SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

(Affiliated to Bharathidasan University, Tiruchirappalli)

Accredited by NAAC- An ISO 9001:2015 Certified Institution

SUNDARAKKOTTAI, MANNARGUDI – 614 016.

TAMILNADU, INDIA.

B.Sc., PHYSICS

CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM FRAME WORK (CBCS – LOCF)

(For the candidates admitted in the academic year 2023 – 2024)

CHOICE BASED CREDIT SYSTEM

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Our College has moved to CBCS and implemented the grading system.

OUTCOME - BASED EDUCATION (OBE)

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications are awarded on the basis of demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected of graduates of a programme of study. Learning outcomes specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. The expected learning outcomes are used as reference points that would help to formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes, which in turn will help in curriculum planning and development, and in the design, delivery and review of academic programmes. They provide general guidance for articulating the essential learnings associated with programmes of study and courses with in a programme, maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility and provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing

student learning levels, and periodic review of programmes and academic standards.

Some important aspects of the Outcome Based Education Course: is defined as a theory, practical or theory cum practical subject studied in a semester.

Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.

Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs): PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC) A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE) Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

Generic Elective Courses An elective course chosen generally from an **unrelated discipline/subject,** with an intention to seek exposure is called a Generic Elective. Generic Elective courses are designed for the students of **other disciplines**. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Non Major Elective (NME). A student shall choose at least two Non – major Elective Courses (NME) from outside his /her department. Non –Major Elective I – Those who choose Tamil in Part I can choose a non –major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studies in school level

or b) Special Tamil if Tamil language was studies upto 10^{th}& 12^{th} std.

Skill Enhancement Courses (SECs) These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge**.**

Field Study/Industrial Visit/Case Study: It has to be completed during the fifth semester of the degree programme. Credit for this course will be entered in the fifth semester's marks statement.

Internship: Students must complete internship during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. Credit for internship will be entered in the fifth semester's mark statement.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL etc.

Undergraduate Programme:

Programme Pattern: The Under Graduate degree programme consists of **FIVE** vital components. They are as follows:

Part -I : Languages (Tamil / Hindi / French / Sanskrit)

Part-II : General English

Part-III: Core Course (Theory, Practicals, Generic Elective courses , Discipline Specific Elective courses , Compulsory and Optional Allied courses, Project)

Part-IV: Non Major Elective, Foundation Course, Value Education, Environmental studies, Skill Enhancement Courses/ Soft Skills, Internship / field visit / industrial visit/ Case Study), Professional Competency Course

Part –V

Extension activity, Gender studies

EXAMINATION

Continuous Internal Assessment (CIA):

UG - Distribution of CIA Marks

Passing Minimum: 40 %

Assisgnment-3	=	30%
Test-3 (Best 2 out of 3)	=	50%
Seminar	=	10%
Attendance	=	10%

Question Paper Pattern

Part A:

Part A 1 (10X1=10 marks)
One word question/ Fill in/ Match the following/True or False/ Multiple Choice Questions
Two Questions from Each unit
Part A 2 (5X2=10 marks)
Short Answers
One question from Each unit
Total Marks – 20
Part B: (5X5=25 marks)
Paragraph Answers
Either/ or type, One Question from each unit
Part C: (10X3=30)
Essay Type Answers
Answer 3 out of 5 Questions
One Question from each unit
Part A: K1 Level
Part B: K2, K3 and K4 Level
Part C: K5 and K6 Level

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

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

WEIGHTAGE of K – LEVELS IN QUESTION PAPER

(Cognitive Level) K-LEVELS →	Lower Order Thinking			Higher Order Thinking			Total
	K1	K2	K3	K4	K5	K6	
END SEMESTER EXAMINATIONS (ESE)	20	25			30		**75**
Continuous Internal Assessment (CIA)	20	25			30		**75**

QUESTION PATTERN FOREND SEMESTER EXAMINATION/Continuous Internal Assessment		
PART		**MARKS**
PART – A I. (No choice, One Mark) **TWO** questions from each unit **II.** (No choice, Two Mark) **ONE** question from each unit	(10x1=10) (5x2=10)	20
PART – B (Either/ or type,5-Marks) **ONE** questions from each unit	(5x5=25)	25
PART – C (3 out of 5) (10Marks) **ONE** question from each unit	(3x10=30)	30
Total		**75**

BLUE PRINT OF QUESTION PAPER FOR END SEMESTER EXAMINATION							
DURATION: 3.00 Hours.							**Max Mark :75**
K- LEVELS / **PART**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**Total Marks**
PART – A(One Mark, No choice) (10x1=10)	10						10
(2 - Marks, No choice) (5x2=10)	10						10
PART – B (5 - Marks) (Either/or type) (5x5=25)		5	10	10			25
PART – C (10 Marks) (3 out of 5) (3x10=30) Courses having only **K5,K6** levels, K5 level- 3 Questions, K6 level- 2 Questions **(One K6 level question is compulsory)**					20	10	30
Total	**20**	**05**	**10**	**10**	**20**	**10**	**75**

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

Grade Point Average (GPA) will be calculated from the first semester onwards for all semester. From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA), respectively. These two are calculated by the following formulae:

$GPA = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{I=1}^{n} C_i}$	WAM (Weighted Average Marks) $= \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{I=1}^{n} C_i}$
Where, C_i is the Credit earned for the Course i G_i is the Grade Point obtained by the student for the Course I M_i is the marks obtained for the course i and n is the number of Courses **Passed** in that semester.	

