7 Ability Enhancement Compulsory Course (AECC) Soft Skill-3	2	4.7 Ability Enhancement Compulsory Course (AECC) Soft Skill-4	2	5.5 Summer Internship /Industrial Training	2		
				3.8 E.V.S	-	4.8 E.V.S	2				
	23		23		22		25		26		21
Total Credit Points											140

**QUESTION PAPER PATTERN FOR THE CONTINUOUS INTERNAL
ASSESSMENT**

Note: Duration – 1 hour

(FOR PART I, PART II & PART III)

The components for continuous internal assessment are:

Part –A

Four multiple choice questions (answer all) 4 x 01= 04 Marks

Part –B

Two questions ('either or 'type) 2 x 05= 10 Marks

Part –C

Two questions ('either or 'type) 2 x 08=16 Marks

Total 30 Marks

THE COMPONENTS FOR CONTINUOUS INTERNAL ASSESSMENT ARE:

(60 Marks of two continuous internal assessments will be converted to 15 marks)

Two tests and their average --15 marks

Seminar /Group discussion / Quiz Test --5 marks

Assignment --5 marks

Total 25 Marks

QUESTION PAPER PATTERN FOR THE SUMMATIVE EXAMINATIONS:

Note: Duration- 3 hours

Part –A

Ten multiple choice questions 10 x 01 = 10 Marks

No Unit shall be omitted: not more than two questions from each unit.)

Part –B

Five Paragraph questions ('either or 'type) 5 x 05 = 25 Marks

(One question from each Unit)

Part –C

Five Paragraph questions ('either or 'type) 5 x 08 = 40 Marks

(One question from each Unit)

Total

75 Marks

PART-IV- SKILL BASED PAPERS / NME:

The Scheme of Examination for Skill Based Papers: (Except Practical Lab Subjects)

QUESTION PAPER PATTERN FOR THE CONTINUOUS INTERNAL ASSESSMENT (SKILL BASED AND NME COURSES) DURATION – 1 HOUR

- ❖ 50 MCQs will be asked for each internal assessment tests (50 x 1=50 Marks) and converted for 15 marks

THE COMPONENTS FOR CONTINUOUS INTERNAL ASSESSMENT ARE:

Two tests and their average	--15 marks
Seminar /Group discussion / Quiz Test	-- 5 marks
Assignment	-- 5 marks

Total	25 Marks

SUMMATIVE EXAMINATION PATTERN (SKILL BASED AND NME COURSES) DURATION – 3 HOURS

Pattern of the Question Paper for Skill Based and Non-Major Elective courses
(External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)
(15MCQ's from each unit)

PART-IV- ENVIRONMENTAL STUDIES AND VALUE EDUCATION
QUESTION PAPER PATTERN (INTERNAL ASSESSMENT)

Pattern of the Question Paper for Environmental Studies & Value Education
(Internal)

50 MCQs will be asked for each internal assessment tests (50 x 1=50 Marks) and
converted for 15 marks

Two tests and their average	--	15 marks
Project	--	10 marks

Total		25 Marks

* The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

SUMMATIVE EXAMINATION PATTERN

Pattern of the Question Paper for Environmental Studies & Value Education only) (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)
(15MCQ's from each unit)

PART V EXTENSION ACTIVITIES: (MAXIMUM MARKS: 100)

1. NCC
2. NSS
3. Physical Education
4. YRC
5. RRC
6. Health & Fitness Club
7. Eco Club
8. Human Rights Club

Internal Examinations - - 25 Marks

Summative Examinations - - 75 Marks

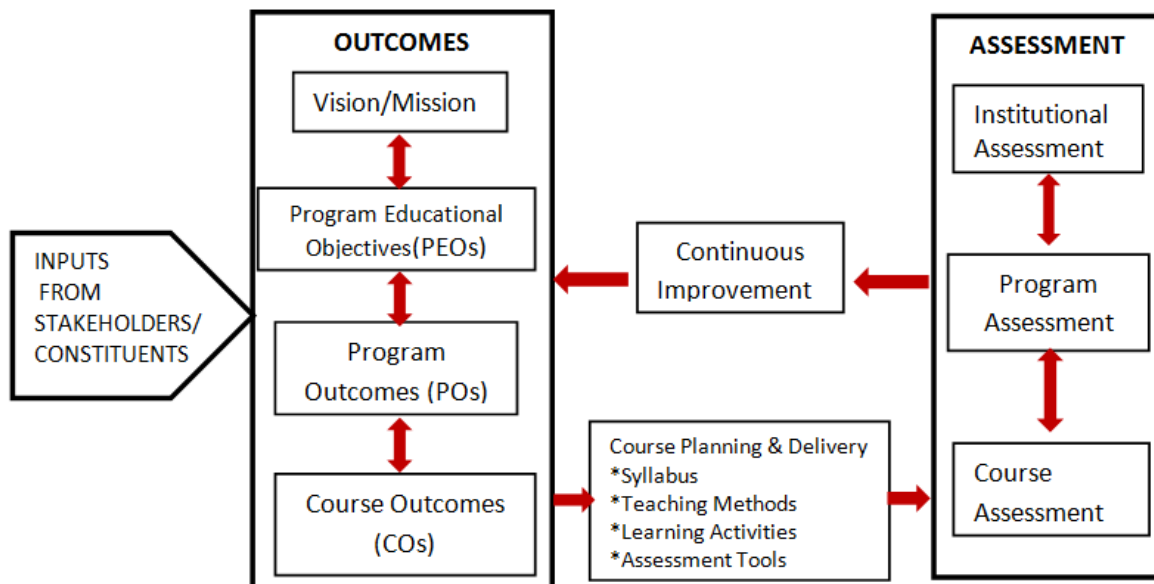
100

OUTCOME BASED EDUCATION:

OBE starts with the identification and articulation of clear and measurable learning outcomes for each course or program. These outcomes describe the skills, knowledge, and abilities that students are expected to acquire. The curriculum, instructional methods, and assessments are aligned with the defined learning outcomes. This ensures that everything taught and evaluated is directly related to what students are expected to learn.

The Learning Outcomes-Based Approach to curriculum planning and transaction in our institution ensures whether the teaching-learning processes are oriented towards enabling students to attain the defined learning outcomes relating to the courses within a programme. The outcome based approach, particularly in the context of undergraduate studies, requires a significant shift from teacher-centric to learner-centric pedagogies and from passive to active/participatory pedagogies.

Assessment Method: The students are assessed with 2 internal examination and the summative examination which includes problem based assignments; practical assignment laboratory reports; observation of practical skills; individual project reports ,case-study reports; team project reports; oral presentations, including seminar presentation; viva voce interviews; computerized adaptive testing; etc. and any other pedagogic approaches as per the context.



INSTITUTIONAL VISION

To Mould the learners into accomplished individuals by providing them with a stimulus for social change through character, confidence and competence.

INSTITUTIONAL MISSION

1. Enlightening the learners on the ethical and environmental issues.
2. Extending holistic training to shape the learners in to committed and competent citizens.
3. Equipping them with soft skills for facing the competitive world.
4. Enriching their employability through career oriented courses.
5. Ensuring accessibility and opportunity to make education affordable to the underprivileged.

Highlights of the Revamped Curriculum:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Mathematics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.

- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS),
MADURAI – 625 004
B.SC PHYSICS CURRICULUM
(For the student admitted during the academic year 2023-2024 onwards)

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
FIRST SEMESTER						
Part – I	Tamil / Alternative Course					
23UTAGT11	தமிழ் இலக்கிய வரலாறு - I	6	3	25	75	100
Part – II	English					
23UENGE11	GENERAL ENGLISH - I	6	3	25	75	100
Part - III	Core Courses					
23UPHCC11	PROPERTIES OF MATTER AND ACOUSTICS	5	5	25	75	100
23UPHCP11	PHYSICS PRACTICAL - I	4	4	25	75	100
Part - III	Elective Course					
23UMTEA11	ALLIED MATHEMATICS - I	5	4	25	75	100
Part IV	Non Major Elective					
23UPHNM11	PHYSICS FOR EVERY DAY LIFE	2	2	25	75	100
Part IV	Foundation Course					
23UPHFC11	INTRODUCTORY PHYSICS	2	2	25	75	100
Total		30	23	175	525	700
SECOND SEMESTER						
Part – I	Tamil / Alternative Course					
23UTAGT21	தமிழ் இலக்கிய வரலாறு – II	6	3	25	75	100
Part – II	English					
23UENGE21	GENERAL ENGLISH - II	6	3	25	75	100
Part - III	Core Courses					
23UPHCC21	HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS	5	5	25	75	100
23UPHCP21	PHYSICS PRACTICAL 2	4	4	25	75	100
Part - III	Elective Course					
23UMTEA21	ALLIED MATHEMATICS - II	5	4	25	75	100
Part IV	Non Major Elective					
23UPHNM21	PHYSICS OF MEDICAL INSTRUMENTS	2	2	25	75	100
Part IV	Skill Enhancement course					
23UPHSC21	FUNDAMENTALS OF ASTROPHYSICS	2	2	25	75	100
Total		30	23	175	525	700

