FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with "A" Grade by NAAC (3rd Cycle)
74th Rank in India Ranking 2020 (NIRF) by MHRD
Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT : THE RESEARCH CENTRE OF PHYSICS

NAME OF THE PROGRAMME : B.Sc. PHYSICS

PROGRAMME CODE : UAPH

ACADEMIC YEAR : 2020 - 2021

FATIMA COLLEGE (AUTONOMOUS),
MADURAI DEPARTMENT OF PHYSICS-

B.Sc

(Effective from June 2019 onwards)

Sem	Sub.Code	Subject Title	No.of Hours	No. of credits	CIA						End Sem	Total
					Mid	Mon	Week	Session	N Sch	Total		
	19P1CC1	Mechanics and Properties of Matter	5	4	15	10	5	5	5	40	60	100
I	19P1CC2	Thermal Physics	4	3	15	10	5	5	5	40	60	100
	19P1CC3	Major practicals-I	3	2	15	10	5	5	5	40	60	100
	19C1ACP1	Allied Physics – I	3	3	-	-	-	-	-	40	60	100
	19C1ACP2	Allied Physics Practicals-I	2	2	-	-	-	-	-	40	60	100
	19P1NME	Physics in everyday life	2	2	15	10	5	5	5	40	60	100
	19B1ACP1	Digital principles and applications	5	5	15	10	5	5	5	40	60	100
II	19P2 CC4	Oscillations and Waves	5	4	15	10	5	5	5	40	60	100
	19P2 CC5	Applied Mechanics	4	3	15	10	5	5	5	40	60	100
	19P2 CC6	Major Practicals - II	3	2	-	-	-	-	-	40	60	100
	19C2ACP3	Allied Physics – II	3	3	15	10	5	5	5	40	60	100
	19C2ACP4	Allied Physics Practicals-II	2	2	-	-	-	-	-	40	60	100
	19P2NME	Physics in everyday life	2	2	15	10	5	5	5	40	60	100
III	19P3CC7	Electromagnetism	5	4	15	10	5	5	5	40	60	100
	19P3CC8	Solid State Physics	4	3	15	10	5	5	5	40	60	100
	19P3CC9	Major Practicals - III	3	2	-	-	-	-	-	40	60	100
	19M3ACP1	Allied Physics – I	3	3	15	10	5	5	5	40	60	100
	19M3ACP2	Allied Physics Practicals -I	2	2	-	-	-	-	-	40	60	100
	19P3SB1	Biomechanics	2	2	15	10	5	5	5	40	60	100
IV	19P4CC10	Analog Electronics	5	4	15	10	5	5	5	40	60	100
	19P4CC11	Materials Science	4	3	15	10	5	5	5	40	60	100
	19P4CC12	Major Practicals – IV	3	2	-	-	-	-	-	40	60	100
	19P4SB2	Physics of Stars	2	2	15	10	5	5	5	40	60	100
	19M4ACP3	Allied Physics –II	3	3	15	10	5	5	5	40	60	100
	19M4ACP4	Allied Physics Practicals -II	2	2	-	-	-	-	-	40	60	100

SEM	Sub.code	Sub. Title	No. of hrs	No. of credit	CIA				Ext	Tot
					T	F.P	Q	Total		
V	P5CC9	Electronics and Communication	7	6	15	5	5	25	75	100
	P5CC10	Optics	7	6	15	5	5	25	75	100
	P5MEB1	Programming with C	5	5	15	5	5	25	75	100
	P5SB3	Physics of Measuring Instruments I	2	2	-	-	-	50	-	50
	P5SB4	Physics of Medical Instruments -I	2	2	-	-	-	50	-	50
VI	P6CC11	Thermodynamics &Statistical Mechanics	5	5	25	5	5	25	75	100
	P6CC12	Modern Physics	5	5	25	5	5	25	75	100
	P6CC13	Major Practicals – III	3	5	-	-	-	40	60	100
	P6CC14	Major Practicals - IV	3	5	-	-	-	40	60	100
	P6ME1/2	Medical Physics/ Microprocessor	5	3	25	5	5	25	75	100
	P6ME3/4	Optoelectronics / Energy Physics	5	3	25	5	5	25	75	100
	P6SB5	Physics of Measuring Instruments - II	3	5	-	-	-	50	-	50
	P6SB6	Physics of Medical Instruments - II	3	4	-	-	-	50	-	50
	P6CC15	Project	2	-	-	-	-	50	-	50

I SEMESTER
MAJOR CORE
MECHNANICS AND PROPERTIES OF MATTER
19P1CC1

(For those who joined in 2019 onwards)

HOURS/WEEK: 5 **CREDIT:4**

COURSE DESCRIPTION

The objective of this course is to understand the basic properties of matter and mechanics of fluids

COURSE OBJECTIVE/S

The course enables the student :

- To understand in depth the gravitational force, field, potential and energy.
- To study the acceleration due to gravity at various positions
- To gain knowledge about the properties of matter and compute the same
- To discuss the mechanics of fluid motion and its applications

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Explain gravitational force, gravitational field, gravitational potential and gravitational energy	K1 and K2
CO 2	Analyze the variation of 'g' with latitude, altitude, depth and rotation of earth and Identify the types of satellite orbits and compute the parameters of satellite motion	K1, K2 andK3
CO 3	Discuss the elastic properties of materials and compute the Young's modulus of a beam	K1, K2 and K3
CO 4	Describe surface tension and capillarity property of liquids and identify its applications	K1and K2
CO 5	Explain the dynamics of fluid motion and its applications and analyse the viscose property of liquids	K1, K2 and K3

UNIT I: GRAVITATION

[15 HRS]

Newton's law of gravitation- Gravitational field- Gravitational potential energy- Gravitational potential and field due to a spherical shell- gravitational potential and field due to a uniform solid sphere-Gravitational self energy –gravitation self energy of a sphere –gravitation self energy of the Sun.

UNIT II: ACCELERATION DUE TO GRAVITY and SATELLITES [15 HRS]

Acceleration due to gravity – simple pendulum- variation of g at the poles and at the equator – variation of g with altitude- variation with depth- variation of g with rotation of Earth- difference between mass and weight- inertial mass and gravitational mass- satellites- stationary satellite- orbital velocity, period of revolution, escape velocity.

UNIT III: ELASTICITY [15 HRS]

Elasticity – Definitions – Glass is more elastic than rubber – Yield Point, Elastic limit, Elastic Fatigue – Poisson's ratio – Work done in deforming a body – Limiting value of Poisson's ratio -Torsion pendulum – Bending of Beams – Bending Moment – Beam supported at its ends and loaded in the middle – I- section Griders – determination of Y by bending.

UNIT IV: SURFACE TENSION [15 HRS]

Surface tension – Explanation of surface tension – Examples of surface tension – Surface energy and surface tension- Pressure difference across a spherical surface – Excess of pressure inside a spherical liquid drop – Excess of Pressure inside a soap bubble – angle of contact- Capillarity –Expression for Surface tension – Determination of Surface tension of water – Examples of Capillarity.

UNIT V: FLUIDS DYNAMICS [15 HRS]

Fluid motion- introduction- stream line flow and rate of flow- equation of continuity- energy of a liquid in motion- Bernoulli's Theorem- practical applications- venturimeter- Bunsen burner- atomizer or sprayer- carburettor- wings of an aeroplane- blowing of roofs – spinning ball- Viscosity- Poiseuille's method for coefficient of viscosity

TEXT BOOKS:

1) **MECHANICS AND ELECTRODYNAMICS- Brijlal , N.Subrahmanyam and Jivan Seshan**
Eurasia Publishing House (Pvt.) Ltd. Ram Nagar , New Delhi

UNIT I - Chapter 5 – 5.5-5.9, 5.12
UNIT III-Chapter 10-10.1,10.2,10.4 -10.6,10.8, 10.13, 10.15 - 10.17, 10.20,10.22,10.23.
UNIT IV – Chapter12- 12.1- 12.4,12.5, 12.6 - 12.8,12.10,12.13 - 12.16.
UNIT V- Chapter 11- 11.1 - 11.5, 11.7.1 - 11.7.3, 11.7.5, 11.7.6, 11.7.8. 11.9, 11.11.

2) **PROPERTIES OF MATTER – Brijlal and N.Subrahmanyam**

Vikas Publishing House Pvt. Ltd.
UNIT II – Chapter 5- 5.9, 5.10, 5.16 - 5.21, 5.29 - 5.31
REFERENCE BOOKS:

1. PHYSICS (fifth edition) – Robert Resnick , David Halliday, Kenneth S. Krane
2. CONCEPTUAL PHYSICS (tenth edition) – Paul G. Hewitt

I SEMESTER
MAJOR CORE
THERMAL PHYSICS – 19P1CC2
(For those who joined in 2019 onwards)

HOURS/WEEK: 4 **CREDIT: 3**

COURSE DESCRIPTION

The course provides a conceptually based exposure to the fundamental principles and processes of significant topics of thermal physics like Kinetic theory of gases, Transport phenomena in gases and Liquefaction of gases.

COURSE OBJECTIVE/S

This course deals with the elemental concepts of molecular properties of gases and enhance the experimental, analytical skills of the students on Maxwellian Distribution of speeds in an Ideal gas, transport phenomena and production of very low temperatures.

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Students will be able to analyse a microscopic approach and seek to account for the macroscopic properties of a gas in terms of properties of its molecules	K1, K2
CO 2	Students will be able to explain the classical Maxwell's distribution law of velocity and its inference.	K1, K3
CO 3	Students will be able to describe molecular collisions and its mean free path , understand the process of thermal conductivity, viscosity and diffusion in gases	K1,K2
CO 4	Students will be able to depict the manner in which the energy changes takes place and outline the different methods to produce low temperature	K1,K2,K3
CO 5	Students will be able to demonstrate the liquefaction of gases and explain the nature of gases in the neighbourhood of absolute zero temperature.	K1,K3

UNIT I: KINETIC THEORY OF GASES: **[12 HRS]**

Three states of matter-Concept of ideal or perfect Gas-Kinetic model-Expression for the pressure exerted by a gas-Estimation of rms speed of Molecules-Kinetic energy per unit volume of a Gas- Derivation of Gas equation- Avogadro's Hypothesis-Graham's Law of Diffusion of Gases- Brownian motion- Langevin's Theory of Brownian Motion- Einstein's Theory of Brownian motion- Degrees of Freedom.

UnitII: MAXWELLIAN DISTRIBUTION OF SPEEDS IN AN IDEAL GAS: [12HRS]

Mean (or) Average speed, Root Mean Square speed and Most Probable Speed-Maxwell's Distribution Law of Velocities-Experimental verification of Maxwellian Distribution of Molecular speeds-Zartman and C.C.Ko experiment.

Unit III: TRANSPORT PHENOMENA IN GASES: **[12HRS]**

Introduction –Molecular Collisions-Mean Free Path- Expression for Mean Free Path-Transport phenomena- Viscosity: Transport of Momentum –Thermal conductivity: Transport of thermal energy- Relation between η and k–Effect of temperature on k – Largest Thermal Conductivity of Hydrogen- Self diffusion : Transport of mass

Unit IV: PRODUCTION OF VERY LOW TEMPERATURES: [12 HRS]

Introduction- Method of freezing mixture- pressure- cooling by evaporation under reduced Cooling by adiabatic expansion- Joule-Thomson expansion- Adiabatic demagnetization-Superconductivity.

Unit V: LIQUEFACTION OF GASES: [12 HRS]

Liquefaction of gases- principle of Regenerative Cooling- Liquefaction of Air (Linde's process)- Liquefaction of Hydrogen-Liquefaction of Helium- Helium I and Helium II- Some peculiar properties of Helium II- Helium 'A unique liquid'.

TEXT BOOKS:

Brijlal , Dr. N.Subramanyam and P.S.Hemne, *HEAT THERMODYNAMICS AND STATISTICAL PHYSICS* , New Delhi-S. Chand & Company Pvt.Ltd.

Unit I : Chapter 1 (1.1-1.5,1.7,1.8, 1.10,1.11,1.13-1.15,1.18)
Unit II: Chapter 11(11.5,11.6,11.9)
Unit III: Chapter 3 (3.1,3.2,3.5,3.7- 3.18)
Unit IV: Chapter 7 (7.1 -7.5, 7.16,7.19)
Unit V: Chapter 7(7.6-7.8,7.10-7.14)

REFERENCE BOOKS:

J.K. Sharma and K.K. Sarkar, *THERMODYNAMICS AND STATISTICAL PHYSICS*, Himalaya Publications.

I SEMESTER
MAJOR CORE
MAJOR PRACTICALS I – 19P1CC3
(For those who joined in 2019 onwards)

SKILL DEVELOPMENT: 100%

HOURS/WEEK: 3 **CREDIT: 2**

COURSE DESCRIPTION

The course provides hands on training to determine the properties of materials relevant to the theory learnt in core courses.

