திருவள்ளுவர் பல்கலைக்கழகம்

THIRUVALLUVAR UNIVERSITY

SERKKADU, VELLORE - 632 115

B.Sc. Physics

Under

Choice Based Credit System (CBCS)

&

Learning Outcomes Based Curriculum Framework (LOCF)

Effective from the Academic Year

2026 – 2027

U28

Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credits and Hours Distribution System for all Under – Graduate Courses including Lab Hours

FIRST YEAR

	Part	Courses	Credits	Hours / Week
Semester I	Part I	Language – Tamil	3	6
	Part II	English	3	6
	Part III	Core Courses & Elective Courses	11	14
	Part IV	Skill Enhancement Course (SEC – I)	2	2
	Part IV	Disaster Management	2	2
	Total		**21**	**30**

	Part	Courses	Credits	Hours / Week
Semester II	Part I	Language – Tamil	3	6
	Part II	English	3	6
	Part III	Core Courses & Elective Courses	14	16
	Part IV	Skill Enhancement Course (SEC – I)	2	2
	Total		**22**	**30**

SECOND YEAR

	Part	Courses	Credits	Hours / Week
Semester III	Part I	Language – Tamil	3	6
	Part II	English	3	6
	Part III	Core Courses & Elective Courses	11	14
	Part IV	Non Major / Basic Tamil / Advance Tamil	2	2
	Part IV	E.V.S	2	2
	Total		**21**	**30**

	Part	Courses	Credits	Hours / Week
Semester IV	Part I	Language – Tamil	3	6
	Part II	English	3	6
	Part III	Core Courses & Elective Courses	14	16
	Part IV	Non Major / Basic Tamil / Advance Tamil	2	2
	Total		**22**	**30**

THIRD YEAR

	Part	Courses	Credits	Hours / Week
Semester V	Part III	Core Courses & Elective Courses	24	26
	Part IV	Value Education	2	2
	Part IV	Value Added Courses -1 (Common for all UG)	2	2
	Part IV	Internship / Industrial Visit / Field Visit	2	-
	Total		**30**	**30**

	Part	Courses	Credits	Hours / Week
Semester VI	Part III	Core Courses & Elective Courses	21	28
	Part IV	Value Added Courses -2 (Discipline Specific)	2	2
	Part IV	Extension Activity	1	-
	Total		**24**	**30**

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	11	14	11	14	24	21	95
Part IV	4	2	4	2	6	2	20
Part V	-	-	-	-	-	1	1
Total	**22**	**21**	**22**	**21**	**30**	**24**	**140**

Part I, II and III components will be separately taken into account for CGPA calculation and classification for the Undergraduate Programme. Components IV and V must be completed during the duration of the programme as per University norms to become eligible for the award of the degree.

METHODS OF EVALUATION

Internal Evaluation Marks	
Continuous Internal Assessment Tests	20
Assignments, Seminars and Attendance	10
Total	**30**
External Evaluation Marks	
End Semester Examination	70
Total	**100**

METHODS OF ASSESSMENT

Knowledge Level	Description	Nature of Assessment
K1	Recall	Definitions, MCQ, Concept Identification
K2	Understanding	Short Notes, True/False, Explanations
K3	Application	Problem Solving, Illustration with Examples
K4	Analysis	Comparative Study, Interpretation, Mapping
K5	Evaluation	Critical Essays, Justification, Review
K6	Creation	Presentation, Discussion, Project Work

B.Sc. Physics - The Course of Study and the Scheme of Examinations

S.No.	Part	Study Components Course Title		Ins. Hrs. / week	Credit	Title of the Paper	Maximum Marks		
SEMESTER I							**CIA**	**Uni. Exam.**	**Total**
1	1	Language	Paper-1	6	3	Tamil / Other Languages	30	70	100
2	2	English	Paper-1	6	3	English	30	70	100
3	3	Core-Major Theory	Paper-1	4	4	Properties of Matter and Sound	30	70	100
4	3	Core-Major Practical	Paper-2	4	3	Properties of Matter Lab	30	70	100
5	3	Core-Allied Theory	Paper-1	6	4	Choose any one: 1. Allied Mathematics I 2. Mathematical Physics I	30	70	100
6	4	SEC	Paper-1	2	2	Choose any one: 1. Communication Systems 2. Home Electrical Installation	30	70	100
7	4			2	2	Disaster Management	30	70	100
				30	**21**		**210**	**490**	**700**

SEMESTER II							**CIA**	**Uni. Exam.**	**Total**
8	1	Language	Paper-2	6	3	Tamil / Other Languages	30	70	100
9	2	English	Paper-2	6	3	English	30	70	100
10	3	Core-Major Theory	Paper-3	6	6	Heat, Thermodynamics and Statistical Physics	30	70	100
11	3	Core-Major Practical	Paper-4	4	4	Heat and Sound Lab	30	70	100
12	3	Core-Allied Theory	Paper-2	6	4	Choose any one: 1. Allied Mathematics II 2. Mathematical Physics II	30	70	100
13	4	SEC	Paper-2	2	2	Choose any one: 1. Energy Physics 2. Numerical Methods and C Programming	30	70	100
14	4	NM	Paper-1	0	2				
				30	**24**		**180**	**420**	**600**

S.No.	Part	Study Components Course Title		Ins. Hrs. / week	Credit	Title of the Paper	Maximum Marks		
SEMESTER III							**CIA**	**Uni. Exam.**	**Total**
15	1	Language	Paper-3	6	3	Tamil / Other Languages	30	70	100
16	2	English	Paper-3	6	3	English	30	70	100
17	3	Core-Major Theory	Paper-5	4	4	General and Classical Mechanics	30	70	100
18	3	Core-Major Practical	Paper-6	4	3	Mechanics Lab	30	70	100
19	3	Core-Allied Theory	Paper-3	3	3	Choose any one: 1. Allied Chemistry I 2. Allied Biochemistry I	30	70	100
20	3	Core-Allied Practical	Paper-4	3	1	Choose any one: 1. Allied Chemistry Lab I 2. Allied Biochemistry Lab I	30	70	100
21	4	NME	Paper-1	2	2	Choose any one: 1. Physics for Everyday Life 2. Physics of Music	30	70	100
22	4	EVS		2	2	Environmental Studies	30	70	100
23	4	NM	Paper-2	0	2				
				30	**23**		**240**	**560**	**800**