FIRST SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



RESEARCH CENTRE OF PHYSICS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	PROPERTIES OF MATTER AND ACOUSTICS			
Course Code	23UPHCC11	L	P	C
Category	CORE PAPER	5	-	5
COURSE OBJECTIVES:				
<p>➤ Study of the properties of matter leads to information which is of practical value to both the physicist and the engineers. It gives us information about the internal forces which act between the constituent parts of the substance. Students who undergo this course are successfully bound to get a better insight and understanding of the subject.</p>				
UNIT - I	ELASTICITY			15
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)				
UNIT - II	BENDING OF BEAMS			15
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				
UNIT - III	FLUID DYNAMICS			15
<i>Surface tension:</i> 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 <i>Viscosity:</i> 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				
UNIT - IV	WAVES AND OSCILLATIONS			15
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				
UNIT - V	ACOUSTICS OF BUILDINGS AND ULTRASONICS			15
Intensity of sound – decibel – loudness of sound –reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings. <i>Ultrasonic waves:</i> Production of ultrasonic waves – Piezoelectric crystal method –magneto striction effect – application of ultrasonic waves				
Total Lecture Hours				75

BOOKS FOR STUDY:

- D.S.Mathur, 2010, Elements of Properties of Matter, S.Chand and Co.
- BrijLaland N. Subrahmanyam, 2003, Properties of Matter, S.Chand and Co
- D.R.Khanna and R.S.Bedi, 1969, Textbook of Sound, Atma Ram and sons
- BrijLal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition, Vikas Publishing House.
- R.Murugesan, 2012, Properties of Matter, S.Chand and Co.

BOOKS FOR REFERENCES:

- C.J. Smith, 1960, General Properties of Matter, Orient Longman Publishers
- H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, R. Chand and Co.
- A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.

WEB RESOURCES:

- ❖ <https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work>
- ❖ <http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html>
- ❖ <https://www.youtube.com/watch?v=gT8Nth9NWPM>
- ❖ <https://www.youtube.com/watch?v=m4u-SuaSu1sandt=3s>
- ❖ <https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work>
- ❖ <https://learningtechnologyofficial.com/category/fluid-mechanics-lab/>
- ❖ <http://www.sound-physics.com/>
- ❖ <http://nptel.ac.in/courses/112104026/>

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL	REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		40	No Changes Made		New Course	

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:	K LEVEL
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After studying this course, the students will be able to:

CO1	Relate elastic behavior in terms of three moduli of elasticity and working of torsion pendulum.	K1 to K4
CO2	Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.	K1 to K4
CO3	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.	K1 to K4
CO4	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 to K4
CO5	Understand the concept of acoustics, importance of constructing buildings with good acoustics. Able to apply their knowledge of ultrasonic in real life, especially in medical field and assimilate different methods of production of ultrasonic waves	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:										
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CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	3	2	2	3	2	3
CO2	2	3	3	3	2	2	3	2	3	3
CO3	3	2	3	2	3	3	2	3	3	3
CO4	3	3	3	3	3	2	3	2	2	2
CO5	2	2	3	3	2	3	3	3	3	2
3 - STRONG			2 - MEDIUM				1 - LOW			

CO / PO MAPPING:					
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COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	1	3	-	2
CO 2	3	1	3	-	2
CO 3	3	1	3	-	2
CO 4	3	1	3	-	2
CO 5	3	1	3	-	2
WEITAGE					
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:			
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UNIT	PROPERTIES OF MATTER AND ACOUSTICS	HRS	PEDAGOGY
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I	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	Chalk & Talk, Videos, PPT and Demonstration
II	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	Chalk & Talk, Videos, PPT and Demonstration
III	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	Chalk & Talk, Videos, PPT and Demonstration
IV	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	Chalk & Talk, Videos, PPT and Demonstration
V	Intensity of sound – decibel – loudness of sound –reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings. <i>Ultrasonic waves</i> : Production of ultrasonic waves – Piezoelectric crystal method –magneto striction effect – application of ultrasonic waves	15	Chalk & Talk, Videos, PPT and Demonstration

**Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of Questions	K - Level		
CI	CO1	K1 – K4	2	K1, K2	K1 OR K1	K3 OR K3
AI	CO2	K1 – K4	2	K1,K2	K2 OR K2	K4 OR K4
CI	CO3	K1 – K4	2	K1, K2	K2 OR K2	K3 OR K3
AII	CO4	K1 – K4	2	K1,K2	K3 OR K3	K4 OR K4
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	10	-	12	21.43	-
	K2	2	10	-	12	21.43	
	K3	-	-	16	16	28.57	42.86
	K4	-	-	16	16	28.57	71.43
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.57	-
	K2	2	10		12	21.43	
	K3		10	16	26	46.43	25.00
	K4			16	16	28.57	71.43
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1 – K4	2	K1, K2	K1, K1	K2, K2
2	CO2	K1 – K4	2	K1, K2	K2, K2	K2, K2
3	CO3	K1 – K4	2	K1, K2	K2, K2	K3, K3
4	CO4	K1 – K4	2	K1, K2	K3, K3	K3, K3
5	CO5	K1 – K4	2	K1, K2	K4, K4	K4, K4
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	10		15	10.72	-
K2	5	20	32	57	40.71	51.43
K3		10	32	42	30.00	30.00
K4		10	16	26	18.57	18.57
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions				PART – A	
(10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions				PART – B	(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K1		
OR					
11. b)	Unit - I	CO1	K1		
12. a)	Unit - II	CO2	K2		
OR					
12. b)	Unit - II	CO2	K2		
13. a)	Unit - III	CO3	K2		
OR					
13. b)	Unit - III	CO3	K2		
14. a)	Unit - IV	CO4	K3		
OR					
14. b)	Unit - IV	CO4	K3		
15. a)	Unit - V	CO5	K4		
OR					
15. b)	Unit - V	CO5	K4		

Answer ALL the questions				PART – C	(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K2		
OR					
16. b)	Unit - I	CO1	K2		
17. a)	Unit - II	CO2	K2		
OR					
17. b)	Unit - II	CO2	K2		
18. a)	Unit - III	CO3	K3		
OR					
18. b)	Unit - III	CO3	K3		
19. a)	Unit - IV	CO4	K3		
OR					
19. b)	Unit - IV	CO4	K3		
20. a)	Unit - V	CO5	K4		
OR					
20. b)	Unit - V	CO5	K4		

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



RESEARCH CENTRE OF PHYSICS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	PHYSICS PRACTICAL 1			
Course Code	23UPHCP11	L	P	C
Category	CORE PRACTICAL	-	4	4

COURSE OBJECTIVES:

- Apply various physics concepts to understand Properties of Matter, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

SEMESTER - I LIST OF EXPERIMENTS

45

Minimum of Eight Experiments from the list:

1. Determination of rigidity modulus without mass using Torsional pendulum.
2. Determination of rigidity modulus with masses using Torsional pendulum.
3. Determination of moment of inertia of an irregular body.
4. Verification of parallel axes theorem on moment of inertia.
5. Verification of perpendicular axes theorem on moment of inertia.
6. Determination of moment of inertia and g using Bifilar pendulum.
7. Determination of Young's modulus by stretching of wire with known masses.
8. Verification of Hook's law by stretching of wire method.
9. Determination of Young's modulus by uniform bending – load depression graph.
10. Determination of Young's modulus by non-uniform bending – scale and telescope.
11. Determination of Young's modulus by cantilever – load depression graph.
12. Determination of Young's modulus by cantilever – oscillation method
13. Determination of Young's modulus by Koenig's method – (or unknown load)
14. Determination of rigidity modulus by static torsion.
15. Determination of Y, n and K by Searle's double bar method.
16. Determination of surface tension and interfacial surface tension by drop weight method.
17. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
18. Determination of critical pressure for streamline flow.
19. Determination of Poisson's ratio of rubber tube.
20. Determination of viscosity by Poiseuille's flow method.
21. Determination of radius of capillary tube by mercury pellet method.
22. Determination of g using compound pendulum.

Total Lecture Hours

45

BOOKS FOR STUDY:

- Srinivasan.M.N., Balasubramanian.S., Ranganathan.R., A Text Book of Practical Physics, 2017 Edition, Sultan Chand & Sons

BOOKS FOR REFERENCES:

- Ouseph.C., Practical Physics and Electronics, 2013, S.Viswanathan.P.Ltd.

