KALAIGNAR KARUNANIDHI GOVERNMENT ARTS COLLEGE FOR WOMEN (AUTONOMOUS),

PUDUKKOTTAI 622001

B.Sc. PHYSICS Programme

(CHOICE BASED CREDIT SYSTEM)

PG & Research Department of Physics

B.Sc Physics Syllabus

(For the candidate admitted from the academic year 2021 – 2022 onwards)

Physics - GENERAL COURSE PATTERN FOR UG

Sl. No.	Part	Course	No. of courses	Inst/Hrs	Credits	Total Marks
1	I	Language - Tamil	4	24	12	400
2	II	Language - English	4	24	12	400
3	III	Core Course	15	72	68	1500
4	III	Allied Course	6	30	18	600
5	III	Major Elective	3	14	12	300
6	IV	Non - Major Elective	2	4	4	200
7	IV	Skill Enhancement	3	6	6	300
8	V	Value Based Education	1	2	2	100
9	V	En. Studies	1	2	2	100
10	V	Yoga	1	1	2	100
11	V	Gender Studies	1	1	1	100
12	V	Extension activity	-	-	1	
		Total	41	180	140	4100

KALAIGNAR KARUNANIDHI GOVERNMENT ARTS COLLEGE FOR WOMEN (AUTONOMOUS),

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B.Sc. PHYSICS COURSE STRUCTURE UNDER CBCS

CHOICE BASED CREDIT SYSTEM

(For the candidate admitted from the academic year 2021 – 2022 onwards)

Sem.	Part	S. No.	Course	Title of the Course	Ins. Hrs	Credit	Exam Hrs	CIA	SE	Total
I	I	1	21UT1	Tamil Paper – I	6	3	3	25	75	100
	II	2	21UE1	English Paper – I	6	3	3	25	75	100
	III	3	21UPH01	Properties of Matter and Acoustics	6	5	3	25	75	100
	III	4	21UPH02P	Major Practical – I	4	4	3	25	75	100
	III	5	21UAM1	Allied Mathematics – I	6	3	3	25	75	100
	IV	6	21UVB (AEC)	Value Based Education	2	2	3	25	75	100
				Total	30	20				600
II	I	7	21UT2	Tamil Paper – II	6	3	3	25	75	100
	II	8	21UE2	English Paper - II	6	3	3	25	75	100
	III	9	21UPH03	Mechanics	5	5	3	25	75	100
	III	10	21UPH04	Thermal Physics and Statistical Mechanics	4	4	3	25	75	100
	III	11	21UAM2	Allied Mathematics - II	5	3	3	25	75	100
	III	12	21UAM3	Allied Mathematics - III	4	3	3	25	75	100
				Total	30	21				600
III	I	13	21UT3	Tamil Paper - III	6	3	3	25	75	100
	II	14	21UE3	English Paper - III	6	3	3	25	75	100
	III	15	21UPH05	Electricity and Magnetism	6	5	3	25	75	100
	III	16	21UPH06P	Major Practical - II	4	4	3	25	75	100
	III	17	21UAC1	Allied Chemistry - I	6	3	3	25	75	100
	IV	18	21UES	AEC -ES	2	2	3	25	75	100
				Total	30	20				600
				SS1		2	3	25	75	100

IV	I	19	21UT4	Tamil Paper - IV	6	3	3	25	75	100
	II	20	21UE4	English Paper - IV	6	3	3	25	75	100
	III	21	21UPH07	Optics and Spectroscopy	4	4	3	25	75	100
	III	22	21UPH08	Energy Physics	3	3	3	25	75	100
	III	23	21UAC2	Allied Chemistry - II	5	3	3	25	75	100
	III	24	21UAC3P	Allied Chemistry - III Practical	4	3	3	25	75	100
	IV	25	21UPHSEC1	Electrical Appliances	2	2	3	25	75	100
				Total	30	21				700
				SS2		2	3	25	75	100
V	III	26	21UPH09	Elementary Solid State Physics	5	5	3	25	75	100
	III	27	21UPH10	Analog Electronics	5	5	3	25	75	100
	III	28	21UPH11	Atomic and Nuclear Physics	5	5	3	25	75	100
	III	29	21UPH12P	Major Practical - III	4	4	3	25	75	100
	III	30	21UPHME1	Programming in C	4	4	3	25	75	100
	IV	31	21UPHSEC2	Communication Systems	2	2	3	25	75	100
	IV	32	21UPHSEC3	Soft Skills Development	2	2	3	25	75	100
	IV	33	21	NME1	2	2	3	25	75	100
	IV	34	21UAEC	AEC - Yoga	1	2	3	25	75	100
				Total	30	31				900
VI	III	35	21UPH13	Digital Electronics	6	5	3	25	75	100
	III	36	21UPH14	Classical and Wave Mechanics	5	5	3	25	75	100
	III	37	21UPH15P	Major Practical - IV	6	5	3	25	75	100
	III	38	21UPHME2	Introduction to Microprocessor 8085	5	4	3	25	75	100
	III	39	21UPHME3	Physics of Materials	5	4	3	25	75	100
	IV	40	21	NME2	2	2	3	25	75	100
	IV	41	21UGS	Gender Studies	1	1	3	25	75	100
	IV	42	21UXA	Extension Activity		1				
				Total	30	27				700
				Grand Total	180	140				4100

OVERALL TOTAL – SEMESTER-WISE

Semester	No. of Courses	Marks	Credits
I	6	600	20
II	6	600	21
III	6	600	21
IV	7	700	21
V	9	900	30
VI	7	700	27
Total	41	4100	140

OVERALL TOTAL – COURSE-WISE

Part	Course	No. of Courses	Credit/ Course	Instruction Hours	Total Credits	Total Marks
I	Language - Tamil	4	3	24	12	400
II	Language - English	4	3	24	12	400
III	Core Course – Theory	8	5	54	40	800
		2	4		8	200
		1	3		3	100
III	Core Course – Practical	1	5	18	5	100
		3	4		12	300
III	Allied Maths	3	3	15	9	300
III	Allied Chemistry Theory	2	3	15	6	200
	Practical	1	3		3	100
IV	Major Based Elective	3	4	14	12	300
IV	Non Major Elective	2	2	4	4	200
IV	Skill Enhancement Course	3	2	6	6	300
IV	Ability Enhancement Course					
	Value Based Education	1	2	2	2	100
	En. Studies	1	2	2	2	100
	Yoga	1	2	1	2	100
V	Gender Studies	1	1	1	1	100
	Extension Activities	1	1	1	1	-
	Total	41			140	4100

Title of proposed papers for new syllabi – B.Sc. Physics

Part III Core Course: Theory

Sl. No.	Sem.	Title of the Paper
1	I	Properties of Matter and Acoustics
2	II	Mechanics
3	II	Thermal Physics and Statistical Mechanics
4	III	Electricity and Magnetism
5	IV	Optics and Spectroscopy
6		Energy Physics
7	V	Elementary of Solid State Physics
8		Analog Electronics
9		Atomic and Nuclear Physics
10		Elective I – Programming in C
11	VI	Digital Electronics
12		Classical and Quantum Mechanics
13		Elective II - Introduction to Microprocessor 8085
14		Elective III – Physics of Materials

Core Practical

Sl. No.	Sem.	Title of the Paper
1	I	Major Practical - I
2	III	Major Practical - II
3	V	Major Practical - III
4	VI	Major Practical - IV

Allied Physics for B.Sc. Mathematics and Chemistry (Part - III)

Sl.No.	Sem.	Title of the Paper
1	III	Allied Physics - I
2	IV	Allied Physics - II
3		Allied Physics Practical - III

Applied Physics for B.Sc. Computer Science (Part -III)

Sl.No.	Sem.	Title of the Paper
1	III	Applied Physics - I
2	IV	Applied Physics - II
3		Applied Physics Practical - III

Skill Enhancement Courses (Part IV)

Sl. No.	Sem.	Title of the Paper
1	IV	Electrical Appliances
2	V	Communication Systems
3		Soft Skills Development

Ability Enhancement Course (Part IV)

Sl. No.	Sem.	Title of the Course
1	I	Value Based Education
2	II	Environmental Studies
3	V	Yoga

Non - Major Elective (Part IV)

Sl. No.	Sem.	Title of the Course
1	V	Electrical Power
2	VI	Essentials of Electronics

Part V

Sl. No.	Sem.	Title of the Course
1	VI	Gender Studies
2		Extension activity

Self-Study Course

Sl. No.	Semester	Title of the Course
1	III	Applications of Physics
2	IV	Electricity and Energy Sources

B.Sc., PHYSICS PROGRAMME

[UNDER CHOICE BASED CREDIT SYSTEM]

[For the candidates to be admitted from the academic year 2021-2022]

Core Course

Sl. No.	Course	Sub. Code	Title of the Course	Ins. Hrs.	Credit
1	CC-I	21UPH01	Properties of Matter and Acoustics	6	5
2	CC-II P	21UPH02P	Major Practical - I	4	4
3	CC-III	21UPH03	Mechanics	5	5
4	CC-IV	21UPH04	Thermal Physics and Statistical Mechanics	4	4
5	CC-V	21UPH05	Electricity and Magnetism	6	5
6	CC-VI P	21UPH06P	Major Practical - II	4	4
7	CC-VII	21UPH07	Optics and Spectroscopy	4	4
8	CC-VIII	21UPH08	Energy Physics	3	3
9	CC-IX	21UPH09	Elementary Solid State Physics	5	5
10	CC-X	21UPH10	Analog Electronics	5	5
11	CC-XI	21UPH11	Atomic and Nuclear Physics	5	5
12	CC-XII P	21UPH12P	Major Practical - III	4	4
13	CC-XIII	21UPH13	Digital Electronics	6	5
12	CC-XIV	21UPH14	Classical and Quantum Mechanics	5	5
13	CC-XV	21UPH15P	Major Practical - IV	6	5

Self-Study Course

Sl. No.	Course	Sub. Code	Title of the Course
1	SSC-I	21UPHSS1	Application of Physics
2	SSC-II	21UPHSS2	Electricity and Energy sources

Course	Title of the Course	Ins. Hrs.	Credit
Allied Course - I Mathematics [I, II & III]	Mathematics – I Mathematics – II Mathematics – III	6 5 4	3 3 3
Allied Course - II Chemistry [I, II & III]	Chemistry – I Chemistry - II Chemistry Practical – III	6 5 4	3 3 3
Elective Course Elective – I Elective – II Elective - III	Any one from ELEC Group - I Any one from ELEC Group - II Any one from ELEC Group - II	4 5 5	4 4 4
Non Major Elective Course NME – I NME – II	Any one from NME Group - I Any one from NME Group - II	2 2	2 2

Elective Courses

ELEC Group – I

1. Programming in C
2. Statistical methods

ELEC Group – II

1. Introduction to Microprocessor 8085
2. Physics of Material
3. Modern Physics

Non Major Elective Courses

NME Group – I

1. Electrical Power
2. Solar Energy Utilization

NME Group – II

1. Essentials of Electronics
2. Electricity and Energy Sources

QUESTION PAPER PATTERN – B.Sc. Physics

THEORY

Part	Type	Qn. No.	Unit	Marks for each Qn.	Total Marks
A	Answer All the Questions	1 & 2	I	2	20
		3 & 4	II		
		5 & 6	III		
		7 & 8	IV		
		9 & 10	V		
B	Internal Choice – Answer All the Questions	11a / 11b	I	5	25
		12a / 12b	II		
		13a / 13b	III		
		14a / 14b	IV		
		15a / 15b	V		
C	Answer any Three Questions	16	I	10	30
		17	II		
		18	III		
		19	IV		
		20	V		
	External Marks				75
	CIA				25
	Max. Marks				100

CONTINUOUS INTERNAL ASSESSMENT PATTERN – B.Sc.

THEORY

Examination	Max. Marks	Converted to
Mid Semester (1 ½ Hours)	40	5
End Semester (1 ½ Hours	40	5
Model (3 Hours)	75	10
Assignment	5	5
Total		25

PRACTICAL

External:

Practical:	60 Marks
Viva	05 Marks
Record:	10 Marks
Total:	75 Marks

Internal:

Model Examination:	15 Marks
(Max.: 60 marks reduced to 15)	
Performance in the class:	10 Marks
Total:	25 Marks

Programme Outcome – UG Science

PO1: Acquire fundamental knowledge of mathematics, physical, chemical, life sciences and computing to identify, formulate and develop solutions to scientific problems.

PO2: Relate scientific ideas and practical experiences and develop skills to implement new scientific techniques.

PO3: Apply analytical, creative and problem solving skills to plan, execute and report the result of theoretical or experimental investigations.

PO4: Explore technical knowledge to pursue higher education and excel as entrepreneurs.

PO5: Integrate professional, ethical and social issues and interpret the benefits, limitations of science and its application in technological developments.

Programme Specific Outcome

PSO1 : Demonstrate the physical concepts, principles and theories of physics. Translate the knowledge to specific problems in theoretical and experimental physics.

PSO2 : Identify the crucial concepts and principles in physics and develop relevant methodological and modern techniques to interpret and analyze the problems.

PSO3 : Analyze the physics problems and apply mathematical formulation to design and perform experiments in almost all fields of physics

PSO4 : Pursue higher education to learn advancement in physics required for industrial, technical applications.

PSO5: Identify ethical issues related to the physics problem and analyze rationally with modern and scientific techniques.

Semester: I Credits: 5

Hours/Week: 6 Code: 21UPH01

CORE COURSE I: PROPERTIES OF MATTER AND ACOUSTICS

General Objective:

To study the basic principles of properties of matter and sound.

Course Objectives:

The learners will be able to

1. Classify the different moduli of elasticity of materials.
2. Build the concept of bending of beams.
3. Examine the basics of surface tension and the production of low pressure.
4. Recall the basic concept of viscosity of fluids.
5. Realize the principles of ultrasonics and its applications.

UNIT I: Elasticity

1.1 Elastic modulus – Poisson's ratio – Relation between elastic constants.

1.2 Work done in a stretching

1.3 Twisting couple on a cylinder – Expression for Poisson's ratio in terms of elastic constants – Twisting couple on a wire

1.4 Work done in twisting a wire

1.5 Torsion pendulum – Rigidity modulus by torsion pendulum – M.I of the disc

UNIT II: Bending of Beams

2.1 Expression for bending moment

2.2 Cantilever – Expression for depression – Experimental determination

2.3 Oscillation of a cantilever

2.4 Theory of non uniform bending – Pin and Microscope method

2.5 Young's modulus by Koenig's method

2.6 Uniform bending – Expression for elevation – Experimental determination of young's modulus using microscope

2.7 I shape girders

UNIT III: Surface Tension and Low Pressure Physics

3.1 Definition and dimension of Surface tension

3.2 Pressure difference across liquid surface – Excess pressure inside a liquid drop soap bubble – Excess of pressure inside a curved liquid surface

3.3 Jaegar's experiment – Variation of surface tension with temperature

3.4 Production of low pressure – Gaede's molecular pump – Measurement of low pressure

3.5 Knudsen's absolute gauge – Detection of leakage

UNIT IV: Viscosity

4.1 Streamlined motion – Turbulent motion

4.2 Coefficient of viscosity and its dimensions – Poiseuille's formula – Corrections to Poiseuille's formula – Experimental determination of viscosity of a liquid by variable pressure head

4.3 Ostwald's viscometer and Searle's viscometer

4.4 Variation of viscosity with temperature – Application of viscosity

4.5 Friction and lubrication

UNIT II: Sound

5.1 Simple Harmonic motion – Free vibrations of a body - Damped vibrations and forced vibrations

5.2 Intensity of Sound – Measurements of intensity of sound
5.3 Loudness of sound - Distinguish between loudness and intensity of sound
5.4 Reverberation – Sabine's formula
5.5 Ultrasonics – Production - Piezoelectric crystal method – Detection – Properties

Books for Study

1. Properties of Matter and Acoustics, R. Murugeshan, Kiruthiga Sivaprasath, S. Chand & Company Pvt. Ltd., New Delhi, 2011.
2. Textbook of Sound, N. Subramanian, Brijlal, Vikas Publishing House Pvt. Ltd., 1998.
3. □□□ □ □ □ , □□□□□ , □. □□□□□□□□□, □□ □ □□□□ , □ , 2015.