SEMESTER IV							**CIA**	**Uni. Exam.**	**Total**
24	1	Language	Paper-4	6	3	Tamil / Other Languages	30	70	100
25	2	English	Paper-4	6	3	English	30	70	100
26	3	Core-Major Theory	Paper-7	6	6	Optics and Spectroscopy	30	70	100
27	3	Core-Major Practical	Paper-8	4	4	Optics Lab	30	70	100
28	3	Core-Allied Theory	Paper-5	3	3	Choose any one: 1. Allied Chemistry II 2. Allied Biochemistry II	30	70	100
29	3	Core-Allied Practical	Paper-6	3	1	Choose any one: 1. Allied Chemistry Lab II 2. Allied Biochemistry Lab II	30	70	100
30	4	NME	Paper-2	2	2	Choose any one: 1. Astrophysics 2. Energy Physics	30	70	100
31	4	NM	Paper-3	0	2				
				30	**24**		**210**	**490**	**700**

S.No.	Part	Study Components Course Title		Ins. Hrs. / week	Credit	Title of the Paper	Maximum Marks		
SEMESTER V							**CIA**	**Uni. Exam.**	**Total**
32	3	Core-Major Theory	Paper-9	6	6	Electricity and Magnetism	30	70	100
33	3	Core-Major Theory	Paper-10	6	6	Atomic Physics and Lasers	30	70	100
34	3	Core-Major	Paper-11	6	6	Relativity and Quantum	30	70	100

		Theory				Mechanics			
35	3	Core-Major Practical	Paper-12	4	3	Electricity and Magnetism Lab	30	70	100
36	3	Core-Elective Theory	Paper-1	4	3	Basic and Applied Electronics	30	70	100
37	4	VAC	Paper-1	2	2	VAC	30	70	100
38	4	Internship		0	2	Internship	100	0	100
39	4	Value Education		2	2	Value Education	30	70	100
40	4	NM	Paper-4	0	2				
				30	**32**		**310**	**490**	**800**

SEMESTER VI							**CIA**	**Uni. Exam.**	**Total**
41	3	Core-Major Theory	Paper-13	6	5	Nuclear and Particle Physics	30	70	100
42	3	Core-Major Theory	Paper-14	5	5	Solid State Physics	30	70	100
43	3	Core-Major Practical	Paper-15	4	3	Basic and Applied Electronics Lab	30	70	100
44	3	Core-Project		6	4	Project	30	70	100
45	3	Core-Elective Theory	Paper-2	4	3	Digital Electronics and Microprocessor 8085	30	70	100
46	3	Core-Elective Practical	Paper-3	3	1	Digital Electronics and Microprocessor 8085 Lab	30	70	100
47	4	VAC	Paper-2	2	2	<u>Choose any one:</u> 1. Material Science 2. Nanoscience and Nanotechnology	30	70	100
48	4	NM	Paper-5	0	2				
49	5	Extension Activity		0	1	Extension Activity	100	0	100
				30	**26**		**310**	**490**	**800**

Core I: **PROPERTIES OF MATTER AND SOUND**			**I YEAR - I SEMESTER**				
Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**Credits**	**Marks**
	PROPERTIES OF MATTER AND SOUND	Core I	4			4	70
Course 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.						

UNITS	**COURSE DETAILS**
UNIT-I	**ELASTICITY**: Hooke's law – Stress-strain diagram – Elastic constants –Poisson's ratio – Relation between elastic constants and Poisson's ratio – Work done in stretching and twisting a wire – Twisting couple on a cylinder – Rigidity modulus by static torsion – Torsional pendulum (with and without masses).
UNIT-II	**BENDING OF BEAMS:** Cantilever – Expression for bending moment – Expression for depression at the loaded end of cantilever – Oscillations of a cantilever – Expression for time period – Experiment to find Young's modulus – Non-uniform bending – Uniform bending – Expression for elevation – Experiment to determine Young's modulus using microscope – Experiment to determine Young's modulus by Koenig's method .
UNIT-III	**FLUID DYNAMICS:** Surface tension: Definition – Molecular forces – Excess pressure over curved surface – Application to spherical and cylindrical drops and bubbles – Determination of surface tension by Jaegar's method. Viscosity: Definition – Streamline and turbulent flow – Bernoulli's theorem – Venturimeter – Poiseuille's formula – Corrections to Poiseuille's formula – Terminal velocity and Stoke's formula.
UNIT-IV	**WAVES AND OSCILLATIONS:** Simple Harmonic Motion (SHM) – Differential equation of SHM – Graphical representation of SHM – Composition of two SHM in a straight line and at right angles – Lissajous 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:** 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 method – Application of ultrasonic waves.
TEXT BOOKS	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. BrijLal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition, Vikas Publishing House. 4. D.R.Khanna & R.S.Bedi, 1969, Textbook of Sound, AtmaRam & sons. 5. R.Murugesan, 2012, Properties of Matter, S.Chand& Co.
REFERENCE BOOKS	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.