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

1. For each of the first three parts, there shall be separate classification on the basis of CGPA, as indicated in Table-2.

2.For the purpose of declaring a candidate to have qualified for the Degree of BachelorofArts/Science/Commerce/ManagementasOutstanding/Excellent/VeryGood/Good/Above Average/Average, the marks and the corresponding CGPA earned by the candidate in Part-III alone will be the criterion, provided the candidate has secured the prescribed passing minimum in the all the Five parts of the Programme.

3. Grade in Part –IV and Part-V shall be shown separately and it shall not be taken into account for classification.

4. A Pass in PART- V will be mandatory although the marks will not count for the calculation of the CGPA.

5. Absence from an examination shall not be taken an attempt.

Table -1: Grading of the Courses - UG

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above and below 90	9	A+
70 and above and below 80	8	A
60 and above and below 70	7	B+
50 and above and below 60	6	B
40 and above and below 50	5	C
Below 40	NA	RA

The candidate's performance in every current semester is indicated by **Semester Grade Point Average (SGPA)** and from the second semester onwards, the continuous performance including pervious semester /s is indicated by **Cumulative Grade Point Average (CGPA).**

Table - 2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re - appearance

The candidates who have passed in the first appearance and within the prescribed duration of the UG programme are eligible. If the candidate's Grade is O/A+ with more than one attempt, the performance is fixed as "Very Good".

Vision.

- To become a centre of excellence in Physics by dissemination and creation of knowledge through teaching and research in Physics at various levels and to help create a scientific Society, which encourages logical thinking.

Mission

- Providing best infrastructure, opportunities and environment to students through which they obtain excellence in knowledge in Physics.
- Exposing the students in developing protocols for the working modules in Physics.

PROGRAMME OUTCOMES FOR B.Sc., DEGREE PROGRAMMES

PO No.	Programme Outcomes (*Upon completion of the B.Sc. Degree Programme, the Undergraduate will be able to)*
PO - 1	**Disciplinary knowledge**: Demonstrate comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate program of study in Bachelor Of Science.
PO - 2	**Critical thinking, Problem Solving and Reflective thinking:** Think critically about the issues and identify, critically analyze and solve problems from the disciplines of concern using appropriate tools and techniques and the knowledge, skills and attitudes acquired and extrapolate the same to real life situations; show critical sensibility to life experiences, With self-awareness and reflexivity of both self and society.
PO - 3	**Analytical & Scientific Reasoning:** Evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence andexamplesandaddressingopposingviewpoints;criticallyevaluateideas,evidence,and Experiences from an open minded and reasoned perspective.
PO - 4	**Research - related Skills:** Develop a sense of capability for relevant/appropriate inquiry and asking questions, synthesize, articulate and report results and to recognize and predict cause and effect relationships, define problems, formulate and establish hypothesis, analyze and interpret and draw conclusions from data, execute and report the results of an experiment Or investigation.
PO - 5	**Digital literacy and Effective Communication:** Use ICT in a variety of learning situationsand**s**peak,read,writeandlistenclearlyinpersonandthroughelectronicmediainEnglis hand in one or more Indian languages, and make meaning of the world by connecting people,ideas,books,mediaandtechnology;efficientlycommunicatethoughtsandideasinaclear and concise manner.
PO - 6	**Individual and Team Work:** Effectively accomplish tasks individually as well as work effectively and respectfully as member or leader with diverse teams, facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the Interests of or a common cause and work efficiently as a member of a team.
PO - 7	**Multicultural Competence and Social Interaction:** Understand the values and beliefs of multiple cultures, global perspectives, engage and interact respectfully with diverse groupsandelicitviewsofothers,mediatedisagreementsandhelpreachconclusionsin Group settings.
PO - 8	**Awareness of Ethical issues, Human values and Gender Issues:** Embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work and understand the value ofrelationshipbetweenselfandthecommunityandawareofthevariousissuesconcerning Women and society.

PO - 9	**Awareness of Environment and Sustainability :** Understand the impacts of technology and business practices in societal and environmental contexts, and sustainable development.
PO -10	**Self directed and Lifelong learning:** Acquire knowledge and skills, including learning" how to learn", that are necessary for participating in learning activities throughout life and to engage in independent and life-long learning in the broadest context of socio-Technological changes.

PROGRAMME SPECIFIC OUTCOMES FOR B.Sc., PHYSICS

PSO1	**Placement:** To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, and beliefs and apply diverse frames of reference to decisions and actions.
PSO2	**Entrepreneur:** To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate start-ups and high potential organizations.
PSO3	**Research and Development:** Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.
PSO4	**Contribution to Business World:** To produce employable, ethical and innovative professionals to sustain in the dynamic business world.
PSO5	**Contribution to the Society:** To contribute to the development to the society by collaborating with stakeholders for mutual benefit.

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
(Affiliated to Bharathidasan University, Tiruchirappalli)
Accredited by NAAC – An ISO 9001:2015 Certified Institution
SUNDARAKKOTTAI, MANNARGUDI – 614 016.
TAMILNADU, INDIA.