WEB RESOURCES:

- ❖ [https://nptel.ac.in/course.html/physics/experimental physics I, II and III](https://nptel.ac.in/course.html/physics/experimental%20physics%20I,%20II%20and%20III)
- ❖ <https://nptel.ac.in/courses/115/105/115105110/>
- ❖ https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLoRX7n8z4tHYK

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		✓	ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		25	No Changes Made			New Course	
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.								

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Remembering the Aim and apparatus used in the experiment	K1
CO2	Understanding of laws and formulas of the experiment	K2
CO3	Applying the knowledge to do the experiment	K4
CO4	Calculating and examining the aim of the experiment	K3
CO5	Interpreting the result of the experiment	K2

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	1	1	2	3	3	3	1	3
CO2	3	3	2	2	2	3	3	3	1	3
CO3	3	3	3	3	3	3	3	3	2	3
CO4	3	3	2	3	3	3	3	3	1	3
CO5	3	3	2	2	2	3	3	3	1	3
3 - STRONG			2 - MEDIUM				1 - LOW			

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	3	-	2
CO 2	3	2	3	-	2
CO 3	3	2	3	-	2
CO 4	3	2	3	-	2
CO 5	3	2	3	-	2
WEITAGE					
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

SEM	PRACTICAL 1	HRS	PEDAGOGY
I	<ol style="list-style-type: none"> 1. Determination of Young's modulus by uniform bending – Pin and Microscope 2. Determination of Young's modulus by non-uniform bending – scale and telescope. 3. Determination of Young's modulus by cantilever – load depression graph. 4. Determination of rigidity modulus with masses using Torsional pendulum 5. Determination of surface tension and interfacial surface tension by drop weight method. 6. Determination of co-efficient of viscosity by Stokes' method – terminal velocity. 7. Determination of viscosity by Poiseuille's flow method. 8. Determination of g using compound pendulum. 	45	Demonstration and Video

**Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	No. of. Questions	K - Level
CIA-I	CO1 - CO5	K1 – K4	1 Question for Each Student	K1 – K4
Question Pattern CIA - I		No. of Questions to be asked	1 Question for Each Student	
		No. of Questions to be answered	1	
		Marks for each question	30	
		Total Marks for each section	30	

Distribution of Marks with COs & K Level for Correction of CIA I

	COs	Distribution of the work of the experiment	K - Level	MARKS
CIA I	CO1	Aim and apparatus	K1	2.0
	CO2	Formula and Tabular Column	K2	5
	CO3	Understanding and Observation	K4	12.0
	CO4	Calculation and Graph	K3	8.0
	CO5	Interpretation of result	K2	3.0
	Total Marks			

Distribution of Marks with K Level CIA I

	K Level	Distribution of the work of the experiment	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	Aim and apparatus	2	6.66	-
	K2	Formula and Tabular Column Interpretation of result	8	26.67	
	K3	Understanding and Observation	8	26.67	33.33
	K4	Calculation and Graph	12	40.00	60.00
	Marks		30	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)			
COs	K - Level	No. of Questions	K – Level
CO1 - CO5	K1 – K4	1 Question for Each Student	K1 – K4
No. of Questions to be Asked		1 Question for Each Student	
No. of Questions to be answered		1	
Marks for each question		60	
Total Marks for each section		60	
(Figures in parenthesis denotes, questions should be asked with the given K level)			

Distribution of Marks with COs & K Level for Correction of the Summative Exam			
COs	Distribution of the work of the experiment	K - Level	MARKS
CO1	Aim and apparatus	K1	5
CO2	Formula and Tabular Column	K2	10
CO3	Understanding and Observation	K4	25
CO4	Calculation and Graph	K3	15
CO5	Interpretation of result	K2	5
Total Marks			60

Distribution of Marks with K Level				
K Level	Parameters for K-Level	Total Marks	% of (Marks without choice)	Consolidated %
K1	Aim and apparatus	5	8.33	-
K2	Formula and Tabular Column, Interpretation of result	15	25.00	8.33
K3	Understanding and Observation	25	41.67	33.33
K4	Calculation and Graph	15	25.00	75.00
Marks		60	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



RESEARCH CENTRE OF PHYSICS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	ALLIED MATHEMATICS - I			
Course Code	23UMTEA11	L	P	C
Category	ELECTIVE	5	-	4
COURSE OBJECTIVES:				
<ul style="list-style-type: none">➤ To explore the fundamental concepts of Mathematics.➤ To acquire knowledge about finding approximate roots of the polynomial equations.➤ To improve students' ability in applications of matrices and calculus.➤ Students are exposed to understanding the concept of derivatives and their applications.➤ To expose double and triple integrals and their applications				
UNIT - I SOLUTIONS OF TRANSCENDENTAL AND ALGEBRAIC EQUATIONS				15
Iteration method, Bisection method, Newton's method – Regula Falsi method, Horner's method(without proof) (Simple problems only)				
UNIT - II SOLUTIONS OF SIMULTANEOUS EQUATIONS				15
Gauss Elimination method - Gauss Jordan method – Gauss Seidel Iterative method - Gauss Jacobi method (Restricted to three variables only) (Simple problems only)				
UNIT - III MATRICES				15
Characteristic equation of a square matrix– Eigen values and eigen vectors – Cayley – Hamilton theorem [without proof] – Verification and computation of inverse matrix				
UNIT - IV DIFFERENTIAL CALCULUS				15
n-th derivatives – Leibnitz theorem [without proof] and applications – Jacobians– Curvature and radius of curvature in Cartesian co-ordinates and polar co-ordinates				
UNIT - V APPLICATION OF INTEGRATION				15
Evaluation of double, triple integrals – Simple applications to area, volume, and centroid.				
Total Lecture Hours				75

BOOKS FOR STUDY:

- P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences
- Numerical Analysis, S. Chand & Company Ltd., New Delhi-55
Unit I : Chapter 1

Unit II: Chapter 2

- P. Duraipandian and Dr. S. Udayabaskaran (1997), “Allied Mathematics” , Vol I

Chennai: Muhil Publishers.

Unit III: Chapter 1 - Sec – 1.1.1, 1.1.2, 1.2, 1.4.3

- P. Duraipandian and Dr. S. Udayabaskaran (1997), “Allied Mathematics” , Vol II. Chennai: Muhil Publishers.

Unit IV : Chapter 1 - Sec – 1.1.1,1.1.2,1.2,1.4.3

Unit V: Chapter 3 – Sec - 3.4, 3.4.1, 3.5.1, 3.5.2, 3.6

BOOKS FOR REFERENCES:

- S.J.Venkatesan, “Allied Mathematics - I”, Sri Krishna Publications, Chennai.
- P. R. Vittal (2003), “Allied Mathematics”, Margham Publication, Chennai
- A.Singaravelu “Numerical Methods”Meenakshi Publications

WEB RESOURCES:

- ❖ <https://www.mathwarehouse.com/>
- ❖ <https://www.mathhelp.com/>
- ❖ <https://www.mathsisfun.com/>

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		✓	ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL	REGIONAL	✓	NATIONAL		GLOBAL	
Changes Made in the Course	Percentage of Change		No Changes Made			New Course	✓

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:	K LEVEL
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After studying this course, the students will be able to:

CO1	Find out the approximate roots of polynomial equations.	K1 to K4
CO2	Develop the skills of finding roots of simultaneous equations	K1 to K4
CO3	Demonstrate knowledge about matrices and their applications	K1 to K4
CO4	Carry out calculations of problems related to curvature and radius of curvature.	K1 to K4
CO5	Evaluate double and triple integrals, and enabled to understand the applications of integration in real-life situation	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:										
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CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	2	3	3				
CO2	2	1	2	2	2	2				
CO3	3	2	2	3	1	2				
CO4	2	2	2	2	2	2				
CO5	2	1	2	2	3	2				

S- STRONG

M – MEDIUM

L - LOW

CO / PO MAPPING:					
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COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	1		
CO 2	3	2	1		
CO 3	3	2	1		
CO 4	3	2	1		
CO 5	3	2	1		
WEIGHTAGE	15	10	5		
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3	2	1		

LESSON PLAN:			
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UNIT	ALLIED MATHEMATICS – I	HRS	PEDAGOGY
I	Iteration method, Bisection method, Newton’s method – Regula Falsi method, Horner’s method(without proof) (Simple problems only)	15	Chalk & Talk
II	Gauss Elimination method - Gauss Jordan method – Gauss Seidel Iterative method - Gauss Jacobi method (Restricted to three variables only) (Simple problems only)	15	Chalk & Talk
III	Characteristic equation of a square matrix– Eigen values and eigen vectors – Cayley – Hamilton theorem [without proof] – Verification and computation of	15	Chalk & Talk

	inverse matrix		
IV	n-th derivatives – Leibnitz theorem [without proof] and applications – Jacobians– Curvature and radius of curvature in Cartesian co-ordinates and polar co-ordinates	15	Chalk & Talk
V	Evaluation of double, triple integrals – Simple applications to area, volume, and centroid.	15	Chalk & Talk