WEB LINKS	1. https://www.biolinscientific.com/blog/what-are-surfactants-andhow-do-they-work 2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html 3. https://www.youtube.com/watch?v=gT8Nth9NWPM

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
30	70	100	

COURSE OUTCOMES:

At the end of the course the student will be able to:

COURSE OUTCOMES	**CO1**	Acquire the knowledge of elastic properties of solids, surface tension and viscosity of liquids, simple harmonic motions, vibrations, sound waves and ultrasonic waves.
	CO2	Understand the concepts of twisting couple, bending moments, molecular forces, excess pressure over curved surfaces, Bernoulli's theorem, terminal velocity, Lissajous' figures, resonance and reverberation.
	CO3	Explain the methods of determination of elastic constants, surface tension, viscosity, frequency of vibrations, production of ultrasonic waves.
	CO4	Apply the concepts of properties of matter and sound to real life situations.
	CO5	Derive the expressions relating elastic constants and Poisson's ratio, depression of a cantilever, oscillations of a cantilever, elevation in uniform bending, excess pressure over curved surfaces, Poisseuille's formula, terminal velocity, Stokes' formula and Sabine's formula.
	CO6	Analyze and evaluate the types of bending in solids, coefficient of surface tension, viscosity, types of vibrations and production of ultrasonic waves.

Suggested Internal Assessment Matrix (IAM)

CO	Test I	Test II	Test III	Assessment I	Assessment II	Quiz / Assessment III	Total	% Allocation	Mapping Strength
CO1	20	10	10	0	0	0	40	17.4%	2
CO2	20	15	20	5	0	0	60	26.1%	3
CO3	10	15	25	5	5	0	60	26.1%	3
CO4	0	10	30	0	5	0	45	19.5%	2
CO5	0	0	15	0	0	5	20	8.7%	1
CO6	0	0	0	0	0	5	5	2.2%	1
Marks	50	50	100	10	10	10	230	100%	
Convert	20			10			30		

The Course Articulation Matrix (CAM) for defined COs:

CO	Learning Outcomes														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	1	2	2	2	-	-	-	-	-	-	-	-	-	-
CO2	3	1	2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	2	2	1	-	2	-	-	-	-	-	-	-
CO4	3	1	3	3	2	1	1	1	-	-	-	-	1	-	-
CO5	3	-	3	3	3	1	-	2	-	-	1	-	-	-	1
CO6	3	1	3	3	3	1	-	3	-	1	1	-	-	-	1
Contribution to PAM	3.0	1.2	2.7	2.5	2.3	1.0	1.0	2.0	-	1.0	1.0	-	1.0	-	1.0

Mapping Strength : 3 = High, 2 = Moderate, 1 = Low, – = No Significant Mapping
*PAM – Program Articulation Matrix

Paper No.		Title of the Course	PRACTICAL I (Properties of Matter Lab)		
Category		I Year	I Semester	Credits	3
Instructional hours per week		Lecture	Tutorial	Lab Practice	Total
		-	-	4	4
Prerequisites		Should have the fundamental knowledge of Physics			
Objectives of the Course		1. To impart the skill of students practical / experimental competencies through hands-on practices in the laboratory. 2. To understand some physical properties of materials by determining the elastic constants, surface tension and viscosity through experiments. 3. To develop the skills to take readings in the measuring instruments and enhance analytical thinking, problem-solving and able to do error analysis and correlate results.			

LIST OF PRACTICALS (Minimum of **Eight** Experiments)

Prac. No	Title	Skill Level (K1–K6)
1	Young's modulus by uniform bending (Pin and microscope) – load depression graph.	K2, K3, K4
2	Young's modulus by non-uniform bending – (scale and telescope)	K2, K3, K4
3	Young's modulus by cantilever –(Pin and microscope)	K2, K4
4	Rigidity modulus with symmetrical masses using Torsional pendulum.	K2, K5
5	Rigidity modulus by static torsion (Scale and telescope)	K2, K3, K4
6	Young's modulus by Koenig's method by Uniform bending – (unknown load)	K1, K2,
7	Searle's double bar method – Determination of Y, n and K.	K2, K4
8	Compound pendulum - Determination of 'g' and 'k'.	K2, K4
9	Bifilar pendulum - Determination of moment of inertia of a slab and verify perpendicular axis theorem	K4, K5
10	Surface tension and interfacial surface tension by drop weight method	K1, K4
11	Stokes' method – Determination of co-efficient of viscosity (terminal velocity)	K2, K4
12	Viscosity by Poiseullie's flow method.	K1, K3
13	Determination of radius of capillary tube by mercury pellet method.	K2, K3
14	Comparison of viscosities of two liquids using capillary flow method.	K4, K6

Text Books	A textbook of practical Physics, M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, Sultan Chand & Sons (2017)
Reference Book	1. Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007) 2. Practical Physics, *R.Sasikumar*, PHI Learning Pvt. Ltd, New Delhi, 2011 3. A Textbook of Practical Physics. *Srinivasan and Balakrishnan,* Viswanathan Publishers.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc]	
Web Resources	https://nptel.ac.in/course.html/physics/experimentalphysicsI,IIandIII https://nptel.ac.in/courses/115/105/115105110/ https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK

K1 – Recall, K2 – Understanding, K3- Application, K4-Analysis, K5-Evaluation, K6-Creation

Course Outcomes (COs)

After successful completion of this course, students will be able to:

Course Outcomes	Description	LOs
CO1	Examine and grasp the concepts of modulus of elasticity, viscosity, and surface tension	LO1, LO3, LO5
CO2	Understanding the mechanical behavior of the material and observe the readings according to the instruments used	LO3, LO4
CO3	Apply the technique to handle the instruments and record the values and calculate using the formulae.	LO5, LO8
CO4	Record the values and plot the graph accordingly and interpret with the theoretical values	LO3, LO8, LO13
CO5	Demonstrate ethical data practices, self-learning and ability to do independently and develop skills through scientific approach.	LO8, LO10, LO11, LO15
CO6	Develop lifelong learning through self-directed exploration of emerging scientific thinking.	LO6, LO8, LO11, LO15