B.Sc., PHYSICS

CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS – LOCF)

(For the candidates admitted from the academic year 2023-2024)

ELIGIBILITY: A Pass in 10+2 with Physics and Mathematics as one of the core subjects

	Part	Name of the Course	Course Code	Title of the Paper	Ins. Hours /Week	Ins. Hours /Week				Credit	Exam Hours	Marks		Total
						L	T	P	S			CIA	ESE	
I	I	Language Course–I	U23LC101	Pothu Tamil – I	6	5	1	-	-	3	3	25	75	100
	II	English Language Course – I	U23ELC101	General English – I	6	5	1	-	-	3	3	25	75	100
	III	Core Course – I	U23PH101	Properties of Matter and Acoustics	5	4	-	1	-	5	3	25	75	100
		Core Practical – I	U23PH102P	Physics Practical –I	4	1	-	3	-	4	3	25	75	100
		Allied Course –I	U23AMM101	Calculus	3	2	1	-	-	2	3	25	75	100
		Allied Course –II	U23AMM102	Algebra and Analytical Geometry(3D)	2	2	-	-	-	-	-	-	-	-
	IV	Non Major Elective –I	U23NMEPH11		2	2	-	-	-	2	3	25	75	100
		Foundation Course	U23FCPH11	Introductory Physics	2	2	-	-	-	2	3	25	75	100
				TOTAL	**30**	**23**	**3**	**4**	**-**	**21**	-	-	-	**700**
II	I	Language Course –II	U23LC202	Pothu Tamil –II	6	5	1	-	-	3	3	25	75	100
	II	English Language Course –II	U23ELC202	General English –II	6	5	1	-	-	3	3	25	75	100
	III	Core Course –II	U23PH203	Heat , Thermodynamics and Statistical Physics	5	4	-	1	-	5	3	25	75	100
		Core Practical –II	U23PH204P	Physics Practical –II	4	1	-	3	-	4	3	25	75	100
		Allied Course–II	U23AMM102	Algebra and Analytical Geometry(3D)	2	2	-	-	-	2	3	25	75	100
		Allied Course –III	U23AMM203	Trigonometry and Fourier Series	3	3	-	-	-	2	3	25	75	100
	IV	Non Major Elective –II	U23NMEPH22		2	2	-	-	-	2	3	25	75	100
		Skill Enhancement Course –I	U23SEPH21	Energy Physics	2	2	-	-	-	2	3	25	75	100
				TOTAL	**30**	**24**	**2**	**4**	**-**	**23**	-	-	-	**800**

	Part	Name of the Course	Course Code	Title of the Paper	Ins. Hours /Week	Ins. Hours /Week				Credit	Exam Hours	Marks		Total
						L	T	P	S			CIA	ESE	
III	I	Language Course –III		PothuTamil –III	6	5	1	-	-	3	3	25	75	100
	II	English Language Course - III		General English –III	6	5	1	-	-	3	3	25	75	100
	III	Core Course –III		Mechanics	5	5	-	-	-	5	3	25	75	100
		Core Practical –III		Physics Practical –III	4	-	-	4	-	4	3	25	75	100
		Allied Course –IV		Computer Science –I	3	3	-	-	-	2	3	25	75	100
		Allied Practical –V		Computer Science(Lab)–I	2	-	-	2	-	-	-	-	-	-
	IV	Skill Enhancement Course –II		Medical Instrumentation	2	2	-	-	-	2	3	25	75	100
		Skill Enhancement Course – III		Lasers and Fiber Optics	2	2	-	-	-	2	3	25	75	100
				TOTAL	**30**	**22**	**2**	**6**	**-**	**21**	-	-	-	**700**
IV	I	Language Course –IV		PothuTamil –IV	6	5	1	-	-	3	3	25	75	100
	II	English Language Course –IV		General English –IV	6	5	1	-	-	3	3	25	75	100
	III	Core Course – IV		Optics and Laser Physics	5	4	-	1	-	5	3	25	75	100
		Core Practical –IV		Physics Practical –IV	4	-	-	4	-	4	3	25	75	100
		Allied Practical –V		Computer Science(Lab) –I	2	2	-	-	-	2	3	25	75	100
		Allied Course –VI		Computer Science –II	3	3	-	-	-	2	3	25	75	100
	IV	Skill Enhancement Course – IV		Communication Systems	2	2	-	-	-	2	3	25	75	100
		Skill Enhancement Course –V		Astrophysics	2	2	-	-	-	2	3	25	75	100
				TOTAL	**30**	**23**	**2**	**5**	**-**	**23**	-	-	-	**800**
V	III	Core Course –V		Electricity, Magnetism and Electromagnetism	5	5	-	-	-	4	3	25	75	100
		Core Course –VI		Atomic and Nuclear Physics	5	5	-	-	-	5	3	25	75	100
		Core Course –VII		Analog and Communication Electronics	6	5	1	-	-	5	3	25	75	100
		Core Practical –V		Physics Practical –V	4	-	-	4	-	4	3	25	75	100
		Elective Course –I		Materials Science	4	4	-	-	-	3	3	25	75	100
		Elective Course –II		Nano Science	4	3	-	1	-	3	3	25	75	100