Learning Outcome Based Education & Assessment (LOBE)						
Formative Examination - Blue Print						
Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
AI	CO2	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
CI	CO3	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
AII	CO4	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	25
	K2	2	10		12	21.4	
	K3		10	16	26	46.4	46.4
	K4			16	16	28.6	28.6
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2	10		2	3.6	
	K3		10	16	26	46.4	46.4
	K4			16	26	46.4	46.4
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	Cos	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
2	CO2	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
3	CO3	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
4	CO4	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
5	CO5	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.6	4
K2	5	20		25	17.8	18
K3		30	32	62	44.3	44
K4			48	48	34.3	34
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions			PART – A		(10 x 1 = 10 Marks)
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions				PART – B	(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K2		
OR					
11. b)	Unit - I	CO1	K2		
12. a)	Unit - II	CO2	K3		
OR					
12. b)	Unit - II	CO2	K3		
13. a)	Unit - III	CO3	K2		
OR					
13. b)	Unit - III	CO3	K2		
14. a)	Unit - IV	CO4	K3		
OR					
14. b)	Unit - IV	CO4	K3		
15. a)	Unit - V	CO5	K3		
OR					
15. b)	Unit - V	CO5	K3		

Answer ALL the questions				PART – C	(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K3		
OR					
16. b)	Unit - I	CO1	K3		
17. a)	Unit - II	CO2	K4		
OR					
17. b)	Unit - II	CO2	K4		
18. a)	Unit - III	CO3	K3		
OR					
18. b)	Unit - III	CO3	K3		
19. a)	Unit - IV	CO4	K4		
OR					
19. b)	Unit - IV	CO4	K4		
20. a)	Unit - V	CO5	K4		
OR					
20. b)	Unit - V	CO5	K4		

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



RESEARCH CENTRE OF PHYSICS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	PHYSICS FOR EVERYDAY LIFE			
Course Code	23UPHNM11	L	P	C
Category	NON MAJOR ELECTIVES (NME)	2	-	2
COURSE OBJECTIVES:				
➤ To know where all physics principles have been put to use in daily life and appreciate the concepts with a better understanding also to know about Indian scientists who have made significant contributions to Physics				
UNIT - I MECHANICAL OBJECTS				06
Spring scales – bouncing balls –roller coasters – bicycles –rockets and space travel.				
UNIT - II OPTICAL INSTRUMENTS AND LASER				06
Vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – color photography – holography and laser.				
UNIT - III PHYSICS OF HOME APPLIANCES				06
Bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners				
UNIT - IV SOLAR ENERGY				06
Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.				
UNIT - V INDIAN PHYSICIST AND THEIR CONTRIBUTIONS				06
C.V.Raman, Homi Jehangir Bhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.				
Total Lecture Hours				30
BOOKS FOR STUDY:				
➤ The Physics in our Daily Lives, Umme Ammara, Gugucool Publishing, Hyderabad, 2019.				
➤ For the love of physics, Walter Lawin, Free Press, New York, 2011.				
BOOKS FOR REFERENCES:				
➤ Physics Appliances in Everyday Life, S.S.Jayabalakrishnan, Shanlax Publications, Madurai, 2022				
WEB RESOURCES:				
❖ https://byjus.com/question-answer/how-physics-affect-our-daily-life/				
❖ https://www.orchidsinternationalschool.com/blog/child-learning/physics-in-everyday-life				
❖ https://twu.edu.in/blog/application-of-physics-in-daily-life/				
❖ https://sciencing.com/applications-physics-everyday-life-8637595.html				

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		✓	ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made			New Course		✓

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:	K LEVEL
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After studying this course, the students will be able to:		
CO1	Understand the concepts of bouncing balls, rockets, lenses, electric bulb and solar water heater	K1 , K2
CO2	Recollecting the principles of bicycles, photography, television and solar cells	K1 , K2
CO3	Comprehend basic concept of laser, vacuum cleaner, voltaic cell and space travel	K1 , K2
CO4	Articulate the knowledge about holography, air-conditioners and solar constant	K1 , K2
CO5	Interpret the real life solutions of UV protective glass, applications of solar energy and solar cells	K1 , K2

MAPPING WITH PROGRAM OUTCOMES:										
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CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3
3 - STRONG			2 - MEDIUM				1 - LOW			

CO / PO MAPPING:					
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COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	1	3	-	2
CO 2	3	1	3	-	2
CO 3	2	1	3	-	2
CO 4	2	1	3	-	3
CO 5	2	1	3		2
WEITAGE					
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

UNIT	PHYSICS FOR EVERYDAY LIFE	HRS	PEDAGOGY
I	Spring scales – bouncing balls –roller coasters – bicycles –rockets and space travel.	6	Chalk & Talk, Videos, PPT and Demonstration
II	Vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – colour photography – holography and laser.	6	Chalk & Talk, Videos, PPT and Demonstration
III	Bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners	6	Chalk & Talk, Videos, PPT and Demonstration
IV	Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.	6	Chalk & Talk, Videos, PPT and Demonstration
V	C.V.Raman, Homi Jehangir Bhabha, Vikram Sarabhai, Subrahmanyam Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.	6	Chalk & Talk, Videos, PPT and Demonstration

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)				
Internal	Cos	K Level	Section A	
			MCQs	
			No. of. Questions	K - Level
CI	CO1	K1 – K2	25	K1,K2
AI	CO2	K1 – K2	25	K1,K2
CI	CO3	K1 – K2	25	K1,K2
AII	CO4	K1 – K2	25	K1,K2
Question Pattern CIA I & II		No. of Questions to be asked	50	
		No. of Questions to be answered	50	
		Marks for each question	1	
		Total Marks for each section	50	

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100
CIA II	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidated %
K1	40	40	53	100
K2	35	35	47	
K3				
K4				
Marks		75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



RESEARCH CENTRE OF PHYSICS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	INTRODUCTORY PHYSICS			
Course Code	23UPHFC11	L	P	C
Category	FOUNDATION COURSE	2	-	2
COURSE OBJECTIVES:				
➤ To help students get an overview of Physics before learning their core courses. To serve as a bridge between the school curriculum and the degree programme.				
UNIT - I				06
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				
UNIT - II				06
Different types of forces – gravitational, electrostatic, magnetic, electromagnetic, nuclear – mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces				
UNIT - III				06
Different forms of energy – conservation laws of momentum, energy – types of collisions – angular momentum – alternate energy sources – real life examples				
UNIT - IV				06
Types of motion – linear, projectile, circular, angular, simple harmonic motions – satellite motion – banking of a curved roads – stream line and turbulent motions – wave motion – comparison of light and sound waves – free, forced, damped oscillations				
UNIT - V				06
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				
Total Lecture Hours				30
BOOKS FOR STUDY:				
➤ D.S. Mathur, 2010, Elements of Properties of Matter, S.Chand and Co				
➤ Brij Lal and N. Subrahmanyam, 2003, Properties of Matter, S.Chand and Co.				
BOOKS FOR REFERENCES:				
➤ H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, S.Chand and Co.				
WEB RESOURCES:				
❖ http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html https://science.nasa.gov/ems/				
❖ https://eesc.columbia.edu/courses/eesc/climate/lectures/radiation_hays/				

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		✓	ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made			New Course		✓

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:	K LEVEL
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After studying this course, the students will be able to:		
CO1	Apply concept of vectors to understand concepts of Physics and solve problems	K1 , K2
CO2	Appreciate different forces present in Nature while learning about phenomena related to these different forces.	K1 , K2
CO3	Quantify energy in different process and relate momentum, velocity and energy	K1 , K2
CO4	Differentiate different types of motions they would encounter in various courses and understand their basis	K1 , K2
CO5	Relate various properties of matter with their behaviour and connect them with different physical parameters involved.	K1 , K2

MAPPING WITH PROGRAM OUTCOMES:										
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CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3
3 - STRONG			2 - MEDIUM				1 - LOW			

CO / PO MAPPING:					
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COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	1	3	-	2
CO 2	3	1	3	-	2
CO 3	2	1	3	-	2
CO 4	2	1	3	-	3
CO 5	2	1	3		2
WEITAGE					
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTIO					