Suggested Internal Assessment Matrix (IAM)

CO	Test I	Test II	Test III	Assessment I	Assessment II	Quiz / Assessment III	Total	% Allocation	Mapping Strength
CO1	10	5	5	5	0	0	25	19%	2
CO2	10	5	10	0	5	0	30	23%	3
CO3	0	10	10	5	0	0	25	19%	2
CO4	5	5	15	0	0	0	25	19%	2
CO5	0	0	5	0	5	5	15	12%	2
CO6	0	0	5	0	0	5	10	8%	1
Marks	25	25	50	10	10	10	130	100%	
Convert	20			10			30		

Course Articulation Matrix (CAM):

COs / LOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3		3		2										
CO2			2	3											
CO3					2			3							
CO4			3					2					3		
CO5								2		3	2				3
CO6						3		1			2				2
Contribution to PAM*	3	-	8	3	4	3	-	8	-	3	4	-	3	-	5

Mapping Strength: 3 = High, 2 = Moderate, 1 = Low, – = No Significant Mapping

*PAM – Program Articulation Matrix

SEC I (A) : COMMUNICATION SYSTEMS		I YEAR - I SEMESTER					
Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**Credits**	**Marks**
	COMMUNICATION SYSTEMS	SEC I (A)	2			2	70
Course Objectives	To get through knowledge on transmission and reception of radio waves, the different types of communication like fiber optics, radar, Satellite, Cellular system. Students who undergo this course are need fully bound to get a better insight and understanding of this subject.						

UNITS	COURSE DETAILS
UNIT-I	**RADIO TRANSMISSION AND RECEPTION:** Transmitters: modulation – Amplitude modulation – Frequency modulation – comparison of AM and FM modulation. Receivers: AM radio receiver – FM radio receiver – difference between AM and FM receivers.
UNIT-II	**FIBER OPTIC COMMUNICATION:** Introduction – basic-principle of fiber optics – construction of optical fiber – attenuation – advantages of fibre optic communication.
UNIT-III	**RADAR COMMUNICATION:** Introduction – basic radar system – radar range equation – antenna scanning – pulsed radar system – search radar – tracking radar – moving target indicator – Doppler effect – CW Doppler radar.
UNIT-IV	**SATELLITE COMMUNICATION:** Introduction – history of satellites – satellite-communication systems – satellite orbits – basic components of satellite communication system – satellite communication in India**.**
UNIT-V	**MOBILE COMMUNICATION:** Introduction – concept of cell – basic cellular mobile radio system – cell phone – facsimile – important features of fax machine – modem – Wi-Fi – 4G & 5G (basic ideas).
Professional Components	expert lectures – seminars – webinars – industry inputs – social accountability.
Text Books	1. V.K. Mehta, Principle of Electronics, S.Chand & CoLtd.,2013 2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chand & CoLtd. 2013.
Reference Books	1. J.S. Chitode, Digital Communications, 2020, Unicorn Publications. 2. Senior John. M, Optical Fibre Communications: Principles and Practice, 2009, Pearson Education.
Web Resources	1. https://ocw.mit.edu/search/?q=radio+communications 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_ee79 3. https://ocw.mit.edu/courses/res-ll-001-introduction-to-radar-systems-spring-2007/ 4. https://innovationspace.ansys.com/product/satellite-communication-systems/ 5. https://www.youtube.com/watch?v=qqPkYDu1FWw

COURSE OUTCOMES:
At the end of the course the student will be able to:

COURSE OUTCOMES	**CO1**	Understand the basic principles of wireless and fiber optic communication systems
	CO2	Explain the working of transmission and reception of signals
	CO3	Apply the concepts of communications to wireless, fiber optic, radar, satellite and mobile technologies
	CO4	Compare the different methods of communications including transmission and reception
	CO5	Analyze the communications systems used for various applications
	CO6	Evaluate the communication system involved in daily life situations

Suggested Internal Assessment Matrix (IAM)

CO	Test I	Test II	Test III	Assessment I	Assessment II	Quiz / Assessment III	Total	% Allocation	Mapping Strength
CO1	20	10	15	0	0	0	45	19%	2
CO2	15	15	15	5	0	0	50	22%	3
CO3	15	15	20	0	0	0	50	22%	3
CO4	0	10	20	5	10	0	45	19%	2
CO5	0	0	20	0	0	5	25	11%	2
CO6	0	0	10	0	0	5	15	7%	1
Marks	50	50	100	10	10	10	230	100%	
Convert	20			10			30		

The Course Articulation Matrix (CAM) for defined COs:

CO	Learning Outcomes														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	-	-	1	3	-	-	1	-	-	-	-	-	-	1
CO2	3	-	-	2	3	2	-	1	-	-	-	-	-	-	1
CO3	3	-	2	2	3	1	-	2	-	-	-	-	-	-	2
CO4	2	-	-	2	3	-	-	2	1	-	1	-	-	-	1
CO5	3	-	2	3	3	-	-	2	2	-	1	-	-	-	2
CO6	3	-	3	2	2	2	-	2	1	-	-	-	-	-	2
Contribution to PAM	2.8	-	2.3	2.0	2.8	1.7	-	1.7	1.3	-	1.0	-	-	-	1.5

Mapping Strength : 3 = High, 2 = Moderate, 1 = Low, – = No Significant Mapping
*PAM – Program Articulation Matrix

SEC I (B) : **HOME ELECTRICAL INSTALLATION**						**I YEAR - I SEMESTER**	
Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**Credits**	**Marks**
	HOME ELECTRICAL INSTALLATION	SEC I (B)	2			2	70
Course Objectives	The students will get knowledge on electricity, electrical instruments, Installations and domestic wiring techniques with safety precautions and servicing.						