	Part	Name of the Course	Course Code	Title of the Paper	Ins. Hours /Week	Ins. Hours /Week				Credit	Exam Hours	Marks		Total
						L	T	P	S			CIA	ESE	
	IV	Environmental Studies		Environmental Studies	2	2	-	-	-	2	3	25	75	100
		Internship/Industrial visit/Field visit		Internship/Industrial visit/Field visit	-	-	-	-	-	2	-	-	-	-
				TOTAL	**30**	**24**	**1**	**5**	**-**	**28**	-	-	-	**700**
VI	III	Core Course –VIII		Solid State Physics	6	5	1	-	-	4	3	25	75	100
		Core Practical –VI		Physics Practical –VI	6	5	1	-	-	4	3	25	75	100
		Core Project		Project with viva – voce/Group Project	5	-	1	4	-	5	3	25	75	100
		Elective Course –III		Numerical Methods and C Programming	4	3	1	-	-	3	3	25	75	100
		Elective Course –IV		Digital Electronics and Microprocessor 8085	4	3	1	-	-	3	3	25	75	100
	IV	Value Education		Value Education	2	2	-	-	-	2	3	25	75	100
		Professional competency Course		Aptitude and reasoning Skills for competitive examinations	2	2	-	-	-	2	3	25	75	100
	V	Extension activity		Extension activity	-	-	-	-	-	1	-	-	-	-
		Gender Studies		Gender Studies	1	1	-	-	-	1	3	25	75	100
				TOTAL	**30**	**21**	**5**	**4**	**-**	**25**	-	-	-	**800**
				GRANDTOTAL	**180**	**137**	**15**	**28**	**-**	**141**	-	-	-	**4500**
	Extra Credit		**NPTEL,SWAYAM,MOOC (Atleast One per Year)**		**-**	**-**	**-**	**-**	**-**	**2**	-	-	-	**-**
			Value added course (Atleast One per Year)		**-**	**-**	**-**	**-**	**-**	**2**	-	-	-	**-**

L-Lecture T-Tutorial P-Practical S-Seminar

Credit Distribution for B.Sc., Physics

S.No	Part	Subject	No. of Courses	Total Credits
1	I	Language	4	12
2	II	English	4	12
3	III	Core Course – Theory	8	38
4		Core Practical	6	24
5		Core Course – Project	1	05
6		Allied Course – Theory	5	10
7		Allied Course – Practical	1	02
8		Elective Course	4	12
9	IV	Non-Major Elective	2	04
10		Foundation Course – FC	1	02
11		Skill Enhancement Course	5	10
12		Internship/Industrial visit/Field visit	1	02
13		Environmental Studies	1	02
14		Value Education	1	02
15		Professional Competency Course	1	02
16	V	Extension Activity	1	01
17		Gender Studies	1	01
		Total	**47**	**141**

*

Note:

		CIA	ESE
1	Theory	25	75
2	Practical	25	75
3	Separate passing minimum is prescribed for Internal and External marks		

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]
The passing minimum for University Examinations shall be 40% out of 75marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 25 marks [i.e.10 marks]
The passing minimum for University Examinations shall be 40% out of 75marks [i.e. 30 marks]

NME OFFERED BY THE DEPARTMENT

NON MAJOR ELECTIVE (NME) OFFERED BY THE DEPARTMENT

Semester	Part	Course	Course Code	Title of the Paper
I	IV	NME - I	U23NMEPH11	Physics For Everyday Life
II	IV	NME - II	U23NMEPH22	Home Electrical Installation

EXTRA CREDIT COURSE – VALUE ADDED COURSE OFFERED BY THE DEPARTMENT

Semester	Course	Course Code	Title of the Paper
I	VAC–I	U23PHVA1	Electronic components in daily life
II	VAC-II	U23PHVA2	Solar Power Plants

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI,MANNARGUDI – 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS
B.Sc., PHYSICS

Semester: I – CC - I: Properties of Matter and Sound
Ins. Hrs./Week: 5 Course Credit: 5 Course Code: U23PH101

OBJECTIVES

- 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.

UNIT – I: Elasticity (12 Hours)

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 (18 Hours)

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 Hours)

***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.

UNIT – IV: Waves and Oscillations (15 Hours)

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 Hours)

Intensity of sound – Decibel – Loudness of sound – Reverberation – Sabine's reverberation formula Acoustic intensity – factors affecting the acoustics of buildings.

***Ultrasonic waves*:** Production of ultrasonic waves – Piezoelectric crystal method –Magnetostriction effect – Application of ultrasonic waves.

Total Lecture Hours - 75

COURSE OUTCOME

1. Relate elastic behavior in terms of three modulii of elasticity and working of torsion pendulum.
2. Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.
3. Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering problems.
4. Analyze simple harmonic motions mathematically and apply them. Understand the concept of resonance and use it to evaluate the frequency of vibration. Set up experiment to evaluate frequency of ac mains.
5. Understand the concept of acoustics, importance of constructing buildings with good acoustics. Able to apply their knowledge of ultrasonics in real life, especially in medical field and assimilate different methods of production of ultrasonic waves.

TEXT BOOK(S)

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

REFERENCE BOOK(S)

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

E- RESOURCES

1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html
3. https://www.youtube.com/watch?v=gT8Nth9NWPM
4. https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s
5. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
6. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/
7. http://www.sound-physics.com/
8. http://nptel.ac.in/courses/112104026/

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI, MANNARGUDI – 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS
B.Sc., PHYSICS

Semester: I – CP- I: Physics Practical – I
(Any Eight Experiments)

Ins.Hrs. / Week: 4 **Course Credit: 4** **Course Code: U23PH102P**

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.

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 & 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 & 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 Poiseullie's flow method.
21. Determination radius of capillary tube by mercury pellet method.
22. Determination of g using compound pendulum.

Total Lecture Hours - 60

COURSE OUTCOME

1. Perform experiments on any material to identify the strength of the given objects.
2. Deal with liquids based on their viscosity.
3. Commend on the relation between frequency, length and tension of a stretched string under vibration.