N TO POS			
LESSON PLAN:			
UNIT	INTRODUCTORY PHYSICS	HRS	PEDAGOGY
I	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	Chalk & Talk, Videos, PPT and Demonstration
II	Different types of forces–gravitational, electrostatic, magnetic, electromagnetic, nuclear –mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces	6	Chalk & Talk, Videos, PPT and Demonstration
III	Different forms of energy– conservation laws of momentum, energy – types of collisions –angular momentum– alternate energy sources–real life examples	6	Chalk & Talk, Videos, PPT and Demonstration
IV	Types of motion– linear, projectile, circular, angular, simple harmonic motions – satellite motion – banking of a curved roads – stream line and turbulent motions – wave motion –comparison of light and sound waves – free, forced, damped oscillations	6	Chalk & Talk, Videos, PPT and Demonstration
V	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	Chalk & Talk, Videos, PPT and Demonstration

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)				
Internal	Cos	K Level	Section A	
			MCQs	
			No. of. Questions	K - Level
CI	CO1	K1 – K2	25	K1,K2
AI	CO2	K1 – K2	25	K1,K2
CI	CO3	K1 – K2	25	K1,K2
AII	CO4	K1 – K2	25	K1,K2
Question Pattern CIA I & II		No. of Questions to be asked	50	
		No. of Questions to be answered	50	
		Marks for each question	1	
		Total Marks for each section	50	

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100
CIA II	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidated %
K1	40	40	53	100
K2	35	35	47	
K3				100
K4				
Marks		75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				

SECOND SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



RESEARCH CENTRE OF PHYSICS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS			
Course Code	23UPHCC21	L	P	C
Category	CORE PAPER	5	-	5

COURSE OBJECTIVES:

- The course focuses to understand a basic in conversion of temperature in Celsius, Kelvin and Fahrenheit scales. Practical exhibition and explanation of transmission of heat in good and bad conductor. Relate the laws of thermodynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its relation

UNIT - I CALORIMETRY & LOW TEMPERATURE PHYSICS 15

Specific heat capacity – specific heat capacity of gases C_p and C_v – Meyer’s relation – Joly’s method for determination of C_v – Regnault’s method for determination of C_p
 Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect – Boyle temperature – temperature of inversion – liquefaction of gas by Linde’s Process – adiabatic demagnetisation.

UNIT - II THERMODYNAMICS-I 15

Zerth 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.

UNIT - III THERMODYNAMICS-II 15

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 – Clausius-Clapeyron’s equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.

UNIT - IV HEAT TRANSFER 15

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.

UNIT - V STATISTICAL MECHANICS 15

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.

Total Lecture Hours 75

BOOKS FOR STUDY:

- BrijlalandN. Subramaniam, 2000, Heat and Thermodynamics, S.Chandand Co.
- NarayanamoorthyandKrishnaRao, 1969,Heat,Triveni Publishers, Chennai.
- V.R.KhannaandR.S.Bedi, 1998 1st Edition, Text book of Sound, Kedharnaath Publish and Co, Meerut
- Brijlal and N. Subramanyam, 2001, Waves and Oscillations,Vikas Publishing House, New Delhi.
- Ghosh, 1996, Text Book of Sound, S.ChandandCo.
- R.MurugeshanandKiruthigaSivaprasath, Thermal Physics, S.Chandand Co.

BOOKS FOR REFERENCES:

- J.B.Rajam and C.L.Arora, 1976, Heat and Thermodynamics, 8th edition, S.Chandand Co. Ltd.
- D.S.Mathur, Heat and Thermodynamics, Sultan Chand and Sons.
- Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand and Co.
- Resnick, HallidayandWalker,2010, Fundamentals of Physics, 6th Edition.
- Sears, Zemansky, Hugh D. Young,Roger A. Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson.

WEB RESOURCES:

- ❖ https://youtu.be/M_5KYncYNyc
- ❖ <https://www.youtube.com/watch?v=4M72kQulGKkandvI=en>
- ❖ [Lecture 1: Thermodynamics Part 1 | Video Lectures | Statistical Mechanics I: Statistical Mechanics of Particles | Physics | MIT OpenCourseWare](#)
- ❖ <http://www.freebookcentre.net/Physics/Physics-Books-Online.html>

Nature of Course	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL	GLOBAL ✓
Changes Made in the Course	Percentage of Change	55	No Changes Made		New Course	
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.						

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Acquires knowledge on how to distinguish between temperature and heat. Introduce him/her to the field of thermometry and explain practical measurements of high temperature as well as low temperature physics. Student identifies the relationship between heat capacity, specific heat capacity. The study of Low temperature Physics sets the basis for the students to understand cryogenics, superconductivity, superfluidity and Condensed Matter Physics	K1 to K4
CO2	Derive the efficiency of Carnot's engine. Discuss the implications of the laws of Thermodynamics in diesel and petrol engines	K1 to K4
CO3	Able to analyze performance of thermodynamic systems viz efficiency by problems. Gets an insight into thermodynamic properties like enthalpy, entropy	K1 to K4

CO4	Study the process of thermal conductivity and apply it to good and bad conductors. Quantify different parameters related to heat, relate them with various physical parameters and analyse them	K1 to K4
CO5	Interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzmann distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac . Apply to quantum particles such as photon and electron	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	3	2	2	3	2	3
CO2	2	3	3	3	2	2	3	2	3	3
CO3	3	2	3	2	3	3	2	3	3	3
CO4	3	3	3	3	3	2	3	2	2	2
CO5	2	2	3	3	2	3	3	3	3	2

3 - STRONG

2 - MEDIUM

1 - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	1	3	-	2
CO 2	3	1	3	-	2
CO 3	3	1	3	-	2
CO 4	3	1	3	-	2
CO 5	3	1	3	-	2
WEITAGE					
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

UNIT	HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS	HRS	PEDAGOGY
I	Specific heat capacity – specific heat capacity of gases C_p and C_v . Meyer's relation – Joly's method for determination of C_v – Regnault's method for determination of C_p Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect – Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation.	15	Chalk & Talk, Videos, PPT and Demonstration
II	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	Chalk & Talk, Videos, PPT and Demonstration

III	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 – Clausius-Clapeyron’s equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.	15	Chalk & Talk, Videos, PPT and Demonstration
IV	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	Chalk & Talk, Videos, PPT and Demonstration
V	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	Chalk & Talk, Videos, PPT and Demonstration

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of Questions	K - Level		
CI	CO1	K1 – K4	2	K1, K2	K1 OR K1	K3 OR K3
AI	CO2	K1 – K4	2	K1,K2	K2 OR K2	K4 OR K4
CI	CO3	K1 – K4	2	K1, K2	K2 OR K2	K3 OR K3
AII	CO4	K1 – K4	2	K1,K2	K3 OR K3	K4 OR K4
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	10	-	12	21.43	-
	K2	2	10	-	12	21.43	
	K3	-	-	16	16	28.57	42.86
	K4	-	-	16	16	28.57	71.43
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.57	-
	K2	2	10		12	21.43	
	K3		10	16	26	46.43	25.00
	K4			16	16	28.57	71.43
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1, K2	2	K1, K2	K1, K1	K2, K2
2	CO2	K1, K2	2	K1, K2	K2, K2	K2, K2
3	CO3	K1, K2	2	K1, K2	K2, K2	K3, K3
4	CO4	K1, K2	2	K1, K2	K3, K3	K3, K3
5	CO5	K1, K2	2	K1, K2	K4, K4	K4, K4
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	10		15	10.72	-
K2	5	20	32	57	40.71	51.43
K3		10	32	42	30.00	30.00
K4		10	16	26	18.57	18.57
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions				PART – A	
				(10 x 1 = 10 Marks)	
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions				PART – B	(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K1		
OR					
11. b)	Unit - I	CO1	K1		
12. a)	Unit - II	CO2	K2		
OR					
12. b)	Unit - II	CO2	K2		
13. a)	Unit - III	CO3	K2		
OR					
13. b)	Unit - III	CO3	K2		
14. a)	Unit - IV	CO4	K3		
OR					
14. b)	Unit - IV	CO4	K3		
15. a)	Unit - V	CO5	K4		
OR					
15. b)	Unit - V	CO5	K4		

Answer ALL the questions				PART – C	(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K2		
OR					
16. b)	Unit - I	CO1	K2		
17. a)	Unit - II	CO2	K2		
OR					
17. b)	Unit - II	CO2	K2		
18. a)	Unit - III	CO3	K3		
OR					
18. b)	Unit - III	CO3	K3		
19. a)	Unit - IV	CO4	K3		
OR					
19. b)	Unit - IV	CO4	K3		
20. a)	Unit - V	CO5	K4		
OR					
20. b)	Unit - V	CO5	K4		

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



RESEARCH CENTRE OF PHYSICS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	PHYSICS PRACTICAL 2			
Course Code	23UPHCP21	L	P	C
Category	CORE PRACTICAL	-	4	4