UNITS	**COURSE DETAILS**
UNIT-I	**ELECTRICITY AND SIMPLE ELECTRICAL MEASURING METERS:** Introduction to Electricity, Electron flow, conductors, Insulators. Current, Resistance, ohms law, Potential difference. Concept of AC and DC, AC current, AC voltage, SINE Wave, cycle, period, frequency. Advantages of AC over DC. Meters – ammeter, voltmeter, ohmmeter, wattmeter, energy meter, multimeter and uses.
UNIT-II	**TRANSMISSION OF ELECTRICITY:** Electromagnetic induction – transformers- production and transmission of electricity – concept of power grid – transmission losses – roles of step-up and step-down transformers – quality of connecting wires – characteristics of single and multicore wires.
UNIT-III	**ELECTRICAL WIRING:** Different types of switches – installation of two way switch – role of sockets, plugs – installation of meters – basic switch board – indicator – fixing of tube light sand 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:** Conversion of electrical energy into different forms – work done by electrical energy – power rating of electrical appliances – energy consumption – electrical energy unit in kWh – calculation of EB bill – useful energy and energy loss – single and three phase connections –Measures to save electrical energy.
UNIT-V	**SAFETY MEASURES:** 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.
TEXT BOOKS	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).
REFERENCE BOOKS	1. Zero to Hero House Wiring Book: Arun Gupta, First Edition, 2025, ISBN-13: 978-9334382303 2. Course in Electrical Installation Estimating & Costing: J. B. Gupta, Kataria S.K. & Sons, 2012, ISBN-13: 9789350142790 3. Electrical Wiring An Introduction: Satheesh Kumar, Ane Books Pvt. Ltd., New Delhi, 2nd Edition, 2020, ISBN-13: 9789383656875
Web Resources	1. https://www.youtube.com/watch?v=liUmAiAU5-s 2. https://www.esfi.org/understanding-your-home-electrical-system/ 3. https://www.youtube.com/watch?v=Do5m06ewhS8

COURSE OUTCOMES:
At the end of the course the student will be able to:

COURSE OUTCOMES	**CO1**	Acquires the basic knowledge of electricity and importance in daily life activity. Meters like voltmeter, ammeter and multi-meters are discussed and how that is used in electrical installation in domestic and industrials.
	CO2	Production of electricity and transmission of electricity are discussed. Also gives importance of transformer in power transmission unit.
	CO3	Able to discuss the various tools is necessary for house wiring like switches, cables and its accessories.
	CO4	Student gets the knowledge of conversion of electrical energy into different forms. Power rating of electrical appliances, energy consumption and calculation of EB bill
	CO5	Student gain the knowledge and understand the electrical safety tips to avoid electrical shock and any other accident from domestic and industrial side.
	CO6	Gain knowledge of electricity, different types of meters, production and transmission of electricity and how the different types of tool play for house wiring. Also student capable to calculation of electric bill for consumption. Finally safety prevention measurements learned.

Suggested Internal Assessment Matrix (IAM)

CO	Test I	Test II	Test III	Assessment I	Assessment II	Quiz / Assessment III	Total	% Allocation	Mapping Strength
CO1	20	10	15	0	0	0	45	19%	2
CO2	15	15	15	5	0	0	50	22%	3
CO3	15	15	20	0	0	0	50	22%	3
CO4	0	10	20	5	10	0	45	19%	2
CO5	0	0	20	0	0	5	25	11%	2
CO6	0	0	10	0	0	5	15	7%	1
Marks	50	50	100	10	10	10	230	100%	
Convert	20			10			30		

The Course Articulation Matrix (CAM) for defined COs:

CO	Learning Outcomes														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	2	2	1	-	1	-	-	1	-	-	-	1
CO3	3	2	2	2	2	1	-	-	-	-	-	-	1	-	-
CO4	3	3	2	2	2	1	1	2	1	-	-	-	1	-	1
CO5	2	2	2	-	1	1	-	-	-	-	1	-	-	-	1
CO6	3	2	2	2	2	1	1	1	-	-	1	-	1	-	1
Contribution to PAM	2.8	2.2	2.0	2.0	1.7	1.0	1.0	1.3	1.0	-	1.0	-	1.0	-	1.0

Mapping Strength : 3 = High, 2 = Moderate, 1 = Low, – = No Significant Mapping
*PAM – Program Articulation Matrix

Core III: **HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS**			I YEAR - II SEMESTER				
Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**Credits**	**Marks**
	HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS	Core III	6			6	70
Course Objectives	The course focuses to understand the basic of heat and temperature also conversion of temperature in Celsius, Kelvin and Fahrenheit scales. Determination of temperature of materials by special type of thermometer. 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						

UNITS	**COURSE DETAILS**
UNIT-I	**THERMOMETRY AND CALORIMETRY:** Concepts of heat and temperature – conversion of Celsius, Kelvin and Fahrenheit scales. Platinum resistance thermometer – Callender & Griffith's bridge for temperature measurements. Heat capacity, Specific heat capacity – specific heat capacity of gases C_P & C_V – Meyer's relation – Jolly'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 demagnetization.
UNIT-II	**TRANSMISSION OF HEAT:** 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. Convection: Convection – Applications of convection. 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.
UNIT-III	**THERMODYNAMICS-I:** Zeroth law and first law of thermodynamics – P-V diagram – heat engine – efficiency of heat engine – Carnot's engine, construction, working and efficiency of Petrol engine and diesel engines – comparison of engines.
UNIT-IV	**THERMODYNAMICS-II:** Second law of thermodynamics – entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram – thermodynamical scale of temperature – Maxwell's thermodynamical relations – Clasius-Clapeyron's equation (first latent heat equation) – third law of thermodynamics – Unattainability, Nernst and Planck statements.
UNIT-V	**STATISTICAL MECHANICS:** Definition of phase-space – micro and macro states – ensembles – definition of 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.
TEXT BOOKS	1. Brijlal & N. Subramaniam, 2000, Heat and Thermodynamics, S.Chand & Co. 2. Narayanamoorthy & Krishna Rao, 1969, Heat, Triveni Publishers, Chennai. **3.** R.Murugeshan & Kiruthiga Sivaprasath, 2004,Thermal Physics, S.Chand & Co.