TEXT BOOK(S)

1. Dr. S. Somasundaram, Practical Physics, Apsara Publications, Tiruchirappalli, 2012.

REFERENCE BOOK(S)

1. S. Srinivasan, A Text Book of Practical physics, S. Sultan Chand publications. 2005
2. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

E – RESOURCES

1.https://youtu.be/GTnPEtksTEc
2.https://youtu.be/veQ-LfJhfxM
3.https://youtu.be/hV0qG7BTJJI

***

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI,MANNARGUDI – 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS
B.Sc., PHYSICS

Semester: I – FC- I: Introductory Physics

Ins. Hrs. / Week: 2 **Course Credit: 2** **Course Code: U23FCPH11**

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: **(6 Hours)**

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: **(7 Hours)**

Different types of forces – Gravitational, Electrostatic, Magnetic, Electromagnetic, Nuclear – Mechanical forces like, Centripetal, Centrifugal, Friction, Tension, Cohesive, Adhesive forces.

UNIT – III: **(5 Hours)**

Different forms of energy – Conservation laws of momentum, Energy – Types of collisions – Angular momentum – Alternate energy sources – Real life examples.

UNIT – IV: **(5 Hours)**

Types of motion– Linear, Projectile, Circular, Angular, Simple Harmonic motions – Satellite motion – Banking of curved roads – Stream line and Turbulent motions – Wave motion – Comparison of light and sound waves – Free, Forced, Damped Oscillations.

UNIT – V: **(7 Hours)**

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

COURSE OUTCOME

1. Apply concept of vectors to understand concepts of Physics and solve problems
2. Appreciate different forces present in Nature while learning about phenomena related to these different forces.
3. Quantify energy in different process and relate momentum, velocity and energy.
4. Differentiate different types of motions they would encounter in various courses and understand their basis.
5. Relate various properties of matter with their behaviour and connect them with different physical parameters involved.

TEXT BOOK(S)

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

REFERENCE BOOK(S)

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

E – RESOURCES

1. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://science.nasa.gov/ems/
2. https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/

***

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI,MANNARGUDI – 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS
B.Sc., PHYSICS

Semester: II – CC- II: Heat, Thermodynamics and Statistical Physics

Ins.Hrs. / Week: 5 **Course Credit: 5** **Course Code: U23PH203**

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 **(15 Hours)**

Specific heat capacity – Specific heat capacity of gases C_P& C_V– Meyer's relation – Joly's method for determination of C_V – Regnault's method for determination of C_P.

Low temperature Physics: Joule - Kelvin effect – Porous Plug Experiment – Joule - Thomson effect – Boyle temperature – Temperature of Inversion – liquefaction of gas by Linde's Process – Adiabatic Demagnetisation.

UNIT – II: Thermodynamics - I **(12 Hours)**

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.

UNIT – III: Thermodynamics – II **(18 Hours)**

Second law of thermodynamics –Entropy of an ideal gas – Entropy change in reversible and irreversible processes – T-S diagram – Thermodynamical scale of temperature – Maxwell's Thermodynamical relations – Clasius-Clapeyron's equation (first latent heat equation) – Third law of thermodynamics – Unattainability of absolute zero – Heat death.

UNIT – IV: Heat Transfer **(17 Hours)**

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 **(13 Hours)**

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

COURSE OUTCOME

1. 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, super fluidity and Condensed Matter Physics.
2. Derive the efficiency of Carnot's engine. Discuss the implications of the laws of Thermodynamics in diesel and petrol engines.
3. Able to analyze performance of thermodynamic systems viz efficiency by problems. Gets an insight into thermodynamic properties like enthalpy, entropy.
4. 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.
5. 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.

TEXT BOOK(S)

1. Brijlal & N. Subramanian, 2000, Heat and Thermodynamics, S.Chand & Co.
2. Narayanamoorthy & Krishna Rao, 1969, Heat,Triveni Publishers, Chennai.
3. V.R.Khanna & R.S.Bedi, 1998 1st Edition, Text book of Sound, Kedharnaath Publish & Co, Meerut
4. Brijlal and N. Subramanyam, 2001, Waves and Oscillations,Vikas Publishing House, New Delhi.
5. Ghosh, 1996, Text Book of Sound, S.Chand & Co.
6. R.Murugeshan & Kiruthiga Sivaprasath, Thermal Physics, S.Chand & Co.

REFERENCE BOOK(S)

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

E- RESOURCES

1. https://youtu.be/M_5KYncYNyc
2. https://www.youtube.com/watch?v=4M72kQulGKk&vl=en

***

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI, MANNARGUDI – 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS
B.Sc., PHYSICS

Semester: II – CP- II: Physics Practical - II
(Any Eight Experiments)

Ins.Hrs. / Week: 4 **Course Credit: 4** **Course Code: U23PH204P**

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.

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 Charlaton'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-Boltzmans 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 Kunds 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 - 60

COURSE OUTCOME

1. Compare the thermal conductivity of solids.
2. Analyze the heat capacity of liquids.

TEXT BOOK(S)

1. Dr. S. Somasundaram, Practical Physics, Apsara Publications, Tiruchirappalli, 2012.

REFERENCE BOOK(S)

1. S. Srinivasan, A Text Book of Practical physics, S. Sultan Chand publications. 2005
2. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

E – RESOURCES

1. https://youtu.be/GTnPEtksTEc
2. https://youtu.be/veQ-LfJhfxM

***

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI, MANNARGUDI – 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS

Semester: II - SEC- I: Energy Physics

Ins. Hrs. /Week: 2 **Course Credit: 2** **Course Code: U23SEPH21**

OBJECTIVES

- To get the understanding of the conventional and non-conventional energy sources, their conservation and storage systems.