Books for Reference

1. Elements of Properties of Matter, D.S. Mathur, S. Chand & Company Pvt. Ltd., New Delhi, 2005.
2. A Textbook of Sound, R.L. Saihgal, S. Chand & Company Pvt. Ltd., New Delhi, 1987.
3. □□□ □ □ □ , □□□□□ , □□□□.□□.□ □□ , □□□□□ □ (□) □□ , 2007. Web

Resources

1. https://courses.washington.edu/me354a/chap3.pdf
2. https://ncert.nic.in/ncerts/l/keph202.pdf
3. https://www.nhn.ou.edu/~strauss/phys2414/L10.pdf

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Recall and relate the modulus of elasticity	K1
CO-2	Apply the knowledge of bending of beams for the determination of modulus of elasticity	K3
CO-3	Analyze the concepts of surface tension and its physical properties	K4
CO-4	Outline basic ideas for the viscosity of liquids and use it to evaluate	K5
CO-5	Summarize the properties of sound and using the techniques for the production of ultrasonics	K2

Semester	Code		Title of the Course			Hours			Credit	
I	21UPH01		Properties of Matter and Acoustics			6			5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔		✔		✔	✔		✔		✔
CO-2	✔		✔	✔	✔	✔		✔	✔	✔
CO-3	✔		✔	✔	✔	✔		✔	✔	✔
CO-4	✔		✔	✔	✔	✔		✔	✔	✔
CO-5	✔	✔	✔		✔	✔	✔	✔		✔
Number of Matches = 38 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. R. Bhuvaneswari

Semester: I Credits: 4

Hours/Week: 4 Code: 21UPH02P

CORE COURSE II: MAJOR PRACTICAL - I

General Objective:

To apprehend the basics of Properties of matter, Optics, Electricity and Electronics by doing related experiments.

Course Outcomes:

On completion of the course the student will be able to

CO-1: Evaluate Young's modulus and Rigidity modulus of the given material. (K5)

CO-2: Assess the principles of optics through lens experiment. (K5)

CO-3: Estimate the specific resistance of a wire using a meter bridge. (K6)

CO-4: Justify the laws of the sonometer. (K5)

CO-5: Measure the viscosity and surface tension of liquids. (K5)

(Any 10 Experiments to be done)

1. Viscosity of a liquid - Variable pressure head.
2. Comparison of viscosities of two liquids.
3. Surface tension – Drop weight method.
4. Interfacial surface tension – Drop weight method.
5. Young's modulus – Non Uniform bending – Pin and microscope method.
6. Young's modulus - Cantilever depression – Scale and telescope method.
7. Young's modulus – Uniform bending – Pin and microscope method.
8. Young's modulus – Uniform bending – Single optic lever method.
9. Rigidity modulus – Torsion pendulum.
10. Moment of Inertia – Torsion pendulum.
11. Acceleration due to gravity (g) and radius of gyration (k) - Compound pendulum.
12. Sonometer – Verification of I and II laws.
13. Sonometer - Relative density of a solid.
14. Focal length of a Concave lens.
15. Focal length of a Convex lens.

Course Designer: Dr. R. Bhuvaneswari

Semester: II Credits: 5

Hours/Week: 5 Code: 21UPH03

CORE COURSE III: MECHANICS

General Objective: To outline the basic principles of dynamics, statics, hydrostatics and hydrodynamics.

Course Objectives:

The learners will be able to

1. Outline the basic concepts of vectors.
2. Distinguish the direct and oblique impacts.
3. Identify the theory of compound pendulum and apply for the determination of center of gravity.
4. Evaluate the center of gravity of different material bodies.
5. Summarize the concepts of friction.
6. Apply the knowledge of hydrostatics and hydrodynamics.

UNIT I: Vector Analysis

1.1 Scalar and vector fields – Directional derivatives
1.2 Gradient of a scalar
1.3 Divergence of a vector point function
1.4 Curl or rotation of a point function
1.5 Line integral – Gauss divergence theorem
1.6 Simple applications of vectors to mechanics.

UNIT II: Dynamics

2.1 Projectiles – Path, Range and time of flight of a projectile
2.2 Impulse – Impulsive force
2.3 Laws of impact – Direct and oblique impacts - Impact of a smooth sphere on a smooth horizontal plane
2.4 Loss of kinetic energy due to impact.

UNIT III: Dynamics of Rigid Bodies

3.1 Theory of Compound pendulum – Centre of suspension and centre of oscillation – Minimum periods of a compound pendulum
3.2 Determination of acceleration due to gravity and radius of gyration
3.3 Period of oscillation of a Bifilar pendulum with and without parallel threads
3.4 System of variable mass – Equation of rocket motion.

UNIT IV: Statics

4.1 Definition of centre of gravity
4.2 Solid hemisphere – Hollow hemisphere – Tetrahedron - Rigid solid cone
4.3 Friction – Laws of friction – Coefficient of friction – Angle of friction – Cone of friction
4.4 Equilibrium of a body on a rough inclined plane (Free and Forced).

UNIT V: Hydrostatics and Hydrodynamics

5.1 Centre of pressure - Definition – Centre of pressure of a rectangular lamina and triangular lamina
5.2 Floating bodies – Laws of floating bodies
5.3 Metacentric height – Metacentric height of a ship – Equation of continuity –
5.4 Energy of liquid in motion
5.5 Bernoulli's theorem and its applications.

Books for Study

1. Dynamics, M. Narayanamurti and N. Nagaratnam, The National Publishing Company, Madras, 2002.
2. Statics, Hydrostatics and Hydrodynamics, M. Narayanamurti and N. Nagaratnam, The National Publishing Company, Chennai, 2002.
3. Mechanics and Special Theory of Relativity, R. Murugeshan, Prasad Publications, Madurai, 1990.
4. □ □□□□□ , □. □□□□ □□□□, □□□ □□□□ , □ , 2013.

Books for Reference

1. Mechanics and Relativity, Brijlal Subrahmanyam, S.Chand & Company Pvt. Ltd., New Delhi, 1989.
2. Properties of Matter and Acoustics, R. Murugeshan, Kiruthiga Sivaprakash, S.Chand & Company Pvt. Ltd., New Delhi, 2011.

Web Resources

1. https://sites.astro.caltech.edu/~golwala/ph106ab/ph106ab_notes.pdf
2. https://web.stanford.edu/~oas/SI/SRGR/notes/srHarris.pdf
3. http://academics.smcvt.edu/abrizard/CP_I/Notes_CPI.pdf

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Explain the basic concepts of scalar and vector fields	K2, K5
CO-2	Discuss the fundamental laws of direct and oblique impacts	K6
CO-3	Categorize the period of oscillation for pendulum	K4
CO-4	Outline the basic laws of centre of gravity and friction	K2
CO-5	Identify the laws of floatation on floating bodies and its applications	K3

Semester	Code			Title of the Course		Hours			Credit	
II	21UPH03			Mechanics		5			5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔		✔	✔	✔	✔	
CO-2	✔	✔	✔			✔	✔	✔		
CO-3	✔	✔	✔			✔	✔	✔		
CO-4	✔	✔	✔			✔	✔	✔		
CO-5	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Number of Matches = 36 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. R. Bhuvaneswari

Semester: II | Credits: 4

Hours/Week: 4 | Code: 21UPH04

CORE COURSE IV: THERMAL PHYSICS AND STATISTICAL MECHANICS

General Objective: To apprehend the concepts of specific heat capacity, transmission of heat, low temperature physics, thermodynamics and statistical mechanics.

Course Objectives:

The learners will be able to

1. Recall the basics of heat transfer and specific heat capacity.
2. Categorize the transmission of heat.
3. Examine the distribution of energy in the black body spectrum.
4. Analyze the concept of low temperature.
5. Classify the laws of thermodynamics and relate their applications.
6. Recall the postulates of statistical mechanics.

UNIT I: Specific Heat Capacity

1.1 Specific heat capacity of a liquid - Newton's law of cooling - Joule's electrical method

1.2 Two specific heat capacities of gases - Mayer's relation Specific heat capacity of gas at constant volume by Joly's differential steam calorimeter method

1.3 Specific heat capacity of gas at constant pressure by Regnault's method

1.4 Calorific value of fuels – Bomb calorimeter.

UNIT II: Transmission of Heat

2.1 Conduction - Thermal Conductivity - Thermal conductivity of a good conductor by Forbe's method - Thermal conductivity of a poor conductor by Lee's disc method

2.2 Radiation - Stefan's law – Experimental determination of Stefan's constant

2.3 Distribution of energy in the spectrum of a black body Stefan–Boltzmann's law

2.4 Wien's displacement law – Rayleigh-Jeans law - Planck's law.

UNIT III: Low Temperature Physics

3.1 Joule Thomson effect – Joule Thomson Porous plug experiment – Theory of Porous plug experiment

3.2 Joule Kelvin Effect – Temperature of inversion production of low temperatures

3.3 Liquefaction of hydrogen and helium Electrolux refrigerator

3.4 Air conditioning system – Equipments used in air conditioning system

3.5 Classifications – Summer and winter air conditioning system.

UNIT IV: Thermodynamics

4.1 Zeroth law of thermodynamics

4.2 First law of thermodynamics Reversible and irreversible processes

4.3 Carnot's ideal heat engine – Carnot's cycle

4.4 Second law of thermodynamics – Carnot's theorem

4.5 Entropy – Change of entropy in reversible and irreversible processes – Temperature-entropy diagram

4.6 Third law of thermodynamics.

UNIT V: Statistical Mechanics

5.1 Postulates of statistical mechanics - Thermodynamic probability and entropy

5.2 Maxwell-Boltzmann statistics – The molecular energy of an ideal gas Bose–Einstein statistics

5.3 Photon gas - Fermi–Dirac statistics - Electron gas Comparison of the three statistics.

Books for Study

1. Heat and Thermodynamics and Statistical Physics, Brijlal, Dr. N. Subrahmanyam and P. S. Hemne, S.Chand & Company Pvt. Ltd., New Delhi, 2015.
2. □ □ □□ □ , □. □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ , □ , 2002. Book for Reference

1. Thermal Physics, R. Murugeshan, Kiruthiga Sivaprasath, S.Chand & Company Ltd., New Delhi, 2004.
2. A Textbook of Heat and Thermodynamics, J.B. Rajam & C.L. Arora, S. Chand & Company Pvt. Ltd., New Delhi, 1983.
3. Thermodynamics and Statistical Physics, J. K. Sharma and K. K. Sarkar, Himalaya Publishing House, 1988.

Web Resources

1. https://vlab.amrita.edu/?sub=1&brch=194&sim=353&cnt=1
2. https://www3.nd.edu/~powers/ame.20231/notes.pdf

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Compare the different specific heat capacities and determine the specific heat capacity of liquids and gases	K2
CO-2	Apply the knowledge of transmission of heat for the determination of thermal conductivity of the material	K3
CO-3	Explain the production of low temperatures and air conditioning systems	K2, K5
CO-4	Discuss the reversible and irreversible processes	K6
CO-5	Compare the different types of statistics based on the postulates	K2

Semester	Code			Title of the Course		Hours			Credit	
II	21UPH04			Thermal Physics and Statistical Mechanics		4			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔		✔	✔	✔	✔		✔
CO-2	✔	✔	✔		✔	✔	✔	✔		✔
CO-3	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-4	✔	✔	✔			✔	✔	✔		
CO-5	✔	✔	✔	✔		✔	✔	✔	✔	
Number of Matches = 40 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. K. Karthikeyani Vijayakumari

Semester: III Credits: 5

Hours/Week: 6 Code: 21UPH05

CORE COURSE V: ELECTRICITY AND MAGNETISM

General Objective: To study the basic principles of electricity, electrostatics and electromagnetism.

Course Objectives:

The learners will be able to

1. Recall the basics of electrostatics and the principle of capacitors.
2. Classify the materials based on their magnetic properties.
3. Analyze the phenomena of electricity in the Wheatstone network.
4. Discuss the flow of currents in A.C and D.C circuits.
5. Recall and analyze the laws of electromagnetic induction.

UNIT I: Electrostatics

1.1 Gauss theorem – Applications – Electric intensity at a point due to a charged sphere
1.2 Coulomb's theorem – Mechanical force experienced by unit area of a charged surface
1.3 Electrified soap bubble
1.4 Capacitors – Expression for capacity – Capacity of spherical and cylindrical capacitors
1.5 Energy of a capacitor – Loss of energy due to sharing of charges.

UNIT II: Magnetic Properties of Materials

2.1 Introduction – Permeability and susceptibility – Inter-relations
2.2 I-H curve – Cycle of magnetization – Hysteresis – Retentivity – Coercivity - Energy loss due to hysteresis
2.3 B-H curve (Ballistic method)
2.4 Properties of dia, para, and ferromagnetic materials
2.5 Wiess theory of ferromagnetism – Curie temperature.

UNIT III: Current Electricity

3.1 Kirchhoff's laws – Wheatstone's network – Condition for balance
3.2 Carey Foster's bridge – Measurements of specific resistance and temperature coefficient
3.3 Potentiometer – Calibration of ammeter, low range and high range voltmeter
3.4 Biot-Savart law – Magnetic induction at a point on the axis of a circular coil carrying current
3.5 Moving coil Ballistic galvanometer – Correction for damping - Figure of merit – Experimental determination.

UNIT IV: A.C. and D.C. Circuits

4.1 Growth and decay of current in an LR circuit with steady EMF
4.2 Charge and discharge of a capacitor throw a resistance – Determination of high resistance by leakage
4.3 Charging Condition of a condenser through R and L Discharge of a condenser through R and L
4.4 Wattles current - AC circuits containing L, C and R.

UNIT V: Electromagnetic Induction

5.1 Faraday's Laws of electromagnetic induction
5.2 Self induction – Expression for self inductance of a solenoid – Rayleigh's method of finding self inductance of a coil
5.3 Mutual inductance - Coefficient of mutual inductance – Expression for the mutual inductance between two coaxial solenoids coefficient of coupling – Determination of mutual inductance between a pair of coils.

Books for Study

1. Electricity and Magnetism, R. Murugeshan, S. Chand & Company Pvt. Ltd., New Delhi, 2017.
2. □□ □□ □□ □ □ □ , □. □□□□ □□□□, N. □ □□□□, □ □□ □ □ □□□ , □ , 2011.

Books for Reference

1. Electricity and Magnetism, D. N. Vasudeva, S. Chand & Company Pvt. Ltd., New Delhi, 1992.
2. Electricity and Magnetism, Brij Lal and N. Subrahmanyam, Ratan Prakashan Mandir, New Delhi, 1997.
3. Fundamentals of Electricity and Magnetism, 2nd edition, Kip, A.F. 1969, McGraw-Hill, New York.

Web Resources

1. https://physicswithpradeep.files.wordpress.com/2013/04/electrostatics .pdf
2. https://www.electrical4u.com/faraday-law-of-electromagnetic-induction /
3. https://www.electronics-tutorials.ws/electromagnetism/electromagnetic -induction.html

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Apply Gauss theorem and Coulomb's theorem for the determination of electrical intensity and mechanical force	K3
CO-2	Examine the M-H curve and B-H curve	K4
CO-3	Adapt the concepts of Wheatstone network for the measurement of resistivity of a wire	K6
CO-4	Estimate the growth and decay of current in different circuits	K5
CO-5	Evaluate the expression for mutual induction between two coaxial solenoids	K5

Semester	Code			Title of the Course		Hours			Credit	
III	21UPH05			Electricity and Magnetism		6			5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔		✔	✔	✔	✔	
CO-2	✔	✔	✔	✔		✔	✔	✔	✔	
CO-3	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-4	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-5	✔	✔	✔	✔		✔	✔	✔	✔	
Number of Matches = 44 ; Relationship: Very High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. K. Karthikeyani Vijayakumari

Semester: III | Credits: 4

Hours/Week: 4 | Code: 21UPH06P

CORE COURSE VI: MAJOR PRACTICAL - II

General Objective: Apply the basic principles of heat, electricity, electronics and optics by doing the relevant experiments.

Course Outcomes:

The learners will be able to

On completion of the course the student will be able to

CO-1: Evaluate the specific heat capacity of the given liquid. (K5)

CO-2: Analyze the specific resistance using Meter Bridge and Carey Foster's Bridge. (K4)

CO-3: Perceive the ways to calibrate an ammeter using a potentiometer. (K5)

CO-4: Determine the refractive index of the material of the prism. (K5)

CO-5: Analyze the characteristics of junction and zener diodes. (K4)

(Any 10 Experiments to be done)

1. Specific heat capacity of a liquid - Joule's calorimeter.
2. Thermal conductivity of a bad conductor - Lee's Disc.
3. Specific heat capacity of a liquid - Newton's law of cooling.
4. Specific resistance - Meter Bridge.
5. Specific resistance - Carey Foster's Bridge
6. Laws of resistance - Carey Foster's Bridge
7. Internal Resistance - Potentiometer.
8. Ammeter calibration - Potentiometer.
9. Low range voltmeter - Potentiometer.
10. Refractive index of glass - Solid prism - Spectrometer.
11. Dispersive power of a prism – Spectrometer.
12. Characteristics of Junction Diode.
13. Characteristics of Zener Diode.
14. Study of Logic Gates using discrete components (AND, OR, NOT).
15. Full wave rectifier using diodes and RC filter circuit.

Course Designer: Dr. A. Janaki

Semester: III Credits: 2
Hours/Week : Code: 21UPHSS1

SELF STUDY COURSE I: APPLICATIONS OF PHYSICS

General Objective:

To recall the concepts of transmission of heat, Physics concepts in everyday life, applications of heat, air conditioning systems and global warming.

Course Objectives:

The learners will be able to

1. Examine the transmission of heat.
2. Discuss the concept of physics in everyday life.
3. Analyze the concept of ventilation and chimneys.
4. Elaborate the equipment used in the air-conditioning system.
5. Outline the effect of global warming.

UNIT I: Transmission of Heat

1.1 Thermometer
1.2 Thermo flask
1.3 Liquid thermometer
1.4 Refrigeration
1.5 Cooker - Rice cooker
1.6 Microwave oven.

UNIT II: Physics Concepts in Everyday Life

2.1 Introduction - Alarm clock
2.2 Steam iron
2.3 Ball point pen
2.4 Car sheet belt
2.5 Headphones/Earphones
2.6 Camera lens
2.7 Cell phones
2.8 Batteries - Doppler Radar.

UNIT III : Applications of Heat: 6 Hrs

3.1 Applications of conduction of heat
3.2 Applications of convection
3.3 Ventilation - Chimneys
3.4 Land and sea breezes – Application of heat radiation.

UNIT IV: Air Conditioning Systems: 6 Hrs

4.1 Factors affecting comfort air-conditioning – Equipment used in air-conditioning system
4.2 Classification – Central air-conditioning system – Industrial air-conditioning system.

UNIT V: Global warming: 6 Hrs

5.1 Weather
5.2 Ozone hole and role of Chloro Fluoro Carbons
5.3 Effect of global warming - Efforts to control global warming – Reduction of global warming
5.4 Greenhouse effect – Types.

Books for Study

1. Heat and Thermodynamics and Statistical Physics, Brijlal, Dr. N. Subrahmanyam and P. S. Hemne, S.Chand & Company Pvt. Ltd., New Delhi, 2014.

2. Solar Energy Utilisation, G.D. Rai, Khanna Publishers, New Delhi, 1993.

Books for Reference

1. A Textbook of Heat and Thermodynamics, J.B. Rajam & C.L. Arora, S. Chand & Company Pvt. Ltd., New Delhi, 1983.

Web Resources

1. https://instrumentationtools.com/liquid-in-glass-thermometer
2. https://en.wikipedia.org/wiki/Greenhouse_effect
3. https://ontime59.com/5-main-parts-air-conditioner/

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Demonstrate the transfer of heat	K2
CO-2	Apply the Physics concepts in every day life	K3
CO-3	Classify the application of heat	K4
CO-4	Explain the factors affecting air conditioning systems and categorize their classification	K5
CO-5	Discuss the Reduction of global warming	K6

Semester	Code			Title of the Course			Hours		Credit	
III	21UPHSS1			Application of Physics					2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-2	✔	✔	✔		✔	✔	✔	✔		✔
CO-3	✔	✔	✔			✔	✔	✔		
CO-4	✔		✔	✔	✔	✔		✔	✔	
CO-5	✔		✔	✔	✔	✔		✔	✔	✔
Number of Matches = 39 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs.R. Renuka

Semester: IV | Credits: 4
Hours / Week: 4 | Code: 21UPH07

CORE COURSE VII: OPTICS AND SPECTROSCOPY

General Objective: To study the concepts of reflection and refraction, interference of light, diffraction, polarization and spectroscopy.

Course Objectives:

The learners will be able to

1. Recall the phenomenon of reflection and refraction, lens system, aberration, methods of minimizing aberrations, Ramsden and Huygens eyepieces.
2. Summarize the concept of interference and diffraction.
3. Analyze the basics of polarization through double refraction, interpret the uses of Nicol prism as producer and analyser and determine the specific rotatory power of sugar solution using Laurent's half shade polarimeter.
4. Discuss the spontaneous and stimulated emission.
5. Classify the different types of spectroscopy and explain the concept of Raman effect on the basis of quantum theory.

UNIT I: Geometrical Optics:

1.1 Introduction – Geometrical Optics – Convex lens – Principal focus and focal planes – First principal focus

1.2 Refraction through thin lens - Power of a lens

1.3 Aberration in lenses - Spherical aberration - Methods of minimizing aberration - Aplanatic lens

1.4 Coma - Astigmatism and its minimization

1.5 Eyepiece - Huygene's eyepiece – Ramsden's eyepiece - Comparison of eyepiece.

UNIT II: Interference and Diffraction:

2.1 Interference – Theory of interference

2.2 Interference in thin films - Colours of thin films – Wedge shaped thin films – Michelson's Interferometer

2.3 Diffraction – Types of Diffraction – Zone plate - Plane transmission grating

2.4 Dispersive power of a grating - Resolving power of a grating

2.5 Comparison of prism and grating spectra.

UNIT III: Polarization:

3.1 Transverse nature of light – Double refraction - Huygens explanation of double refraction

3.2 Nicol prism – Nicol prism as an analyzer and polarizer

3.3 Elliptically and circularly polarized light – Production and detection

3.4 Quarter wave plate and half wave plate

3.5 Optical activity – Fresnel's explanation of optical activity - Laurent's half shade polarimeter.

UNIT IV: Laser Optics:

4.1 Spontaneous and stimulated emissions – Population inversion

4.2 Types of lasers – He-Ne laser - Ruby laser – Ga-As laser – Carbon dioxide Laser

4.3 Applications of holography

4.4 Maser – Ammonia Gas Maser – Applications of Maser.

UNIT V: Spectroscopy:

5.1 Types of spectra – Emission and absorption spectra – Continuous, band and line spectra

5.2 Solar spectrum – Fraunhofer lines

5.3 Raman effect – Quantum theory of Raman effect

5.4 Instrumentation – Basic theory of IR spectroscopy – Instrumentation – Applications of IR and Raman spectroscopy.

Books for Study

1. Optics and Spectroscopy, R.Murugeshan, S. Chand & Company Pvt. Ltd., New Delhi, 2014.
2. Modern Physics, R.Murugeshan, S. Chand & Company Pvt. Ltd., New Delhi, 2014.
3. □ □ □ □ , □. □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ , □ , 2002

Books for Reference

1. Optics, Ajoy Ghatak, Tata McGraw – Hill Publishing Company Limited, New Delhi, 1998.
2. Text book of Optics, N.Subramaniam and Brijlal, S. Chand & Company Pvt. Ltd., New Delhi, 1999.

Web Resources

1. https://www.photonics.com/Articles/Lens_Aberrations_Avoiding_Defects_in_Imagery/a25443
2. http://www.sfu.ca/phys/141/1134/Lectures/SP%20Lecture%2029%20-%20Interference&Diffraction.pdf
3. https://www.rfwireless-world.com/Articles/Laser-basics-and-Laser-types.html
4. http://www.chemistry.uoc.gr/lapkin/Infrared_and_Raman_Spectroscopy_Principles_and_Spectral_Interpretation.pdf

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Know the phenomenon of reflection and refraction, aberration, and eyepieces	K1
CO-2	Identify the concepts of interference and diffraction	K3
CO-3	Apply the theory of double refraction and optical activity	K3
CO-4	Analyze the types of laser and maser with its applications	K4
CO-5	Determine the theory and experimental techniques of IR and Raman spectroscopy	K5

Semester	Code		Title of the Course			Hours			Credit	
IV	21UPH07			Optics and Spectroscopy		4			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔			✔	✔	✔		
CO-2	✔	✔	✔			✔	✔	✔		
CO-3	✔	✔	✔			✔	✔	✔	✔	
CO-4	✔	✔	✔	✔		✔	✔	✔	✔	✔
CO-5	✔	✔	✔	✔		✔	✔	✔	✔	
Number of Matches = 36 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. A. Janaki

Semester: IV | Credits: 3

Hours / Week: 3 | Code: 21UPH08

CORE COURSE VIII: ENERGY PHYSICS

General Objective: To summarize the concepts of solar energy, wind energy, biomass energy and oceans thermal energy.

Course Objectives

The learners will be able to

1. Discuss solar energy storage systems.
2. Analyze the principles of wind energy conversion.
3. Outline biomass conversion and biogas generation.
4. Summarize ocean thermal electric power generation.
5. Explain the operation of fuel cells and their applications

UNIT I: Solar Energy Storage

1.1 Introduction – Solar energy storage systems - Thermal storage

1.2 Sensible heat storage - Electrical storage – Battery storage - Chemical energy storage – Hydrogen storage - Mechanical energy storage

1.3 Applications of solar energy.

UNIT II: Wind Energy

2.1 Basic principles of wind energy conversion – The nature of the wind – The power in the wind – Forces on the blades

2.2 Wind energy conversion

2.3 Site selection

2.4 Basic components of a wind energy conversion system (WECS)

2.5 Classification of WECS – Advantages and Disadvantages of WECS.

UNIT III: Biomass Energy

3.1 Biomass conversion Technologies – Thermo chemical conversion

3.2 Wet and dry processes

3.3 Photosynthesis – Photosynthesis efficiency

3.4 Biogas generation – Anaerobic digestion

3.5 Classification of Biogas plants.

UNIT IV: Energy from Oceans

4.1 Ocean thermal electric conversion (OTEC) – Methods of ocean thermal electric power generation – Energy from tides

4.2 Basic principle of tidal power – Components of tidal power plants - Operation

4.3 Methods of utilization of tidal energy storage

4.4 Advantages and limitation of tidal power generation.

UNIT V: Chemical Energy Sources

5.1 Design and principle of operation of a fuel cells

5.2 Fuel cells – Classification of fuel cells – Types of fuel cells

5.3 Applications of fuel cells

5.4 Batteries – Basic battery theory – Battery fundamental characteristics

5.5 Different types of battery arrangement – Advantages of batteries for bulk energy storage.

Books for Study

1. Non-Conventional Energy Sources, G.D. Rai, Khanna Publishers, New Delhi, 2013.
2. Solar Energy Utilisation, G.D. Rai, Khanna Publishers, New Delhi, 1993.
3. □ □ □□ □ □ , S.□□□□, R. □□ □□ □ □□□□ , □ , 2005. .

Books for Reference

1. Non-Conventional Energy Resources, B. H. Khan, Tata McGraw–Hill Publishing Company, New Delhi, 1992.
2. Solar Energy Principles of Thermal Collection and Storage Second Edition, S. P. Sukhatme, Tata McGraw–Hill Publishing Company, New Delhi, 2001.

Web Resources

1. https://en.wikipedia.org/wiki/Solar_thermal_energy
2. https://en.wikipedia.org/wiki/Biomass
3. https://www.britannica.com/technology/fuel-cell/Types-of-fuel-cells

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Classify solar energy systems and their applications	K2, K4
CO-2	Discuss the basic principle and experimental techniques of wind energy conversion system	K6
CO-3	Explain the concepts of biomass energy and its types	K5
CO-4	Utilize the principle of tidal power for the generation of power	K3
CO-5	Analyze the fuel cells and their applications	K4

Semester	Code		Title of the Course			Hours			Credit	
IV	21UPH08			Energy Physics		3			3	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-2	✔	✔	✔		✔	✔	✔	✔		✔
CO-3	✔	✔	✔		✔	✔	✔	✔		✔
CO-4	✔	✔	✔		✔	✔	✔	✔		✔
CO-5	✔	✔	✔		✔	✔	✔	✔		✔
Number of Matches = 42 ; Relationship: Very High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. D. Chandrika

Semester: IV Credits: 2

Hours/Week: 2 Code: 21UPHSEC1

SKILL ENHANCEMENT COURSE I: ELECTRICAL APPLIANCES

General Objective: To conceive the basics of automatic electric iron mixer and grinder, electric fan and fluorescent lamp, air conditioners and refrigerators , washing machines and house wiring

Course Objectives :

The learners will be able to

1. Recall the basics of Wiring requirements .
2. Classify Parts of a fan and Choke.
3. Summarize Parts of an A/C and refrigerator.
4. Explain the Automatic and semi automatic type machines.
5. Outline Fuse wire and working of a fuse.

UNIT I: Automatic Electric Iron Mixer and Grinder

1.1 Parts of an Automatic electric iron box – Heating arrangement – Thermostat – Wiring requirements – Non Sticking contact surface.

1.2 Parts of a mixer – Motor – RPM control – over load indicator.

1.3 Parts of a grinder – Motor – grinding arrangements – Troubleshooting.

UNIT II: Electric fan and Fluorescent lamp

2.1 Parts of a fan – Motor – Winding – Rotor and stator – Swing arrangement of a table fan – Uses of condenser and regulators.

2.2 Parts – Choke – Starter – Bulb – Wattage calculation – Luminous efficacy – Compact fluorescent lamp.

UNIT III: Air conditioners and Refrigerators

3.1 Parts of an A/C and refrigerator – Power supply – Compressor loads

3.2 Tonnage calculation – Location selection for installation.

UNIT IV: Washing Machines

4.1 Parts of a washing machine – Supply load

4.2 Water supply – Earthing

4.3 Automatic and semi automatic type machines

4.4 Motor speed control – Over load indication.

UNIT V: House Wiring

5.1 Single phase, two phase and three phase electrical supply – Neutral and line

5.2 Fuse wire and working of a fuse – Tripper

5.3 Switch installation – One way and two way switches

5.4 Plugs – Wiring for lamps and motors.

Books for Study

1. Basic shop practicals in Electrical Engineering, L.R. Hans and M.L. Anwani, Dhanpat Rai Co Pvt. Ltd., New Delhi, 2008.
2. Basics of Electrical and Electronics Engineering, A. Balakrishnan, T. Vasantha, M. Parasuram, N.V.Publication, Pollachi-1.

Books for Reference

1. Basic Electrical, Electronics and Computer Engineering , R. Muthusubramanian, S. Salivahanan, K.A. Muraleedharan , Tata McGra– Hill Publishing Company, New Delhi 2001.

Web Resources

1. https://en.wikipedia.org/wiki/Thermostat
2. https://azairconditioning.com/7-essential-elements-for-air-conditioner-oper ation/

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	outline the parts of an automatic electric iron box, mixture and grinder	K1
CO-2	Identify the parts of electric fan and lamp	K3
CO-3	Analyze the working of air conditioners and refrigerators	K4
CO-4	Explain the types and parts of working machine	K5
CO-5	Discuss the phase electrical supply	K6

Semester	Code			Title of the Course		Hours			Credit	
IV	21UPHSEC1			Electrical Appliances		2			2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1					✔	✔				
CO-2	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-3	✔	✔		✔	✔	✔	✔		✔	
CO-4	✔	✔	✔			✔	✔	✔		
CO-5	✔	✔				✔	✔	✔		✔
Number of Matches = 32 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. K. Renuka Devi

Semester: IV Credits: 2
Hours/Week : Code: 21UPHSS2

SELF STUDY COURSE II: ELECTRICITY AND ENERGY SOURCES

General Objective:

By studying this course to outline the theory of electrical measurements, heating effects of an electric current, practical application, conventional and Non-conventional energy sources.

Course Objectives:

The learners will be able to

1. Elaborate the basic knowledge of electrical quantities
2. Outline the heating effects on electric current.
3. Classify the single and polyphase.
4. Interpret the different types of cell.
5. Predict the different energy sources.

UNIT I: Electrical Measurements

1.1 Definitions – Potential difference – Volt – Electric current – Ampere - Resistance – Ohm -
1.2 Ohms law
1.3 Laws of resistance – Resistance in series – Resistance in parallel
1.4 Shunt.

UNIT II: Heating Effects of an Electric Current

2.1 Joule law of heat
2.2 Electric power – Electric energy – Electric heats – Electric force
2.3 Electric furnace – Electric filament lamp
2.4 Domestic electric circuit.

UNIT III: Practical Application

3.1 Choke
3.2 Transformer – Long distance transmission
3.3 Electric generators and motors – A.C. Generator and D.C Generator (Basic principle only) –
3.4 Motors
3.5 Single phase – Polyphase – Distribution of three phases AC
3.6 Star connection – Delta connection.

UNIT IV: Energy Sources - 1

4.1 Primary and secondary cells - Comparison
4.2 Cell and battery
4.3 Voltages and current of a cell
4.4 Types of dry cell - Cadmium zinc cell - Alkanes cell.

UNIT V: Energy Sources - 2

5.1 Mercury cell
5.2 Silver oxide cell
5.3 Lead acid cell
5.4 Testing dry cells
5.5 Photovoltaic cell
5.6 Solar cell - Construction and working - Characteristics and uses.

Books for Study

1. Electricity and Magnetism, R. Murugeshan, S. Chand & Company Pvt. Ltd., New Delhi, 2017.
2. Heat and Thermodynamics and Statistical Physics, Brijlal, Dr. N. Subrahmanyam and P. S. Hemne, S. Chand & Company Pvt. Ltd., New Delhi, 2014.

3. Basic Electronics, B.L. Theraja, S. Chand and Company Ltd., Delhi, 2008.

Books for Reference

1. Solar Energy Utilisation, G.D. Rai, Khanna Publishers, New Delhi, 1993.
2. Electricity and Magnetism, Brij Lal and N. Subrahmanyam, Ratan Prakashan Mandir, New Delhi, 1997.

Web Sources

1. https://www.khanacademy.org/science/high-school-physics/dc-circuits
2. https://www.elprocus.com/electric-generator-and-its-working
3. https://www.world-nuclear.org/nuclear-essentials

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Outline the basic electrical measurement	K2
CO-2	Apply heating effect an electric current in furnace and electric filament lamp	K3
CO-3	Distinguish the application of choke, transformer and motors	K4
CO-4	Explain cells and battery	K5
CO-5	Elaborate the function of different cell	K6

Semester	Code		Title of the Course			Hours			Credit	
IV	21UPHSS2			Electricity and Energy Sources					2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔			✔	✔	✔		
CO-2	✔	✔	✔	✔		✔	✔	✔	✔	
CO-3						✔	✔	✔		
CO-4	✔	✔	✔	✔		✔	✔	✔	✔	
CO-5			✔	✔		✔	✔		✔	✔
Number of Matches = 31 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. K. Renuka Devi

Semester: V | Credits: 5

Hours/Week: 5 | Code: 21UPH09

CORE COURSE IX: ELEMENTARY SOLID STATE PHYSICS

General Objective: To summarize the basic ideas of crystal structure, X-Ray diffraction, dielectrics, and superconductors.

Course Objectives:

The learners will be able to

1. Outline the concepts of crystal structure.
2. Discuss crystal defects.
3. Explain X-Ray diffraction methods.
4. Describe dielectric properties.
5. Analyze the fundamental properties of superconductors.

UNIT I: Crystal structure

1.1 Crystal lattice – Primitive and unit cells
1.2 Seven crystals system – Bravais lattice
1.3 Miller indices
1.4 Structure of crystals – Simple cubic, hexagonal close packed, FCC, BCC structures - NaCl, CsCl, Diamond structures
1.5 Types of bonds in Crystals – Ionic , Valence, metallic, Van der Waals and hydrogen bonding.

UNIT II: Defects in Crystal

2.1 Crystal imperfections
2.2 Classification of imperfections
2.3 Point defects
2.4 Line defects – Edge and screw dislocation
2.5 Surface defects – External and internal surface imperfection
2.6 Volume defects
2.7 Effect of crystal imperfection.

UNIT III: X–ray Diffraction

3.1 Diffraction of X–Rays by crystals – Bragg's Law in one dimension
3.2 Experimental methods - Laue and rotating crystal methods for single crystals – Powder photograph method – Diffraction intensities
3.3 Determination of unit cell constants.

UNIT IV: Dielectrics

4.1 Fundamental definitions
4.2 Electric polarization
4.3 Different types Frequency and temperature effects on polarization
4.4 Dielectric loss
4.5 Local field
4.6 Clausius-Mossotti relation
4.7 Dielectric breakdown – Determination of dielectric constant.

UNIT V: Superconductivity

5.1 Fundamentals - Qualitative explanation for the occurrence of

superconductivity

5.2 BCS Theory

5.3 General properties of superconductors – Critical currents – Meissner Effect

5.4 Thermal Properties – Entropy – Specific heat

5.5 Thermal conductivity – Energy gap – Isotope effect

5.6 Type I and type II superconductors – Applications of superconductors.

Books for Study

1. Materials Science, M. Arumugam, Anuradha Agencies, Kumbakonam, 2003.
2. Material Science and Engineering, V. Raghavan, Prentice Hall of India, New Delhi, 1990.
3. Material Science, R.S. Khurmi, R.S. Sedha, S.Chand & Company Pvt. Ltd., New Delhi, 2004.
4. □□ □ □□□□□□ □ □ , □. □□□□□□□□, □□□ □□□□ , □ , 2009.

Books for Reference

1. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern Limited, New Delhi, 1993.
2. Solid State Physics, M. Arumugam, Anuradha Agencies, Kumbakonam, 2004.

Web Resources:

1. https://en.wikipedia.org/wiki/Crystal_structure
2. https://www.sciencedirect.com/topics/physics-and-astronomy/laue-me thod
3. https://en.wikipedia.org/wiki/Superconductivity

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Explain the concepts of crystal structure and Classify the types of bonds in crystals	K1,K2
CO-2	Categorize the defects in crystals	K4
CO-3	Identify the diffraction pattern using experimental methods	K3
CO-4	Discuss the hypothesis of Dielectrics and local field	K6
CO-5	Outline the general properties of superconductors	K2

Semester	Code			Title of the Course		Hours			Credit	
V	21UPH09			Elementary Solid State Physics		5			5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-2	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-3	✔	✔	✔	✔		✔	✔	✔	✔	
CO-4	✔	✔	✔	✔		✔	✔	✔	✔	
CO-5	✔	✔	✔	✔		✔	✔	✔	✔	
Number of Matches = 44 ; Relationship: Very High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. S. Mugeshini

Semester: V | Credits: 5

Hours / Week: 5 | Code: 21UPH10

CORE COURSE X: ANALOG ELECTRONICS

General Objective: To recall the concepts of semiconductors, amplifiers and oscillators.

Course Objectives:

The learners will be able to

1. Outline the functions of PN junction in semiconductor electronics.
2. Explain the characteristics of Transistor.
3. Discuss the transistor amplifier, FET amplifier and power amplifier.
4. Recall the feedback amplifier and oscillators.
5. Analyze the working of an operational amplifier.

UNIT I: Diodes and Rectifiers

1.1 Semiconductors
1.2 PN junction diode - V-I characteristics of a PN junction diode
1.3 Zener diode - V-I characteristics of a Zener diode –
1.4 Tunnel diode
1.5 PIN diode
1.6 Light Emitting Diode
1.7 Rectifiers – Half-Wave Rectifier – Full Wave Rectifier.

UNIT II: Transistors and biasing techniques

2.1 Junction transistor structure - Working of a transistor - Transistor amplifying action
2.2 Transistor characteristics – CB and CE configurations
2.3 Comparison between CB and CE configurations
2.4 Basic CE amplifier circuit Selection of operating point
2.5 Need for bias stabilization - Requirements of a biasing circuit - Fixed bias - Voltage divider biasing circuit
2.6 Types of FET JFET - Working principle - Output characteristics - JFET parameters.

UNIT III: Amplifiers

3.1 Single stage (RC coupled amplifier) transistor amplifier - Frequency response
3.2 Analysis of two stages RC coupled amplifier
3.3 Emitter Follower
3.4 FET amplifier (CS)
3.5 Power amplifiers - Classification of power amplifiers – Class B Push pull amplifier.

UNIT IV: Feedback amplifiers and Oscillators

4.1 Concept of feedback in amplifiers
4.2 Types of feedback
4.3 Voltage gain of feedback amplifier
4.4 Advantages of negative feedback
4.5 Amplifier circuits with negative feedback
4.6 Positive feedback amplifier as an oscillator
4.7 LC oscillators
4.8 Hartley, Colpitts and RC oscillators (Phase shift oscillator).

UNIT V: Operational amplifier

5.1 Integrated circuits - Advantages and disadvantages
5.2 Operational amplifier - Differential amplifier
5.3 Basic circuit operation - Common mode and differential mode signals - Voltage gain –

CMRR - Slew rate

5.4 Schematic symbol of OP-AMP - Inverting amplifier - Non inverting amplifier – Adder and Subtractor - Integrator and differentiator.

Books for study

1. Principles of Electronics, V.K. Mehta and Rohit Mehta, S. Chand & Company Pvt. Ltd., New Delhi, 2013.
2. Basic Electronics-Solid State, B.L. Theraja, S.Chand & Company Pvt. Ltd., New Delhi, 2014.
3. □□ □ □□ , □. □□□□ □□□□ , □□□ □□□□ , □ , 2004.

Books for Reference

1. Basic Electronics and Linear Circuits, Bhargava N.N, Kulshreshtha D.C and S.C. Gupta, Tata McGraw- Hill Publishing Company Limited, 2007.
2. Electronics - Fundamentals and Applications Eleventh Edition, D. Chattopadhyay, P. C. Rakshit, New Age International Publishers, New Delhi, 2010.

Web Resources

1. https://en.wikipedia.org/wiki/Rectifier
2. https://www.electronics-tutorials.ws/amplifier/transistor-biasing.html
3. https://www.electronics-tutorials.ws/amplifier/amp_2.html
4. https://shrishailbhat.com/2019/06/06/basic-electronics-feedback-amplifier s-and-oscillators/
5. https://en.wikipedia.org/wiki/Operational_amplifier.

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Summarize the working, characteristics and applications of semiconductor diodes	K2
CO-2	Identify and classify the configuration of transistors	K3
CO-3	Demonstrate the concepts of power amplifier and categories the amplifiers	K2,K4
CO-4	Discuss the principles of feedback amplifiers and oscillators	K5
CO-5	Elaborate the working of operational amplifier and their applications	K6

Semester	Code			Title of the Course		Hours			Credit	
V	21UPH10			Analog Electronics		5			5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔		✔	✔	✔	✔	
CO-2	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-3	✔	✔	✔	✔		✔	✔	✔	✔	
CO-4	✔	✔	✔	✔		✔	✔	✔	✔	
CO-5	✔	✔	✔	✔		✔	✔	✔	✔	
Number of Matches = 42 ; Relationship: Very High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. S. Mugeshini

Semester: V | Credits: 5

Hours / Week: 5 | Code: 21UPH11

CORE COURSE XI: ATOMIC AND NUCLEAR PHYSICS

General Objective: To recall the concepts of atom model, atomic spectra, nuclear fission and fusion.

Course Objectives:

The learners will be able to

1. Support the vector atomic model with Stern Gerlach experiment.
2. Realize the concept of spectral lines and Zeeman Effect.
3. Explain the fundamentals of photoelectric effect and Compton effect.
4. Apprehend the properties of nucleus and their models.
5. Distinguish nuclear fission and fusion

UNIT I: Atom models

1.1 Vector atom model – Spatial quantization - Spinning electron
1.2 Quantum numbers
1.3 Coupling schemes
1.4 Pauli's exclusion principle
1.5 The periodic classification
1.6 Electronic configuration of elements
1.7 Magnetic dipole moment – Orbital and spin motions
1.8 Bohr magneton
1.9 Experimental confirmation of the vector atom model – Stern and Gerlach experiment.

UNIT II: Atomic spectra

2.1 Optical spectra - Spectral terms – Spectral notations
2.2 Selection rules – Fine structure of sodium D line – Hyperfine structure
2.3 Zeeman effect – Lorentz theory – Expression for Zeeman shift
2.4 Larmor's theorem
2.5 Quantum mechanical explanation of normal Zeeman effect
2.6 Anomalous Zeeman effect - Explanation – Lande's 'g' factor - Measurement of atomic magnetic moment
2.7 Paschen Pack effect
2.8 Stark effect

UNIT III: Photoelectric and Compton effects

3.1 Photoelectric effect – Lenard, Richardson and Compton experiments
3.2 Laws of photoelectric emission – Einstein's photoelectric equation
3.3 Millikan's experiment – Determination of Planck's constant
3.4 Photo-emissive cell – Photo-voltaic cell – Photoconductive cell – Photomultiplier
3.5 Compton effect Theory - Experimental verification

UNIT IV: Nuclear structure and models

4.1 Classification of nuclei
4.2 General properties of nucleus - Size – Charge – Mass – Nuclear Moments - Measurement of nuclear radius
4.3 Binding Energy
4.4 Semi empirical mass formula
4.5 Nuclear stability

4.6 Packing fraction
4.7 Liquid drop model – Shell model.

UNIT V: Nuclear fission, fusion and detectors

5.1 Nuclear Fission: Types - Energy released in fission – Bohr and Wheeler theory - Chain reaction – Atom Bomb – Nuclear reactor.
5.2 Nuclear fusion: Source of Stellar energy - Carbon-Nitrogen cycle – Proton–Proton cycle – Thermonuclear reactions – Hydrogen bomb – Controlled thermonuclear reaction
5.3 Nuclear Detectors
5.4 Proportional counter – G.M counter.

Books for Study

1. Modern Physics, R. Murugeshan and Kiruthiga Sivaprasath, S. Chand & Company Pvt. Ltd., 2014.
2. Modern Physics, Arul Dhas, K. Ilangovan, MJP Publishers, Chennai, Ist Edition, 2012.
3. □ □ □□ □ □ , □. □□□□ □□□□, K. □ □ & N. □ □□□□, □□ □ □ □□□ , □ , 2009.

Books for Reference

1. Modern Physics, J.B. Rajam, S. Chand & Company Pvt. Ltd., New Delhi, 1980.
2. Concepts of Modern Physics, S. L. Gupta & S. Gupta, Dhanpat Rai & Sons, New Delhi, 1992.
3. Nuclear Physics, D. C. Tayal, Himalayan Publication house, Bombay, 1980.

Web Resources

1. https://www.sciencedirect.com/topics/mathematics/vector-model
2. https://en.wikipedia.org/wiki/Zeeman_effect
3. https://www.britannica.com/science/photoelectric-effect
4. https://en.wikipedia.org/wiki/Nuclear_structure
5. https://www.jagranjosh.com/general-knowledge/nuclear-fission-and-nuclear-fusion-1458720673-1

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Outline vector atom model and Periodic classification	K2
CO-2	Recall the optical spectra and elaborate normal and anomalous Zeeman effect	K1,K6
CO-3	Analyze the laws of photoelectric and compton effects	K4
CO-4	Summarize the general properties of nucleus and their models	K2
CO-5	Distinguish nuclear fission and fusion	K4

Semester	Code			Title of the Course		Hours			Credit	
V	21UPH11			Atomic and Nuclear Physics		5			5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔			✔	✔	✔		
CO-2	✔	✔	✔	✔		✔	✔	✔	✔	
CO-3	✔	✔	✔		✔	✔	✔	✔		✔
CO-4	✔	✔	✔	✔		✔	✔	✔	✔	
CO-5	✔	✔	✔	✔		✔	✔	✔	✔	
Number of Matches = 40 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. D. Chandrika

Semester: V | Credits: 4

Hours / Week: 4 | Code: 21UPH12P

CORE COURSE X: MAJOR PRACTICAL - III

General Objective: To obtain practical knowledge in various topics in General Physics and Electronics.

Course Outcomes:

On completion of the course the student will be able to

CO1. Determine the refractive index of the prism using a spectrometer. (K6)
CO2. Examine the calibration of the Potentiometer. (K4)
CO3. Estimate the figure of merit of BG. (K6)
CO4. Measure the Q factor in resonance circuits. (K5)
CO5. Design oscillator and amplifier circuits. (K5)
CO6. Develop Operational amplifier circuits. (K5)

(Any 10 experiments to be done)

1. i – d curve – Spectrometer.
2. Grating – Normal incidence – Spectrometer.
3. Dispersive power of Grating – Spectrometer.
4. Newton's ring – Refractive index (μ).
5. Calibration of high range voltmeter - Potentiometer.
6. Field along the axis of a coil – Magnetic Moment.
7. Figure of merit of a Ballistic Galvanometer.
8. e/m - Thomson method.
9. Young's Modulus uniform bending – Koening's method.
10. Series resonance circuit.
11. Parallel resonance circuit.
12. Transistor Characteristics – CB configuration.
13. FET – Characteristics.
14. Hartley oscillator.
15. FET amplifier.
16. Adder and subtractor - Operational amplifier.

Course Designer: Dr. M. Ragamathunnisa

Semester: V | Credits: 4
Hours / Week: 4 | Code: 21UPHME1

ELECTIVE COURSE I: PROGRAMMING IN C

General Objective: To comprehend the fundamentals of C, operators, control statements, arrays, functions, arrays and pointers.

Course Objectives:

The learners will be able to

1. Outline the fundamental concepts of C language.
2. Classify the operators and control statements.
3. Summarize arrays, strings and functions.
4. Explain the basic functions of structures and pointers.
5. Recall the basics of algorithms, flow charts.

UNIT I: Fundamentals

1.1 Importance of C – Basic structure of C
1.2 Character set - Keywords and identifiers
1.3 Constants – Variables - Data types
1.4 Declarations of variables – Assigning values to variables
1.5 Defining symbolic constants
1.6 Input output operators – Reading a character (getchar) - Writing a character (putchar) Formatted input and formatted output.

UNIT II: Operators and Control Statements

2.1 Operators and expressions - Arithmetic, relational, logical, assignment, increment and decrement, conditional, bitwise, special operators
2.2 Arithmetic expressions – Precedence of arithmetic operators - Precedence and associativity
2.3 Control Statements - Decision making with if, if-else, else-if ladder, switch, goto, while, do, for and continue statements.

UNIT III: Arrays and Functions

3.1 Arrays - One-dimensional and two-dimensional arrays - Declaration and initialization - Character strings - Declaration and initialization - String handling functions.
3.2 Functions – Definition and declaration - Return values and their types – Calling a function – Types of functions – Recursion – Functions with arrays.

UNIT IV: Structures and Pointers

4.1 Structures – Definition – Initialization - Arrays of structures – Arrays within structures - Union.
4.2 Pointers – Declaring and initializing pointers – Accessing a pointer – Pointer arithmetic – Pointers and arrays – Pointers and character strings.

UNIT V: Programs

5.1 Development of algorithms, flowchart and program for the following problems: Conversion of Celsius to Fahrenheit / Fahrenheit to Celsius
5.2 Arranging the numbers in ascending order
5.3 Finding the largest and smallest number in an array - 1's complement and 2's complement
5.4 Solving a quadratic equation

5.5 Factorial of a number
5.6 Arranging words in alphabetical order.

Books for Study

1. Programming in ANSI C, E. Balagurusamy, Tata McGraw Hill, VII Edition, New Delhi, 2017.
2. Schaum's Outline of Theory and Problems of Programming with C, Byron S. Gottfried, Tata McGraw Hill, New Delhi, 2003.

Books for Reference

1. Programming with C, K.R. Venugopal and R.P. Sudep, Tata McGraw Hill, New Delhi, 1998.

Web Resources

1. https://www.tutorialspoint.com/cprogramming/c_program_structure.htm
2. https://cppguide.readthedocs.io/en/latest/cpp/control.html
3. https://www.educba.com/array-functions-in-c/
4. https://dev.to/mikkel250/structures-and-pointers-in-c-n6i

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Outline the fundamental concepts of C	K2
CO-2	Categorize the types of expressions and decision making statements	K4
CO-2	Discuss constants, variable and data types	K6
CO-3	Illustrate the functions of arrays and functions	K2
CO-4	Explain the importance of structures, union and pointers	K5
CO-5	Develop simple programs	K3

Semester	Code			Title of the Course		Hours			Credit	
V	21UPHME1			Programming in C		4			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔		✔	✔	✔	✔		✔
CO-2	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-3	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-4	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-5	✔	✔	✔			✔	✔	✔		
Number of Matches = 44 ; Relationship: Very High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. G. Amudha

Semester: V | Credits: 2
Hours / Week: 2 | Code: 21UPHSEC2

SKILL ENHANCEMENT COURSE II: COMMUNICATION SYSTEMS

General Objective: To understand the basic ideas of radio communication, satellite communication, fiber optic, mobile communication and internet.

Course Objectives:

The learners will be able to

1. Recall the concepts of radio wave propagation in radio communication.
2. Outline the basics of satellite communication.
3. Explain the elements of optical fiber transmission link.
4. Summarize the mobile communication.
5. Study the essentials of wireless communication and the usage of the internet.

UNIT I: Radio Communication

1.1 Transmitter
1.2 Modulation
1.3 Propagation of waves – Surface, space and sky waves
1.4 Amplitude modulation – Frequency modulation – Phase modulation
1.5 Receivers.

UNIT II: Satellite Communication

2.1 Introduction – Classification of satellites
2.2 Geostationary orbit
2.3 Satellite Launching
2.4 Application of satellite
2.5 Indian satellite in 20th century.

UNIT III: Fiber Optic Communication System

3.1 Introduction – Concept of light
3.2 EM Spectrum
3.3 Critical angle
3.4 Total internal reflection in optical fiber
3.5 Fiber optic communication system.

UNIT IV: Mobile Communication

4.1 Cellular Phone : Basics and signal transmission
4.2 GSM
4.3 Mobile service
4.4 Wifi – 3G & 4G Bluetooth (Basic idea).

UNIT V: Internet

5.1 INTERNET (Basic ideas)
5.2 Search engines
5.3 EMAIL (Basic ideas)
5.4 Blogs
5.5 Twitter – Whatsapp – Facebook.

Books for Study

1. Dennis Roddy & John Coolen-Electronic Communication, 3rd Edition, Reston Publishing Company (1984).

Books for Reference

1. Kumar R, Communication Systems, Anuradha Agencies, Educational Publishers, Kumbakonam.

Web Resources

1. https://www.britannica.com/technology/radio-technology
2. https://www.tutorialspoint.com/satellite_communication/satellite_communication
3. https://en.wikipedia.org/wiki/Fiber-optic_communication
4. https://www.javatpoint.com/mobile-communication-tutorial
5. https://en.wikipedia.org/wiki/Internet

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Recall modulation and its types	K1
CO-2	Summarize satellite communication	K2
CO-3	Analyze the basic elements of optical fiber transmission link	K4
CO-4	Explain the concept of mobile communication	K5
CO-5	Discuss the basic ideas of EMAIL , Blogs, Twitter, Whatsapp and Facebook.	K6

Semester	Code			Title of the Course		Hours			Credit	
V	21UPHSEC2			Communication Systems		2			2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔		✔	✔	✔	✔			✔
CO-2	✔	✔		✔		✔	✔		✔	
CO-3	✔	✔		✔	✔	✔	✔		✔	✔
CO-4	✔	✔		✔		✔	✔		✔	
CO-5	✔	✔		✔	✔	✔	✔			✔
Number of Matches = 36 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. A. Dhanalakshmi

Semester: V | Credits: 2
Hours / Week: | Code: 22UPHSEC3

SKILL ENHANCEMENT COURSE III: SOFT SKILLS DEVELOPMENT

General Objective: Today's world is all about relationships, communication and presenting oneself, one's ideas and the company in the most positive and impactful way. This course intends to enable students to achieve excellence in both personal and professional life.

Course Objectives :

The learners will be able to

1. Outline developing positive attitude.
2. Classify the interpersonal relationship.
3. Discuss the Art of listening
4. Identify etiquette and mannerism.
5. Analyze Goal setting

Unit I: Know Thyself/ Understanding Self

1.1 Introduction to Soft skills
1.2 Self discover
1.3 Developing positive attitude
1.4 Improving perceptions
1.5 Forming values

Unit II: Interpersonal Skills/ Understanding Others

2.1 Developing interpersonal relationship
2.2 Team building
2.3 group dynamics
2.4 Net working
2.5 Improved work relationship

Unit III: Communication Skills / Communication with others

3.1 Art of listening
3.2 Art of reading
3.3 Art of speaking
3.4 Art of writing - Art of writing e-mails - e mail etiquette

Unit IV: Corporate Skills / Working with Others

4.1 Developing body language
4.2 Practising etiquette and mannerism
4.3 Time management
4.4 Stress management

Unit V: Selling Self / Job Hunting

5.1 Writing resume/cv
5.2 interview skills
5.3 Group discussion
5.4 Mock interview - Mock GD
5.5 Goal setting
5.6 Career planning

Books for Study

1. Development of Soft Skills (Soft Skills : A Road Map to Success), Meena.K and V.Ayothi , P.R. Publishers & Distributors, Tiruchirappalli, 2013.

Books for Reference

1. Soft Skills – Know Yourself & Know the World, Alex K. S.Chand & Company LTD, Ram Nagar, New Delhi 2012.

Web Resources

1. https://www.clarke.edu/campus-life/health-wellness/counseling/articles-advice/developing-a-positive-attitude/
2. https://www.mindtools.com/pages/article/Body_Language.htm
3. https://www.softwaretestinghelp.com/how-to-crack-the-gd/
4. https://harappa.education/harappa-diaries/career-planning-and-itsimportance

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Demonstrate the concepts of self discover	K2
CO-2	Explain the concepts of Team building	K5
CO-3	Analyze the Art of writing e-mails and e-mail etiquette	K4
CO-4	Outline Time management and Stress management	K2
CO-5	Distinguish Mock interview and Mock GD	K6

Semester	Code			Title of the Course		Hours		Credit		
V	21UPHSEC3			Communication Systems		2		2		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	
CO-1	✔	✔	✔	✔	✔	✔	✔				
CO-2	✔	✔		✔		✔	✔		✔	✔	✔
CO-3	✔	✔		✔	✔	✔	✔		✔		
CO-4	✔	✔		✔		✔	✔		✔		
CO-5	✔	✔		✔	✔	✔	✔				
Number of Matches = 36 ; Relationship: High											

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. A. Dhanalakshmi

Semester: VI Credits: 5

Hours/Week: 6 Code: 21UPH13

CORE COURSE XIII: DIGITAL ELECTRONICS

General Objective: To recall the concepts of number systems, logic gates, combinational and sequential systems.

Course Objectives:

The learners will be able to

1. Distinguish analog and digital signals and be aware of basic terminology.
2. Classify the number systems and binary arithmetic operations.
3. Explain the fundamental ideas about Boolean algebra.
4. Discuss various combinational digital circuits using logic gates.
5. Categorize the flip flops and registers.

UNIT I: Digital principles

1.1 Definitions for digital signals – Digital waveforms – Voltage levels – Switching time – Period and frequency – Duty cycle

1.2 Digital logic – Buffer – Inverter – AND gate – OR gate - Moving and storing digital Information

1.3 Digital operations

1.4 Digital ICs – Digital IC signal levels.

UNIT II: Number systems

2.1 Decimal, binary, octal, hexadecimal number systems

2.2 Inter conversions – One's and two's complement – Signed binary numbers

2.3 Arithmetic operations – Addition, subtraction, multiplication and division – Binary subtraction using 1's and 2's complements

2.4 Binary Codes - BCD code, Gray code – Code conversions..

UNIT III: Digital logic and Boolean algebra

3.1 Basic gates (NOT, OR, AND)

3.2 Universal logic gates - NAND and NOR

3.3 Bubbled AND gate – Bubbled OR gate

3.4 De-Morgan's Theorems – Positive and negative logic

3.5 Basic laws and Boolean algebra - Reduction of Boolean expressions using Boolean laws -

3.6 Fundamental products – Sum of products (SOP) and Product of Sums (POS) - Minterms - Maxterms

3.7 Karnaugh maps (Three and four variable)

3.8 Simplification using SOP and POS.

UNIT IV: Combinational digital Systems

4.1 Half and full adders

4.2 Half and full subtractors

4.3 Parallel binary adder/ Subtractor – Two's complement adder / subtractor circuits

4.4 Decoder (3 to 8 line decoder circuit) – Encoder – Multiplexer (81) – Demultiplexer (18)

4.5 A/D conversion – Successive approximation method – D/A conversion – Binary weighted resistor method and R-2R ladder method.

UNIT V: Sequential digital Systems

5.1 Flip flop – RS – clocked RS – T and D flip flops - JK flip flop - Master slave flip flop

5.2 Counters – Four bit asynchronous ripple counter – Mod 10 counter - Synchronous counter

– Three bit parallel binary counter – Ring counter

5.3 Digital Clock

5.4 Shift registers – Serial in serial out and serial in parallel out shift registers.

Books for Study

1. Digital Principles and Applications, Albert Paul Malvino, Donald P.Leach, Tata McGraw-Hill, New Delhi, 1986.
2. Donald P. Leech , Albert Paul Malvino, Goutam Saha, Digital Principles and Applications, 7th Ed., Tata-Mcgraw Hill Education Private Limited, New Delhi, 2011.
3. □ □ □ □□□ □□□□ , □□□ . □□□□□, □. □□□□ □□□□ □□□□□□□□□ □□□ □□□ , □□ □□.

Books for Reference

1. Digital Electronics, M. Vijayendran, V. Viswanathan, Printers & Publishers Pvt. Ltd., Chennai, 2007.

Web Resources

1. https://tutorialsinhand.com/tutorials/digital-electronics-tutorial/digital-electronics-basics/digital-waveform-and-characteristics.aspx
2. https://blog.oureducation.in/number-system-in-digital-electronics/
3. https://www.allaboutcircuits.com/textbook/digital/chpt-7/demorgans-theor_ems/
4. https://en.wikipedia.org/wiki/Adder_(electronics)
5. https://www.electronics-tutorials.ws/counter/count_3.html

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Summarize the concepts of digital signals, digital waveforms and digital operations	K2
CO-2	Explain the various number systems and arithmetic operations	K5
CO-3	Design and Solve Boolean expressions using boolean laws and K Map	K6
CO-4	Build different combinational circuits using logic gates	K3
CO-5	Analyze the sequential digital circuits like flip flops, counters and registers	K4

Semester	Code			Title of the Course		Hours			Credit	
VI	21UPH13			Digital Electronics		6			5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔		✔	✔	✔	✔		✔	✔
CO-2	✔	✔	✔			✔	✔	✔		
CO-3	✔	✔	✔	✔		✔	✔	✔	✔	
CO-4	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-5	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Number of Matches = 42 ; Relationship: Very High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. G. Amudha

Semester: VI Credits: 5

Hours / Week: 5 Code: 21UPH14

CORE COURSE XIV: CLASSICAL AND WAVE MECHANICS

General Objective: To summarize the basic ideas of the system of particles, equation of motion, wave nature of matter, postulates of wave mechanics and the applications of Schrodinger's equations.

Course Objectives:

The learners will be able to

1. Analyze conservation laws and constraints.
2. Discuss the wave nature of matter and uncertainty principle.
3. Realize the concept of wave mechanics.
4. Apply Schrodinger's equation in different problems.
5. Recall the concepts of relativity and relate the idea of space, mass and time.

UNIT I: Classical Mechanics

1.1 Mechanics of a single particle - System of particles
1.2 Statement of theorem of conservation of linear momentum, angular momentum and energy
1.3 Basic Concepts - Degrees of freedom
1.4 Constraints – Classification
1.5 Generalized coordinates.

UNIT II: Wave nature of Matter

2.1 Matter waves – de Broglie wavelength
2.2 Wave velocity and group velocity – Relation between them
2.3 Experimental study of matter waves - Davisson and Germer's experiment
2.4 G.P. Thomson's experiment
2.5 Heisenberg's Uncertainty principle
2.6 Electron microscope.

UNIT III: Schrodinger's Equation

3.1 Basic postulates of wave mechanics
3.2 Quantum Operators – Angular momentum operators
3.3 Schrodinger's equation – Time-dependent form and steady-state form
3.4 Properties of wave function
3.5 Eigenfunctions and Eigenvalues.

UNIT IV: Applications of Schrodinger's Equation

4.1 The particle in a box
4.2 Wave functions
4.3 The barrier penetration problem
4.4 Linear harmonic oscillator
4.5 Eigenvalues and wave functions
4.6 Hydrogen atom (one dimension).

UNIT V: Relativity

5.1 Frame of reference - Galilean transformation and invariance
5.2 Michelson-Morley experiment
5.3 Postulates of special theory of relativity
5.4 Lorentz transformation equations
5.5 Length contraction and time dilation

5.6 Applications to meson decay - Relativity of simultaneity

5.7 Addition of velocities – Variation of mass with velocity – Mass-Energy equivalence and its physical significance.

Books for Study

1. Modern Physics, R. Murugeshan and Er. Kiruthiga Sivaprasath , S. Chand & Company Pvt. Ltd., New Delhi, 2016.
2. Classical Mechanics, S.L. Gupta, Kumar and K.V. Sharma, Pragati Prakashan, Meerut, 2003.
3. □ □□□□ , □. □□□□ □□□□, K. □ □□□□, □□ □ □□□ , □ , 2013.

Books for Reference

1. Modern Physics, J.B. Rajam, S. Chand &Company Ltd., New Delhi, 1980.
2. Classical Mechanics, Hilbert Goldstein, Charles Poole and John Safko, Pearson Education Pvt. Ltd., 2003.
3. Classical Mechanics, J.C. Upadhya, Himalaya Publishing House, ISO 9001, 2016.

Web Resources

1. https://en.wikipedia.org/wiki/Angular_momentum
2. https://en.wikiversity.org/wiki/De_Broglie_wavelength
3. http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/schr.html
4. https://www.britannica.com/science/twin-paradox

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Outline the basic concepts of classical Mechanics	K2
CO-2	Discuss the matter waves and charge of an electron using different experiments	K6
CO-3	Explain the basic postulates of wave mechanics and develop Schrodinger's equation	K4
CO-4	Apply Schrodinger's equation to solve simple problems	K5
CO-5	Recall the frame of reference and intercept the special theory of relativity	K1,K5

Semester	Code			Title of the Course		Hours			Credit	
VI	21UPH14			Classical and Wave Mechanics		5			5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔		✔	✔	✔	✔	
CO-2	✔	✔	✔			✔	✔	✔		
CO-3	✔	✔	✔	✔		✔	✔	✔	✔	
CO-4	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-5	✔	✔	✔	✔		✔	✔	✔	✔	
Number of Matches = 40 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. R. Renuka

Semester: VI Credits: 5

Hours / Week: 6 Code: 21UPH15P

CORE COURSE XI: MAJOR PRACTICAL - IV

General Objective: To design various electronic circuits using IC and Programming in C and in Microprocessor 8085.

Course Outcome:

On completion of the course the student will be able to

CO-1. Design Universal gate, Multiplexer and Demultiplexer. (K6)

CO-2. Construct a Digital comparator using XOR gate. (K6) CO-

3. Examine De Morgan's theorems using basic gates (K4)

CO-4. Assess the largest and smallest 8-bit number using Microprocessor 8085. (K5)

CO-5. Formulate 8-bit addition and 8-bit subtraction using Microprocessor 8085. (K5)

CO-6. Develop simple program using C. (K5)

Section – A (Digital Electronics)

(Any 6 experiments to be done)

1. NAND as Universal gate.
2. NOR as Universal gate.
3. Verification of De Morgan's theorems using basic gates.
4. Half Adder using basic gates.
5. Half subtractor using basic gates.
6. Study of Multiplexer using IC.
7. Study of Demultiplexer using IC.
8. 2–bit Digital comparator using XOR gate.
9. Study of JK flip flop (IC 7473).

Section – B (Programming using Microprocessor 8085)

(Any 3 experiments to be done)

10. 8-bit addition and 8-bit subtraction.
11. 8–bit multiplication and 8-bit division.
12. Biggest number among the given list.
13. Smallest number among the given list.
14. 1's Complement and 2's Complement of an 8-bit number.
15. Sum of a series of 8-bit numbers.

Section – C (Programming in C language)

(Any 3 experiments to be done)

16. Conversion- Celsius to Fahrenheit / Fahrenheit to Celsius.
17. Arranging words in alphabetical order.
18. Finding the largest and smallest of a set of numbers.
19. 1's Complement & 2's Complement.
20. Solving a quadratic equation.
21. Arranging the numbers in ascending order.

Course Designer: Mrs. R. Renuka

Semester: VI | Credits: 4

Hours / Week: 5 | Code: 21UPHME2

ELECTIVE COURSE II: INTRODUCTION TO MICROPROCESSOR – 8085

General Objective: To create basic knowledge about INTEL 8085 microprocessor.

Course Objectives:

The learners will be able to

1. Summarize the various forms of semiconductor memories.
2. Outline the basic concept of microprocessor 8085.
3. Classify the different types of instructions and addressing modes.
4. Discuss interrupts, memory interface and timing diagram.
5. Make use of instruction sets to solve simple assembly language programs.

UNIT I : Semiconductor memories

1.1 Semiconductor Memory – RAM – ROM – PROM – EPROM – EEPROM
1.2 Magnetic Memory – Magnetic Tape – Hard disks - Floppy Disks
1.3 Optical memory – CD ROM –CD-RW – DVD.

UNIT II : Architecture of 8085

2.1 8085 microprocessor Architecture
2.2 CPU, Timing and control unit
2.3 Registers, ALU
2.4 Flags
2.5 Address bus - Data and Address bus
2.6 Control and status signals
2.7 Pin configuration - Functions of different pins.

UNIT III : Instruction set

3.1 Assembly language
3.2 Machine language
3.3 Types of instructions Instruction set of 8085 - Data transfer, arithmetic, logic, branching and machine control group of instructions
3.4 Addressing modes - Register, register indirect, direct, immediate and implied addressing modes.

UNIT IV: Interrupts and Interfacing

4.1 Interrupts in 8085 - hardware and software interrupts
4.2 RIM and SIM instructions
4.3 Memory interface - Interfacing ROM and RAM interface
4.4 Timing diagram of 8085 instructions (MOV Rd, Rs - MVI data8)

UNIT V: Assembly language programs

5.1 Simple programs – Addition, Subtraction, Multiplication and Division (8-bit numbers only)
5.2 1's complement and 2's complement of an 8-bit number
5.3 Largest number in a data array – Smallest number in a data array -
5.4Ascending and descending order.

Books for Study:

1. Fundamentals of Microprocessor and Microcomputers, B. Ram, Dhanpat Rai Publications (P) Ltd., New Delhi, 2009.
2. Fundamentals of Microprocessor 8085, V. Vijayendran, S. Viswanathan, (Printers & Publishers) Pvt. Ltd., Chennai, 2012.
3. [illegible]

Books for Reference

1. Microprocessor Architecture, Programming, and Applications with the 8085 (5th Edition), Ramesh Gaonkar, Penram International Publishing (India) Pvt. Ltd., Mumbai, 2006.
2. Digital Electronics, M. Vijayendran, S. Viswanathan, (Printers & Publishers) Pvt. Ltd., Chennai, 2012.

Web Resources

1. https://lecturenotes.in/subject/22/microprocessor-and-microcontrollermpmc
2. https://www.ic.unicamp.br/~pannain/mc404/aulas/pdfs/Art%20Of%20Int_el%20x86%20Assembly.pdf

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Summarize the various forms of semiconductor memories	K2
CO-2	Elaborate the architecture and pin configuration of microprocessor 8085	K6
CO-3	Explain the instructions set and addressing modes	K5
CO-4	Examine the Timing diagrams	K4
CO-5	Develop simple assembly language programs.	K3

Semester	Code			Title of the Course		Hours			Credit	
VI	21UPHME2			Introduction to Microprocessor - 8085		5			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO -1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-2	✔	✔	✔			✔	✔	✔		
CO-3	✔	✔	✔	✔		✔	✔	✔	✔	
CO-4	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-5	✔	✔	✔			✔	✔	✔		
Number of Matches = 40 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. R. Bhuvaneswari

Semester:VI Credits: 4
Hours/Week:5 Code: 21UPHME3

ELECTIVE COURSE III: PHYSICS OF MATERIALS

General Objective: To summarize the dielectric materials, ceramic materials, modern engineering materials, optical material and optoelectronic devices.

Course Objectives:

The learners will be able to

1. Outline the properties of dielectrics.
2. Discuss the ceramic materials.
3. Identify the modern engineering materials.
4. Summarize the optical materials.
5. Classify the optoelectronic devices.

UNIT I: Dielectric Materials

1.1 Dielectrics - Definitions - Types of dielectrics
1.2 Ferroelectric materials - Properties - Applications
1.3 Types of electric polarization
1.4 Ionic Clausius-Mossotti equation.

UNIT II: Ceramic Materials

2.1 Introduction - Functional and structural classification of ceramics – Structure of ceramics
2.2 Cesium chloride, rock salt, zinc blende, and silicate structures (Ortho, Pyro and Meta silicates)
2.3 Mechanical properties and electrical properties of ceramic phases – 2.4Applications of ceramics.

UNIT III: Modern Engineering Material

3.1 Introduction – Polymers – Types – Properties
3.2 Plastics – Types – Rubbers – Properties
3.3 Super strong materials – Types – High temperature and Thermoelectric materials.

UNIT IV: Optical Material: 15 Hrs

4.1 Introduction - Optical absorption in metals, semiconductors and insulators
4.2 Display devices and materials
4.3 Fluorescence and phosphorescence
4.4 Different phosphors used in CRT screen.

UNIT V: Optoelectronic Devices

5.1 Photo diode
5.2 Photo transistor
5.3 Photo conductors – Photo conductivity - Photo conducting materials
5.4 Light Emitting Diode (LED)
5.5 Liquid Crystal Display (LCD) – Advantages and disadvantages
5.6 Comparison between LED and LCD displays.

Books for Study

1. Materials Science, M. Arumugam, Anuradha Agencies, Kumbakonam, 2003.
2. Solid State Physics-Structure and Properties of Materials, M. A. Wahab., Narosa Publishing House, New Delhi, 2014.

Books for Reference

1. Materials Science, Dr. S. Jayakumar, R.K. Publishers, Coimbatore, 2003.
2. Materials Science and Processes, S. K. Hajra Choudhury, Indian Book Distributing Company, Calcutta, 2003.

Web Resources

1. https://www.elprocus.com/optoelectronics-devices-with-their-applications
2. https://en.wikipedia.org/wiki/Ceramic
3. https://www.vedantu.com/physics/dielectric-properties

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Outline the types of dielectrics and their applications	K2
CO-2	Categorize the ceramic materials and their properties	K4
CO-3	Discuss the Modern Engineering Materials based on their properties	K6
CO-4	Explain optical absorption in materials	K5
CO-5	Identify the types of opto electronic devices	K3

Semester	Code	Title of the Course	Hours	Credit
VI	21UPHME3	Physics of Materials	5	4

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔		✔	✔	✔	✔		
CO-2	✔	✔	✔		✔	✔	✔	✔		✔
CO-3	✔	✔			✔	✔	✔			
CO-4	✔	✔		✔	✔	✔	✔		✔	✔
CO-5	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Number of Matches = 40 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. K. Renuka Devi

Semester: III | Credits: 3

Hours / Week: 6 | Code: 21UAP1

ALLIED COURSE I: ALLIED PHYSICS - I

(For B. Sc. Mathematics and Chemistry Main)

General Objective: To study the basics of properties of matter, optics, hydrostatics, hydrodynamics and sound.

Course Objectives:

The learners will be able to

1. Explain the center of gravity of different material bodies.
2. Comprehend the nature of simple harmonic motion and realize the principles of ultrasonics and its applications.
3. Identify the requisites for a good auditorium.
4. Recall the different moduli of elasticity, surface tension and viscosity.
5. Analyze the basic concepts of conduction and radiation.
6. Outline the principles of UV and IR radiations.

UNIT I: Mechanics

1.1 Centre of gravity – Solid hemisphere, hollow hemisphere and solid cone –

1.2 Floating bodies – laws of floating bodies - Stability of floating bodies -

1.3 Metacentre – Determination of metacentric height of a ship.

UNIT II: Sound

2.1 Simple harmonic motion – Composition of two simple harmonic motions along a straight line and at right angles to each other

2.2 Ultrasonics – Production – Piezoelectric oscillator – Properties and applications of ultrasonic waves

2.3 Acoustics of buildings - Reverberation and Reverberation time Sabine's formula

2.4 Factors affecting the acoustics of buildings – Requisites for good auditorium.

UNIT III: Properties of Matter

3.1 Elasticity – Modulus of elasticity – Poisson's ratio – Relations connecting them

3.2 Surface tension - Definition - Dimension – Determination of surface tension by drop weight method

3.3 Viscosity - Coefficient of viscosity and its dimension - Rate of flow of liquid in a capillary tube

3.4 Poiseuille's formula – Viscosity of liquid - Variable pressure head method.

UNIT IV: Thermal Physics

4.1 Newton's law of cooling – Verification – Specific heat capacity of a liquid by cooling – Calorific value of a fuel

4.2 Bomb calorimeter

4.3 Conduction - Thermal conductivity – Good and bad conductors - Lee's disc method

4.4 Stefan's law of radiation – Solar Constant – Angstrom's pyrheliometer – Temperature of the sun.

UNIT V: Optics

5.1 UV and IR Sources – Production, detection, properties and applications of UV and IR radiations

5.2 Theory of Raman effect – Experimental study and applications of Raman effect

5.3 Fiber optic communication – Optical fiber – Numerical aperture – Coherent bundle – Fiber optic communication system – Fiber optic sensors (Temperature sensor only).

Books for Study

1. Allied Physics - Paper – I, A. Sundaravelusamy, Priya Publications, Karur, 2013.
   □□ □ □ □□□□ – I, □. □□□□ □□□□, □□□ □ □□□ , □ , 2013.

Books for Reference

1. Dynamics, M. Narayanamurti and N. Nagaratnam, The National Publishing Company, Madras, 2002.
2. Statics, Hydrostatics and Hydrodynamics - M.Narayanamurti and N. Nagaratnam, The National Publishing Company, Madras, 2002.
3. Optics and Spectroscopy , R. Murugeshan, S. Chand & Company Pvt. Ltd., New Delhi, 2012.
4. Properties of Matter, R.Murugeshan, S. Chand & Co., New Delhi, 2011.
5. Heat and Thermodynamics, Brijlal and Subrahmaniam, S. Chand & Company Pvt. Ltd., New Delhi, 2008.

Web Resources

1. https://courses.washington.edu/me354a/chap3.pdf
2. https://ncert.nic.in/ncerts/l/keph202.pdf
3. https://vlab.amrita.edu/?sub=1&brch=194&sim=353&cnt=1 Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Apply the center of gravity for the determination of material bodies	K3
CO-2	Summarize the properties of sound and the production of ultrasonics	K2
CO-3	Evaluate the modulus of elasticity, viscosity and surface tension of liquids by different methods	K5
CO-4	Apply the knowledge of transmission of heat for the determination of thermal conductivity of the materials	K3
CO-5	Examine the types of radiations, Raman effect and fiber optic communication	K4

Semester	Code	Title of the Course	Hours	Credit
III	21UAP1	ALLIED PHYSICS - I	6	3

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔		✔	✔	✔	✔	✔			✔
CO-2	✔	✔	✔	✔	✔	✔		✔	✔	
CO-3	✔		✔	✔	✔	✔		✔	✔	✔
CO-4			✔		✔	✔	✔	✔	✔	
CO-5	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Number of Matches = 39 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. K. Rajakumari

Semester: IV Credits: 3

Hours / Week: 5 Code: 21UAP2

ALLIED COURSE II: ALLIED PHYSICS - II

(For B.Sc. Mathematics and Chemistry Main)

General Objective : To study the basics of electrostatics, electricity, atomic physics, nuclear physics and digital electronics.

Course Objectives:

The learners will be able to

1. Recall the basics of electrostatics and the principle of capacitors.
2. Analyze the phenomena of electricity in the Wheatstone network.
3. Examine the laws of electromagnetic induction.
4. Elaborate the characteristics of X-rays and its applications.
5. Outline the basics of nuclear physics.
6. Relate the concept of digital electronics in constructing universal gates.

UNIT I: Electrostatics

1.1 Coulomb's law - Mechanical force on the surface of a charged conductor - Electrostatic energy in the medium

1.2 Formation of cloud on charged particle

1.3 Principle of a condenser - Capacity of a capacitor - Capacity of an isolated sphere - Capacity of a spherical and cylindrical capacitors

1.4 Energy of a charged capacitor

1.5 Sharing of charges and loss of energy due to sharing.

UNIT II: Electricity

2.1 Kirchoff's laws - Application to Wheatstone bridge – Carey foster's bridge - Variation of Resistance with temperature

2.2 Laws of electromagnetic induction - Expression for induced EMF - Definition of self and mutual induction - Self and mutual inductance of a solenoid

2.3 Coefficient of coupling

2.4 L by Rayleigh's method.

UNIT III: Atomic Physics

3.1 Atom models – Sommerfield atom model - Vector atom model – Quantum numbers in vector atom model

3.2 Pauli's exclusion principle

3.2 X-rays – Continuous and characteristic X-rays

3.3 Moseley's law and its importance

3.4 Bragg's law

3.5 Miller indices

3.6 Determination of crystal structure - Laue's and powder photographic methods.

UNIT IV: Nuclear Physics

4.1 Nucleus – Nuclear size – Charge – Mass - Spin – Nuclear models - Liquid drop - shell models

4.2 Types of nuclear reactions - Elementary particles and their classification

4.3 Particle detectors – Cloud chamber - Bubble chamber Photographic emulsion technique.

UNIT V: Digital Electronics

5.1 Number system – Decimal, binary, octal and hexadecimal number system - Binary

arithmetic - Addition and Subtraction only

5.2 Basic logic gates - AND, OR, NOT, NOR and NAND gates – NOR and NAND gate as Universal gates

5.3 Boolean algebra - Laws of Boolean algebra - De Morgan's theorem.

Books for Study

1. Allied Physics - Paper - II, A. Sundaravelusamy , Priya Publications, Karur, 2011.

□□ □□ □□□ - II, □. □□□□ □□□□, □□□ □□□ , □ , 2011..

Books for Reference

1. Electricity and Magnetism, R.Murugeshan, S. Chand & Co., New Delhi, 2011.
2. Modern Physics, R. Murughesan, S.Chand & Co, New Delhi, 2011.
3. Digital Principles and Applications, Albert Paul Malvino, Donald P.Leach, Tata McGraw-Hill, New Delhi, 1986.

Web Resources

1. https://www.toppr.com/ask/en-in/question/define-electric-capacity-derivean-expression-for-the-capacitance-of/
2. https://www.electronics-tutorials.ws/electromagnetism/electromagnetic-ind uction.html
3. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
4. https://byjus.com/physics/nuclear-physics/

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Apply Coulomb's theorem for the determination of electrical intensity and mechanical force	K3
CO-2	Adapt the concepts of Wheatstone network for the measurement of resistivity of a wire	K6
CO-3	Explain vector atom model, Bragg's law, Miller Indices and crystal structure	K2, K5
CO-4	Discuss nuclear properties and categorize particle detectors	K6
CO-5	Solve Boolean expressions using Boolean laws	K6

Semester	Code	Title of the Course	Hours	Credit
IV	21UAP2	ALLIED PHYSICS - II	5	3

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔		✔		✔	✔			✔	
CO-2	✔	✔	✔	✔	✔	✔		✔	✔	✔
CO-3	✔		✔	✔	✔	✔	✔	✔	✔	✔
CO-4		✔	✔		✔	✔	✔	✔		✔
CO-5	✔	✔	✔			✔	✔	✔	✔	✔
Number of Matches = 38 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. K. Rajakumari

Semester: IV | Credits: 3

Hours / Week: 4 | Code: 21UAP3P

ALLIED COURSE III: ALLIED PHYSICS PRACTICAL

(For B.Sc. Mathematics and Chemistry Main)

General Objective: To apprehend the basics of properties of matter, sound, electricity and electronics by doing related experiments.

Course Outcomes:

On completion of the course the student will be able to

CO-1: Measure the viscosity and surface tension of liquids. (K5)

CO-2: Estimate the specific resistance of a wire using a meter bridge. (K5)

CO-3: Verify the laws of the sonometer. (K5)

CO-4: Determine the specific heat capacity of the given liquid. (K5)

CO-5: Analyze the characteristics of diodes and logic gates. (K4)

(Any 15 Experiments)

1. Surface tension - Method of drops
2. Interfacial surface tension – Method of drops
3. Coefficient of viscosity – Variable pressure head method
4. Comparison of Viscosities – Variable pressure head method
5. Thermal conductivity of a bad conductor - Lee's disc method
6. Verification of I and II laws - Sonometer
7. Determination of frequency - Sonometer
8. Specific heat capacity of a liquid – Newton's law of cooling
9. Verification of laws of resistances - Metre bridge
10. Specific Resistance - Metre bridge
11. Characteristics of Junction diode
12. Characteristics of Zener diode

Course Designer: Mrs. K. Rajakumari

Semester: III Credits: 3

Hours / Week: 6 Code: 22UAPCS1

APPLIED COURSE I: APPLIED PHYSICS - I

(For B.Sc. Computer Science Main)

General Objective: To apprehend the characteristics and functions of various electronic elements such as diode, transistor and operational amplifier.

Course Objectives:

The learners will be able to

1. Outline the functions of PN junction in semiconductor electronics.
2. Identify the special devices based on their characteristics and function.
3. Explain the characteristics of Transistor and FET.
4. Recall the basics of optoelectronic devices.
5. Analyze the working of an operational amplifier.

UNIT I: Diodes and Rectifiers

1.1 Intrinsic and extrinsic semiconductors

1.2 PN junction diode – Characteristics – Zener diode – Characteristics

1.3 Rectifiers - Half wave, full wave and bridge rectifiers using semiconductor diodes

1.4 Ripple factor

1.5 Filters - LC filters.

UNIT II: Special devices

2.1 Tunnel diode

2.2 Varactor diode – Applications

2.3 Uni Junction Transistor – Characteristics – Advantages

2.4 SCR – Characteristics – SCR as a switch -

2.5 TRIAC – DIAC – Characteristics.

UNIT III: Transistors

3.1 PNP and NPN transistors - Transistor characteristics of CE and CB configurations – Transistor as amplifier

3.2 FET - n-channel and p-channel FET – Principle and working of FET - Characteristics - FET amplifier (common source).

UNIT IV: Opto electronic devices

4.1 Photo devices – Photoconduction – Photodiode – Characteristics – Phototransistors – Characteristics

4.2 Digital clock

4.3 Seven segment display (LED) – Advantages

4.4 Liquid crystal display (LCD) – Types of LCD.

UNIT V: Operational amplifier

5.1 The basic operational amplifier – Inverting and non inverting operational amplifier - Differential operational amplifier – Op amp characteristics – CMRR

5.2 Adder, subtractor, integrator and differentiator

5.3 D/A converter - Ladder method – A/D converter – Successive approximation method.

Book for Study

1. Applied Physics paper - II, A. Sundaravelusamy, Priya Publications, Karur, 2016.
2. Basic Electronics-Solid State, B. L. Theraja , S. Chand & Company Pvt. Ltd., New Delhi, 2010.

Books for Reference

1. Principles of Electronics (Edition-XI), V. K. Mehta, S.Chand & Company Pvt. Ltd., New Delhi, 2013.

Web Resources

1. http://cau.ac.kr/~jjang14/IEEE/Chap9.pdf
2. https://www.electrical4u.com/applications-of-op-amp/
3. https://byjus.com/physics/characteristics-of-a-transistor/
4. https://www.electronics-tutorials.ws/transistor/tran_5.html

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Explain the functions of diodes and rectifiers	K2, K5
CO-2	Elaborate the working of special devices like UJT, SCR,TRIAC and DIAC	K6
CO-3	Examine the characteristics of Transistor and FET	K4
CO-4	Discuss the functions of opto electronic devices	K6
CO-5	Develop the D/A converter and A/D converter using operational amplifier	K3

Semester	Code	Title of the Course	Hours	Credit
III	21UAPCS1	APPLIED PHYSICS - I	6	3

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔		✔		✔	✔		✔	✔
CO-2			✔	✔		✔	✔		✔	✔
CO-3	✔	✔		✔	✔	✔	✔		✔	✔
CO-4		✔	✔	✔		✔	✔	✔	✔	
CO-5	✔	✔	✔			✔	✔	✔		✔
Number of Matches = 35 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. N. Rajeswari

Semester: IV | Credits: 3

Hours / Week: 5 | Code: 21UAPCS2

APPLIED COURSE II: APPLIED PHYSICS - II

(For Computer Science Main)

General Objective: To apprehend the basics of electrostatics, magnetostatics and electricity.

Course Objectives:

The learners will be able to

1. Recall the basics of electrostatics.
2. Summarize the properties of magnetic materials.
3. Analyze the phenomena of electricity in the Wheatstone network.
4. Recall and analyze the laws of electromagnetic induction.
5. Compare the flow of currents in A.C and D.C circuits.

UNIT I: Electrostatics

1.1 Fundamentals of electrostatics – Coulomb's law – Electric field and lines of force – Electric field strength – Electric flux

1.2 Gauss theorem – Electric field intensity due to a charged sphere

1.3 Electric potential – Potential at a point due to a point charge – Relation between potential and field .

UNIT II: Magnetostatics

2.1 Fundamental definitions – Magnetic potential – Magnetic potential at a point due to a single isolated pole – Potential due dipole – Relation between magnetic potential and intensity

2.2 Magnetic shell – Potential at a point due to magnetic shell – Magnetic properties of materials

2.3 Dia, para and ferro magnetic substances.

UNIT III: Current Electricity

3.1 Laplace's law – Magnetic field intensity due to long straight conductor – Magnetic field intensity at a point on the axis of a solenoid

3.2 Ohm's law – Kirchhoff's law – Wheatstone's bridge – Carey foster's bridge

3.3 Potentiometer Measurement of current and resistance - Calibration of low range voltmeter.

UNIT IV: Electromagnetic Induction

4.1 Faraday's laws of electromagnetic induction – Self induction – Expression for self inductance of a solenoid – Rayleigh's method of finding self inductance of a coil

4.2 Mutual inductance - Coefficient of mutual inductance – Expression for the mutual inductance between two coaxial solenoids - Coefficient of coupling – Determination of mutual inductance between a pair of coils.

UNIT V: Alternating Currents

5.1 AC circuits with single components – Resistance, Inductance and capacitance – AC circuits with double components – LR and RC – Power in a pure resistive circuit, inductive circuit and capacitive circuit

5.2 Wattless current

5.3 AC circuit having L, C and R - Series and parallel resonance circuits.

Books for Study

1. Applied Physics Paper-I, A. Sundaravelusamy, Priya Publications, Karur, 2014.
2. Electricity and Magnetism, R. Murugeshan, S.Chand & Company Pvt. Ltd., New Delhi, 2017.

Books for Reference

1. Electricity and Magnetism, Brij Lal and N. Subrahmanyam, Ratan Prakashan Mandir, New Delhi, 1997.

Web Resources

1.https://www.electronics-tutorials.ws/electromagnetism/electromagnetic-ind uction.html
2.https://physicswithpradeep.files.wordpress.com/2013/04/electrostatics.pdf
3.https://www.tcd.ie/Physics/research/groups/magnetism/files/lectures/500 6/5006-2.pdf
4.https://byjus.com/physics/current-electricity/

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Apply Gauss theorem and Coulomb's theorem for the determination of electrical intensity and mechanical force	K3
CO-2	Examine the potential of magnetic shell	K4
CO-3	Adapt the concepts of Wheatstone network for the measurement of resistivity of a wire	K6
CO-4	Evaluate the expression for self and mutual induction	K5
CO-5	Discuss the series and parallel resonance circuits	K6

Semester	Code	Title of the Course	Hours	Credit
IV	21UAPCS2	APPLIED PHYSICS - II	5	3

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔		✔	✔	✔	✔	✔	
CO-2	✔	✔	✔			✔	✔	✔		✔
CO-3	✔	✔	✔			✔	✔	✔	✔	
CO-4	✔	✔	✔			✔	✔	✔		✔
CO-5		✔	✔		✔	✔	✔	✔		✔
Number of Matches = 36 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. N. Rajeswari

Semester: IV | Credits: 3

Hours / Week: 4 | Code: 21UAPCS3P

APPLIED COURSE III: APPLIED PHYSICS PRACTICAL

(For B.Sc. Computer Science Main)

General Objective: To apprehend the role of various components in electronic circuits and to build basic circuits such as diodes, operational amplifiers, logic gates and transistors.

Course Outcomes:

On completion of the course the student will be able to

CO-1: Analyze the characteristics of diodes, FET and transistor (K4).

CO-2: Construct rectifier circuit using diodes (K3).

CO-3: Determine the functions of logic gates (K5).

CO-4: Examine the characteristics of Op amp (K4).

CO-5: Perceive the ways to calibrate a low range voltmeter using potentiometer (K5).

(Any 10 experiments to be done)

1. Characteristics of Junction diode
2. Characteristics of Zener diode
3. Characteristics of a FET
4. Transistor characteristics – CE configuration
5. Bridge rectifier - semiconductor diodes
6. Zener regulated power supply
7. Logic gates using discrete components
8. Logic gates using IC's
9. Demorgan's Theorems
10. NAND as Universal gate
11. NOR as Universal gate
12. Operational amplifier - adder and subtractor

Course Designer: Mrs. N. Rajeswari

Semester: V | Credits: 2

Hours / Week: 2 | Code: 21UPHNME1

NON MAJOR ELECTIVE COURSE I: ELECTRICAL POWER

(Non - Major Elective)

General Objective: To recall the concepts of Electrical power, power station, load, energy sources and tariff.

Course Objectives:

The learners will be able to

1. Classify the different types of electrical power.
2. Analyze the concept of a power station.
3. Outline the principle of power.
4. Elaborate the energy sources.
5. Examine the principle of tariff

UNIT I: Electrical Power

1.1 Sources of electrical energy

1.2 Conventional methods of power generation Fuel - Water power - Nuclear power

1.3 Non conventional methods of power generation - solar power - Wind power - Tidal power.

UNIT II: Power Station

2.1 Hydroelectric power station - Classification of hydroelectric plant Thermal power - Advantages and disadvantages - Choice of site of thermal power station

2.2 Nuclear power station

2.3 Comparison of hydel, thermal and nuclear power plant

UNIT III: Power and Load

3.1 Principles and types of Cogeneration

3.2 Diesel power

3.3 Gas power

3.4 Grid Load curves - Load duration curve - Important terms and factor - Diversity of load - Diversity factor - Significance of load factor.

UNIT IV: Energy Sources

4.1 Basic principle of solar energy

4.2 Grid connected solar PV system Advantages and disadvantages - Standalone PV system

4.3 Hybrid solar PV system - Photovoltaic diesel hybrid system

4.4 Solar wind hybrid system - Application of solar energy

4.5 Wind power plant.

UNIT V: Tariff

5.1 Tariff design - Types of tariff - Simple tariff - Flat rate tariff - Block rate tariff - Two part tariff - Maximum demand tariff - Power factor tariff - Three part tariff

5.2 Base and peak Load -

5.3 Load despatching centre.

Books for Study

1. Generation Transmission and Switcher, T. Balakrishnan, T. Vasantha, N.V. Publications, Pollachi, 1984
2. Solar Energy Utilisation, G.D. Rai, Khanna Publishers, New Delhi, 1999.

Books for Reference

1. Non-Conventional Energy Resources, B. H. Khan, Tata McGraw–Hill Publishing Company, New Delhi, 2007.
2. Solar Energy Principles of Thermal Collection and Storage Second Edition, S. P. Sukhatme, Tata McGraw–Hill Publishing Company, New Delhi, 2001

Web Resources

1. https://en.wikipedia.org/wiki/Nuclear_power
2. https://vikaspedia.in/energy/energy-basics/sources-of-energy
3. https://circuitglobe.com/electricity-tariffs.html

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Describe the conventional and nonconventional methods of power generation	K1
CO-2	Discuss the different types of power station	K2
CO-3	Explain the principles and types of power generation	K5
CO-4	Summarize the basic principle of solar energy	K2
CO-5	Identify solar PV system	K3
CO-6	Categorize the tariff	K4

Semester	Code	Title of the Course	Hours	Credit
V	21UPHNME1	ELECTRICAL POWER	2	2

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔		✔	✔	✔	✔	✔	
CO-2	✔	✔	✔			✔	✔	✔		✔
CO-3	✔	✔	✔			✔	✔	✔	✔	
CO-4	✔	✔	✔			✔	✔	✔		✔
CO-5		✔	✔		✔	✔	✔	✔		✔

Number of Matches = 36 ; Relationship: High

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. D. Chandrika

Semester: VI Credits: 2
Hours/Week: 2 Code: 21UPHNME2

NON MAJOR ELECTIVE COURSE II: ESSENTIALS OF ELECTRONICS

(Non - Major Elective)

General Objective: To apprehend the basics of modulation, communication system, satellite communications, integrated circuit and semiconductor memories.

Course Objectives :

The learners will be able to

1. Recall the basics of modulation.
2. Explain the propagation of radio waves.
3. Outline of satellite communication.
4. Summarize integrated circuits.
5. Classify semiconductor memories.

UNIT I: Modulation and Demodulation

1.1 Modulation - Methods of modulation - Amplitude modulation - Frequency modulation - Modulation index.

1.2 Demodulation - Comparison between AM and FM.

UNIT II: Communication Systems

2.1 Radio communication

2.2 Radio transmitter

2.3 Antenna

2.4 Propagation of radio waves - Skip distance – Maximum usable frequency.

UNIT III: Satellite Communication

3.1 Satellite orbits – Geostationary orbit – Geosynchronous orbit

3.2 Basic components of satellite communication system

3.3 Constructional features of satellites

3.4 Satellite communication in India.

UNIT IV: Integrated Circuits

4.1 Integrated Circuit – Advantages and disadvantages of integrated circuits

4.2 IC Classification

4.3 Making Monolithic IC

4.4 Fabrication of components on Monolithic IC.

UNIT V: Semiconductor Memories

5.1 Semiconductor Memory – RAM – ROM – PROM – EPROM – EEPROM

5.2 Magnetic Memory

5.3 Floppy Disks

5.4 Optical Disks

5.5 CD-ROM.

Books for Study

1. Principles of Electronics, V.K. Mehta and Rohit Mehta, S. Chand & Company Pvt. Ltd., New Delhi, 2013.
2. Principles of Communication Engineering, Anokh Singh, A.K. Chhabra, S. Chand & Company Pvt. Ltd., 2006.

Books for Reference

1. Basic electronics and linear circuits, Bhargava N.N, Kulshreshtha D.C and S.C Gupta, Tata McGraw- Hill Publishing Company Limited, 2007.
2. Basic Electronics-Solid State, B.L. Theraja, S.Chand & Company Pvt. Ltd.,

New Delhi, 2014.

Web Resources

1. https://en.wikipedia.org/wiki/Modulation
2. https://en.wikipedia.org/wiki/Integrated_circuit
3. https://en.wikipedia.org/wiki/Communications_satellite

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Classify the modulation and demodulation	K2
CO-2	Discuss the radio communications	K6
CO-3	Identify the basic components of satellite communication system	K3
CO-4	Analyze advantages and disadvantages of integrated circuits	K4
CO-5	Explain the function of various semiconductor memories.	K5

Semester	Code	Title of the Course	Hours	Credit
VI	21UPHNME2	ESSENTIALS OF ELECTRONICS	2	2

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔		✔	✔	✔	✔	✔	
CO-2	✔	✔	✔			✔	✔	✔		✔
CO-3	✔	✔	✔			✔	✔	✔	✔	
CO-4	✔	✔	✔			✔	✔	✔		✔
CO-5		✔	✔		✔	✔	✔	✔		✔
Number of Matches = 36 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. D. Chandrika

Semester: V Credits: 4
Hours/Week: 4 Code:

ELECTIVE COURSE : STATISTICAL METHODS

General Objective: To recall the concepts of positive ray, photon, radioactivity, particle accelerators, cosmic rays and elementary particles.

Course Objectives:

The learners will be able to

1. Summarize the mean, median and mode.
2. Realize the concept of dispersion.
3. Outline the types of correlation and regression.
4. Classify events in probability.
5. Distinguish probability distribution.

UNIT I: Measures of Averages

1.1 Bar diagram
1.2 Pie diagram
1.3 Arithmetic mean – Geometric mean – Harmonic mean
1.4 Median – Quartiles - Mode – Relationship among mean, median and mode.

UNIT II: Measure of Dispersion

2.1 Range
2.2 Quartile deviation – Mean deviation – Relative measure - Standard deviation
2.3 Coefficient of variation
2.4 Skewness – Bowley's coefficient of skewness – Pearson's coefficient of skewness
2.5 Kurtosis – Measures of Kurtosis.

UNIT III: Correlation and Regression

3.1 Positive correlation – Negative correlation – No correlation – Simple correlation
3.2 Scatter diagram
3.3 Numerical value of the correlation coefficient – Rank correlation
3.4 Karl Person's formula
3.5 Spearman's rank correlation
3.6 Properties of correlation coefficient
3.7 Regression.

UNIT IV: Probability

4.1 Definition – Trial and event – Exhaustive events – Favourable events – Mutually exclusive events – Equally likely events – Independent events – Complementary events
4.2 Addition theorem of probability – Multiplication theorem
4.3 Conditional probability
4.4 Bayes theorem.

UNIT V: Probability distribution

5.1 Moments - Definition of r^{th} momen
5.2 Definition of Binomial distribution – First three moments of Binomial distribution
5.3 Definition of Poisson's distribution – First three moments of Poisson's distribution
5.4 Normal distribution – Properties of normal curve.

Books for Study

1. Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor,

S. Chand & Company Pvt. Ltd., New Delhi, 2008.
2. Business Mathematics and Statistics, P.R. Vittal, Margham Publications, Chennai, 2004.
3. Statistical Methods, S.P. Gupta, S. Chand & Company Pvt. Ltd., New Delhi, 2008.

Books for Reference

1. Statistics, R. S. N.Pillai and Bagavathi, S. Chand & Company Pvt. Ltd., New Delhi, 2009.
2. Computer Oriented Numerical Methods and Statistical Methods, M.S. Lakshminarayanan, Trichy, Publications.

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Determine mean, median and mode	K5
CO-2	Evaluate deviation, variation and Skewness	K6
CO-3	Categorize the types of correlation	K4
CO-4	Discuss events and Addition theorem of probability	K6
CO-5	Outline the probability distribution	K2

Semester	Code		Title of the Course			Hours			Credit	
V			STATISTICAL METHODS			4			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔	✔	✔	✔	✔	✔	
CO-2						✔	✔	✔		
CO-3	✔	✔				✔	✔	✔		
CO-4	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-5	✔	✔	✔			✔	✔	✔		
Number of Matches = 34 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. K. Renuka Devi

Semester: VI Credits: 4
Hours/Week: 5 Code:

ELECTIVE COURSE : MODERN PHYSICS

General Objective: To recall the concepts of positive ray, photon, radioactivity, particle accelerators, cosmic rays and elementary particles.

Course Objectives:

The learners will be able to

On completion of the course the learner will

1. Summarize the uses of spectrographs.
2. Realize the concept of alpha, beta and gamma rays.
3. Explain the types of accelerators.
4. Apprehend the primary and secondary cosmic rays.
5. Distinguish elementary particles.

UNIT I: Positive Rays and Photon

1.1 Discovery – Properties of positive rays – Bainbridge's mass spectrograph – Dempster's mass spectrograph – Uses of mass spectrograph – Mass defect and packing fraction.

1.2 Photon – Wave duality – Photons and gravity – Gravitational redshift – Rest mass of a photon.

UNIT II: Radioactivity

2.1 Discovery – Natural radioactivity - Alpha, beta and Gamma rays – Properties of alpha, beta and gamma rays

2.2 Law of radioactive disintegration – Mean life – Measurement of decay constant

2.3 Law of successive disintegration

2.4 Biological effects of nuclear radiations.

UNIT III: Particle accelerators

3.1 Introduction – Linear accelerator

3.2 Cyclotron

3.3 Betatron

3.4 Synchrocyclotron

3.5 Synchrotrons – Electron Synchrotron – Proton Synchrotron.

UNIT IV: Cosmic Rays

4.1 Discovery – Latitude effect – Azimuth effect – Altitude effect

4.2 Primary and secondary cosmic rays – Cosmic rays showers

4.3 Discovery of positron

4.4 Origin of cosmic rays.

UNIT V: Elementary Particles

5.1 Classification

5.2 Particles and antiparticles

5.3 Antimatter

5.4 Fundamental interactions

5.5 Conservation laws and symmetry.

Books for Study

1. Modern Physics, R. Murugeshan and Kiruthiga Sivaprasath, S. Chand & Company Pvt. Ltd., New Delhi, 2008.

2. Nuclear Physics, D. C.Tayal, Himalayan Publication House, Bombay, 1980.
3. □ □ □□ □ □ , □. □ □ □ □ □ □ □ □K. □ □ □ & N.□ □ □ □ □ □ □ □ □ □ □ □ □ □ , □ , 2011.
4. □ □□ □ □ , □. □ □ □ □ □ □ □ □ □K.□ □ □ & M. □ □ □ □ □ , □ □ □ □ □ □ □ □ , □ , 2011.

Books for Reference

1. Modern Physics, J.B. Rajam, S. Chand & Company Pvt. Ltd., New Delhi, 1980.
2. Concepts of Modern Physics, S. L. Gupta & S. Gupta, Dhanpat Rai & Sons, New Delhi, 1992.

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Explain the working of mass spectrograph and Gravitational red shift	K5
CO-2	Identify the law of radioactive disintegration and successive disintegration	K3
CO-3	Categorize the Particle accelerators	K4
CO-4	Discuss the Primary , secondary cosmic rays and Origin of cosmic rays.	K6
CO-5	Outline the Conservation laws and Symmetry	K2

Semester	Code		Title of the Course			Hours			Credit	
VI			MODERN PHYSICS			5			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-2	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-3	✔	✔				✔	✔	✔		
CO-4	✔	✔	✔			✔	✔	✔		
CO-5	✔	✔	✔			✔	✔	✔		
Number of Matches = 37 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Dr. K. Renuka Devi

Semester: Credits: 2
Hours/Week: 2 Code: 21UPHNME1

NM ELECTIVE COURSE I: SOLAR ENERGY UTILIZATION

(Non - Major Elective)

General Objective: To summarize the concepts of energy sources, solar energy collectors, chemical energy sources, wind energy and biomass energy.

Course Objectives

1. Recall the solar energy sources.
2. Classify the types of solar energy collectors.
3. Analyze the principles of wind energy conversion.
4. Outline biomass conversion and biogas generation.
5. Explain the operation of fuel cells and their applications.

UNIT I: Energy Sources

1.1 Conventional energy sources
1.2 Fossil fuels
1.3 Water power
1.4 Nuclear power
1.5 Non-Conventional sources – Solar energy – Applications of solar energy .

UNIT II: Solar Energy Collectors

2.1 Solar collector
2.2 Greenhouse effect
2.3 Solar air heaters – Applications of solar air heaters – Advantages of flat plate collector
2.4 Flat plate Collector (Basic principle only) - Focusing collector (Basic principle only) – Comparison between flat plate collector and focusing collector.

UNIT III: Wind Energy

3.1 Basic principles of wind energy conversion – The nature of the wind
3.2 Wind energy conversion – Small producers – Large producers
3.3 Site selection considerations
3.4 Basic components of a wind energy conversion system (WECS)
3.5 Classification of WECS systems – Advantages and Disadvantages of WECS.

UNIT IV: Biomass Energy

4.1 Biomass - Resources of biomass
4.2 Biomass conversion technologies – Biomass conversion - Thermochemical conversion
4.3 Wet and dry processes
4.4 Photosynthesis – Photosynthesis efficiency
4.5 Biogas generation – Anaerobic digestion – Advantages of anaerobic digestion.

UNIT V: Chemical Energy Sources

5.1 Fuel cells – Design and Principle
5.2 Hydrogen fuel cells
5.3 Classification of fuel cells
5.4 Types of fuel cells – Ion exchange membrane cell – Molten carbonate cells – Advantages and disadvantages of fuel cell – Applications of fuel cells.

Books for Study

1. Non-Conventional Energy Sources, G.D. Rai, Khanna Publishers, New Delhi, 2013.

2. Solar Energy Utilisation, G.D. Rai, Khanna Publishers, New Delhi, 1993.

Books for Reference

1. Non-Conventional Energy Resources, B. H. Khan, Tata McGraw–Hill Publishing Company, New Delhi, 1992.
2. Solar Energy Principles of Thermal Collection and Storage Second Edition, S. P. Sukhatme, Tata McGraw–Hill Publishing Company, New Delhi, 2001.

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Classify the solar energy sources	K2
CO-2	Distinguish between flat plate and focussing collectors	K4
CO-3	Categorize the wind energy conversion system and their advantages	K4
CO-4	Importance of anaerobic digestion and biogas plants	K5
CO-5	Classify the fuel cells and their application	K2

Semester	Code	Title of the Course	Hours	Credit
		SOLAR ENERGY UTILIZATION	2	2

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔	✔	✔	✔	✔	✔	✔	✔	
CO-2						✔	✔	✔		
CO-3	✔	✔				✔	✔	✔		
CO-4	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-5	✔	✔	✔			✔	✔	✔		

Number of Matches = 34 ; Relationship: High

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designer: Mrs. D. Chandrika

Semester: Credits: 2
Hours/Week: 2 Code:

NM ELECTIVE COURSE II: ELECTRICITY AND ENERGY SOURCES
(Non - Major Elective)

General Objective: To recall electrical measurements, electric power, electric generators, conventional and non conventional energy sources.

Course Objectives :

The learners will be able to

1. Outline volt, ampere and ohms .
2. Define electric power and electric energy.
3. Summarize electric generators and motors.
4. Explain the power generation.
5. List the non conventional energy sources .

UNIT I: Electrical Measurements

1.1 Definitions – Potential difference – Volt – Electric current – Ampere - Resistance – Ohm
1.2 Ohms law
1.3 Laws of resistance – Resistance in series – Resistance in parallel
1.4 Shunt.

UNIT II: Heating Effects of an Electric Current

2.1 Joule law of heat
2.2 Electric power – Electric energy – Electric heats – Electric force
2.3 Electric furnace
2.4 Electric filament lamp
2.5 Domestic electric circuit.

UNIT III: Practical Applications

3.1 Choke – Transformer
3.2 Long distance transmission
3.3 Electric generators and motors – A.C. Generator and D.C Generator (Basic principle only)
3.4 Motors
3.5 Single phase – Polyphase – Distribution of three phases AC – Star connection – Delta connection.

UNIT IV: Energy Sources

4.1 Primary and secondary cells – Cell and battery – Voltage and current of a cell – Cell life – Different types of dry cells – Alkaline cells – Lead acid cell
4.2 Battery rating
4.3 Photoelectric devices
4.4 Photovoltaic cell
4.5 Solar cell.

UNIT V: Conventional and Non-Conventional Energy Sources

5.1 Conventional energy Sources: Fossil fuels – Water power – Nuclear power – Hazards of nuclear energy
5.2 Non-Conventional energy Sources: Solar energy – Applications of solar energy - Wind energy – Ocean energy.

Books for Study

1. Electricity and Magnetism, R. Murugeshan, S. Chand & Company Pvt. Ltd., New Delhi, 2011.

2. Non-Conventional Energy Sources, G.D. Rai, Khanna Publishers, New Delhi, 2013.

Books for Reference

1. Solar Energy Utilisation, G.D. Rai, Khanna Publishers, New Delhi, 1993.
2. Electricity and Magnetism, Brij Lal and N. Subrahmanyam, Ratan Prakashan Mandir, New Delhi, 1997.

Course Outcomes:

On completion of the course the student will be able to

	Course Outcomes	Knowledge level
CO-1	Analyze the laws of resistance	K4
CO-2	Demonstrate heating effects of an electric current	K2
CO-3	Identify single phase and polyphase	K3
CO-4	Discuss the conventional energy sources	K6
CO-5	Examine the various energy sources	K3

Semester	Code		Title of the Course			Hours			Credit	
			ELECTRICITY AND ENERGY SOURCES			2			2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO-1	✔	✔		✔	✔	✔	✔		✔	
CO-2	✔	✔	✔	✔		✔	✔	✔	✔	
CO-3	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CO-4	✔	✔	✔			✔	✔	✔		
CO-5	✔	✔	✔	✔		✔	✔	✔	✔	
Number of Matches = 39 ; Relationship: High										

Mapping	1-20	21-40	41-60	61-80	81-100
Matches	1-10	11-20	21-30	31-40	41-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Designers: Dr. K. Renuka Devi and Mrs. D. Chandrika