COURSE OBJECTIVES:

- Apply their knowledge gained about the concept of heat and sound waves, resonance, calculate frequency of ac mains set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

SEMESTER - II LIST OF EXPERIMENTS 45

Minimum of Eight Experiments from the list:

1. Determination of specific heat by cooling – graphical method.
2. Determination of thermal conductivity of good conductor by Searle's method.
3. Determination of thermal conductivity of bad conductor by Lee's disc method.
4. Determination of thermal conductivity of bad conductor by Charlton's method.
5. Determination of specific heat capacity of solid.
6. Determination of specific heat of liquid by Joule's electrical heating method (applying radiation correction by Barton's correction/graphical method),
7. Determination of Latent heat of a vaporization of a liquid.
8. Determination of Stefan's constant for Black body radiation.
9. Verification of Stefan's-Boltzmann's law.
10. Determination of thermal conductivity of rubber tube.
11. Helmholtz resonator.
12. Velocity of sound through a wire using Sonometer.
13. Determination of velocity of sound using Kundt's tube.
14. Determination of frequency of an electrically maintained tuning fork
15. To verify the laws of transverse vibration using sonometer.
16. To verify the laws of transverse vibration using Melde's apparatus.
17. To compare the mass per unit length of two strings using Melde's apparatus.
18. Frequency of AC by using sonometer.

Total Lecture Hours 45

BOOKS FOR STUDY:

- Srinivasan.M.N., Balasubramanian.S., Ranganathan.R., A Text Book of Practical Physics, 2017 Edition, Sultan Chand & Sons

BOOKS FOR REFERENCES:

- Ouseph.C., Practical Physics and Electronics, 2013, S.Viswanathan.P.Ltd.

WEB RESOURCES:

- ❖ [https://nptel.ac.in/course.html/physics/experimental physics I, II and III](https://nptel.ac.in/course.html/physics/experimental%20physics%20I,%20II%20and%20III)
- ❖ <https://nptel.ac.in/courses/115/105/115105110/>
- ❖ https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLoFRX7n8z4tHYK

Nature of Course	EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL	GLOBAL ✓
Changes Made in the Course	Percentage of Change	80	No Changes Made		New Course	
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.						

COURSE OUTCOMES:	K LEVEL
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After studying this course, the students will be able to:	
CO1	Remembering the Aim and apparatus used in the experiment
CO2	Understanding of laws and formulas of the experiment
CO3	Applying the knowledge to do the experiment
CO4	Calculating and examining the aim of the experiment
CO5	Interpreting the result of the experiment

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	1	1	2	3	3	3	1	3
CO2	3	3	2	2	2	3	3	3	1	3
CO3	3	3	3	3	3	3	3	3	2	3
CO4	3	3	2	3	3	3	3	3	1	3
CO5	3	3	2	2	2	3	3	3	1	3

3 - STRONG

2 - MEDIUM

1 - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	3	-	2
CO 2	3	2	3	-	2
CO 3	3	2	3	-	2
CO 4	3	2	3	-	2
CO 5	3	2	3	-	2
WEITAGE					
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

SEM	PRACTICAL 2	HRS	PEDAGOGY
I	1. Determination of thermal conductivity of bad conductor by Lee's disc method. 2. Determination of specific heat capacity of solid. 3. Determination of Stefan's constant for Black body radiation. 4. Determination of thermal conductivity of rubber tube. 5. Velocity of sound through a wire using Sonometer. 6. Determination of frequency of an electrically maintained tuning fork 7. To verify the laws of transverse vibration using sonometer. 8. Frequency of AC by using sonometer.	45	Demonstration and Video

Learning Outcome Based Education & Assessment (LOBE)				
Formative Examination - Blue Print				
Articulation Mapping – K Levels with Course Outcomes (COs)				
Internal	Cos	K Level	No. of. Questions	K - Level
CIA-I	CO1 - CO5	K1 – K4	1 Question for Each Student	K1 – K4
Question Pattern CIA - I		No. of Questions to be asked	1 Question for Each Student	
		No. of Questions to be answered	1	
		Marks for each question	30	
		Total Marks for each section	30	

Distribution of Marks with COs & K Level for Correction of CIA I				
	COs	Distribution of the work of the experiment	K - Level	MARKS
CIA I	CO1	Aim and apparatus	K1	2.0
	CO2	Formula and Tabular Column	K2	5.0
	CO3	Understanding and Observation	K4	12.0
	CO4	Calculation and Graph	K3	8.0
	CO5	Interpretation of result	K2	3.0
	Total Marks			30

Distribution of Marks with K Level CIA I					
	K Level	Distribution of the work of the experiment	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	Aim and apparatus	2	6.66	-
	K2	Formula and Tabular Column Interpretation of result	8	26.67	
	K3	Understanding and Observation	8	26.67	33.33
	K4	Calculation and Graph	12	40.00	60.00
	Marks		30	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)			
COs	K - Level	No. of Questions	K – Level
CO1 - CO5	K1 – K4	1 Question for Each Student	K1 – K4
No. of Questions to be Asked		1 Question for Each Student	
No. of Questions to be answered		1	
Marks for each question		60	
Total Marks for each section		60	
(Figures in parenthesis denotes, questions should be asked with the given K level)			

Distribution of Marks with COs & K Level for Correction of the Summative Exam			
COs	Distribution of the work of the experiment	K - Level	MARKS
CO1	Aim and apparatus	K1	5
CO2	Formula and Tabular Column	K2	10
CO3	Understanding and Observation	K4	25
CO4	Calculation and Graph	K3	15
CO5	Interpretation of result	K2	5
Total Marks			60

Distribution of Marks with K Level				
K Level	Parameters for K-Level	Total Marks	% of (Marks without choice)	Consolidated %
K1	Aim and apparatus	5	8.33	-
K2	Formula and Tabular Column, Interpretation of result	15	25.00	8.33
K3	Understanding and Observation	25	41.67	33.33
K4	Calculation and Graph	15	25.00	75.00
Marks		60	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)**RESEARCH CENTRE OF PHYSICS****FOR THOSE WHO JOINED IN 2023-2024 AND AFTER**

Course Name	ALLIED MATHEMATICS - II			
Course Code	23UMTEA21	L	P	C
Category	ELECTIVE	5	-	4
COURSE OBJECTIVES:				
<ul style="list-style-type: none"> ➤ This course is designed for the students to expose the topics such as expansions of trigonometric functions, partial differential equations, and integration. ➤ To gain knowledge of expansions of trigonometric functions. ➤ To acquire the knowledge of solving partial differential equations. ➤ Basic knowledge of vector calculus. ➤ To understand and carry out the calculations of a given set of data 				
UNIT – I TRIGONOMETRY				15
Expansions of $\sin n\theta$, $\cos n\theta$, $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ – Expansions of $\sin\theta$, $\cos\theta$, $\tan\theta$ in terms of θ – Hyperbolic and inverse hyperbolic functions – Logarithms of complex numbers.				
UNIT – II PARTIAL DIFFERENTIAL EQUATION				15
Formation-complete integrals and general integrals-Four standard types-Lagrange's equation.				
UNIT - III VECTOR DIFFRENTIATIO				15
Vector functions- Derivative of a vector function- Scalar and vector point functions- Gradient of a scalar point function-Gradient- Directional derivatives –Unit vector normal to a surface– angle between the surfaces- divergence, curl.				
UNIT – IV VECTOR INTEGRATION				15
Green's theorem in the plane- Gauss divergence theorem- Stoke's theorem [without proofs].				
UNIT - V FINITE DIFFERENCE				15
Operator E, Relation between Δ , ∇ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation- Lagrange's interpolation formula for unequal intervals(without proof) .				
Total Lecture Hours				75

BOOKS FOR STUDY:

- P. Duraipandian and S. Udayabaskaran(1997), “Allied Mathematics”, Vol I & II. Chennai: Muhil Publishers.

Unit-I: Chapter 6 (6.1,6.1.1-6.1.3,6.2,6.2.1-6.2.3,6.3,6.4), Vol I,

Unit-II: Chapter :6 (6.1,6.1.1,6.2,6.3,6.4), Vol II,

Unit-III Chapter 8 - (8.1,8.1.1,8.2,8.3,8.3.1,8.3.2,8.4,8.4.1,8.4.2,8.4.3,8.4.4),Vol I,

Unit-IV: Chapter 8 - (8.6.1 - 8.6.3), Vol I,

Unit-V: Chapter 5 - (5.1,5.2) Vol II

BOOKS FOR REFERENCES:

- S.P.Rajagopalan and R.Sattanathan(2005), “Allied Mathematics”, Vol I & II. New Delhi: Vikas Publications.
- S.J.Venkatesan, “Allied Mathematics - II”, Sri Krishna Publications, Chennai.
- P. R. Vittal (2003), “Allied Mathematics”, Margham Publications, Chennai.
- P.Kandhasamy, K. Thilagavathy (2003), “Allied Mathematics” Vol I & II, New Delhi: Tata McGraw Hill.
- P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences & Numerical Analysis,S. Chand & Company Ltd., New Delhi-55.

WEB RESOURCES:

- ❖ <https://www.mathwarehouse.com/>
- ❖ <https://www.mathhelp.com/>
- ❖ <https://www.mathsisfun.com/>

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		✓	ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL	REGIONAL	✓	NATIONAL		GLOBAL	
Changes Made in the Course	Percentage of Change		No Changes Made			New Course	✓

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Find out the expansions of trigonometric functions and carry out problems related to hyperbolic and inverse hyperbolic functions.	K1 to K4
CO2	Provide a basic knowledge of partial differential equations and develops knowledge on handling practical problems. Develop the skills of finding roots of simultaneous equations	K1 to K4
CO3	Demonstrate knowledge of solving problems involving vector and scalar functions.	K1 to K4
CO4	Carry out calculations of problems related to vector integration	K1 to K4
CO5	Evaluate finite differences using various interpolation methods	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:										
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	1	3	3	2	3				
CO2	2	2	2	3	2	3				
CO3	3	2	2	3	1	1				
CO4	1	2	2	1	2	3				
CO5	3	2	2	1	2	3				
S- STRONG			M - MEDIUM				L - LOW			

CO / PO MAPPING:					
COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	1		
CO 2	3	2	1		
CO 3	3	2	1		
CO 4	3	2	1		
CO 5	3	2	1		
WEIGHTAGE	15	10	5		
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3	2	1		

LESSON PLAN:			
UNIT	ALLIED MATHEMATICS –II	HRS	PEDAGOGY
I	Expansions of $\sin n\theta$, $\cos n\theta$, $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ – Expansions of $\sin\theta$, $\cos\theta$, $\tan\theta$ in terms of θ – Hyperbolic and inverse hyperbolic functions – Logarithms of complex numbers.	15	Chalk & Talk
II	Formation-complete integrals and general integrals-Four standard types-Lagrange's equation	15	Chalk & Talk

III	Vector functions- Derivative of a vector function- Scalar and vector point functions- Gradient of a scalar point function-Gradient- Directional derivatives –Unit vector normal to a surface– angle between the surfaces-divergence, curl..	15	Chalk & Talk
IV	Green’s theorem in the plane- Gauss divergence theorem- Stoke’s theorem [without proofs].	15	Chalk & Talk
V	Operator E, Relation between Δ , ∇ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation- Lagrange’s interpolation formula for unequal intervals(without proof) .	15	Chalk & Talk

Learning Outcome Based Education & Assessment (LOBE)						
Formative Examination - Blue Print						
Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
AI	CO2	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
CI	CO3	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
AII	CO4	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	25
	K2	2	10		12	21.4	
	K3		10	16	26	46.4	46.4
	K4			16	16	28.6	28.6
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2	10		2	3.6	
	K3		10	16	26	46.4	46.4
	K4			16	26	46.4	46.4
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S. No	Cos	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
2	CO2	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
3	CO3	K1 – K4	2	K1,K2	2(K2,K2)	2(K3,K3)
4	CO4	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
5	CO5	K1 – K4	2	K1,K2	2(K3,K3)	2(K4,K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.6	4
K2	5	20		25	17.8	18
K3		30	32	62	44.3	44
K4			48	48	34.3	34
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions			PART – A		(10 x 1 = 10 Marks)
1.	Unit - I	CO1	K1	a)	b)
				c)	d)
2.	Unit - I	CO1	K2	a)	b)
				c)	d)
3.	Unit - II	CO2	K1	a)	b)
				c)	d)
4.	Unit - II	CO2	K2	a)	b)
				c)	d)
5.	Unit - III	CO3	K1	a)	b)
				c)	d)
6.	Unit - III	CO3	K2	a)	b)
				c)	d)
7.	Unit - IV	CO4	K1	a)	b)
				c)	d)
8.	Unit - IV	CO4	K2	a)	b)
				c)	d)
9.	Unit - V	CO5	K1	a)	b)
				c)	d)
10.	Unit - V	CO5	K2	a)	b)
				c)	d)

Answer ALL the questions				PART – B	(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K2		
OR					
11. b)	Unit - I	CO1	K2		
12. a)	Unit - II	CO2	K3		
OR					
12. b)	Unit - II	CO2	K3		
13. a)	Unit - III	CO3	K2		
OR					
13. b)	Unit - III	CO3	K2		
14. a)	Unit - IV	CO4	K3		
OR					
14. b)	Unit - IV	CO4	K3		
15. a)	Unit - V	CO5	K3		
OR					
15. b)	Unit - V	CO5	K3		

Answer ALL the questions				PART – C	(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K3		
OR					
16. b)	Unit - I	CO1	K3		
17. a)	Unit - II	CO2	K4		
OR					
17. b)	Unit - II	CO2	K4		
18. a)	Unit - III	CO3	K3		
OR					
18. b)	Unit - III	CO3	K3		
19. a)	Unit - IV	CO4	K4		
OR					
19. b)	Unit - IV	CO4	K4		
20. a)	Unit - V	CO5	K4		
OR					
20. b)	Unit - V	CO5	K4		

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



RESEARCH CENTRE OF PHYSICS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	PHYSICS OF MEDICAL INSTRUMENTS			
Course Code	23UPHNM21	L	P	C
Category	NON MAJOR ELECTIVES (NME)	2	-	2
COURSE OBJECTIVES:				
➤ The students will be exposed to instruments like ECG,EEG,EMG, medical imaging, diagnostic specialties, operation theater and its safety which will kindle interest to specialize in instrument servicing.				
UNIT - I BIO-POTENTIALS AND ELECTRODES				06
Transport of ions through cell membrane- resting and action potential - Characteristics of resting potential – bio-electric potential – design of medical instruments – components of bio-medical instrumentation – electrodes – electrode potential – metal microelectrode – depth and needle electrodes – types of surface electrode – the pH electrode.				
UNIT - II BIO-POTENTIAL BASED INSTRUMENTATION				06
Electrocardiography (ECG) – origin of cardiac action potential - ECG lead configuration –block diagram of ECG recording set up (qualitative) – Electroencephalography (EEG) – origin of EEG – action and evoked potentials - brain waves – block diagram of modern EEG set up – electromyography (EMG) – block diagram of EMG recording setup.				
UNIT - III OPERATION THEATRE AND SAFETY, RADIATION SAFETY				06
Diathermy – block diagram of the electrosurgical diathermy– shortwave, microwave, ultrasonic diathermy – ventilators – servo controlled systems Units of radiation - pocket dosimeter – pocket type radiation alarm – thermo-luminescence dosimeter.				
UNIT - IV MEDICAL IMAGING				06
Nuclear imaging technique –computer tomography (CT) – principle – mathematical basis of image construction –block diagram of CT scanner – ultrasonic imaging systems – construction of transducer – display modes – MRI principle and instrumentation.				
UNIT - V DIAGNOSTICS AND SPECIALITIES, LASER IN MEDICINE				06
X-rays in radiography – fluoroscopy – comparison– image intensifiers – angiography – applications of X-ray examination (<i>problems</i>). Laser interactions with biomolecules – advantages of laser surgery – endoscopy – types of endoscopes with their operation (qualitative).				
Total Lecture Hours				30

BOOKS FOR STUDY:

- Biomedical Instrumentation and measurement, Leslie Cromwell, PHI, 2015
- Medical Instrumentation, M. Arumugam, Anuradha agencies, 1992
- Medical Electronics, M.J.Kumar Doss, Prathibha Publishers, 1987
- Medical Physics, John R. Cameron and James G. Skofronick, Thrift books, Atlanta, 1985
- Electronic Instruments and Instrumentation Technology, M. M.M.Anand, PHI, 2015

BOOKS FOR REFERENCES:

- Handbook of Biomedical Instrumentation, Dr R. S. Khandpur, 3rd Edition, McGraw Hill Education (India) Private Limited, 2014

WEB RESOURCES:

- ❖ <https://libguides.msoe.edu/biomedical-engineering-resources>
- ❖ <https://web.mei.edu/access?rackid=F801026&FilesData=Introduction-To-Biomedical-Instrumentation.pdf>
- ❖ <https://www.cambridge.org/highereducation/books/introduction-to-biomedical-instrumentation/F69C6825BABA2590E066CA68193BAC37/resources/instructor-resources/808B5A075C2A2AC10B8EC1F08B55D34F>

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		✓	ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made			New Course		✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.								