UNIT – I Introduction to Energy Sources (6 Hours)

Energy consumption as a measure of prosperity – World energy future – energy sources and their availability – Conventional energy sources – Non - Conventional and Renewable energy sources – Comparison – merits and demerits.

UNIT – II Solar Energy (7 Hours)

Solar energy Introduction – Solar constant – Solar radiation at the Earth's surface – Solar radiation geometry – Solar radiation measurements – Solar radiation data – Solar energy storage and storage systems – Solar pond – Solar cooker – Solar water heater – Solar greenhouse – Types of greenhouses – Solar cells.

UNIT – III Wind Energy (5 Hours)

Introduction – Nature of the wind – Basic principle of wind energy conversion – Wind energy data and energy estimation – Basic components of Wind Energy Conversion Systems (WECS) – Advantages and disadvantages of WECS – Applications – Tidal Energy.

UNIT – IV Biomass Energy (6 Hours)

Introduction – Classification – Biomass Conversion technologies – Photosynthesis – Fermentation - Biogas generation – Classification of biogas plants – Anaerobic digestion for biogas – Wood gasification – Advantages and disadvantages.

UNIT – V Energy Storage (6 Hours)

Importance of energy storage - Batteries - Lead acid battery – Nickel - Cadmium battery – Fuel cells – Types of fuel cells – Advantages and disadvantages of fuel cells – Applications of fuel cells - Hydrogen Storage.

Total Lecture Hours – 30

TEXT BOOK(S)

1. G.D.Rai, Non-Conventional Sources of Energy, Khanna Publishers, 2009, 4th Edn.
2. S P Sukhstme, J K Nayak, Solar Energy, Principles of Thermal Collection and Storage, McGraw Hill, 2008, 3rd Edn.
3. D P Kothari, K P Singal, Rakesh Rajan, PHI Learning Pvt Ltd, 2011, 2nd Edn.

REFERENCE BOOK(S)

1. John Twidell & Tony Weir, Renewable Energy Resources, Taylor & Francis, 2005, 2nd Edn.
2. S.A. Abbasi and Nasema Abbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd, 2008.
3. M. P. Agarwal, Solar Energy, S. Chand & Co. Ltd., New Delhi,1982
4. H. C. Jain, Non-Conventional Sources of Energy, Sterling Publishers, 1986.

***

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI,MANNARGUDI – 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS

Semester: I – NME - I : Physics for Everyday Life

Ins. Hrs. /Week: 2 **Course Credit: 2** **Course Code: U23NMEPH11**

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 **(6 Hours)**

Spring scales – Bouncing balls – Roller coasters – Bicycles – Rockets and Space travel.

UNIT – II Optical Instruments and Laser **(7 Hours)**

Vision corrective lenses – Polaroid glasses – UV protective glass – Polaroid camera – Colour photography – Holography and Laser.

UNIT – III Physics of Home Appliances **(5 Hours)**

Bulb – Fan – Hair drier – Television – Air Conditioners – Microwave ovens – Vacuum cleaner.

UNIT – IV Solar Energy **(6 Hours)**

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 **(6 Hours)**

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

TEXT BOOK(S)

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

***

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI, MANNARGUDI – 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS

Semester: II – NME - II : Home Electrical Installation
Ins. Hrs. /Week: 2 **Course Credit: 2** **Course Code: U23NMEPH22**

OBJECTIVES

- The students will get knowledge on electrical instruments, installations and domestic wiring techniques with safety precautions and servicing.

UNIT – I Simple Electrical Circuits **(6 Hours)**

Charge, current, potential difference, resistance – Simple electrical circuits – DC ammeter, voltmeter, ohmmeter – Ohm's law – difference between DC and AC – Advantages of AC over DC – Electromagnetic induction - Transformers – Inductors/Chokes – Capacitors/Condensers – impedance – AC ammeter, Voltmeter – Symbols and Nomenclature.

UNIT – II Transmission of Electricity **(7 Hours)**

Production and transmission of electricity – Concept of power grid – Series and Parallel connections – Technicalities of junctions and loops in circuits –Transmission losses (qualitative) – roles of step-up and step-Down transformers – Quality of connecting wires – Characteristics of single and multicore wires

UNIT – III Electrical Wiring **(5 Hours)**

Different types of switches – Installation of two way switch – Role of sockets, Plugs, Sockets - Installation of meters – Basic switch board – Electrical bell – Indicator – Fixing of tube lights and fans – Heavy equipment like AC, Fridge, Washing machine, Oven, Geyser, Jet pumps – Provisions for inverter – Gauge specifications of wires for various needs.

UNIT – IV Power Rating and Power Delivered **(6 Hours)**

Conversion of electrical energy in to different forms – Work done by electrical energy – Power rating of electrical appliances – Energy consumption – Electrical energy unit in kWh – Calculation of EB bill – Joule's heating – Useful energy and Energy loss – Single and three phase connections – Measures to save electrical energy – Energy audit.

UNIT – V Safety **(6 Hours)**

Insulation for wires – Colour specification for mains, Return and Earth – Understanding of fuse and circuit breakers – Types of fuse: kit-kat, HRC, Cartridge, MCB, ELCB – Purpose of earth line – Lighting arrestors – Short circuiting and Over loading – Electrical safety – Tips to avoid electrical shock – First aid for electrical shock – Fire safety for electric current

Total Lecture Hours - 30

TEXT BOOK(S)

1. Wiring a House: 5th Edition by Rex Cauldwell, (2014).
2. Black & Decker Advanced Home Wiring, 5th Edition: Backup Power - Panel Upgrades - AFCI Protection - "Smart" Thermostats, by Editors of Cool Springs Press, (2018).
3. Complete Beginners Guide to Rough in Electrical Wiring: by Kevin Ryan (2022).