REFERENCE BOOKS	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.
WEB RESOURCES	1. https://ocw.mit.edu/courses/8-333-statistical-mechanics-i-statistical-mechanics-of-particles-fall-2013/ 2. https://www.youtube.com/watch?v=c1R9PHHrS_0 3. https://pravegaa.com/free-study-material/thermodynamics-statistical-mechanics/ 4. https://www.youtube.com/watch?v=4RX_lpoGRBg&t=2546s 5. https://phys.libretexts.org/Bookshelves/Thermodynamics_and_Statistical_Mechanics/Heat_and_Thermodynamics_(Tatum) 6. https://www.thermodynamics-forum.com/post/best-online-resources-to-study-thermodynamics-fluid-mechanics-and-heat-transfer

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
30	70	100	

COURSE OUTCOMES:

At the end of the course the student will be able to:

COURSE OUTCOMES	**CO1**	Gain the knowledge of temperature and heat. Introduce to the field of thermometry, Calorimetry and explain practical measurements of high temperature as well as low temperature physics. Students understand between heat capacity, specific heat capacity. The study of Low temperature Physics sets the basis for the students to understand material physics and Condensed Matter Physics
	CO2	Modes of transmission of heat and process give the knowledge insight the transmission of heat in various material media. Study the process of thermal conductivity and apply it to good and bad conductors.
	CO3	Give the importance of thermodynamical laws and implementation in natural system. Discuss the implications of the laws of Thermodynamics in diesel and petrol engines
	CO4	Students get an insight into thermodynamic Parameter entropy and how it is used in various natural systems. Able to analyze performance of thermodynamic systems viz efficiency by problems.
	CO5	Interpret classical statistics concepts such as phase space, ensemble, and Maxwell-Boltzmann distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac by apply to quantum particles such as photon and electron
	CO6	Discussed the field of thermometry, Calorimetry, measurements of high temperature as well as low temperature physics. Methods of transmission of heat various material media and learn thermal conductivity good & bad conductors. Studied thermodynamical laws and efficiency calculation for different engine. Various types of statistics are explained.

Suggested Internal Assessment Matrix (IAM)

CO	Test I	Test II	Test III	Assessment I	Assessment II	Quiz / Assessment III	Total	% Allocation	Mapping Strength
CO1	20	10	10	0	0	0	40	17.4%	2
CO2	20	15	20	5	0	0	60	26.1%	3
CO3	10	15	25	5	5	0	60	26.1%	3
CO4	0	10	30	0	5	0	45	19.5%	2
CO5	0	0	15	0	0	5	20	8.7%	1
CO6	0	0	0	0	0	5	5	2.2%	1
Marks	50	50	100	10	10	10	230	100%	
Convert	20			10			30		

The Course Articulation Matrix (CAM) for defined COs:

CO	Learning Outcomes														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	2	2	1	-	-	-	-	1	-	-	-	-
CO2	3	3	2	3	2	1	-	1	-	-	-	-	1	-	1
CO3	2	2	2	3	3	1	-	1	-	-	-	-	-	-	-
CO4	3	2	2	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	2	2	-	-	-	1	-	1	-	-	-	-
CO6	3	3	2	2	2	1	-	1	-	-	1	-	1	-	-
Contribution to PAM	2.8	2.7	2.0	2.5	2.3	1.0	-	1.0	1.0	-	1.0	-	1.0	-	1.0

Mapping Strength : 3 = High, 2 = Moderate, 1 = Low, – = No Significant Mapping
*PAM – Program Articulation Matrix

Paper No.		Title of the Course	PRACTICAL II (Heat and Sound Lab)		
Category		**I Year**	**II Semester**	**Credits**	3
Instructional hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**
		-	-	4	4
Prerequisites		Should have the fundamental knowledge of Physics			
Objectives of the Course		1. To develop the skills of using laboratory Heat experiment instruments to determine some physical quantities required for the understanding of the principles in physics 2. To make the learner to realize the vibrations of stretched strings and apply the experimental techniques in Sound. 3. To gain knowledge about the experimental results based on learning and analyse the theoretical values.			

LIST OF PRACTICALS (Minimum of **Eight** Experiments)

Prac. No	Title	Skill Level (K1–K6)
1	Specific heat by cooling – graphical method (Newton's law of cooling)	K1, K2, K4
2	Thermal conductivity of a good conductor – Searle's method.	K2, K4
3	Thermal conductivity of bad conductor - Lee's disc method.	K2, K4, K5
4	Thermal conductivity of a metal – Forbe's method	K2, K4
5	Determination of specific heat capacity of solid - method of mixtures.	K2, K4
6	Determination of specific heat of liquid by Joule's electrical heating method (applying radiation correction by Barton's correction / graphical method)	K2, K3
7	Solar cell - To study the Fill factor and conversion efficiency	K3, K5, K6
8	Stefan's constant - Black body radiation.	K1, K3
9	Verification of Stefan's – Boltzman's law.	K1, K2, K5
10	Sonometer – Frequency of tuning fork.	K2, K4
11	Kund's tube - Velocity of sound	K2, K3, K6
12	Melde's apparatus - Frequency of an electrically maintained tuning fork (both transverse & longitudinal mode)	K2, K3
13	Frequency of AC by using sonometer – (both electromagnet using Steel wire and Bar magnet using Brass wire)	K2, K3, K5
14	Sonometer - Determination of specific gravity of given solid and liquid.	K2, K4