COURSE OUTCOMES:										K LEVEL
After studying this course, the students will be able to:										
CO1	Remembering the concepts of cell membrane, components of bio medical instruments and radiography									K1 , K2
CO2	Understanding the principles of bio potential electrodes and radiation safety									K1 , K2
CO3	Applying the characteristics of bio electric potential, cardiac action potential, ultrasonic imaging systems and X- rays									K1 , K2
CO4	Analyzing the micro electrodes, electro surgical diathermy and CT scanner									K1 , K2
CO5	Interpret the real life solutions using pH electrode, EMG recording, thermo luminescence and MRI principle									K1 , K2
MAPPING WITH PROGRAM OUTCOMES:										
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2

CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3 - STRONG

2 - MEDIUM

1 - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	1	3	-	2
CO 2	3	1	3	-	2
CO 3	2	1	3	-	2
CO 4	2	1	3	-	3
CO 5	2	1	3		2
WEITAGE					
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

UNIT	PHYSICS OF MEDICAL INSTRUMENTS	HRS	PEDAGOGY
I	Transport of ions through cell membrane- resting and action potential - Characteristics of resting potential – bio-electric potential – design of medical instruments – components of bio-medical instrumentation – electrodes – electrode potential – metal microelectrode – depth and needle electrodes – types of surface electrode – the pH electrode.	6	Chalk & Talk, Videos, PPT and Demonstration
II	Electrocardiography (ECG) – origin of cardiac action potential - ECG lead configuration –block diagram of ECG recording set up (qualitative) – Electroencephalography (EEG) – origin of EEG – action and evoked potentials - brain waves – block diagram of modern EEG set up – electromyography (EMG) – block diagram of EMG recording setup.	6	Chalk & Talk, Videos, PPT and Demonstration
III	Diathermy – block diagram of the electrosurgical diathermy– shortwave, microwave, ultrasonic diathermy – ventilators – servo controlled systems Units of radiation - pocket dosimeter – pocket type radiation alarm – thermo-luminescence dosimeter.	6	Chalk & Talk, Videos, PPT and Demonstration
IV	Nuclear imaging technique –computer tomography (CT) – principle – mathematical basis of image construction –block diagram of CT scanner – ultrasonic imaging systems – construction of transducer – display modes – MRI principle and instrumentation.	6	Chalk & Talk, Videos, PPT and Demonstration
V	X-rays in radiography – fluoroscopy – comparison– image intensifiers – angiography – applications of X-ray examination (problems). Laser interactions with biomolecules – advantages of laser surgery – endoscopy – types of endoscopes with their operation (qualitative).	6	Chalk & Talk, Videos, PPT and Demonstration

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)				
Internal	Cos	K Level	Section A	
			MCQs	
			No. of. Questions	K - Level
CI AI	CO1	K1 – K2	25	K1,K2
	CO2	K1 – K2	25	K1,K2
CI AII	CO3	K1 – K2	25	K1,K2
	CO4	K1 – K2	25	K1,K2
Question Pattern CIA I & II		No. of Questions to be asked	50	
		No. of Questions to be answered	50	
		Marks for each question	1	
		Total Marks for each section	50	

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100
CIA II	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidated %
K1	40	40	53	100
K2	35	35	47	
K3				
K4				
Marks		75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



RESEARCH CENTRE OF PHYSICS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	FUNDAMENTALS OF ASTROPHYSICS			
Course Code	23UPHSC21	L	P	C
Category	ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)	2	-	2
COURSE OBJECTIVES: (TANSCHE)				
➤ This course intends to introduce principles of astrophysics describing the science of formation and evolution of stars and interpretation of various heavenly phenomena and provide an understanding of the physical nature of celestial bodies along with the instrumentation and techniques used in astronomical research				
UNIT - I MODERN ASTROPHYSICS				06
Birth of modern Astronomy - celestial sphere - Geo centric theory - Helio centric theory - Kepler's law of planetary motion - Newton's law of gravitation - Planets - Asteroids - Comets - Meteors.				
UNIT - II ASTRONOMICAL INSTRUMENTS				06
Orientation of earth in space - Arc and Time units - Local time - Standard time - Elements of telescope - Properties of image - Kinds of optical telescope - reflecting and refracting telescope - Radio telescope - Spectrograph				
UNIT - III SOLAR PHYSICS				06
Physical properties of Sun - Structure of Sun - Sun spots - Sun spots - Auroras - Solar prominence and flares - space weather effects				
UNIT - IV STELLAR PHYSICS				06
Classification of stars under spectral classes - H-R diagram – luminosity of a star – stellar evolution - Chandrasekar limit – white dwarfs – black holes – supernovae.				
UNIT - V GALAXIES				06
Galaxy nomenclatures - types of galaxies – Milky way galaxy - star clusters – galactic clusters, Pulsars - Supernova explosion.				
Total Lecture Hours				30
BOOKS FOR STUDY:				
➤ Introduction to Astrophysics, Dr.A.Mujiber Rahman, First Edition, KAMS Publication, India, 2018				
BOOKS FOR REFERENCES:				
➤ Baidyanath Basu, (2001). <u>An introduction to Astrophysics</u> , Second printing, Prentice – Hall of India (P) Ltd, New Delhi				
➤ K.S.Krishnaswamy, (2002), <u>Astrophysics – a modern perspective</u> , New Age International (P) Ltd, New Delhi.				
➤ Shylaja, B.S. and Madhusudan, H.R.,(1999), <u>Eclipse: A Celestial Shadow Play</u> , Universities Press, Hyderabad, India.				
WEB RESOURCES:				
❖ https://byjus.com/question-answer/how-physics-affect-our-daily-life/				
❖ https://www.orchidsinternationalschool.com/blog/child-learning/physics-in-everyday-life				
❖ https://tws.edu.in/blog/application-of-physics-in-daily-life/				
❖ https://sciencing.com/applications-physics-everyday-life-8637595.html				

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		✓	ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL	REGIONAL		NATIONAL		GLOBAL		✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course		✓	
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.								

COURSE OUTCOMES:	K LEVEL
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After studying this course, the students will be able to:		
CO1	Understand the concepts of bouncing balls, rockets, lenses, electric bulb and solar water heater	K1 , K2
CO2	Recollecting the principles of bicycles, photography, television and solar cells	K1 , K2
CO3	Comprehend basic concept of laser, vacuum cleaner, voltaic cell and space travel	K1 , K2
CO4	Articulate the knowledge about holography, air-conditioners and solar constant	K1 , K2
CO5	Interpret the real life solutions of UV protective glass, applications of solar energy and solar cells	K1 , K2

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3 - STRONG

2 - MEDIUM

1 - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	1	3	-	2
CO 2	3	1	3	-	2
CO 3	2	1	3	-	2
CO 4	2	1	3	-	3
CO 5	2	1	3		2
WEITAGE					
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

UNIT	FUNDAMENTALS OF ASTROPHYSICS	HRS	PEDAGOGY
I	Birth of modern Astronomy - celestial sphere - Geo centric theory - Helio centric theory - Kepler's law of planetary motion - Newton;s law of gravitation - Planets - Asteroids - Comets - Meteors.	6	Chalk & Talk, Videos, PPT and Demonstration
II	Orientation of earth in space - Arc and Time units - Local time - Standard time - Elements of telescope - Properties of image - Kinds of optical telescope - reflecting and refracting telescope - Radio telescope - Spectrograph	6	Chalk & Talk, Videos, PPT and Demonstration
III	Physical properties of Sun - Structure of Sun - Sun spots - Sun spots - Auroras - Solar prominence and flares - space weather effects	6	Chalk & Talk, Videos, PPT and Demonstration
IV	Classification of stars under spectral classes - H-R diagram – luminosity of a star – stellar evolution - Chandrasekar limit – white dwarfs – black holes – supernovae.	6	Chalk & Talk, Videos, PPT and Demonstration
V	Galaxy nomenclatures - types of galaxies – Milky way galaxy - star clusters – galactic clusters, Pulsars - Supernova explosion.	6	Chalk & Talk, Videos, PPT and Demonstration

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)				
Internal	Cos	K Level	Section A	
			MCQs	
			No. of. Questions	K - Level
CI	CO1	K1 – K2	25	K1,K2
AI	CO2	K1 – K2	25	K1,K2
CI	CO3	K1 – K2	25	K1,K2
AII	CO4	K1 – K2	25	K1,K2
Question Pattern CIA I & II		No. of Questions to be asked	50	
		No. of Questions to be answered	50	
		Marks for each question	1	
		Total Marks for each section	50	

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100
CIA II	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidated %
K1	40	40	53	100
K2	35	35	47	
K3				
K4				
Marks		75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				