***

I B.Sc., MATHEMATICS

ALLIED PHYSICS

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI,MANNARGUDI – 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS
For the students of I B.Sc. Mathematics

Semester: I – AC - I: Allied Physics – I

Ins. Hrs. / Week:3 **Course Credit: 2** **Course Code:U23APY101**

OBJECTIVES

- To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

UNIT – I Waves, Oscillations and Ultrasonics **(10 Hours)**

Simple harmonic motion (SHM) – Composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – Laws of transverse vibrations of strings – Determination of AC frequency using Sonometer (steel and brass wires) – Ultrasound – production – piezoelectric method – application of ultrasonics: Medical field – Lithotripsy, Ultrasonography – Ultrasonoimaging- Ultrasonics in dentistry – Physiotherapy, Opthalmology – Advantages of non-invasive surgery – Ultrasonics in green chemistry.

UNIT – II: Properties of Matter **(10 Hours)**

***Elasticity*:** Elastic constants – bending of beam – theory of non- uniform bending – determination of Young's modulus by non-uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum.

***Viscosity*:** Streamline and Turbulent motion – Critical Velocity – Coefficient of viscosity – Poiseuille's formula – Comparison of viscosities – Burette method.

***Surface tension*:** Definition – Molecular theory – Droplets formation – shape, size and lifetime – COVID transmission through droplets, saliva – Drop weight method – Interfacial surface tension.

UNIT – III: Heat and Thermodynamics **(8 Hours)**

Joule - Kelvin effect – Joule - Thomson Porous Plug experiment – Theory – Temperature of inversion – Liquefaction of Oxygen – Linde's process of liquefaction of air – Liquid Oxygen for medical purpose – Importance of Cryocoolers – Thermodynamic System – Thermodynamic Equilibrium – Laws of thermodynamics – Heat engine – Carnot's cycle – Efficiency – Entropy – Change of entropy in reversible and irreversible process.

UNIT – IV: Electricity and Magnetism **(8 Hours)**

Potentiometer – Principle – Measurement of Thermoemf using potentiometer –Magnetic field due to a current carrying conductor – Biot-Savart's law – Field along the axis of the coil carrying current – Peak, Average and RMS values of ac Current and Voltage – Power factor and Current values in an AC circuit – Types of switches in household and factories – Smart wifi switches -Fuses and Circuit breakers in houses.

UNIT – V: Digital Electronics and Digital India **(9 Hours)**

Logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – Universal building blocks – Boolean algebra – De Morgan's theorem – verification – overview of Government initiatives: software technological parks under MeitY, NIELIT- Semiconductor laboratories under Dept. of Space – an introduction to Digital India.

Total Lecture Hours – 45

COURSE OUTCOME

1. Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in medical field.
2. Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life. Connect droplet theory with Corona transmission.
3. Comprehend basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the background of growth of this technology.
4. Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlate the connection between electric field and magnetic field and analyze them mathematically verify circuits and apply the concepts to construct circuits and study them.
5. Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary ideas of ICcircuits.Acquire information about various Govt. programs/ institutions in this field.

TEXT BOOK(S)

1. R.Murugesan (2001), Allied Physics,S. Chand & Co, New Delhi.
2. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi.
3. Brijlal and N.Subramaniam (1994), Properties of Matter, S.Chand & Co., New Delhi.
4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8th edition), S.Chand & Co., New Delhi.
5. R.Murugesan (2005), Optics and Spectroscopy, S.Chand & Co,New Delhi.
6. A.Subramaniyam, Applied Electronics 2ndEdn., National Publishing Co.,Chennai.

REFERENCE BOOK(S)

1. Resnick Halliday and Walker (2018).Fundamentals of Physics (11thedition),John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. V.R.Khanna and R.S.Bedi (1998), Textbook of Sound1stEdn. Kedharnaath Publish & Co, Meerut.
3. N.S.Khare and S.S.Srivastava (1983), Electricity and Magnetism 10thEdn.,AtmaRam & Sons, New Delhi.
4. D.R.Khanna and H.R. Gulati (1979). Optics, S. Chand & Co. Ltd., New Delhi.
5. V.K.Metha (2004).Principlesofelectronics6thEdn. S.Chand and company.

E- RESOURCES

1. https://youtu.be/M_5KYncYNyc
2. https://youtu.be/ljJLJgIvaHY
3. https://youtu.be/7mGqd9HQ_AU
4. https://youtu.be/h5jOAw57OXM
5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/

***

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI,MANNARGUDI– 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS
For the students of I B.Sc. Mathematics

Semester: I - AP- I: Allied Physics Practical - I
(Any Eight Experiments)

Ins. Hrs. /Week: 2 **Course Credit: 2** **Course Code: U23APY102P**

OBJECTIVES

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

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever, scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial Surface tension – drop weight method
6. Comparison of viscosities of two liquids – burette method.
7. Specific heat capacity of a liquid – half time correction
8. Verification of laws of transverse vibrations using sonometer
9. Calibration of low range voltmeter using potentiometer
10. Determination of thermo emf using potentiometer
11. Verification of truth tables of basic logic gates using ICs
12. Verification of De Morgan's theorems using logic gate ICs.
13. Use of NAND as universal building block.
14. Radius of curvature of lens by forming Newton's rings
15. Thickness of a wire using air wedge
16. Wavelength of mercury lines using spectrometer and grating
17. Refractive index of material of the lens by minimum deviation
18. Refractive index of liquid using liquid prism
19. Determination of AC frequency using sonometer
20. Specific resistance of a wire using PO box
21. Thermal conductivity of poor conductor using Lee's disc
22. Determination of figure of merit table galvanometer
23. Determination of Earth's magnetic field using field along the axis of a coil
24. Characterisation of Zener diode
25. Construction of Zener/IC regulated power supply.
26. Construction of AND, OR, NOT gates using diodes and transistor.
27. NOR gate as a universal building block.