Text Books	**A textbook of practical Physics,** *M.N.Srinivasan, S.Balasubramanian, R.Ranganathan,* Sultan Chand & Sons (2017)
Reference Book	1. Practical Physics and Electronics, *C.C.Ouseph, U.J.Rao, V.Vijayendran,* S.Viswanathan Publishers(2007) 2. Practical Physics, *R.Sasikumar,* PHI Learning Pvt.Ltd, NewDelhi, 2011. 3. A Textbook of Practical Physics. *Srinivasan and Balakrishnan,* Viswanathan Publishers.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc]	
Web Resources	1. https://nptel.ac.in/course.html/physics/experimentalphysicsI,IIandIII

	2. https://nptel.ac.in/courses/115/105/115105110/ 3. https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK 4. https://www.vlab.co.in/broad-area-physical-sciences

K1 – Recall, K2 – Understanding, K3- Application, K4-Analysis, K5-Evaluation, K6-Creation

Course Outcomes (COs)

After successful completion of this course, students will be able to:

Course Outcomes	Description	LOs
CO1	Examine and grasp the concepts of heat capacity, thermal conductivity, stefan's constant and stretching vibrations of a string/tuning fork	LO1, LO3, LO4
CO2	Understanding and solve the problems of the heat capacity of solids, liquids, gases and frequency of vibration strings of materials.	LO3, LO4, LO6
CO3	Handle the instruments and record the values and calculate using the formulae.	LO5, LO6, LO8
CO4	Observation are made and the graph is drawn accordingly and interpret with the theoretical values	LO3, LO7, LO13
CO5	Capability to handle the instruments, ability of self-learning to do independently and develop skills through scientific method.	LO8, LO10, LO11, LO15
CO6	Cultivate continuous learning by independently exploring new and evolving scientific ideas.	LO6, LO8, LO11, LO15

Suggested Internal Assessment Matrix (IAM)

CO	Test I	Test II	Test III	Assessment I	Assessment II	Quiz / Assessment III	Total	% Allocation	Mapping Strength
CO1	10	5	5	5	0	0	25	19%	2
CO2	10	10	10	0	0	0	30	23%	3
CO3	5	5	10	5	0	0	25	19%	2
CO4	0	0	15	0	5	5	25	19%	2
CO5	0	5	5	0	5	0	15	12%	2
CO6	0	0	5	0	0	5	10	8%	1
Marks	25	25	50	10	10	10	130	100%	
Convert	20			10			30		

Course Articulation Matrix (CAM):

COs / LOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3		3	2											
CO2			1	2		2									
CO3					3	2		2							
CO4			3				2						3		
CO5								2		3	2				3
CO6						1		2			3				2
Contribution to PAM*	3	-	7	4	3	5	2	6	-	3	5	-	3	-	5

Mapping Strength: 3 = High, 2 = Moderate, 1 = Low, – = No Significant Mapping

*PAM – Program Articulation Matrix

SEC II (A) : ENERGY PHYSICS						I YEAR - II SEMESTER	
Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**Credits**	**Marks**
	ENERGY PHYSICS	SEC II (A)	2			2	70
Course Objectives	The prime goal is to understand the conventional and non-conventional energy sources, their conservation and storage system						

UNITS	COURSE DETAILS
UNIT-I	**INTRODUCTION TO ENERGY SOURCES**: energy consumption as a measure of prosperity – world energy future – energy sources and their availability – conventional energy sources – nonconventional and renewable energy sources – comparison – merits and demerits.
UNIT-II	**SOLAR ENERGY**: 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**: 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**: introduction – classification – biomass conversion technologies –photosynthesis – fermentation – biogas generation – classification of biogas plants – anaerobic digestion for biogas – wood gasification – advantages & disadvantages.
UNIT-V	**ENERGY STORAGE**: 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.
TEXT BOOKS	1. G.D.Rai, Non-Conventional Sources of Energy, Khanna Publishers, 2009, 4thEdn. 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, RakeshRajan, PHI Learning Pvt Ltd, 2011, 2ndEdn
REFERENCE BOOKS	1. John Twidell& Tony Weir, Renewable Energy Resources, Taylor & Francis, 2005, 2ndEdn. 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.
WEB RESOURCES	1. https://www.youtube.com/watch?v=N5mHKqcit9I 2. https://www.youtube.com/watch?v=QapVSyXKIkc 3. https://www.youtube.com/watch?v=GRu1_wyc9qU 4. https://understand-energy.stanford.edu/tools/energy-storage 5. https://www.solarenergy.org/free-learning/

COURSE OUTCOMES:
At the end of the course the student will be able to:

COURSE OUTCOMES	**CO1**	Recognize the importance and types of energy sources and its conservation.
	CO2	Relate various energy technologies and identify its applications.
	CO3	Understand the generation of energy and conversion systems.
	CO4	Examine various energy technologies and assess their applications.
	CO5	Identify the energy storage technologies for suitable applications and summarize the concepts of energy conversions.
	CO6	Infer the importance of energy sources, its conversion and storage technologies for sustainable life.

Suggested Internal Assessment Matrix (IAM)

CO	Test I	Test II	Test III	Assessment I	Assessment II	Quiz / Assessment III	Total	% Allocation	Mapping Strength
CO1	20	10	10	0	0	0	40	17.4%	2
CO2	20	15	20	5	0	0	60	26.1%	3
CO3	10	15	25	5	5	0	60	26.1%	3
CO4	0	10	30	0	5	0	45	19.5%	2
CO5	0	0	15	0	0	5	20	8.7%	1
CO6	0	0	0	0	0	5	5	2.2%	1
Marks	50	50	100	10	10	10	230	100%	
Convert	20			10			30		

The Course Articulation Matrix (CAM) for defined COs:

CO	Learning Outcomes														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3		3	1	1			1		1			1		
CO2	3		3	1	1			2					1		1
CO3	3		3	2	2	1		2							
CO4	3		3	3	2	1		2					1		1
CO5	3		3	3	3	1		2							1
CO6	3	2	3	3	3	1		3	2	1			1		1
Contribution to PAM	3.0	2.0	3.0	2.2	2.0	1.0	-	2.0	2.0	1.0	-	-	1.0	-	1.0

Mapping Strength : 3 = High, 2 = Moderate, 1 = Low, – = No Significant Mapping
*PAM – Program Articulation Matrix

SEC II (B) : NUMERICAL METHODS AND C PROGRAMMING			I YEAR - II SEMESTER				
Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**Credits**	**Marks**
	NUMERICAL METHODS AND C PROGRAMMING	SEC II (B)	2			2	70
Course Objectives	To use the numerical methods like curve fitting, interpolation and numerical integration to solve mathematical problems with given set of data. To introduce the basics of C programming, its control structures and designing simple C programs.						

UNITS	COURSE DETAILS
UNIT-I	**CURVE FITTING AND NUMERICAL SOLUTIONS:** Principle of least squares: Fitting a straight line – Fitting an exponential curve – Determination of roots of algebraic and transcendental equations: Bisection method – Newton-Raphson method.
UNIT-II	**INTERPOLATION AND NUMERICAL INTEGRATION:** Newton's forward and backward interpolation for equal intervals – Lagrange's interpolation for unequal intervals – Trapezoidal rule – Simpson's 1/3 and 3/8 rules.
UNIT-III	**INTRODUCTION TO C:** Importance of C – Basic structure of C program – Character set, key words and identifiers – Constants, variables and data types – Declaration of variables – Operators: arithmetic, relational, logical, assignment, increment and decrement – Precedence of arithmetic operators – scanf() and printf() functions – User defined functions.
UNIT-IV	**CONTROL STRUCTURE:** Decision making with if, if-else, nested if, else if ladder and switch statements – goto – Looping with while, do while, for statements – break and continue – Arrays: one dimensional and two dimensional – Declaration of arrays.
UNIT-V	**PROGRAM DESIGN STAGES:** Problem analysis, program structure outline, development of algorithm/flowchart, control structures, program coding, program testing and debugging – flow chart for solving simple problems: Conversion of Fahrenheit to Celsius, Celsius to Kelvin, miles to kilometer – Average of set of numbers – Greatest/smallest.
TEXT BOOKS	1. Numerical methods, Singaravelu, Meenakshi Publication, 4th Edn., 1999. 2. Programming in C, Balagurusamy, TMG, ND, 2012. 3. Numerical Methods P.Kandasamy, K.Thilagavathy, K.Gunavathi, S.Chand, 2016. 4. Numerical Analysis,,M.K.Venkatraman, NPH, 2013. 5. Numerical Analysis, B.D.Gupta, Konark Publishers, New Delhi, 2013.
REFERENCE BOOKS	1. Schaum's outline series, Theory and Problems of programming in C, C.Byron & S. Gottfried, Tata McGraw Hill 2003. 2. Numerical methods and C Programming, Veerarajan, 2015.
WEB LINKS	1. https://www.coursera.org/learn/numerical-methods-engineers 2. https://ocw.mit.edu/search/?d=Mathematics 3. https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ma45 4. https://www.learn-c.org/ 5. https://www.codecademy.com/learn/paths/c 6. https://www.youtube.com/watch?v=fmSnLiAv-zc

COURSE OUTCOMES:

At the end of the course the student will be able to:

COURSE OUTCOMES	**CO1**	Understand the principles of least squares, curve fitting, roots of algebraic and transcendental equations, formulae for numerical interpolation and integration.

		Understand the basics of C programs including constants, variables, operators, statements, decision making and looping, control structures and program design.
	CO2	Explain the concepts of fitting a straight line and curve, interpolation, finding roots of algebraic and transcendental equations, and integration. Explain the basic constructs and design of C programming including decision making and looping.
	CO3	Apply numerical methods to fit a curve, to solve linear algebraic and transcendental equations, to interpolate data, to integrate values. Apply control structures in designing and writing simple C programs.
	CO4	Analyze and compare different numerical methods for solving linear equations, interpolation and integration. Compare the effectiveness of different structures in C programs for different situations.
	CO5	Evaluate the applicability of appropriate methods for solving mathematical problems encountered in various disciplines. Evaluate the usage of appropriate statements, control structures in designing and writing C programs for problem solving.
	CO6	Justify the appropriate method for solving numerical problems. Design and produce C programs for solving a given problem using its statements and control structures.

Suggested Internal Assessment Matrix (IAM)

CO	Test I	Test II	Test III	Assessment I	Assessment II	Quiz / Assessment III	Total	% Allocation	Mapping Strength
CO1	20	10	10	0	0	0	40	17.4%	2
CO2	20	15	20	5	0	0	60	26.1%	3
CO3	10	15	25	5	5	0	60	26.1%	3
CO4	0	10	30	0	5	0	45	19.5%	2
CO5	0	0	15	0	0	5	20	8.7%	1
CO6	0	0	0	0	0	5	5	2.2%	1
Marks	50	50	100	10	10	10	230	100%	
Convert	20			10			30		

The Course Articulation Matrix (CAM) for defined COs:

CO	Learning Outcomes														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	1	2	2	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	2	2	1	-	2	-	-	-	-	-	-	-
CO4	3	1	3	3	2	2	1	1	-	-	-	-	1	-	-
CO5	2	-	2	2	3	1	-	2	-	-	2	-	-	-	1
CO6	3	1	3	3	3	1	-	2	-	1	1	-	-	-	1
Contribution to PAM	2.8	1.4	2.5	2.3	2.5	1.3	1.0	1.8	-	1.0	1.5	-	1.0	-	1.0

Mapping Strength : 3 = High, 2 = Moderate, 1 = Low, – = No Significant Mapping
*PAM – Program Articulation Matrix