COURSE OBJECTIVE/S

This course offers opportunity to handle the laboratory equipments and develop skills to determine elastic properties, thermal properties, surface tension

1) Determination of Youngs' Modulus - Uniform bending.(scale & telescope)
2) Determination of Youngs' Modulus - Non-Uniform bending (pin & microscope).
3) Determination of 'g' - Compound pendulum
4) Determination of Surface Tension & Interfacial surface tension - Drop Weight Method
5) Melde's String - Determination of the frequency of vibrator
6) Determination of surface tension - Capillary rise method
7) Specific Heat Capacity of Solid - Method of mixture using Barton's Correction

I SEMESTER
ALLIED CORE
ALLIED PHYSICS I –19C1ACP1
(For those who joined in 2019 onwards)

HOURS/WEEK: 3 **CREDIT:3**

COURSE DESCRIPTION

The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like Waves and Oscillations, Properties of matter, Electricity and Magnetism and Geometrical Optics.

COURSE OBJECTIVE/S

This course will improve the elemental concepts and enhance the intellectual, experimental, analytical skills of the students on Simple Harmonic motion, Elasticity of solid matters, viscosity of liquids and thermal properties of Gas, magnetic effect of electric current, Refraction, dispersion of optical devices.

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Define and discuss about the simple harmonic waves and its oscillations and laws of transverse vibrations of strings.	K1, K2
CO 2	Classify and describe the properties of matter such as electricity, viscosity and surface tension.	K1, K2, K3

CO 3	Summarise the basic concepts of thermal physics and apply the laws of thermodynamics in higher learning concepts such as entropy and its reversible and irreversible process.	K1,K2
CO 4	Explain the principles and laws used in electricity and magnetism those are useful in defining the energy of a capacitor and magnetic effect of electric current.	K1,K2
CO 5	Demonstrate the properties of geometrical optics and explain the refraction and dispersion through a prism.	K1,K2,K3

Unit1:Waves and scillations **(9 hrs)**

Simple Harmonic motion- Composition of two simple harmonic motions in a straight line-Composition of two simple harmonic motions of equal time periods at right angles-Lissajous's figures- Uses – laws of transverse vibrations of strings – Melde's string – transverse and longitudinal modes.

Unit 2 Properties of Matter **(9 hrs)**

Elasticity –Different Moduli of Elasticity- Poisson's ratio.

Streamline flow and Turbulent flow –Coefficient of Viscosity-Rate of Flow of liquid in a Capillary Tube-Poiseuille's Formula (Method of dimensions)- Poiseuille's Method for determining coefficient of viscosity of liquid- Comparison of viscosities of two liquids

Surface Tension: Molecular theory of surface tension-pressure difference across a liquid surface-Pressure difference across a liquid surface -excess pressure inside a soap bubble and drop.

Unit 3 Thermal Physics **(9 hrs)**

Postulates of Kinetic theory of gases – Van der Waals equation of state – Derivation of Critical Constants - Joule Kelvin effect – Joule Thomson porous plug experiment – Laws of thermodynamics- Heat Engine– entropy - changes of entropy in reversible and irreversible processes

Unit 4 Electricity and Magnetism **(9 hrs)**

Capacitor-energy of charged capacitors-Loss of energy on sharing of charges between two capacitors- magnetic effect of electric current-Biot Savart's law-Magnetic induction at a point on the axis of a circular coil

Unit 5 Geometrical optics **(9 hrs)**

Laws of Refraction – Refractive index by travelling microscope, Refraction through Prism - Dispersion through a prism – Expression for dispersive power of the material of a thin prism – Combination of two prisms to produce dispersion without deviation - Combination of two prisms to produce deviation without dispersion

TEXT BOOKS:

Allied Physics by R.Murugeshan **(2012- I Edition)** ***Allied Physics,*** **Ram Nagar, New Delhi: S. Chand & Company Ltd.**

Unit 1: 1.1-1.4, 1.7, 1.9

Unit 2: 2.1-2.3, 2.14 -2.16, 2.18-19, 2.24-2.28
Unit 3: 3.1-3.5, 3.15-3.22
Unit 4:4.1-4.6
Unit 5:5.1-5.3, 5.6,5.11-5.13,5.15

REFERENCE BOOKS:

1. Elements of Physics by Robert F. Kingsbury, Ist Edition,Van Nostrand Company, London
2. Elements of properties of matter by Brijlal and Subramanian, S. Chand & Company Pvt ltd
3. Allied Physics by Dr.Dhanalakshmi, Dr.Sabesan, Popular Book depots

WEB REFERENCES (OPTIONAL)

https://study.com/academy/lesson/physical-property-of-matter-definition-examples-quiz.html
https://www.physicsforums.com
https://www.kullabs.com/classes/subjects/units/lessons/notes/note-detail/1761

I SEMESTER
ALLIED CORE
ALLIED PHYSICS PRACTICALS I – 19C1ACP2/19M4ACP2/19G4ACP2
(For those who joined in 2019 onwards)

HOURS/WEEK: 2 **CREDIT: 2**

COURSE DESCRIPTION

The course provides hands on training in Physics experiments relevant to the theory learnt in allied core courses.

COURSE OBJECTIVE/S

This course enables the students to develop basic lab skills.

SKILL DEVELOPMENT: 100%

LIST OF EXPERIMENTS (Any eight)

1. Comparison of coefficient of viscosity of two liquids
2. Determination of coefficient of viscosity
3. Determination of Surface Tension – Capillary rise method
4. Determination of Surface Tension – Drop Weight method
5. Determination of Latent heat of fusion of Ice
6. Determination of Young's Modulus - Uniform bending
7. Determination of specific heat capacity of a liquid-Newton's law of cooling
8. Determination of focal length of biconvex lens(UV& Distant object methods).
9. Determination of refractive index of a liquid
10. Determination of rigidity modulus – Torsional Pendulum

I/II SEMESTER

NON MAJOR ELECTIVE

PHYSICS IN EVERYDAY LIFE – 19P1NME/19P2NME

(For those who joined in 2019 onwards)

HOURS/WEEK:2 **CREDIT:2**

COURSE DESCRIPTION

Aim of this course is to enable the student to understand the physics concepts in day today life.

COURSE OBJECTIVE/S
COURSE OUTCOMES (CO)

This course imparts basic ideas of physical quantities, standards and units. It further deals with mechanics and properties of matter comprising the concepts of Newton's law of motion, impulse, work, power and energy, moment of a force,etc., Also this course throws light on the fundamental knowledge on concepts of heat,waves,sound,electricity, magnetism and explore their nature.

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Discuss and illustrate the importance of paying attention to the basic units of physical quantities and the standards accepted for their measurement, describe the motion in terms of particle's position, velocity and acceleration and analyse the cause of motion	K1,K2
CO 2	Understand the concepts of heat, waves, sound, electricity, magnetism and explore their nature.	K2,K3

UNIT I: PHYSICAL QUANTITIES, STANDARDS AND UNITS

[15 HRS] Unit of length, unit of mass and unit of time

MECHANICS AND PROPERTIES OF MATTER: Motion, Force, Newton's law of motion, impulse, work, power and energy, moment of a force, Centre of gravity, Machines, Artificial satellites, Density and relative density, Pressure, upthrust, Hydrometer, Matter and its properties, Motion of fluids- Bernoulli's theorem

UNIT II **[15 HRS]**

HEAT: Internal energy, thermal expansion, transmission of heat, Quantity of heat, Change of state, relative humidity, Air conditioning, **Pressure cooker (self study)**.

WAVE MOTION: Electromagnetic radiation, radio and television transmission, Radar, Microwave oven.
SOUND: Sound characteristics, The speed of sound, Reflection of sound and Echo, Doppler effect, sonic boom.
MAGENTISM: Earth's magnetism.
STATIC ELECTRICITY: Electricity of Friction, **Insulators, Conductors, Super conductors and semiconductors (self study).**
CURRENT ELECTRICITY: Effects of electric current, Power generations and transmission, Domesitic Electric installation, **Electric light(self study)**.
TEXT BOOKS:
1. Dr.Tara Chand (2007), ***GENERAL STUDIES MANUAL*****, TMH**

I SEMESTER

ALLIED

DIGITAL PRINCIPLES AND APPLICATIONS – 19B1ACP1

(For those who joined in 2019 onwards)

HOURS/WEEK: 5 **CREDIT:5**

COURSE DESCRIPTION

Aim of this course is to enable the student to understand the concepts in Digital Electronics which forms the basis for Computer Architecture.

COURSE OBJECTIVE/S COURSE OUTCOMES (CO)

This course focuses on imparting the fundamental knowledge of digital principles namely the number systems, basic and universal logic circuits. It will enable the students to simplify the logic expressions using Boolean laws and Kmap. Further, the students will be introduced to principles behind the data processing and arithmetic circuits. Also the working of flipflops , counters and registers will be dealt with necessary circuitry.

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Students will be able to define the different types of number systems and explain the basic and universal logic circuits	K1,K2
CO 2	Students will be able to simplify the logic expressions using Boolean laws and Kmap	K2
CO 3	Students will be able to describe the principles behind the data processing and arithmetic circuits	K1,K2
CO 4	Students will be able to explain the working of basic flipflops and design master slave flipflops	K2,K3
CO 5	Students will be able to understand the working of shift registers and counters	K2,K3
CO 6	Students will be able to describe D/A and A/D conversion techniques	K2,K3

UNIT I: Numbers and Systems and Codes: **(15hrs)**

Binary number System – Octal numbers – hexadecimal numbers – ASCII code – Excess-3 code – Gray Code

Logic Circuits: Inverters – OR Gates – AND Gates- NOR Gates – NAND gates- Exclusive OR Gates.

UNIT II: circuit Analysis and Design: (15hrs)

Boolean Algebra – Sum-of-Products method – Truth Table to Karnaugh map – Karnaugh Simplifications – Don't care conditions – product-of-Sums method

UNIT III: Data Processing Circuits: (15hrs)

Multiplexers – Demultiplexers.

Arithmetic circuits:

Binary Addition – Binary subtraction – Unsigned Binary numbers – Sign-Magnitude Numbers – 2's Complement representation – 2's Complement Arithmetic – Arithmetic Building Blocks – The Adder- Subtracter

UNIT IV: (15 hrs)

Flip- Flops:RS Flip-Flop – Gated Flip-Flops – Edge Triggered RS Flip flops-Edge Triggered D Flip-Flop –Edge Triggered JK flip flop – JK Master Slave Flip Flop.

Shift registers: Serial In-Serial Out – Serial In-Parallel out – Parallel In-Serial Out – Parallel In- Parallel Out - Application of shift registers(Switched tail Counter only)

UNIT V: Counters: (15 hrs)

Asynchronous Counters – Synchronous Counters(3 bits only) – Mod-3 Counter – Decade Counters –

D/A and A/D conversion:

Variable – resistor networks, Binary ladder, D/A converter, A/D converter- Simultaneous Conversion, Counter Method.

TEXT BOOKS:

1. Albert Paul Malvino and Donald P. Leach, *Digital principles and applications*, Tata McGraw-Hill, Sixth Edition

REFERENCE BOOKS:

1. **R.P. Jain, *Modern digital Electronics*, Tata McGraw-Hill, III edition,2006**
2. **Thomas C Bartee , *Digital Computer Fundamentals*, McGraw Hill; 5th edition,1981**
3. **M.Morris Mano, *Digital Logic and computer design*, Prentice-Hall , 2000**

II SEMESTER
MAJOR CORE
OSCILLATIONS AND WAVES - 19P2CC4

(For those who joined in 2019 onwards)

HOURS/WEEK: 5 **CREDIT:4**

COURSE DESCRIPTION

To understand waves, oscillations and its applications in human ear, musical instruments. To know about Doppler effect, Ultrasonics and various applications of them

COURSE OBJECTIVE/S

The course enables the student :

- To understand simple harmonic motion
- To understand Principle of Superposition and apply to derive mathematical representation of stationary waves, interference waves and beats. Determine the conditions for the same.
- To understand the Doppler effect in acoustics and apply the same and solve problems
- To distinguish the different range of acoustic waves.
- To study the ultrasonic waves generation and application of the same

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Describe simple harmonic motion and explain damped and forced oscillations	K1 and K2
CO 2	Explain the Principle of superposition in sound waves	K1 and K2
CO 3	Apply the same to interference, stationary waves and beats of sound waves	K1 and K2
CO 4	Explain Doppler effect in sound and identify relative motion and solve problems	K1, K2 and K3
CO 5	Discuss ultrasonics and its applications & Outline the physics of voice generation and hearing	K1, K2 and K3

UNIT I: SIMPLE HARMONIC MOTION **[15 HRS]**

Introduction- simple harmonic motion- differential equation of SHM- graphical representation of SHM- total energy of vibrating particle- simple pendulum- simple harmonic oscillations of a loaded spring- free vibrations- undamped vibrations- damped vibrations- forced vibrations, resonance and sharpness of resonance, Quality factor.

UNIT II: Progressive Waves **[15 HRS]**

Wave motion- what propagates in wave motion?- characteristics of wave motion-of simple harmonic wave- Transverse wave motion- longitudinal wave motion- definitions- relation between frequency and wavelength- Equation of simple harmonic wave- Differential equation of wave motion- particle velocity and wave velocity- energy of a progressive wave.

UNIT III: STATIONARY WAVES, INTERFERENCE AND BEATS

[15 HRS]

Stationary waves- properties properties of stationary longitudinal waves- analytical treatment of open end organ pipe or string free at the other end (open end pipe only).

Interference of sound waves- special cases- conditions for interference of sound waves.

Beats- analytical treatment of beats.

UNIT IV: DOPPLER EFFECT **[15 HRS]**

Doppler effect- observer at rest and source in motion- source at rest and observer in motion- both source and observer are in motion- effect of wind velocity - tracking of artificial satellites .

UNIT V: MUSIC AND ULTRASONICS

[15 HRS]

Musical Sound and Noise – Speech – Human Voice – human Ear – Characteristics of Musical Sound – Intensity of Sound – Bel – Musical Scale – Limits of Audibility.

Ultrasonics – Production of Ultrasonic Waves (Piezoelectric oscillator ONLY) – Acoustic grating – Applications of Ultrasonic Waves

TEXT BOOKS:

1) **N.Subrahmanyam, Brijlal, *WAVES AND OSCILLATIONS* , Vikas Publishing House Pvt. Ltd.**

UNIT I- Chapter 1- 1.1, 1.2, 1.3, 1.4, 1.6, 1.10, 1.18.
Chapter 3- 3.1, 3.2, 3.3, 3.5,3.6, 3.8
UNIT II- Chapter 4- 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.11, 4.12, 4.13, 4.15.
UNIT III- Chapter6- 6.1, 6.2, 6.4a, 6.5, 6.6, 6.7, 6.8,6.9, 6.12, 6.13.
UNIT IV - Chapter 9- 9.1, 9.2, 9.3, 9.4, 9.5, 9.6.
UNIT V - Chapter 7.16, 7.17, 7.18, 7.19, 7.20, 7.21, 7.23, 7.25, 7.26.
Chapter 11.23, 11.24 (Piezoelectric oscillator ONLY), 11.26, 11.27.

REFERENCE BOOKS:

1. **Robert Resnick , David Halliday, Kenneth S. Krane**
   PHYSICS (fifth edition) **,** John Wiley and sons, Inc.
2. **Paul G. Hewitt ,** ***CONCEPTUAL PHYSICS*** **(tenth edition),** Pearson education Inc.
   and Dorling Kindersey Publishing

I SEMESTER
MAJOR CORE
ADVANCED MECHANICS – 19P2CC5
(For those who joined in 2019 onwards)

HOURS/WEEK: 4 **CREDIT:3**

COURSE DESCRIPTION

The course enables the students to understand the fundamental and advanced concepts of Central force, Projectile motion, interrelationship between energy and work, linear momentum and angular momentum.

COURSE OBJECTIVE/S

This course enhance the intellectual, experimental, analytical skills of the students on Kepler's laws of Planetary motion, Projectile motion, collisions, law of conservation of linear momentum and law of conservation of angular momentum.

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Students will be able to demonstrate an understanding of central forces and explain Kepler's laws of Planetary motion	K1, K3
CO 2	Students will be able to compute the path of projectile launched with horizontal and vertical velocity components in the Earth's gravity	K1, K2,K3
CO 3	Students will be able to evaluate the interrelationship between energy and work	K2,K3
CO 4	Students will be able to describe the motion of the center of mass of an object, state the conservation principles involving momentum and explore its applications, analyse collisions between two objects	K1,K2,K3
CO 5	Students will be able to apply law of conservation angular momentum appropriately in rigid body rotations, relate the rotational and translational parameters based on rotational kinematics.	K1,K3

UNIT I: CENTRAL FORCE [12 HRS]

Newton's second law of motion- central force – central force motion is confined to a single plane – angular momentum and energy are constants – Law of equal areas - law of orbit- Kepler's third law.

Unit II: PROJECTILE MOTION [12HRS]

Projectile motion- Maximum height- Maximum Range- Special cases-Horizontal Projection-Object thrown from Airplane- Fast –Moving Projectiles-Satellites.

Unit III: WORK AND KINETIC ENERGY [12HRS]

Work and Kinetic Energy- Workdone by a constant force-Translatory motion-Workdone by a variable force- Kinetic energy and the work-energy theorem.

Unit IV: LINEAR MOMENTUM [12 HRS]

Center of mass – Center of mass coordinates -Motion of centre of mass and linear momentum- -collisions- Elastic collsions- Inelastic collisions – Coefficient of Restitution-Rocket motion.

Unit V: ANGULAR MOMENTUM [12 HRS]

Dynamics of rigid body- Rotational Kinetic energy, Moment of inertia and it's physical significance-Angular momentum and angular velocity-Angular acceleration-Angular momentum-Law of conservation of angular momentum-torque- analogy between translatory motion and rotatory motion – workdone by a torque.

TEXT BOOKS:

1) Brijlal , N.Subrahmanyam and Jivan Seshan, *MECHANICS AND ELECTRODYNAMICS,*
New Delhi -EURASIA Publishing House (PVT.) LTD..
Unit I : Chapter 4 – 4.2, Chapter 5- 5.1, 5.2, 5.3, 5.4.
Unit IV: Chapter 6- 6.6, 6.8, 6.9, 6.12.
Unit V : Chapter 7-7.1-7.9
2) Brijlal and Subrhamanyam (V edition), *PROPERTIES OF MATTER* , New Delhi -Eurasia Publishing Pvt. Ltd, ,.

Unit II Chapter: 2

Unit III Chapter: 2

REFERENCE BOOKS:

1. Robert Resnick, David Halliday and S. Krane (Vol I- fifth edition-) ,*PHYSICS*-John Wiley & Sons, Inc.

2. Francis W. Sears, Mark W. Zemansky and Hugh D. Young(Sixth edition), *UNIVERSITY PHYSICS*-New Delhi -Narosa Publishing House.

3. Paul G. Hewitt (tenth edition), *CONCEPTUAL PHYSICS*, Pearson Education, Inc.and Dorling Kindersley Publishing, Inc.

WEB REFERENCES (OPTIONAL)

1. physics.oregonstate.edu/~mcintyre/COURSES/ph426_W12/cfnotes.pdf
2. *https://***ocw.mit.edu/***.../***lecture***-*notes/MIT***16_07***F09_Lec15.pdf*
3. *https://***ocw.mit.edu/***.../***lecture***-*notes/MIT***16_07***F09_Lec16.pdf*

I B.Sc. PHYSICS MAJOR PRACTICALS- II- 19P2CC6

Skill development-100%

SEMESTER II

1. Determination of Rigidity Modulus - Static torsion(scale & telescope).
2. Determination of Rigidity Modulus of the wire - Torsional Pendulum
3. Determination of Young's Modulus - Cantilever Depression
4. Determination of Viscosity - Capillary Flow Method
5. Specific Latent Heat of Ice - Method of mixture using Barton's Correction
6. Specific Heat Capacity of liquid - Newton's Law of cooling
7. Comparison of viscosities of two liquids
8. Determination of Thermal Conductivity of Bad Conductor - Lee's disc Method.

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II SEMESTER
ALLIED CORE
ALLIED PHYSICS II – 19C2ACP3
(For those who joined in 2019 onwards)

HOURS/WEEK: 3 **CREDIT:3**

COURSE DESCRIPTION

The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like geometrical Optics, Atomic Physics, Nuclear Physics and Electronics.

COURSE OBJECTIVE/S

This course will improve the elemental concepts and enhance the intellectual, experimental, analytical skills of the students on Atomic Physics, Nuclear Physics, Electronics and Physical optics.

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Students will be able to categorize and clarify the different optical phenomena of interference, diffraction, polarization.	K1, K2
CO 2	Students will be able to explain the atom model and calculate the total energy of an atom and account for the spectral series of hydrogen atom.	K1, K2, K3
CO 3	Students will be able to elucidate the models of nuclear structure and to learn the principle behind atom bomb, nuclear reactors.	K1,K2
CO 4	Students will be able to summarize the working principle of p-n junction diode in forward and reverse biasing, its V-I characteristics, the Zener Diode, n-p-n transistor	K1,K2

	in common emitter characteristics.	
CO 5	Students will be able to classify the number system and demonstrate the skill in conversion of Number systems, Boolean algebra and its associated laws.	K1,K2,K3

Objective: The aim of this course is to impart an understanding of atomic, nuclear physics and electronics

Unit 1 PHYSICAL OPTICS **(10 hours)**

Velocity of light-Michelson's method-Interference in thin films-Production of colours in thin films-Air wedge-Diffraction- Polarisation- Polarisation by reflection-Double refraction –-Nicol Prism.

Unit 2 ATOMIC PHYSICS **(8 hours)**

Introduction – Rutherford's experiments on scattering of alpha particles- Bohr atom model – Bohr formula – calculation of total energy – Bohr's Interpretation of Hydrogen spectrum – Spectral series of hydrogen atom

Unit 3 NUCLEAR PHYSICS **(9 hours)**

Models of Nuclear Structure-The Liquid Drop Model-Mass defect-Binding energy-Nuclear fission-chain reaction - atom bomb-energy released in fission - Nuclear reactor-Nuclear Fusion.

Unit 4 BASIC ELECTRONICS **(9 hours)**

Formation of p-n Junction Diode-Forward and Reverse Biasing of a Junction Diode-V-I Characteristics of a Junction Diode-The Zener Diode-Experiment to study the characteristics of zener diode-Junction Transistor-working of n-p-n transistor - common emitter characteristics of a transistor

Unit 5 DIGITAL ELECTRONICS **(9 hours)**

Decimal Number system- Binary Number system-conversion of Binary number into decimal number-conversion of decimal number into binary number- Octal Number system-Hexadecimal number system – Boolean Algebra-Boolean addition and multiplication-Logic Expressions-commutative laws-associative laws-distributive law-Rules for Boolean algebra-De Morgan's Theorem.

TEXT BOOKS:

Murugesan, R. (2012 II Edition) ***Allied Physics,*** **Ram Nagar, New Delhi: S. Chand & Company Ltd.**

Unit 1: 6.1-6.5, 6.8, 6.12-6.14, 6.16

Unit 3: 8.1 – 8.4,8.8,8.9, 8.11-8.14

Kiruthiga Sivaprasath, Murugesan, R. (2007 Thirteenth Revised multicolour edition) ***Modern Physics,*** **Ram Nagar, New Delhi: S. Chand & Company Ltd.**

Unit 2: 6.1,6.2, 6.4
Unit 4: 58.1-58.5, 58.14, 58.15
Unit 5: 70.1-70.4, 70.10-70.19

REFERENCE BOOKS:

1. Kumar and Gupta (1994), *Hand Book of Electronics*, Meerut : Pragati Prakashan
2. Mithal G.K. (1998), Basic Electronics, G.K. Publishers Pvt. Ltd.,
3. Halliday D., Resnick R and Krane K.S. (2004), Physics 4th Edition, Vol.1,2 , New York

WEB REFERENCES (OPTIONAL)

https://www.khanacademy.org/science/physics/quantum-physics/atoms-and-electrons/v/atomic-energy-levels
https://www.nature.com/subjects/nuclear-physics
https://www.dictionary.com/browse/physical-optics

II SEMESTER

ALLIED CORE

ALLIED PHYSICS PRACTICALS I – 19C2ACP4/19M4ACP4/19G4ACP4

(For those who joined in 2019 onwards)

HOURS/WEEK: 2 **CREDIT: 2**

COURSE DESCRIPTION

The course provides hands on training in Physics experiments relevant to the theory learnt in allied courses.

COURSE OBJECTIVE/S

This course enables the students to develop basic lab skills.

Skill development-100%

LIST OF EXPERIMENTS (Any eight)

1. Low range Voltmeter calibration using Potentiometer
2. Air wedge - Determination of thickness of insulation
3. Diode characteristics – (Forward & Reverse bias)
4. Ohm's law verification
5. Bridge rectifier
6. Verification of AND, OR, NOT, NAND and NOR gates
7. Verification of Boolean expressions
8. NAND as universal gate
9. NOR as universal gate
10. De Morgan's theorems

III SEMESTER
MAJOR CORE
ELECTROMAGNETISM – 19P3CC7
(For those who joined in 2019 onwards)

HOURS/WEEK: 5 **CREDIT:5**

COURSE DESCRIPTION

The course provides an exposure to electric field, electric potential energy, magnetic field, magnetic field of current, magnetic dipole moment, magnetization and Maxwell's electromagnetic waves

COURSE OBJECTIVE/S

This course deals with fundamentals of electricity, magnetism and electromagnetic theory based on Maxwell's equations

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Students will be able to calculate electric field for a distribution of charges by applying method of calculus	K1, K2
CO 2	Students will be able to evaluate electric field for problems involving symmetry by using Gauss's law	K1, K3
CO 3	Students will be able to estimate the magnetic field of a current using Biot Savarat law and Ampere's law	K1,K2
CO 4	Students will be able to describe the working of generators and motors based on Faraday's law of induction and Lenz law. Also, they will be able to classify magnetic materials based on magnetic dipole moments	K1,K2,K3
CO 5	Students will be able to comprehend Maxwell's equations and generation of electromagnetic waves	K1,K3

UNIT I: THE ELECTRIC FIELD **[12 Hrs]**

Coulomb's law - Coulomb's law : Vector form.

The electric field - The electric field of point charges-The Electric dipole – Electric field of continuous charge distributions- A Uniform line of charge – A uniform ring or disk of charge – An infinite sheet of charge – A uniform spherical shell of charge – Electric field lines - A dipole in an electric field.

UNIT II: GAUSS'S LAW, ELECTRIC POTENTIAL ENERGY AND ELECTRIC POTENTIAL **[18 Hrs]**

Gauss's law- Gauss's law and Coulomb's law-Applications of Gauss's law – Infinite line of charge – Infinite sheet of charge- A spherical shell of charge

Electric potential –Calculating the potential from the field – Potential due to point charges – Potential due to electric dipole - Electric potential of continuous charge distributions–A uniform line of charge – A ring of charge – A charged disk - Equipotential surfaces

UNIT III: THE MAGNETIC FIELD, THE MAGNETIC FIELD OF A CURRENT **[15 Hrs]**

Magnetic interactions and magnetic poles - Magnetic force on a moving charge - Circulating charges –cyclotron - The Hall effect – Magnetic force on a current carrying wire– Torque on a current loop.

The magnetic field of a current- A straight wire segment – A circular current loop - Ampere's law- Applications of Ampere's law

UNIT IV: FARADAY'S LAW OF INDUCTION, MAGNETIC PROPERTIES OF MATERIALS **[15 Hrs]**

Faraday's experiments – Faraday's law of induction – Lenz's law – Motional emf – Eddy currents - Generators and motors

The magnetic dipole –The force on a dipole in a nonuniform field- Atomic and nuclear magnetism – Magnetization – Magnetic materials: Paramagnetism – Diamagnetism-

Ferromagnetism-Gauss's law for magnetism

UNIT V: MAXWELL'S EQUATIONS AND ELECTROMAGNETIC WAVES [15 Hrs]

The basic equations of electromagnetism- Induced magnetic field and displacement current- Maxwell's equations- Generating an electromagnetic wave- Travelling waves and Maxwell's equations- Energy transport and Poynting vector.

TEXT BOOKS:

David Halliday, Robert Resnick & Kenneth S. Krane , *Physics – Volume II*, Fifth edition, (John Wiley and sons, Inc.) (Relevant sections in all Chapters)

UNIT I : Chapter 25: 25.4
Chapter 26: 26.2, 26.4,26.5 26.7
UNIT II : Chapters 27: 27.4
Chapter 28: 28.3- 28.6, 28.8
UNIT III : Chapters: 32.1, 32.2, 32.3-32.6, 33.2,33.3, 33.5
UNIT IV : Chapters: 34.1-34.5, 35.1-35.3-35.5,35.7
UNIT V : Chapters: 38.1-38.6

REFERENCE BOOKS:

1. **K.K. Tiwari, *Electricity and Magnetism*, S. Chand & Co.**
2. **D.C. Dayal, *Electricity and Magnetism*, IV edition, Himalaya Publishing House, Bombay.**
3. **Sehgal, Chopra and Sehgal, *Electricity and Magnetism*, Sultan Chand and Sons, New Delhi**

WEB REFERENCES (OPTIONAL)

1. http://www.gutenberg.org/ebooks/34221
2. https://bookboon.com/en/university-physics-ii-notes-and-exercises-i-ebook

II B.Sc.

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19P3CC8	Solid State Physics	Core	4	3

COURSE DESCRIPTION

Aim of this course is to enable the student to understand the concepts in crystal structure and magnetic and dielectric materials which forms the basis for material world.

COURSE OBJECTIVES

Solid State Physics is basic for material fabrications for various electronic applications. This course aims at giving an idea about crystal structure and various properties of solids like magnetic and dielectric behaviours. This course also deals with the super conductors and their applications.

UNIT I: CRYSTAL STRUCTURE [12 HRS.]

Introduction – crystal lattice and translation vectors-unit cells- basis- symmetry operation-point groups-space groups-types of lattices- lattice directions and planes-interplanar spacing-simple crystal structures-structure of diamond-zinc blende structure and sodium chloride structure

UNIT II: LATTICE VIBRATIONS [12 HRS.]

Introduction-vibration of one dimensional monoatomic lattice-vibration of one dimensional diatomic lattice-phonons-momentum of phonons-inelastic scattering of photons by phonons-specific heat-classical theory of lattice heat capacity- Einstien's theory of lattice heat capacity- Debye's model of lattice heat capacity

UNIT III: MAGNETISM IN SOLIDS (12 HRS.)

Magnetic terminology - types of magnetism - diamagnetism, paramagnetism-

ferromagnetism- antiferromagnetism - ferrimagnetism

UNIT IV: DIELECTRIC PROPERTIES OF SOLIDS (12 HRS.)

Polarization and susceptibility- the local field-dielectric constant and polarizability- sources of polarizability- frequency dependence of total polarizability - ferroelectricity- Piezo electricity

UNIT V: SUPER CONDUCTIVITY (12 HRS.)

Introduction and historical development- electrical resistivity- prefect diamagnetism or meissner effect-super current and penetration depth-critical field and critical temperature-type I and II superconductor- thermo dynamical and optical properties-isotope effect-flux quantization- the Josephson effects and tunneling -additional characteristics - theoretical aspects-high temperature ceramic superconductors-applications.

UNIT VI: DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Applications of crystals in solar cell - Application of super conductor in MRI body scanner.

REFERENCES

1. R.K.Pure and V.K.Babber "Solid State Physics" First Edition 1997, S.Chand.
2. S.O.Pillai "Solid state Physics" Second Edition 2009, New Age International Publishers.
3. Charles Kittel " Introduction to Solid state Physics" First Edition 2018, Wiley Publishers.

Skill Development: 100%

III SEMESTER
MAJOR CORE
MAJOR PRACTICALS III – 19P3CC9
(For those who joined in 2019 onwards)

HOURS/WEEK: 3 **CREDIT:2**

COURSE DESCRIPTION

This laboratory course explores the basic principles of electricity and magnetism, basic elements of electric circuits through experiments

COURSE OBJECTIVE/S

On completion of this course, the learner will be able to understand physical laws using appropriate equipments through experiments

(Any Eight)

1. Series Resonance- LCR circuit
2. De Sauty's Bridge
3. Calibration of ammeter using potentiometer
4. Calibration of low range voltmeter using potentiometer
5. Field along the axis of the coil – Determination of M & H
6. Owen's bridge
7. Parallel Resonance – LCR circuit
8. Calibration of high range voltmeter using potentiometer
9. Comparison of capacitances using spot galvanometer
10. Comparison of EMF of two cells using spot galvanometer

III SEMESTER
ALLIED CORE
ALLIED PHYSICS I –19M3ACP1/19G3ACP1
(For those who joined in 2019 onwards)

HOURS/WEEK: 3 **CREDIT:3**

COURSE DESCRIPTION

The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like Waves and Oscillations,Properties of matter, Electricity and Magnetism and Geometrical Optics.

COURSE OBJECTIVE/S

This course will improve the elemental concepts and enhance the intellectual, experimental, analytical skills of the students on Simple Harmonic motion, Elasticity of solid matters, viscosity of liquids and thermal properties of Gas, magnetic effect of electric current, Refraction, dispersion of optical devices.

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Define and discuss about the simple harmonic waves and its oscillations and laws of transverse vibrations of strings.	K1, K2
CO 2	Classify and describe the properties of matter such as electricity, viscosity and surface tension.	K1, K2, K3

CO 3	Summarise the basic concepts of thermal physics and apply the laws of thermodynamics in higher learning concepts such as entropy and its reversible and irreversible process.	K1,K2
CO 4	Explain the principles and laws used in electricity and magnetism those are useful in defining the energy of a capacitor and magnetic effect of electric current.	K1,K2
CO 5	Demonstrate the properties of geometrical optics and explain the refraction and dispersion through a prism.	K1,K2,K3

Unit1:Waves and scillations **(9 hrs)**

Simple Harmonic motion- Composition of two simple harmonic motions in a straight line-Composition of two simple harmonic motions of equal time periods at right angles-Lissajous's figures- Uses – laws of transverse vibrations of strings – Melde's string – transverse and longitudinal modes.

Unit 2 Properties of Matter **(9 hrs)**

Elasticity –Different Moduli of Elasticity- Poisson's ratio.

Streamline flow and Turbulent flow –Coefficient of Viscosity-Rate of Flow of liquid in a Capillary Tube-Poiseuille's Formula (Method of dimensions)- Poiseuille's Method for determining coefficient of viscosity of liquid- Comparison of viscosities of two liquids

Surface Tension: Molecular theory of surface tension-pressure difference across a liquid surface-Pressure difference across a liquid surface -excess pressure inside a soap bubble and drop.

Unit 3 Thermal Physics **(9 hrs)**

Postulates of Kinetic theory of gases – Van der Waals equation of state – Derivation of Critical Constants - Joule Kelvin effect – Joule Thomson porous plug experiment – Laws of thermodynamics- Heat Engine– entropy - changes of entropy in reversible and irreversible processes

Unit 4 Electricity and Magnetism **(9 hrs)**

Capacitor-energy of charged capacitors-Loss of energy on sharing of charges between two capacitors- magnetic effect of electric current-Biot Savart's law-Magnetic induction at a point on the axis of a circular coil

Unit 5 Geometrical optics **(9 hrs)**

Laws of Refraction – Refractive index by travelling microscope, Refraction through Prism - Dispersion through a prism – Expression for dispersive power of the material of a thin prism – Combination of two prisms to produce dispersion without deviation - Combination of two prisms to produce deviation without dispersion

TEXT BOOKS:

Allied Physics by R.Murugeshan**(2012- I Edition)***Allied Physics,* **Ram Nagar, New Delhi: S. Chand & Company Ltd.**

Unit 1: 1.1-1.4, 1.7, 1.9

Unit 2: 2.1-2.3, 2.14 -2.16, 2.18-19, 2.24-2.28
Unit 3: 3.1-3.5, 3.15-3.22
Unit 4:4.1-4.6
Unit 5:5.1-5.3, 5.6,5.11-5.13,5.15

REFERENCE BOOKS:

1. Elements of Physics by Robert F. Kingsbury, IstEdition,Van Nostrand Company, London
2. Elements of properties of matter by Brijlal and Subramanian, S. Chand & Company Pvt ltd
3. Allied Physics by Dr.Dhanalakshmi, Dr.Sabesan, Popular Book depots

WEB REFERENCES (OPTIONAL)

https://study.com/academy/lesson/physical-property-of-matter-definition-examples-quiz.html
https://www.physicsforums.com
https://www.kullabs.com/classes/subjects/units/lessons/notes/note-detail/1761

III SEMESTER
ALLIED CORE
ALLIED PHYSICS PRACTICALS I – 19M3ACP2/19G3ACP2
(For those who joined in 2019 onwards)

HOURS/WEEK: 2 **CREDIT: 2**

COURSE DESCRIPTION

The course provides hands on training in Physics experiments relevant to the theory learnt in allied core courses.

COURSE OBJECTIVE/S

This course enables the students to develop basic lab skills.

SKILL DEVELOPMENT: 100%

LIST OF EXPERIMENTS (Any eight

1. Comparison of coefficient of viscosity of two liquids
2. Determination of coefficient of viscosity
3. Determination of Surface Tension – Capillary rise method
4. Determination of Surface Tension – Drop Weight method
5. Determination of Latent heat of fusion of Ice
6. Determination of Young's Modulus - Uniform bending
7. Determination of specific heat capacity of a liquid-Newton's law of cooling
8. Determination of focal length of biconvex lens(UV& Distant object methods).
9. Determination of refractive index of a liquid
10. Determination of rigidity modulus – Torsional Pendulum

III SEMESTER
MAJOR CORE

Biomechanics – 19P3SB1

(For those who joined in 2019 onwards)

HOURS/WEEK: 2 **CREDIT:2**

COURSE DESCRIPTION

This course aims to introduce the Biomechanical concepts and to provide an idea about the anatomic pulleys and lever systems.

COURSE OBJECTIVE/S

This course impart knowledge about mechanics applied to Biological systems.

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Students will be able to acquire a skill to apply the laws of kinematics to biological systems	K1, K2
CO 2	Students will be able to identify the anatomical pulleys and lever systems	K1, K3
CO 3	Students will be able to access the types of levers in our body	K1,K2
CO 4	Students will be able to explain how the biological machines inside our body	K1,K2,K3
CO 5	Students will be able to discuss different kinds of activities, equilibrium and stability of the body using law of physics	K1,K3

UNIT I : BIOMECHANICAL CONCEPTS **[12 Hrs]**

Kinematics – kinetics- centre of mass and centre of gravity - moment of force – mass moment of inertia – Newton's laws of motion – equilibrium-Lever systems – moment of force.

UNIT II: Muscle Forces **[12 Hrs]**

Total muscle force vector – measuring muscle forces – anatomic pulleys, action lines and moment arms –changes to moment arm of a force –moment arm and angle of application of force- classes of levers – muscles in third class, second class and first class

lever systems – mechanical advantage.

Text Books

Unit I - Biomechanics of Musculoskeletal Injury- William C. Whiting, Ronald F. Zernick (Human Kinetics) Pages: 41 - 55 , 62 – 66 (Chapter -3)

Unit II – Joint Structure and Function: A Comprehensive analysis (IV Edition)- Pamela K.
Levangie, Cynthia C. Norkin (JP brothers, New Delhi) Pages : 42 – 52.

IV SEMESTER
MAJOR CORE
ANALOG ELECTRONICS – 19P4CC10
(For those who joined in 2019 onwards)

HOURS/WEEK: 5 **CREDIT:5**

COURSE DESCRIPTION

The course provides an exposure to transistors, amplifiers, oscillators and operational amplifers

COURSE OBJECTIVE/S

This course deals with working of electronic devices and its applications

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge level(According to Bloom's Taxonomy)
CO 1	Students will be able to acquire basic knowledge of PN junction diode, different rectifiers and filters	K1, K2
CO 2	Students will be able to explain different transistor configuration and various biasing circuits	K1, K3
CO 3	Students will be able to obtain the knowledge of transistor amplifier and analyse using DC and AC load line	K1,K2
CO 4	Students will be able to elucidate the concept of feedback in amplifiers and design various types of oscillators	K1,K2,K3
CO 5	Students will be able to describe the parameters of OP-AMP and to design OP-AMP circuits	K1,K3

Unit I: SEMICONDUCTOR DIODE [12 Hrs]

PN junction – junction theory –The ideal diode-Static and dynamic resistance of a diode-Use of diodes in rectifiers- Half wave rectifier – Full wave rectifier - Efficiency of rectifiers to convert AC into DC – Shunt capacitor filter – Choke input LC filter – π filter

Unit II TRANSISTOR (BJT & FET) [18 Hrs]

Transistor characteristics – Common base (CB) configuration – Common emitter (CE) configuration – Common collector (CC) configuration – comparison between the three configurations – Reason for CE configuration is widely used in amplifier circuits – Basic CE amplifier circuit – DC load line – Amplifier analysis using DC load line - Field Effect Transistor (FET). Structure of a junction field effect transistor – JFET characteristics – JFET parameters

Unit III: SMALL SIGNAL AMPLIFIERS & MULTISTAGE AMPLIFIERS [15 Hrs]

Single stage transistor amplifier – Equivalent circuit method: Development of Transistor ac equivalent circuit, h-parameter equivalent circuit, amplifier analysis.

Need of Multistage Amplifiers – Gain of a multistage amplifier – Coupling of two stages: Resistance- Capacitance coupling-Frequency response curve of an RC coupled amplifier: fall of gain in low frequency range, fall of gain at high frequencies, band width of an amplifier

Unit IV: FEEDBACK IN AMPLIFIERS & OSCILLATORS [15 Hrs]

Concept of feedback in amplifiers – Types of feedback – Voltage gain of feedback amplifier Positive feedback amplifiers as an oscillator – LC oscillators: tuned collector oscillator, Hartley oscillator, Colpitts oscillator – RC oscillators (no derivation): phase shift oscillator, Wein bridge oscillator –Astable multivibrators.(circuit using transistor only)

Unit V: OPERATIONAL AMPLIFIER [15 Hrs]

The operational amplifier (OP-AMP) – Basic concepts- Ideal op-amp-Characteristics of an OP-AMP- Operational amplifiers: Basic inverting OP-AMP, Practical inverting OP-AMP,

Non inverting OP- AMP ,parameters of OP-AMP -Applications of OP-AMP: Scale changer, phase shifter, Summing amplifier, Integrator, Differentiator.

TEXT BOOKS:

1. N.N. Bhargava, D.C. Kulshreshtha, S.C. Gupta, *Basic Electronics and linear circuits* –– Tata McGraw Hill Publishing Company Ltd.
   UNIT I : Chapter 4 : 4.1-4.7,4.8.1,4.8.3,4.8.4
   UNIT II : Chapter 5 : 5.7, 5.7.1, 5.7.2, 5.7.3, 5.8,5.9, 5.10, 5.14,5.14.1-5.14.3
   UNIT III : Chapter 8: 8.2, 8.4,8.4.1, 8.4.2,8.4.3, 9.1-9.3.1-9.3.3,9.4
   UNIT IV : Chapter 12 : 12.1-12.3, 13.4-13.5.1,13.5.3,13.5.4,13.6.1,13.6.3, 13.8

2. Dr.S.L. Gupta, Dr. V. Kumar, *Hand Book of Electronics*- -20th edition- Pragati Prakashan Publications.
   UNIT V : Chapter 20: 20.1, 20.4, 20.7-20.7.6 (Relevant sections only).

REFERENCE BOOKS:

1. V.K. Mehta and Rohit Mehta, *Principles of Electronics* –Eleventh Edition –– S.Chand and Company
2. L. Floyd, *Electronic Devices, Pearson* Educatin, New York, 2004
3. A. David Bell, *Electronic Devices and circuits*, Oxford university press, New Dehi, 2008
4. Ramakant A Gayakwad, *OP-AMPS and Linear Integrated circuits*, Prentice Hall of India Private Ltd.

WEB REFERENCES (OPTIONAL)

3. http://hyperphysics.phy-astr.gsu.edu/hbase/magnetic/magcur.html
4. https://www.britannica.com/science/electromagnetism

III SEMESTER
MAJOR CORE
MATERIAL SCIENCE – 19P4CC11
(For those who joined in 2019 onwards)

HOURS/WEEK: 4 **CREDIT:4**

COURSE DESCRIPTION

The course provides concept based exposure to conducting, dielectric, magnetic, superconducting and other emerging new materials

COURSE OBJECTIVE/S

This course deals with the elemental concepts of properties of various materials

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Students will be able to gain the knowledge of properties of various materials	K1, K2
CO 2	Students will be able to explain the classical Maxwell's distribution law of velocity and its inference.	K1, K3
CO 3	Students will be able to determine electrical conductivity, thermal conductivity of conducting materials	K1,K2
CO 4	Students will be able to explain theory of various magnetic and superconducting materials	K1,K2,K3
CO 5	Students will be able to identify new materials that find diverse applications.	K1,K3

Unit I: Conducting Materials **[12 Hrs]**

Material Science-Properties of engineering materials.

Atomic interpretation of ohm's law-Relaxation time and electrical conductivity-Derivation of electrical conductivity of a metal-Electrical and thermal conductivity-Relaxation time, collision time, mean free path. Thermal conductivity-Wiedemann Franz law-Thermal expansion.

Unit II: Dielectric Materials **[12**

Hrs]

Fundamental definitions in dielectrics-Different types of electric polarization-Frequency and temperature effects on polarization – dielectric loss – Local field –Clausius Mosotti relation -Determination of dielectric constant of a dielectric material-Properties and different types of insulating materials

Unit III: Magnetic materials [12 Hrs]

Introduction - Different types of magnetic materials-classical theory of diamagnetism-Langevin theory of paramagnetism-Weiss theory of paramagnetism - Molecular field theory of ferromagnetism-Heisenberg theory on ferromagnetism.

Unit IV: Superconducting materials [12 Hrs]

Introduction - Explainations for the occurrence of superconductivity-General properties of superconductors-Types of superconductors-High temperature superconductors-Applications of superconductors

Unit V: New Materials [12 Hrs]

Metallic glasses-fiber reinforced plastics- Metal matrix composites –Biomaterials-Ceramics-Cermets-High temperature materials-Thermoelectric materials-Electrets-Nanophase materials-Shape memory alloys-smart materials-conducting polymers.

TEXT BOOKS:

Dr. M. Arumugam, M. Sethuraman, *Material Science*, Anuradha publications, Reprint 2010

Unit. I: 1.1-1.2,5.1-5.9
Unit.II: 6.1-6.8,6.10
Unit. III: 7.1-7.7
Unit.IV: 8.1-8.7
Unit. V: 11.2-11.4,11.5-11.11,11.14-11.17

REFERENCE BOOKS:

1. V. Rajendran, *Material science*, TATA Mc GRAW HILL EDUCATION PVT. LTD. Second Reprint 2013
2. V.Raghavan, *Materials science and engineering A First Course,* A First course Prentice Hall of India 2004
3. William.D. Callister, Jr., *Materials science and Engineering* – an introduction (V edition) 2012

WEB REFERENCES (OPTIONAL)

5. https://easyengineering.net/materialssciencebooks/

Skill Development: 100%

III SEMESTER
MAJOR CORE
MAJOR PRACTICALS IV – 19P4CC12
(For those who joined in 2019 onwards)

HOURS/WEEK: 3 **CREDIT:2**

COURSE DESCRIPTION

This laboratory course explores the basic principles of electronics through experiments

COURSE OBJECTIVE/S

On completion of this course, the learner will be able to understand physical laws using appropriate equipments through experiments

List of Experiments (Any Eight)

1. Bridge Rectifier-study of percentage of regulation
2. Transistor characteristics – CE configuration
3. Single Stage RC coupled Amplifier-Study of frequency response curve
4. OP-AMP –Inverting amplifier, Differential amplifier
5. OP-AMP - Adder and Subtractor
6. OP-AMP-Parameters
7. Low pass & High pass filter using RC circuit
8. Zener diode characteristics
9. Hartley Oscillator
10. Colpitt Oscillator

IV SEMESTER
MAJOR CORE

Physics of Stars – 19P4SB2

(For those who joined in 2019 onwards)

HOURS/WEEK: 2 **CREDIT:2**

COURSE DESCRIPTION

This course briefly explains the life cycle of a star. It throws light on various nuclear reactions taking place in a star. It also explains about the mysterious objects of the Universe.

COURSE OBJECTIVE/S

This course impart knowledge about physics of stars and other mysterious objects of Universe

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	On completion of the course, the student will be able to explain the life cycle of stars	K1, K2
CO 2	Students will be able to discuss the spectral classification of stars	K1, K3
CO 3	Students will be able to outline the nuclear reactions taking place in stars	K1,K2
CO 4	Students will be able to distinguish between various mysterious objects of the universe like supernova, white dwarfs, pulsars, red giants, black holes etc	K1,K2,K3
CO 5	Students will be able to explain classification of galaxies, red and blue shift of spectral lines	K1,K3

UNIT I The Stars in the Sky **[15 Hours]**

Life cycle of the stars – The black body model of a star – Morgan – Keenan spectral classification of stars - Hertzsprung – Russel diagram – Mass Luminosity relationship of a star in the main sequence – The size limits of a star.

The Life of Stars in the Main Sequence - The stellar structures – The stellar models – The energy transport mechanism inside a star – The main sequence and life span of

the stars – Nuclear reactions inside a main sequence star – The Proton – proton chain reaction – The Carbon – Nitrogen – Oxygen cycle.

UNIT II Mysterious objects of the Universe [15Hours]

Brilliant Phenomena and Mysterious Objects of the Universe - Supernova – Type I supernova – Type II supernova. Compact Objects of the sky - White dwarfs - Neutron stars- Pulsars - Black holes - Quasars- Evidences of dark matter - Gravitational lensing.

Text Books:

Astronomy and AstroPhysics- Asit Baran Bhattacharya, Shubhendu Joardar & Rina Bhattacharya

Unit I : Ch: 5: 5.1 – 5.7

Ch: 17: 17.2 – 17.2.1, 17.2.3, 17.2.4; 17.3 - 17.3.1, 17.3.2.

Unit II : Ch: 19: 19.2 , 19.3 , 19.7.

Reference Books

1. Astrophysics for Physicists by Arnab Rai Choudhuri, Cambridge Universit y Press

IV SEMESTER
ALLIED CORE
ALLIED PHYSICS II – 19M4ACP3/19G4ACP3
(For those who joined in 2019 onwards)

HOURS/WEEK: 3 **CREDIT:3**

COURSE DESCRIPTION

The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like geometrical Optics, Atomic Physics, Nuclear Physics and Electronics.

COURSE OBJECTIVE/S

This course will improve the elemental concepts and enhance the intellectual, experimental, analytical skills of the students on Atomic Physics, Nuclear Physics, Electronics and Physical optics.

COURSE OUTCOMES (CO)

No.	Course Outcome	Knowledge Level(According to Bloom's Taxonomy)
CO 1	Students will be able to categorize and clarify the different optical phenomena of interference, diffraction, polarization.	K1, K2
CO 2	Students will be able to explain the atom model and calculate the total energy of an atom and account for the spectral series of hydrogen atom.	K1, K2, K3
CO 3	Students will be able to elucidate the models of nuclear structure and to learn the principle behind atom bomb, nuclear reactors.	K1,K2
CO 4	Students will be able to summarize the working principle of p-n junction diode in forward and reverse biasing, its V-I characteristics, the Zener Diode, n-p-n transistor	K1,K2

	in common emitter characteristics.	
CO 5	Students will be able to classify the number system and demonstrate the skill in conversion of Number systems, Boolean algebra and its associated laws.	K1,K2,K3

Objective: The aim of this course is to impart an understanding of atomic, nuclear physics and electronics

Unit 1 PHYSICAL OPTICS **(10 hours)**

Velocity of light-Michelson's method-Interference in thin films-Production of colours in thin films-Air wedge-Diffraction- Polarisation- Polarisation by reflection-Double refraction –-Nicol Prism.

Unit 2 ATOMIC PHYSICS **(8 hours)**

Introduction – Rutherford's experiments on scattering of alpha particles- Bohr atom model – Bohr formula – calculation of total energy – Bohr's Interpretation of Hydrogen spectrum – Spectral series of hydrogen atom

Unit 3 NUCLEAR PHYSICS **(9 hours)**

Models of Nuclear Structure-The Liquid Drop Model-Mass defect-Binding energy-Nuclear fission-chain reaction - atom bomb-energy released in fission - Nuclear reactor-Nuclear Fusion.

Unit 4 BASIC ELECTRONICS **(9 hours)**

Formation of p-n Junction Diode-Forward and Reverse Biasing of a Junction Diode-V-I Characteristics of a Junction Diode-The Zener Diode-Experiment to study the characteristics of zener diode-Junction Transistor-working of n-p-n transistor - common emitter characteristics of a transistor

Unit 5 DIGITAL ELECTRONICS **(9 hours)**

Decimal Number system- Binary Number system-conversion of Binary number into decimal number-conversion of decimal number into binary number- Octal Number system-Hexadecimal number system – Boolean Algebra-Boolean addition and multiplication-Logic Expressions-commutative laws-associative laws-distributive law-Rules for Boolean algebra-De Morgan's Theorem.

TEXT BOOKS:

Murugesan, R. (2012 II Edition) ***Allied Physics*****, Ram Nagar, New Delhi: S. Chand & Company Ltd.**

Unit 1: 6.1-6.5, 6.8, 6.12-6.14, 6.16

Unit 3: 8.1 – 8.4,8.8,8.9, 8.11-8.14

Kiruthiga Sivaprasath, Murugesan, R. (2007 Thirteenth Revised multicolour edition) ***Modern Physics*****, Ram Nagar, New Delhi: S. Chand & Company Ltd.**

Unit 2: 6.1,6.2, 6.4
Unit 4: 58.1-58.5, 58.14, 58.15
Unit 5: 70.1-70.4, 70.10-70.19

REFERENCE BOOKS:

4. Kumar and Gupta (1994), *Hand Book of Electronics*, Meerut : Pragati Prakashan
5. Mithal G.K. (1998), Basic Electronics, G.K. Publishers Pvt. Ltd.,
6. Halliday D., Resnick R and Krane K.S. (2004), Physics 4th Edition, Vol.1,2 , New York

WEB REFERENCES (OPTIONAL)

https://www.khanacademy.org/science/physics/quantum-physics/atoms-and-electrons/v/atomic-energy-levels
https://www.nature.com/subjects/nuclear-physics
https://www.dictionary.com/browse/physical-optics

IV SEMESTER

ALLIED CORE

ALLIED PHYSICS PRACTICALS I –19M4ACP4/19G4ACP4

(For those who joined in 2019 onwards)

HOURS/WEEK: 2 **CREDIT: 2**

COURSE DESCRIPTION

The course provides hands on training in Physics experiments relevant to the theory learnt in allied courses.

COURSE OBJECTIVE/S

This course enables the students to develop basic lab skills.

Skill development-100%

LIST OF EXPERIMENTS (Any eight)

11. Low range Voltmeter calibration using Potentiometer
12. Air wedge - Determination of thickness of insulation
13. Diode characteristics – (Forward & Reverse bias)
14. Ohm's law verification
15. Bridge rectifier
16. Verification of AND, OR, NOT, NAND and NOR gates
17. Verification of Boolean expressions
18. NAND as universal gate
19. NOR as universal gate
20. De Morgan's theorems

FATIMA COLLEGE (AUTONOMOUS), MADURAI
DEPARTMENT OF PHYSICS- SEMESTER V
ELECTRONICS AND COMMUNICATION - (P5CC9)
(For those who joined in June 2018)

7hrs/week **6 credits**

Course objective:
This course aims at the fundamentals of digital electronics, flip-flops, registers, counters and D/A & A/D converters. It also exposes the students to modulation, satellite communication and fibre optics communication.

UNIT I ***(21 hrs)***

Combinational logic circuits:
Boolean laws and theorem - Sum-of- products method - Truth table to Karnaugh Map - Pairs, Quads and Octets - Karnaugh simplifications, Don't care conditions - Product –of- sums method - product-of-sum simplification.

Flip-flops:
RS flip-flops- Gated flipflops – Edge triggered RS flipflop- Edge triggered D-flip-flops-
Edge triggered JK flip-flops-Flip-flop Timing- Edge triggered D-flip-flops-JK master-slave flip-flop.

UNIT II ***(21 hrs)***

Shift registers :
Types of registers -Serial in- serial out - Serial in-parallel out-Parallel in – serial out – parallel in-parellel out.

Counters:
Asynchronous counters – decoding gates - synchronous counters – changing the counter modulus – decade counters.

UNIT III ***(16 hrs)***

D/A Conversion and A/D conversion:
Variable resistor networks – binary ladders –D/A converters – A/D converter- Simultaneous conversion – continuous A/D conversion – A/D techniques.

UNIT IV *(26 hrs)*

Modulation:

Introduction – Modulation- forms of modulation- Amplitude modulation-

AM transmitter and receiver (block diagram only) – Side band transmission

Generating the side bands only (filter method) – Frequency modulation – Direct Frequency modulation – Phase modulation - FM transmitter and receiver (block diagram only) – Pulse amplitude modulation – Time division multiplexing – Pulse width modulation (brief theory only) – Pulse position modulation (brief theory only).

UNIT V *(21 hrs)*

Satellite communications:

Introduction- The satellite orbits-satellite position- assignable satellite frequencies - Station keeping.

Fiber optic communications:

Introduction - Modulation techniques – Frequencies – Fibre optic cables - Advantages and disadvantages of optical fiber communications.

Books For Study :

1. Digital Principles and Applications – Albert Paul Malvino & Donald p. Leach (VI Edition)

UnitI: Ch 3 : 3.1- 3.8
Ch 8 : 8.1-8.7

Unit II : Ch 9: 9.1- 9.5
Ch 10: 10.1-10.5

Unit III: Ch12 : 12.1 –12.3 , 12.5 , 12.7 , 12.8.

2 Electronic Communications , Modulation and transmission – Robert J. Schoenbeck.

Unit IV& V: Ch1: 1.1 – 1.2.6, 1.2.8, 1.3
Ch2: 2.1, 2.2
Ch3: 3.1 – 3.2, 3.2.1
Ch4: 4.1, 4.2
Ch5: 5.1 , 5.2, 5.4.4 – 5.4.10, 5.5
Ch7: 7.1
Ch13: 13.3.1 – 13.3.4
Ch 14: 14.1, 14.3, 14.4, 14.8.
Ch 16: 16.1- 16.3, 16.5, 16.6.4.

Books for reference:

1. **Digital integrated electronics – H. Taub and D. Schilling.**
2. **Electronic Communication system – George Kennedy.**

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FATIMA COLLEGE (AUTONOMOUS), MADURAI

DEPARTMENT OF PHYSICS- SEMESTER V

OPTICS - P5CC10

(For those who joined in June 2008 and later)

(Reviewed in 2017)

7 Hrs/week **6 Credits**

Course objective:

This course aims at giving a detailed study of interference, diffraction, polarization, Holography, Laser and Maser.

UNIT I **(21 hrs)**

Interference of light (division of amplitude)

Change of phase on reflection- Interference by reflected light- Interference by transmitted light- Colors of thin films- Necessity of an extended source-Non reflecting films- Interference in a wedged-shaped film- Fringes in white light- Fringes of equal thickness and fringes of equal inclination - Newton's rings- Michelson's interferometer.

UNIT II **(21 hrs)**

Interference of light (division of wave front)

Fresnel's biprism- Interference fringes with white light- Displacement of the fringes- Fresnel's double mirror – Lloyd's single mirror- Achromatic white light fringes.

Lasers and Holography

Introduction to Lasers: Absorption, Spontaneous emission and Stimulated emission- Relation between Einstein's A&B coefficients – Characteristics of a Laser beam-Principle of Laser action -Ruby Laser- Helium Neon Laser –Semi conductor Lasers-Applications of a Lasers: Lasers in medicine and surgery - Laser in Holography.

UNIT III **(21 hrs)**

Diffraction of light - Fresnel class:

Fresnel's half period zones- Explanation of rectilinear propagation of light- Zone plate - Diffraction at a circular aperture- Diffraction at an opaque disc – Division of a cylindrical wave-front into half period strips- Diffraction at a straight edge - Diffraction at a slit – Diffraction at a narrow wire - Cornu's spiral.

UNIT IV **(21 hrs)**

Fraunhofer Diffraction:

Fraunhofer diffraction at a single slit- Two slits – N parallel equidistant slits- plane diffraction grating- Determination of angle of Diffraction- Dispersive power of grating- resolving power – Rayleigh's criterion for resolution- Resolving power of telescope, Microscope, Grating, Prism.

UNIT V **(21 hrs)**

Polarization of light:

Polarized and unpolarised light – Production of plane polarised light –Polarization by reflection-Brewster's law- Polarisation by refraction- Law of Malus- Uniaxial and biaxial crystals – Double refraction- Double image prisms- Production and analysis of polarized light– Babinet's Compensator.

Book for study:

Optics by **Satya Prakash** 12th edition 2005, Educational & university Publishers.
Unit 1: Ch. 3 : 3.2 – 3.6, 3.9 - 3.19.
Unit 2: Ch2: 2.9- 2.13, 2.15 , Ch.1.1,1.2,1.3,1.6,2.3,3.4,3.8,3.13,4.2,4.7
Unit 3: Ch 4
Unit 4: Ch.5: 5.1-5.14 , & Ch.6 : 6.1-6.6 , 6.9-6.11
Unit 5: Ch.7: 7.1-7.14, & Ch.8: 8.1-8.9

Reference Book:

1) A text book of optics- Dr.N.Subrahmanyam, Brijlal, Dr.M.N.Avadhanulu, 24th Revised Edition 2010, S. Chand & Company limited.

2) OPTICS – Ajoy Ghatak, 4th Edition, Tata Mc Graw Hill Publishing Company Ltd, New Delhi.

III BSc. PHYSICS- SEMESTER V

PHYSICS OF MEASURING INSTRUMENTS –I - P5SB3

2 hrs/week **2 Credits**

Objective:

To enable the students learn the principles behind thermodynamical measurements and mechanical and electrical measurements.

UNIT I (6 hours)

THERMODYNAMICAL MEASUREMENTS

Temperature: Average Body Temperature – Low body temperature on health **–**Basal body temperature thermometer –Swine flu thermometer –Bulb thermometer-Bimetallic strip thermometer-digital thermometer

UNIT II (6 hours)

Atmospheric pressure: Standard atmospheric pressure- Mean sea level pressure- Altitude atmospheric pressure variation- Local atmospheric pressure variation- Atmospheric pressure based on height of water.

Density**:** Change of density with pressure and temperature- Densities of various materials.

Humidity: Hygrometer- Psychrometer- Difficulty of accurate humidity measurement- Hair tension hygrometer- Electronic hygrometer- Applications.

UNIT III (6hours)

Aircraft instrumentation: Altimeter: Pressure altimeter- Radar altimeter-Other modes of transport: Measuring air pressure-Sattelite altimetry-Sextants: Navigational sextant- Aircraft Sextant- Adjustment and care-Advantages.

UNIT IV **(**6 hours)

Wind speed: Factors affecting wind speed- Design of structures considering Wind Speed.

Anemometers: Velocity anemometers: Windmill anemometer-Laser Doppler anemometer -Sonic anemometer_ Pressure anemometers**:** Plate anemometer- Tube anemometer- Effect of density on measurements:Other practical onsiderations**:** Lightning-Precipitation-Low Temperatures.

UNIT V **(**6 hours)

Force: Force, Torque, Shaft power measurements-Scales and balances, Optical torsion meter, mechanical brakes-Car Brakes.

Transducers: Piezoelectric Trasnducers-Temperature transducers- Resistance temperature detectors- Thermistors-Ultrasonic termperature transducers- Photoelectric transducers- The photomultiplier tube- - The semiconductor photodiode- The phototransistor-Biosensors-Chemical sensors-pH sensing-Optical sensors.

TEXT BOOKS

1. D.S.Kumar, Mechanical measurements and Control Metropolitan Book Co., II Edition. (Relevant Sections only)

2. Larry Jones, A. Foster Chin, Electronic insrtuments and measurements, J.Wiley & sons, Inc. (Relevant sections only)

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18
III B.Sc. PHYSICS - SEMESTER V

PHYSICS OF MEDICAL INSTRUMENTS I – P5SB4

OBJECTIVE:

To enable the student learn the physics principles behind the medical instruments used for diagnosis especially pressure, sound, light and electricity

UNIT 1:

The breathing mechanism-Physics of some common lung diseases-Blood pressure and its measurement- Spicomanometer,

Sound in Medicine: Stethoscope.

Light in Medicine: Instruments used in Opthomology, Keratometer, Opthalmoscope - Lasers in Medicine

UNIT 2:

Electricity within the body: Electrical potentials of Nerves - The electromyogram, ECG, EEG, Electroretinogram, Cardio vascular Instrumentation- Bio potential of heart, Pacemakers, Angiography

BOOKS FOR STUDY

1.John R. Cameron, James G. Skofronick- Medical Physics, John Wiley & Sons

2.IrinaCromwell,CarolWeibell,LiannePfeiffer-Biomedical Instrumentation and Measurements-Prentice Hall of India Pvt .Ltd., New Delhi

Employability:

This course is a part of the syllabi for the Diploma courses on Opthomology , electromyogram, ECG, EEG, Electroretinogram, Cardio vascular Instrumentation, Pacemakers, Angiography technecians which decide the eligibility to get employment in multispeciality hospitals and also to get admission for M.Sc. Medical physics course.

Skill development:

Physics is the language of Studying the functioning of human body. This paper will develop the skill of understanding the functioning of different organs of the human body. This course also develops the knowledge of identifying the abnormalities in the functioning of different organs of the human body and also diagnose the problems arose in the normal functioning of the body.

FATIMA COLLEGE (AUTONOMOUS), MADURAI
SEMESTER VI- P6CC11
THERMODYNAMICS AND STATISTICAL MECHANICS
(For those who joined in June 2008 and later)
(Reviewed in 2017)

5 hrs/week **5 Credits**

Course objective:

The aim of this course is to deal with thermodynamics, entropy and thermodynamic potentials. This course also deals with statistical thermodynamics and applications of statistics to gases.

UNIT I **(15 hrs)**

Scope of thermodynamics – Thermodynamic systems- State of a system, properties- pressure-Thermal equilibrium and temperature – the Zeroth law- Thermodynamic equilibrium- The first law of thermodynamics- Internal energy- the energy equation T and V independent - T and P independent- P and V independent.

UNIT II **(15 hrs)**

Entropy and the second law of thermodynamics:

The second law of thermodynamics-Thermodynamic temperature- Entropy – Calculation of entropy changes in reversible process- temperature entropy diagrams- Entropy changes in irreversible processes- The principle of increase of entropy-Clausius and kelvin- Plank statement of the second law.

Combined first and second laws:

Introduction- T and V independent- T and P independent- P and V independent- The T ds equations- properties of a pure substance- Properties of an ideal gas- Properties of a Vander Waals gas.

UNIT III **(15 hrs)**

Thermodynamic Potentials:

The Helmholtz function and the Gibbs function- Thermodynamic potentials- The Maxwell's relations- stable and unstable equilibrium, phase transitions- The Clausius-Clapeyron equation- The third law of thermodynamics.

UNIT IV **(15 hrs)**

Statistical Thermodynamics:

Introduction- Energy states and energy levels- Macrostates and microstates- Thermodynamic probability- The Bose Einstein statistics- The Fermi-Dirac statistics- The Maxwell-Boltzmann statistics- The Bose- Einstein distribution function- The Fermi Dirac distribution function- The classical distribution function-Comparison of distribution functions for indistinguishable particles-The Maxwell- Boltzmann distribution function-The partition function.

UNIT V **(15 hrs)**

Applications of statistics to gases:

The Monoatomic ideal gas- The principle of equipartition of energy- The quantized linear oscillator- Specific heat capacity of a diatomic gas.

Applications of quantum statistics to other systems:

The Einstein theory of the specific heat capacity of a solid- The Debye theory of the specific heat capacity of a solid- Blackbody radiation.

Book for Study:

Thermodynamics, Kinetic theory and Statistical thermodynamics.
Francis W.Sears&Gerhard L.Salinger,Narosa Publishing.
Unit 1: 1-1 – 1-5,1-8,3-6,3-7,4-1 – 4-4.
Unit 2: 5,6-1 6-8
Unit 3: Ch : 7
Unit 4: 11-1 – 11-7, 11-9 – 11-14
Unit 5: 12-1, 12-5 – 12-7, 13-1 – 13 -3

Books for Reference:

1.Statistical Mechanics:Agarwal, Eisner:Wiley Eastern ltd
2 .Fundamentals of statistical and thermal physics:Reif ,McGraw-Hill

FATIMA COLLEGE (AUTONOMOUS) , MADURAI-18
DEPARTMENT OF PHYSICS - SEMESTER VI
MODERN PHYSICS – P6CC12
(For those who joined in June 2018)

5 Hrs /Week **5 Credits**

Objective :

This course deals with the wave properties of particles and fundamentals of Quantum Mechanics. Nuclear models and special relativity are dealt with in detail.

UNIT I

Wave properties of particles **(15 Hrs)**

De Broglie waves – wave function - De Broglie wave velocity – Wave and group velocities - The Davisson – Germer experiment – The uncertainty principle – Applications of the uncertainty principle – The wave particle duality.

UNIT II

The Schrodinger's Equation **(15 Hrs)**

The wave function – The wave equation – Time dependent form of Schrodinger's Equation – Probability current – Expectation values – Operators – The steady state form of Schrodinger's equation – Eigen values and Eigen functions – The particle in a box – energy quantization – Momentum wave functions – Momentum quantization.

UNIT III

The Vector Aom Model **(15 Hrs)**

Magnetic quantum number – The Normal Zeeman Effect – Angular momentum – Electron spin – The Stern-Gerlach Experiment – Spin – Orbit coupling – The Exclusion Principle – Hund's rule – Total Angular momentum – LS coupling – jj coupling.

UNIT IV

The Nucleus **(15 Hrs)**

Atomic masses – Nuclear electrons – The Neutron – Stable nuclei – Nuclear sizes – Binding Energy – The deuteron – Ground state of the deuteron – Triplet and singlet states – Meson theory of nuclear forces – The Liquid Drop Model – The Shell Model.

UNIT V

Theory of relativity **(15 Hrs)**

Special theory of Relativity – The Michelson –Morley experiment – The Galilean Transformation – The Lorentz transformation – Lorentz – Fitzerald contraction – The time Dilation – Meson decay – Simultaneity – Space – Time – Velocity addition – The relativity of Mass - The Cerenkov effect – Mass and Energy – Some relativistic formulas – General Relativity – The Twin Paradox.

Book for study :

"Perspectives of Modern Physics" by Arthur Beiser. (McGraw Hill)

Unit I: Ch.4: 4.1 - 4.8

Unit II: Ch.7: 7.1 – 7.9

Ch.8: 8.1 – 8.3

Unit III: Ch.9: 9.6 – 9.8

Ch.10: 10.1 – 10.3 , 10.6 – 10.9

Unit IV: Ch.21: 21.1 – 21.6

Ch.22: 22.1 - 22.6

Unit V : Ch.1: 1.1 – 1.8

Ch.2: 2.1 – 2.5, 2.7, 2.8.

Books for reference:

1. " Modern Physics" by N.K.Sehgal , K.L.Chopra and D.L. Sehgal. (VIII Edition – Sultan and Chand)
2. " Modern physics" by G. Aruldas & P.Rajagopal(2005 Edition) (PHI Ltd.)

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Employability,:

This course is a part of the syllabi for competitive exams like NET, SET, etc., which decide the eligibility to get employment as lecturers in colleges and also to get admission for Ph.D. This course also develops the problem solving skill of the students

FATIMA COLLEGE (AUTONOMOUS), MADURAI – 625 018.

III B. Sc. PHYSICS – MAJOR PRACTICALS (ELECTRONICS) – P6CC13

Skill development-100%

LIST OF EXPERIMENTS

1. Single stage amplifier – Frequency response curve
2. RS and JK Flip flop using NAND gates
3. Hartley Oscillator – Determination of L
4. Colpitt's Oscillator – Determination of L
5. Astable Multivibrator using transistors
6. Op-Amp Parameters (output resistance, closed loop gain)
7. Op-Amp applications- I (Adder, Subtractor)
8. Op-Amp applications- II (Integrator, Differentiator)
9. Half adder, Full adder using ICs.
10. Half subtractor, Full subtractor using ICs.
11. AND ,OR ,NOT Gates using Discrete components and verification with IC
12. Boolean Expression, De Morgan's Theorem-using gates
13. K-Map simplification
14. NAND and NOR as Universal gates
15. Regulated power supply using IC7805
16. Regulated power supply using Zener diode
17. Counters using IC-7490 (mod-5 & mod 10)
18. NAND ,NOR gates using discrete components

FATIMA COLLEGE (AUTONOMOUS), MADURAI – 625 018.

III B. Sc. PHYSICS – MAJOR PRACTICALS- IV (NON ELECTRONICS) – P6CC14

Skill development-100%

LIST OF EXPERIMENTS

1. Newton's rings in air – determination of radius of curvature of lens
2. Newton's rings in liquid – determination of μ
3. Air Wedge – determination of thickness of wire
4. He-Ne LASER- Determination of Refractive index of a liquid
5. Solar Spectrum - Determination of of Fraunhofer lines using Grating
6. Carey Foster's bridge- Determination of temperature coefficient of resistance
7. Biprism and spectrometer - Determination of λ
8. Determination of Refractive index of a calcite prism
9. Fraunhofer diffraction of a single slit- Diode Laser
10. Conversion of galvanometer to millivoltmeter
11. Determination of Resolving power of a grating
12. Determination of Groove spacing of a CD - LASER
13. Verification of Malus law- LASER
14. Determination of λ -Hartmann's Interpolation Formula
15 - Determination of the Numerical Aperture of a Fiber optic cable
16. Determination of Thermo emf – Potentiometer.
17. Solar cell characteristics
18. Study of the Characteristics of a Thermistor.

III BSc. PHYSICS- SEMESTER VI
MICROPROCESOR - P6ME1
(For those who joined in June 2013 onwards)

5 Hrs/week **5 Credits**

Course objective: This course gives exposure to microprocessor architecture and assembly language programming

UNIT I (15 hrs)

Number systems and Microprocessor Architecture

Number inter conversion(decimal, hexa, binary and octal)
The 8085 microprocessor unit-microprocessor communications and bus timings(excluding timings diagram)-demultiplexing the bus AD_7-AD_0-generating control signals- the detailed look at the 8085 MPU and its architecture.

UNIT II (15 hrs)

Introduction to 8085 assembly language programming

The 8085 programming model- instruction classification- instruction format-how to write, assemble and execute a simple program- overview of the 8085 instruction set.

UNIT III (15 hrs)

Introduction to 8085 instructions

Data transfer operations- arithmetic operations- logic operations-branch operations- writing assembly language programs- debugging a program.

UNIT IV **(15 hrs)**

Programming techniques with additional instructions
Programming techniques:
Looping, counting and indexing- additional data transfer and sixteen bit arithmetic instructions-arithmetic operations related to memory-logic operations: rotate-logic operations: compare-dynamic debugging.

UNIT V **(15 hrs)**
Counters and time delay:
Counters and time delay- illustrative program: hexa decimal counters- illustrative programs: Zero to Nine (modulo ten) counter- illustrative programs:
Generating pulse waveforms

Book for Study:

Microprocessor architecture, programming and applications with the 8085-III edition
By Ramesh S.gaonker

UNIT I - Appendix A-1,A-2, Ch-3 (3.1)
UNIT II- Ch 5 (5.1-5.5)
UNIT III- Ch.6 (6.1-6.6)
UNIT IV- Ch 7(7.1-7.6)
UNIT V- Ch.8 (8.1- 8.4)

FATIMA COLLEGE (AUTONOMOUS) , MADURAI-18

DEPARTMENT OF PHYSICS - SEMESTER VI

MEDICAL PHYSICS - P6ME2

(For those who joined in June 2008)

5 Hrs/week **5 Credits**

Course objective :

This course deals with the applications of electricity and magnetism in medicine, light in medicine, nuclear medicine, radiation protection in medicine and computers in medicine.

UNIT-I (15hrs)

Terminology, Modeling and Measurement :

Terminology, Modeling and Measurement

Applications of Electricity and Magnetism in Medicine

Electrical shock, High frequency Electricity in Medicine,Low-frequency Electricity and Magnetism in Medicine

UNIT-II (15 hrs)

Light in medicine:

Measurement of light and its units, Application of visible light in Medicine, Applications of Ultraviolet and Infrared Light in Medicine, Lasers in Medicine.

Physics of Diagnostic X Rays :

Making an X-ray image, Radiation to patients from x-rays. Producing Live X-ray images-Fluoroscopy.

UNIT III (15 hrs)

Radio isotopes in Medicine (Nuclear Medicine) :

Sources of Radioactivity for Nuclear Medicine, Basic Instrumentation and its clinical applications, Nuclear Medicine Imaging Devices, Therapy with radioactivity, Radiation Doses in Nuclear Medicines.

UNIT IV (15 hrs)

Radiation Protection in Medicine :

Biological effects of Ionizing Radiation, Radiation protection in Diagnostic Radiology, Radiation protection in Radiation therapy, Radiation protection in Nuclear Medicine, Radiation Accidents.

UNIT V (15 hrs)

Computers in Medicine:

History taking, Laboratory Automation, Electrocardiogram Interpretation, Patient Monitoring, Drug-Test interactions, prescribing Drug Dosage, Pulmonary Function Testing, Medical Record systems, Hospitals book keeping, Other uses of computers in Medicine.

Books For Study

Medical Physics: by John R.Cameron & James G.Skofronick,
A Wiley-Interscience Publication
John Wiley & Sons.

Chap:1 - 1.1-1.3
Chap:11 - 11.1-11.3
Chap:14 - 14.1-14.4
Chap:16 - 16.3 - 16 .5
Chap: 17- 17.2, 17.4, 17.5, 17.7, 17.8
Chap:19 - 19.1, 19.4-19.7
Chap:20 - 20.1-20.10

Books For Reference

Irina Cromwell,Carol Weibell ,Lianne Pfeiffer –Biomedical Instrumentation and Measurements –Prentice Hall of India Pvt .Ltd ,New Delhi .

FATIMA COLLEGE (AUTONOMOUS), MADURAI
SEMESTER VI - OPTO ELECTRONICS - P6ME3
(For those who joined in June 2018 onwards)

5Hrs/week 5 Credits

Course objective:
Opto electronics is a recent field. This course aims at giving an idea about fiber optics systems and communication. This course also deals with the LEDs and stimulated emission in intrinsic semiconductors, photo detectors.

UNIT I **(12hrs)**

Forms of communication Systems- The evolution of fiber optic systems -elements of an optical fiber transmission link -The quantum nature of light- basic optical laws & definitions- optical fiber modes and configurations -fiber types -rays and modes -step index fiber structure - ray optics representations -wave representation.

UNIT II **(12hrs)**

Introduction- Attenuation -Material absorption losses in silica glass fibers: intrinsic absorption, extrinsic absorption -linear scattering losses: Rayleigh scattering, Mie scattering- non-linear scattering losses: stimulated Brillouin scattering, stimulated Raman scattering- Bending losses -core and cladding losses-signal distortion in optical wave guides - information capacity determination -refractive index profiles.

UNIT III

(12hrs)

Optical fibers and cables: Introduction-preparation of optical fibers -Vapour phase deposition techniques: outside vapour-phase oxidation process- vapour axial deposition - fluoride glass fibers- plastic-clad fibers -All plastic fibers - fiber strength durability -cable sheath and water barrier -examples of fiber cables.

UNIT IV

(12hrs)

Direct band gap semi conductors - Indirect band gap semi conductors- Spantaneous emission: electroluminescense- LEDs emitting different colors -Semiconductor laser: Basic principle of laser action –population inversion –Non-semiconductor laser system - Stimulated emission: Intrinsic semiconductors- Stimulated emission: p-n diode-salient points about LASER action.

UNIT V

(12hrs)

Photodetectors : photodetector materials - basic principles for optical detection- The p-n junction photo diode-The p-i -n photo diode -diffusion length and life time -Quantum efficiency -Responsivity -The p-i-n avalanche diode- Electron and hole ionization rates, Responsivity of avalanche photodiode.

Books for Study

Unit I

Optical fiber communications- Gerd Keiser, Second edition, McGraw-Hill International Edition 1991, Singapore.

Ch 1: 1.1-1.3

Ch 2: 2.1.3, 2.2, 2.3, 2.3.1-2.3.5

Unit II

Optical fiber Communications- principles and practice – John M. Senior, Second edition-Prentice-Hall of India Private Ltd, New Delhi.

Ch 3: 3.1-3.3, 3.3.1, 3.3.2, 3.4, 3.4.1, 3.4.2, 3.5, 3.5.1, 3.5.2

Unit II

Optical fiber communications- Gerd Keiser, Second edition, McGraw-Hill International Edition 1991, Singapore.

Ch 3: 3.1.4, 3.1.5, 3.2, 3.2.1, 3.5.1

Unit III

Optical fiber Communications- principles and practice – John M. Senior, Second edition-Prentice-Hall of India Private Ltd, New Delhi.

Ch 4: 4.1, 4.2, 4.4, 4.4.1, 4.4.2, 4.5, 4.6.4, 4.6.5, 4.7, 4.7.1, 4.9.3, 4.9.4

Unit IV & Unit V

Optoelectronics and Fiber optic communication by C.K. Sarkar, D.C. Sarkar, I Edition, New Age International (P) Ltd., Publishers, New Delhi.

Unit IV- Ch 4: 4.9, 4.10, 4.12, 4.13 (LED emitting different colours only)

Ch 5: 5.1, 5.3, 5.4, 5.9-5.11

Unit V - Ch 6: 6.1- 6.5, 6.7, 6.8, 6.10, 6.13

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III BSc. PHYSICS- SEMESTER VI
ENERGY PHYSICS - P6ME4
(For those who joined in June 2013 onwards)

5 Hrs/week **5 credits**

UNIT I (15 hrs)

Energy resources:

Classification of energy resources – Conventional resources – Coal – Petroleum and Natural gas – Thermal power – Hydro Power – Nuclear Power – Nonconventional energy – Solar energy – Bio energy – Ocean energy – Wind energy – Geothermal energy – Magnetohydrodynamics – Animal energy – Alternative Fuels

UNIT II (15 hrs)

Solar Energy:

Solar Radiation – Physics of the Sun – Solar Position in relation to the earth – Solar Constant -Components- Some important application – Solar drying – Solar distillation – Solar Cooker – Solar energy collector – Solar water heater- Photovoltaic effect - Performance of Solar cell- Storage of solar energy – water storage – Solar pond.

UNIT III(20 hrs)

Geothermal energy - Geothermal resources – Uses of geothermal energy – hydrothermal convective system – Geothermal power plants – Dry field power plant.

Magnetohydrodynamics- power generator – ionising of a gas – method of ionising gas – MHD generator

Fuel cell – fundamentals of electrochemistry – types of fuel cells – hydrogen oxygen cell – bio chemical cell – regenerative cells

UNIT IV(15 hrs)

Wind energy- Technology – Principle of wind energy conversion – site evaluation – Wind turbines - **Biomass** – introduction – Photosynthesis – Biomass production efficiency – Biomass conversion – Gasification of Biomass

Ocean thermal energy- Technology– energy from **waves and tides** – Tidal barrage design – Modes of operations(Basic ideas, nature, applications, merits and demerits of these.)

UNIT V(10 hrs)

Energy Storage & Impacts of Non-Conventional Energy:

Conservation of energy- Conservation principles in these sectors- Energy audit– Energy conservation – approach and technology- Energy options for the developing countries—Energy Storage-Instrumentation and control

TEXT BOOKS:

D.S.Chauhan and S. K.Srivastava , "Non-Conventional Energy Resources", Ed II , 2006

Unit I : Ch -1

Unit II : Ch -3 (43-48),(78-83), Ch 4 (84- 89),(102-105), Ch 2(18-27),

Unit III: Ch 6, Ch7, Ch8 (139-141, 144-146)

Unit IV: Ch 10 (153-166), Ch11 (173-180), Ch 12, Ch 13
G.d.Rai, " Non Conventional Energy Sources", Ed IV, 1997
Unit V- Ch 17(825 -834), (887-892)

REFERENCE:

1. G. D. Rai, " Solar energy utilization" Ed. V, 1995
2. S. Rao and Dr. B. B. Parulekar, " Energy Technology", Ed II, 1977.
3. A.K. Wahil, " Power Plant Technology" , 1993
4. Godfrey Boyle, " Renewable Energy : Power for a sustainable Future", Alden Oess Limited- Oxford 1996.
5. Jyoti Parikh, " Energy models for 2000 and beyond", TATA Mc. Graw – Hill Publishing Company, New Delhi.

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

III B.Sc. PHYSICS - SEMESTER VI

PHYSICS OF MEASURING INSTRUMENTS II – P6SB5

2 hrs/week **2 Credits**

UNIT I **(8 hours)**

ASTRONOMICAL INSTRUMENTS:

Optical telescopes-radio telescopes-Hubble space telescopes- astronomical spectrographs-Photographic and photoelectric photometry-Spectrophoto-metry-Detectors and image processing.Stellar magnitude sequence- absolute magnitude and the distance modulus-Bolometric magnitude –Stellar parallax and units of stellar distances-Harvard spectral classification- Hertzsprung –Russel diagram.

UNIT II **(7 hours)**

BASIC PHYSICS IN ASTRONOMICAL MEASUREMENTS:

Planck's theory of blackbody radiation- photoelectric effect – pressure of radiation –Doppler effect – Zeeman effect.

UNIT III **(8 hours)**

ELECTRON MICROSCOPES:

Scanning electron microscopy – principle and working only-transmission electron microscopy – Atomic force microscopy.

UNIT IV **(7 hours)**

X-RAY DIFFRACTION MEASUREMENTS:

X-ray diffraction method – Powder method – Determination of lattice constants- Photoelectron spectroscopy.

Books for Study:

1. An Introduction to Astrophysics- Baidyanath Basu-Prentice Hall of India, Pvt Ltd.- Chapter 1 - (1.3 to 1.10)

Chapter 3- (3.1 to 3.3) and Chapter 4- 4.4 & 4.8

2. A basic course in crystallography –Jak Tareen and TRN Kutty-University Press – (relevant sections from pages 180-184)

3. Nano:The essentials –understanding Nanoscience and Nanotechnology-T. Pradeep – TMG Hill Publishing Co. Ltd. Newdelhi- (Pages 20- 31) relevant sections only.

4.Elements of Solid State Physics – II edition- J.P.Srivastava page 545

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

III B.Sc. PHYSICS - SEMESTER VI

PHYSICS OF MEDICAL INSTRUMENTS II – P6SB6

2 Hrs./Week **2 credits**

Objective:

To enable the student learn the working principles of medical instruments used in radiography and nuclear medicine.

UNIT I **(15 hours)**

Radiography-X- Ray-Endoscopy-Computed Tomography-Magnetic Resonance Imaging –Ultrasonography

UNIT II **(15 hours)**

Nuclear Medicine – Therapy with Radioactivity-Radiation protection in Diagnostic Radiology- Biomedical Computer Applications

Books for reference:

1) John R. Cameron, James G. Skofronick- Medical Physics, John Wiley&Sons
2) Irina Cromwell, Carol Weibell,Lianne Pfeiffer-Biomedical Instrumentation and Measurements-Prentice Hall of India Pvt .Ltd., New Delhi

Employability:

This course is a part of the syllabi for the Diploma courses on x-Ray, CT,MRI and Ultrasonogram technecians which decide the eligibility to get employment in multispeciality hospitals and also to get admission for M.Sc.Medical physics course.

Skill development:

Physics is the language of Studying the functioning of human body. This paper will develop the skill of understanding the functioning of different organs of the human body. This course also develops the knowledge of identifying the abnormalities in the functioning of different organs of the human body and also diagnose the problems arose in the normal functioning of the body.

Signature of the HOD with Seal

Dr. A. SHEELA VIMALA RANI
HEAD & ASSOCIATE PROFESSOR
DEPARTMENT OF PHYSICS
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