Total Lecture Hours – 30

COURSE OUTCOME

1. Understand the laboratory technique and to educate and motivate the students in the field of Physics.

TEXT BOOK(S)

1. Dr. S. Somasundaram, Practical Physics, Apsara Publications, Tiruchirappalli, 2012.
2. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi2011.

REFERENCE BOOK(S)

1. S. Srinivasan, A Text Book of Practical Physics, Sultan Chand Publications.

E – RESOURCES

1. https://youtu.be/Q8Otf6k3uGk
2. https://youtu.be/8DhfUz0idwM

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
SUNDARAKKOTTAI,MANNARGUDI– 614 016.
(For the candidates admitted from the academic year 2023 -2024)
DEPARTMENT OF PHYSICS
For the students of I B.Sc. Mathematics

Semester: II – AC - II: Allied Physics – II
Ins.Hrs. / Week: 3 Course Credit: 2 Course Code: U23APY203

OBJECTIVES

- To understand the basic concepts of optics, Modern Physics, concepts of relativity and Quantum physics, Semiconductor Physics, and Electronics.

UNIT – I Optics (10 Hours)

Interference – Interference in thin films – Colors of thin films – Air wedge – determination of diameter of a thin wire by air wedge – Diffraction – Diffraction of light vs sound – Normal incidence – experimental determination of wavelength using diffraction grating (no theory) – Polarization – Polarization by Double reflection – Brewster's law – Optical activity – Application in sugar industries.

UNIT – II Atomic Physics (10 Hours)

Atom models – Bohr atom model – Mass number – Atomic number – Nucleons – Vector atom model – various quantum numbers – Pauli's exclusion principle – Electronic configuration – Periodic classification of elements – Bohr Magneton – Stark effect –Zeeman effect (elementary ideas only) – Photo electric effect – Einstein's photoelectric equation – Applications of photoelectric effect: Solar cells, Solar panels, Optoelectric devices.

UNIT – III Nuclear Physics (8 Hours)

Nuclear models – Liquid drop model – Magic numbers – Shell model – Nuclear energy – Mass defect – Binding energy – Radioactivity – uses – Half- life – Mean life - Radio isotopes and uses – Controlled and Uncontrolled chain reaction – Nuclear fission – Energy released in fission – Chain reaction – Critical reaction – Critical size - Atom bomb – Nuclear reactor – Breeder reactor – Importance of commissioning PFBR in our country – Heavy water disposal, Safety of reactors: Seismic and floods – Introduction to DAE, IAEA – Nuclear fusion – Thermonuclear reactions – Differences between fission and fusion.

UNIT – IV Introduction to Relativity and Gravitational Waves (8 Hours)

Frame of reference – Postulates of Special theory of relativity – Galilean transformation equations – Lorentz transformation equations – Derivation – Length contraction – Time Dilation – Twin Paradox – Mass-Energy equivalence – Introduction on Gravitational waves, LIGO, ICTS opportunities at International Centre for Theoretical Sciences.

UNIT – V Semiconductor Physics (9 Hours)

P- n Junction diode – Forward and reverse biasing – Characteristic of diode – Zener diode – characteristic of Zener diode – Voltage regulator – Full wave bridge rectifier – construction and working – Advantages (no mathematical treatment) – USB cell phone charger – Introduction to e -vehicles and EV charging stations.

Total Lecture Hours - 30

COURSE OUTCOME

1. Explain the concepts of interference diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns.
2. Outline the foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation. Appreciate interdisciplinary nature of science and in solar energy related applications.
3. Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half-life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy, safety measures carried and get our Govt. agencies like DAE guiding the country in the nuclear field.
4. To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa. Relate this with current research in this field and get an overview of research projects of National and International importance, like LIGO, ICTS, and opportunities available.
5. Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and practical devices we daily use like USB chargers and EV charging stations.

TEXT BOOK(S)

1. R.Murugesan (2005), Allied Physics, S.Chand & Co, New Delhi.
2. K.Thangaraj and D.Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai.
3. Brijlal and N.Subramanyam (2002), Text book of Optics, S.Chand & Co, New Delhi.
4. R.Murugesan (2005), Modern Physics, S.Chand & Co,New Delhi.
5. A.Subramaniyam Applied Electronics, 2nd Edn.,National Publishing Co., Chennai.

REFERENCE BOOK(S)

1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. D.R.Khanna and H.R. Gulati (1979).Optics, S.Chand & Co. Ltd., New Delhi.
3. A.Beiser (1997), Concepts of Modern Physics, Tata McGraw Hill Publication, New Delhi.
4. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi.
5. V.K.Metha (2004), Principles of electronics, 6th Edn. ,S.Chand and Company, New Delhi.

E – RESOURCES

1. https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo
2. https://www.youtube.com/watch?v=JrRrp5F-Qu4
3. https://www.validyne.com/blog/leak-test-using-pressure-transducers/
4. https://www.atoptics.co.uk/atoptics/blsky.htm -
5. https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects