PG & RESEARCH DEPARTMENT OF PHYSICS

B.Sc. PHYSICS SYLLABUS

(For the Candidates to be admitted from the academic year 2022-2023 onwards)

POOMPUHAR COLLEGE (AUTONOMOUS)

(of the Tamil Nadu H.R.& C.E Admn. Dept)

MELAIYUR - 609 107

2022

POOMPUHAR COLLEGE (AUTONOMOUS)

OF THE TAMIL NADU HR & CE DEPARTMENT
MELAIYUR - 609 107

PG & RESEARCH DEPARTMENT OF PHYSICS

COURSE STRUCTURE FOR UG COURSE

(Applicable to the candidates admitted from the academic year 2022 – 2023 onwards)

PART	SUBJECT	HRS	CRED	EXAM	MAX. MARKS		
					CIA	EXTE	TOTAL
	SEMESTER- I						
I	Tamil – I	5	3	3	25	75	100
II	English – I	5	3	3	25	75	100
III	First Allied – I	5	3	3	25	75	100
	First Allied – II	3	*	*	*	*	*
	Core Course – I **Properties Of Matter And Sound**	5	5	3	25	75	100
	Core Course – II (Practical)	3	*	*	*	*	*
IV	Value Education	2	1	3	25	75	100
	Gender Studies	2	1	3	25	75	100
TOTAL		30	16	-	-	-	600
	SEMESTER- II						
I	Tamil – II	5	3	3	25	75	100
II	English – II	5	3	3	25	75	100
III	First Allied – II	3	3	3	25	75	100
	First Allied – III	5	4	3	25	75	100
	Core Course – II (Practical)	3	3	3	40	60	100
	Core Course – III **Mechanics**	5	5	3	25	75	100
IV	Skill Based Elective – I **Basic Electrical Technology**	2	2	3	25	75	100
	Environmental Studies	2	1	3	25	75	100
TOTAL		30	24	-	-	-	800
	SEMESTER- III						
I	Tamil – III	5	3	3	25	75	100
II	English – III	5	3	3	25	75	100
III	Second Allied – I	4	3	3	25	75	100
	Second Allied – II (Practical)	2	*	*	*	*	*
	Core Course – IV **Heat And Thermodynamics**	5	5	3	25	75	100
	Core Course – V (Practical)	3	*	*	*	*	*
	Major Based Elective – I (**Energy Physics /Fundamentals Of Physics/ Astrophysics)**	4	4	3	25	75	100
IV	Non Major Elective – I	2	2	3	25	75	100
TOTAL		30	20	-	-	-	600

Continued…

PART	SUBJECT	HRS	CRED	EXAM	MAX. MARKS		
					CIA	EXT	TOTAL
	SEMESTER- IV						
I	Tamil – IV	5	3	3	25	75	100
II	English – IV	5	3	3	25	75	100
III	Second Allied – II (Practical)	3	3	3	40	60	100
	Second Allied – III	5	4	3	25	75	100
	Core Course – V (Practical)	3	3	3	40	60	100
	Core Course – VI Optics And Spectroscopy	5	4	3	25	75	100
IV	Non Major Elective – II	2	2	3	25	75	100
	Skill Based Elective – II Electrical Wiring	2	2	3	25	75	100
TOTAL		30	24	-	-	-	800
	SEMESTER- V						
III	Core Course – VII Electricity And Electromagnetism	4	4	3	25	75	100
	Core Course – VIII Classical Mechanics, Relativity And Quantum Mechanics	4	4	3	25	75	100
	Core Course – IX Analog Electronics	4	4	3	25	75	100
	Core Course – X (Practical)	3	*	*	*	*	*
	Core Course – XI (Practical)	3	*	*	*	*	*
	Major Based Elective – II (Materials Science / Laser Physics/ Integrated Electronics)	4	4	3	25	75	100
	Major Based Elective – III (Opto Electronics And Fibre Optics/ Weather Forcasting / Spectroscopy)	4	4	3	25	75	100
IV	Skill Based Elective – III Electric Machines	2	2	3	25	75	100
	Skill Based Elective – IV Basic Instrumentation	2	2	3	25	75	100
TOTAL		30	24	-			700
	SEMESTER- VI						
III	Core Course – X (Practical)	3	4	3	40	60	100
	Core Course – XI (Practical)	3	4	3	40	60	100
	Core Course – XII Atomic Physics	5	5	3	25	75	100
	Core Course – XIII Nuclear Physics	5	5	3	25	75	100
	Core Course – XIV Solids State Physics	4	4	3	25	75	100
	Core Course – XV Digital And Communication Electronics	4	4	3	25	75	100
	Major Based Elective – IV (Microprocessor And 'C' Programming/ Medical Physics/ Nano Physics)	4	4	3	25	75	100
IV	Soft Skills Development	2	1	3	25	75	100
V	Extension Activities	-	1	-	-	-	100
TOTAL		30	32	-	-	-	900
GRAND TOTAL		-	140	-	-	-	4400

Note: * Examination at the end of the even semester

Head of the Department **Principal**

POOMPUHAR COLLEGE (AUTONOMOUS)

OF THE TAMIL NADU HR & CE DEPARTMENT

MELAIYUR - 609 107

COURSE STRUCTURE FOR PG & RESEARCH DEPARTMENT OF PHYSICS

(Applicable to the candidates admitted from the academic year 2022 – 2023 onwards)

PART	NAME OF THE PAPERS	NUMBER OF PAPERS	CREDITS
I	TAMIL	04	12
II	ENGLISH	04	12
III	CORE (INCLUDING OPTIONAL)	19	79
	FIRST ALLIED	03	10
	SECOND ALLIED	03	10
IV	NON-MAJOR ELECTIVE	02	04
	SKILLBASED ELECTIVE	04	08
	VALUE EDUCATION	01	01
	ENVIRONMENTAL STUDIES	01	01
	SOFT SKILLS DEVELOPMENT	01	01
	GENDER STUDIES	01	01
V	EXTENSION ACTIVITIES	01	01
	TOTAL	**44**	**140**

Head of the Department **Principal**

QUESTION PAPER PATTERN (FOR PART I, II, III)

Part A

Ten questions — 10 x 2 = 20 marks

(Two questions from each unit – No choice)

Part B

Five questions (either or type) — 5 x 5 = 25 marks

(One question from each unit)

Part C

Three questions out of five — 3 x 10 = 30 marks

(One question from each unit)

Total — **75 marks**

Question Paper Pattern (for Part IV only)

Part A

Three questions (either or type) — 3 x 10 = 30 marks

(One question from each unit)

Part B

Three questions out of five — 3 x 15 = 45 marks

(Atleast one question from each unit,

Not more than two questions from each unit,

No unit shall be omitted)

Total — **75 marks**

Head of the Department **Principal**

INTERNAL ELECTIVE COURSES

Major Based Elective – I Semester: III	1. Energy Physics
	2. Fundamentals of Physics
	3. Astor Physics
Major Based Elective – II Semester: V	1. Material Science
	2. Laser Physics
	3. Integrated electronics
Major Based Elective – III Semester: V	1. Opto electronics And Fiber Optics
	2. Weather Forecasting
	3. Spectroscopy
Major Based Elective – VI Semester: VI	1. Microprocessor And C Programming
	2. Medical Physics
	3. Nano Physics

ALLIED COURSES

(Maths and Chemistry Student)

Theory	Allied Physics - I
Practical	Allied Physics – II (Practical)
Theory	Allied Physics – III

NON-MAJOR ELECTIVE COURSES (NME)

(Department of Physics offers the following NME to other Departments)

Semester: III	Energy Physics
Semester: IV	Laser Physics

PG & RESEARCH DEPARTMENT OF PHYSICS

(For the Candidates to be admitted from the academic year 2022-2023 onwards)

MINUTES

04.08.2022

The board of studies meeting in Physics (UG) was held on 04.08.2022 at 10.30 a.m. The following members were present.

S.No	Name, Designation and address	Members	Signature
1	Dr.P.Rajesh Assistant Professor & HOD Poompuhar College, Melaiyur	Chairman	
2	Dr.S.Johnson Jeyakumar Associate Professor TBML College, Porayar	VC Nominee member	
3	Dr.K.Ravichandran Associate Professor & Head A.V.V.M Sri Pushpam College, Poondi, Tanjore.	Academic Council Nominee Member	
4	Dr.B.Samual Ebinezer Assistant Professor, Govt. Arts College (M) Kumbakonam	Alumni Member	
5	Dr.T.Mohamed Ali Assistant Professor Poompuhar College, Melaiyur	Member	
6	Mrs.S.Sathya Assistant Professor (SF) Poompuhar College, Melaiyur	Member	
7	Dr.J.Vijayapriya Assistant Professor (SF) Poompuhar College, Melaiyur	Member	
8	Miss. Renuga Assistant Professor (SF) Poompuhar College, Melaiyur	Member	

PG & RESEARCH DEPARTMENT OF PHYSICS

(For the Candidates to be admitted from the academic year 2022-2023 onwards)

RESOLUTIONS

04.08.2022

The following Resolutions have been passed unanimously

1. Resolved to incorporate all the suggestions given by board members.
2. The board scrutinized the regulations of 2022 -2023, programme structure and Scheme of Examinations for B.Sc., Physics programme and approved the same.
3. The board scrutinized the draft syllabus for each course submitted by the members. After incorporating the suggestions made by the members, the board approved the syllabi for B.Sc. Physics which will be introduced from 2022 – 23 onwards.
4. The board discussed the pattern of question papers to be followed in each year for the End Semester Examinations and approved the same.

S.No	Name, Designation and address	Members	Signature
1	Dr.P.Rajesh Assistant Professor & HOD Poompuhar College, Melaiyur	Chairman	
2	Dr.S.Johnson Jeyakumar Associate Professor TBML College, Porayar	VC Nominee member	
3	Dr.K.Ravichandran Associate Professor & Head A.V.V.M Sri Pushpam College, Poondi, Tanjore.	Academic Council Nominee Member	
4	Dr.B.Samual Ebinezer Assistant Professor, Govt. Arts College (M) Kumbakonam	Alumni Member	
5	Dr.T.Mohamed Ali Assistant Professor Poompuhar College, Melaiyur	member	
6	Mrs.S.Sathya Assistant Professor (SF) Poompuhar College, Melaiyur	member	
7	Dr.J.Vijayapriya Assistant Professor (SF) Poompuhar College, Melaiyur	member	
8	Miss. Renuga Assistant Professor (SF) Poompuhar College, Melaiyur	member	

PG & Research Department of Physics

Learning Objectives, Course Outcome and Course Outcome Mapping are included in every subjects of PG and UG Physics syllabus.

- ✓ Learning Objective for units of Subject covers from LO1 to LO5.
- ✓ Course Outcome for units of Subject takes CO1 to CO5
- ✓ Course Outcome Mapping for each subject gives correlation between Programme Outcome versus Course Outcome.

Programme Outcomes (POs)

- **PO1: Disciplinary Knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.
- **PO2** - Analytical and Technical Skills: Ability to handle/use appropriate tools/techniques.
- **PO3** – Critical thinking and Problem Solving: Critically analyse problems and to arrive viable conclusions
- **PO4** – Environment and Society: Analyze the impact of scientific advances on the environment and society.
- **PO5** –Lifelong learning: Ability to engage in lifelong learning in the discipline.

Programme Specified Outcomes:

- **PSO1:** Acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of Physics and its allied disciplines.
- **PSO2:** Understand, formulate, and develop physics concepts for applications to address issues arising in social sciences, business and other context /fields.
- **PSO3:** Students will show that they have learned laboratory skills, enabling them to take measurements in a physics laboratory and analyze the measurements to draw valid conclusions.
- **PSO4:** To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making, technical skill and leadership skill that will facilitate to establish high potential organizations.
- **PSO5:** Enabling students to develop a positive attitude towards Physics as an interesting and valuable subject of study.

HOD **PRINCIPAL**

SEMESTER: I	TITLE: PROPERTIES OF MATTER AND SOUND	CREDITS: 5
PART: CORE COURSE I	COURSE CODE:	Hours/Week: 5

Learning Objectives:

LO 1	To expound the fundamentals of elastic properties of solids.
LO 2	To understand the surface properties of liquids.
LO 3	To explain the viscous properties of liquids and gases.
LO 4	To acquire knowledge on the SHM, resonance phenomena and loudness.
LO 5	To understand the ultrasonic generation method and acoustics of buildings.

Unit I: Elasticity **(12 Hours)**

Elasticity – Hooke's law – Elastic moduli – Poisson's ratio – Beams – bending of beams – Expression for bending moment – Cantilever- Theory of uniform and non – uniform bending - Determination of Young's modulus -Koenig's method –Torsion of a body – Expression for couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body - Rigidity modulus by dynamic torsion method (Torsional pendulum).

Unit II: Surface Tension **(12 Hours)**

Surface tension – definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy – work done in increasing the area of a surface – Excess pressure inside a curved liquid surface – Excess pressure inside a spherical drop and bubble - angle of contact - experimental determination- Jaegar's and method drop weight method - variation of surface tension with temperature.

Unit III: Viscosity **(12 Hours)**

Viscosity – Co efficient of viscosity – Streamlined and turbulent motion – critical velocity – Reynold's number-Rate of flow of liquid in a capillary tube – Poiseuille's formula – viscosity of highly viscous liquid-terminal velocity-Stoke's method-Ostwald Viscometer-viscosity of gas - Mayer's formula.

Unit IV: Sound **(12 Hours)**

Simple Harmonic Motion –Composition of two S.H.M in a straight line - at right angles - Lissajous's figures- Free, Damped, Forced vibrations - Resonance - Laws of transverse vibration of strings - Sonometer-Determination of AC frequency using sonometer - Determination of frequency using Melde's apparatus-Decibels - Intensity levels - noise pollution.

Unit V: Ultrasonics and Acoustics **(12 Hours)**

Ultrasonics –Production - Magnetostriction method – Piezoelectric crystal method – Properties and Applications - Acoustics of building – Reverberation- Sabine's Reverberation formula (No derivation) - Factors affecting acoustics of building- Sound distribution in an auditorium- Requisites for good acoustics.

Course Outcome

On completion of the course, the student will be able to

CO 1	expound the fundamentals of elastic properties of solids.
CO 2	understand the surface properties of liquids.
CO 3	know the viscous properties of liquids and gases.
CO 4	acquire knowledge on the SHM, resonance phenomena and loudness.
CO 5	understand the ultrasonic generation method and acoustics of buildings.

Text Books:

1. MathurD.S, *Elements of properties of matter*, S. Chand & Co., (2004).
2. Murugesan R. *Properties of matter* S. Chand & Co., (2004).
3. Brijlal and Subramanian , *Properties of matter*S. Chand & Co., (2006)
4. KhannaD.R. and Bedi.R.S, *Textbook of Sound,*Atmaram and sons , (1969).
5. SubrahmanyamN and Brijlal, *A Textbook of Sound,*Vikas Publishing House Second revised edition (1995).

Supplementary Readings:

1. Feynman, *Lectures on Physics.* Vol. I & II by Richard P. Feynman, The New Millennium Edition, (2012).
2. David Halliday and Robert Resnick, *Fundamentals of Physics* by Wiley Plus., (2013).
3. B.H. Flowers and E. Mendoza, *Properties of matter*, Wiley Plus, (1991).
4. H.R. GulatL *Fundamentals of General properties of matter,* S. Chand *8a* Co. Pvt. Ltd, (2012).
5. Chatterjee and Sen Gupta, *A treatise on general properties of matter,* New central Books agency (p) Ltd, Kolkata, (2001).
6. R.L. Saihgal, *A Text Book of Sound,* S. Chand & CO. Pvt. Ltd, New Delhi, (1979).

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	2
CO2	3	3	3	2	3
CO3	2	3	3	2	3
CO4	2	2	2	2	3
CO5	2	2	2	3	2

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SEMESTER: I	TITLE: MAJOR PRACTICAL - I	CREDITS: 3
PART: CORE COURSE II	COURSE CODE:	Hours/Week: 3

Learning Objectives:

LO 1	To understand the concept of physical quantities.
LO 2	To acquire experimental skill to measure physical quantities using measuring instruments.
LO 3	To know the problem solving.
LO 4	To understand concepts related with Optic experiments.
LO 5	To understand concepts related with diode and logic experiments.

LIST OF EXPERIMENTS

(Any Twelve Experiments)

1. Verniercaliper, Screw gauge and spectrometer
2. Non uniform bending - Pin & Microscope
3. Uniform bending – Single optic lever
4. Surface Tension - Capillary rise method
5. Surface Tension and interfacial Surface Tension – Drop weight method.
6. Melde's experiment -T & L Mode
7. Compound pendulum - g & k
8. Stoke's method - Viscosity of highly viscous liquid.
9. Coefficient of viscosity of liquid—Poiseuille's flow method
10. Comparison of viscosity of two liquids – Hare's apparatus
11. Potentiometer -Calibration of low range Voltmeter
12. Spectrometer - μ of a solid prism
13. P.O box –Temperature coefficient of a coil
14. Meter bridge - Specific resistance
15. Carey Foster's Bridge –Specific resistance

Course Outcome

On completion of the course, the student will be able to know

CO 1	use basic measuring instruments such as vernier caliper, screw gauge, travelling microscope.
CO 2	perform lab experiments to find various physical quantities involved in elasticity, viscosity, surface tension.
CO 3	perform lab experiments to find various physical quantities involved in electricity and optics.
CO 4	perform lab experiments to find various physical quantities involved in spectrometer, Potentiometer.
CO 5	study characteristic of diode and logic gates

Text Books

1. Dr. S. Somasundaram, *Practical Physics,* Apsara publications, Tiruchirapalli, 2012.
2. Department of Physics, *Practical Physics,* (B.Sc. Physics Main), St. Joseph's College, Tiruchirapalli 1998.

Books for Reference:

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

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	2
CO2	2	3	3	2	2
CO3	2	2	3	2	2
CO4	2	2	2	2	2
CO5	2	3	3	2	2

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SEMESTER: II	TITLE: MECHANICS	CREDITS: 5
PART: CORE COURSE III	COURSE CODE:	Hours/Week: 5

Learning Objectives:

LO 1	To expose students to the basics of projectile motion, Impulse and impact
LO 2	To get the knowledge of Rigid body dynamics and its application to compound pendulum.
LO 3	To understand the laws of gravitation, gravitational field and potential.
LO 4	To acquire adequate knowledge on rotational motion, centre of mass.
LO 5	To know fundamentals on hydrostatics and hydrodynamics.

Unit I: Projectile, Impulse and Impact **(12 Hours)**

Projectile - particle projected in any direction - Path of a projectile is a parabola - Range of a projectile on plane inclined to the horizontal -Maximum range on the inclined plane - Impulse of a force - Laws of impact - Direct impact between two smooth spheres - oblique impact between two smooth spheres - Impact of a smooth sphere on a smooth fixed horizontal plane - Loss of KE due to direct impact - Oblique impact.

Unit II: Dynamics of Rigid body **(12 Hours)**

Moment of inertia – Theorems of perpendicular and parallel axes – M.I of a circular ring, disc, solid sphere, hollow sphere and cylinder about all axes –Compound pendulum – theory – equivalent simple pendulum – reversibility of centers of oscillation and suspension – determination of g and k.

Unit III: Gravitation **(12 Hours)**

Newton's law of gravitation – Kepler's laws of gravitation – Determination of G by Boy's method –Mass and density of earth – Acceleration due to gravity – Variation of g with altitude, depth and rotation of earth - Value of g at poles and equator- Gravitational field – Gravitational potential – Gravitational potential due to spherical shell – Gravitational potential due to a solid sphere (inside and outside)

Unit IV: **Central Force Motion** **(12 Hours)**

Angular velocity, angular momentum and K.E of rotation – Torque and angular acceleration – Relation between them – Expression for acceleration of a body rolling down an inclined plane without slipping- Center of mass –velocity and acceleration of centre of mass – determination of motion of individual particle–system of variable mass- Rocket motion- Satellite.

Unit V: **Statics and Hydrodynamics** **(12 Hours)**

Centre of gravity- solid and hollow hemisphere - solid cone –Centre of pressure –vertical rectangular lamina – vertical triangular lamina.

Hydrodynamics -Equation of continuity - Euler's equation of Unidirectional flow - Torricelli's theorem – Bernoulli's theorem and its applications– Pitot's tube and Venturimeter.

Course Outcome

On completion of the course, the student will be able to

CO 1	know the basics of projectile motion, Impulse and impact
CO 2	understand rigid body dynamics and its application to compound pendulum.
CO 3	understand the laws of gravitation, gravitational field and potential.
CO 4	get adequate knowledge on rotational motion, centre of mass.
CO 5	know the fundamentals on hydrostatics and hydrodynamics.

Text Books:

1. M. Narayanamurthi and N. Nagarathinam, *Dynamics,* The National Publishing Company (2005) Chennai.
2. M. Narayanamurthi and N. Nagarathinam, *Statics, Hydrostatics and Hydrodynamics* - The National Publishing Company (2005), Chennai.
3. R.Murugeshan, *Properties of Matter* , S. Chand & Co., New Delhi(2001).
4. M. Narayanamurthy, *Mechanics- part I and II* , National Publishing Company.
5. P. Duraipandian, LaxmiDuraipandian, MuthamizhJayapragasam, *Mechanics,* S.Chand&Co.New Delhi (1988).

Supplementary Readings:

1. R. Murugesan, *Mechanics and Mathematical Physics,* S. Chand 85 Company Ltd., New Delhi(2008).
2. D.S. Mathur, *Mechanics,* S. Chand & Company Ltd., New Delhi (2001).
3. Fundamentals of Physics by D. Halliday, R.Rensick and J. Walker, 6th edition, Wiley,NY (2001).

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	3	2	3
CO2	2	3	3	2	2
CO3	3	2	3	3	3
CO4	2	2	3	2	2
CO5	2	2	3	2	2

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SEMESTER: III	TITLE: HEAT AND THERMODYNAMICS	CREDITS: 5
PART: CORE COURSE IV	COURSE CODE:	Hours/Week: 5

Learning Objectives:

LO 1	To understand the fundamentals of kinetic theory of gases and laws.
LO 2	To get knowledge on specific heat capacity of matter and method to determine.
LO 3	To understand different modes of heat transmission.
LO 4	To acquire adequate knowledge on low temperature and its applications.
LO 5	To understand the concept and various laws involved in thermodynamics.

Unit I: Kinetic theory of gases (12Hours)

Kinetic theory of gases-Expression of pressure of gas-Boyle's law-Charle'slaw-Perfect gas equation- Mean free path-Expression for mean free path-Maxwell's velocity distribution law-Transport phenomena-Diffusion-Law of equipartition energy- Application to specific heat of gases.

Unit II: Specific heat capacity (12 Hours)

Specific heat capacity-Principle of method of mixtures-Specific heat capacity of liquid by method of mixtures-Newton's law of cooling-Specific heat capacity of a liquid by the method of cooling- Specific heat capacity of a liquid by Calendar and Barne's method-Specific heat capacity of gases- Mayer's relation between C_P and C_v – C_V by Joly's differential steam calorimeter method – C_p by Regnault's method.

Unit III : Transmission of Heat (12 Hours)

Conduction – coefficient of thermal conductivity –thermal conductivity of good and bad conductors – Forbe's method– Lee's disc method - convection –Radiation - black body – Kirchhoff's law – Stefan – Boltzmann law - energy distribution in black body spectrum - Wien's law – Rayleigh Jean's law– Planck's law - solar constant – water flow Pyroheliometer.

Unit IV: Low Temperature Physics (12 Hours)

Joule - Kelvin effect - Liquefaction of Air-Linde's Process—liquefaction of hydrogen - liquefaction of helium- Onne's method - Helium I and II - Lambda point - super fluidity - application of super fluidity - production of low temperatures - adiabatic demagnetization - practical applications of low temperature - refrigerators and air-conditioning machines.

Unit V: Thermodynamics (12 Hours)

Zeroth and first law of thermodynamics – reversible and irreversible processes – isothermal process-adiabatic process-gas equation during adiabatic process -work done during adiabatic and isothermal process - Carnot's engine – its efficiency - second law of thermodynamics – Entropy – change of entropy in reversible and irreversible processes – temperature-entropy diagram – Third law.

Course Outcome

On completion of the course, the student will be able to

CO 1	understand the fundamentals of kinetic theory of gases and laws.
CO 2	get knowledge on specific heat capacity of matter and method to determine.
CO 3	understand different modes of heat transmission and related laws.
CO 4	acquire adequate knowledge on low temperature and its applications.
CO 5	understand the concept and various laws involved in thermodynamics.

Text Books:

1. Brijlal and Subramanyam, *Heat and Thermodynamics*, S.Chand & Co, 16th Edition New Delhi, (2005).
2. D.S. Mathur, *Heat and Thermodynamics*, Sultan Chand & Sons, 5th Edition, New Delhi, (2014).
3. R. Murughesan and Kiruthiga Sivaprasath ,*Thermal Physics*, S.Chand & Co, II Edition, New Delhi, (2008).

Supplementary Readings:

1. J.B. Rajan, *Heat & Thermodynamics*, SC Publisher, New Delhi, (1985).
2. H.C. Varma, *Concepts of Physics Volume I and II*- Bharati Bhawan Publishers, New Delhi, (2015).
3. M. Narayanamoorthy and N. Nagarathinam, *Heat,* National publishing Co,Chennai, Eight edition, (1987).

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	2	3	2	2
CO2	3	3	3	2	3
CO3	2	3	2	3	2
CO4	2	2	3	2	3
CO5	3	2	2	2	3

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SEMESTER: III	**TITLE: MAJOR PRACTICAL - II**	**CREDITS: 3**
PART: CORE COURSE V	**COURSE CODE:**	**Hours/Week: 3**

Learning Objectives:

LO 1	To understand the concept of physical quantities.
LO 2	To acquire experimental skill to measure physical quantities using measuring instruments.
LO 3	To know the problem solving.
LO 4	To understand concepts related with elasticity, heat, Optic and electrical experiments.
LO 5	To understand concepts related with diode and logic experiments.

LIST OF EXPERIMENTS

(Any Twelve Experiments)

1. Static Torsion -Determination of rigidity modulus.(η)
2. Torsional Pendulum – Rigidity modulus(η) and moment of inertia (I)
3. Emissive power of a surface - Spherical calorimeter.
4. Thermal conductivity of bad conductor – Lee's disc method.
5. Specific heat capacity of liquid - Newton's law of cooling
6. Joule's calorimeter - Specific heat capacity of liquid.
7. Potentiometer -Ammeter calibration.
8. Potentiometer - Determination of resistance.
9. Figure of merit of a Galvanometer.
10. Spectrometer - μ of a liquid.
11. Spectrometer - grating – wavelength - minimum deviation method.
12. Air Wedge - Thickness of a wire.
13. Newton's rings – Radius of curvature of a lens.
14. Construction of a full wave rectifier.
15. Characteristics of Zener diode.

Text Books

1. Dr. S. Somasundaram, *Practical Physics,* Apsara publications, Tiruchirapalli, 2012.
2. Department of Physics, *Practical Physics*, (B.Sc. Physics Main), St. Joseph's College, Tiruchirapalli 1998.

Books for Reference:

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

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	2
CO2	2	3	3	2	2
CO3	2	2	3	2	2
CO4	2	2	2	2	2
CO5	2	3	3	2	2

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SEMESTER: IV	TITLE: OPTICS AND SPECTROSCOPY	CREDITS: 4
PART: CORE COURSE VI	COURSE CODE:	Hours/Week: 5

Learning Objectives:

LO 1	To know the aberration and dispersion in lenses and eyepieces.
LO 2	To understand the phenomenon of interference and interferometers.
LO 3	To get the sufficient knowledge on diffraction and its application to grating.
LO 4	To acquire knowledge of different types of polarization and its applications.
LO 5	To gain knowledge on spectroscopic instrumentation and theory.

Unit I: Geometrical Optics **(12 Hours)**

Lens – Spherical aberration in lenses – Methods of minimizing spherical aberration – chromatic aberration in lenses – condition for achromatism of two thin lenses (in and out of contact) –Aplanatic lens –Dispersion – Angular and Chromatic dispersion –Eyepieces – Ramsden's and Huygens's eyepieces – compound microscope.

Unit II: Interference **(12 Hours)**

Conditions for interference – Theory of interference fringes – interference due to reflected light (thin films) -colours of thin films – wedge shaped thin film –theory – determination of diameter of a thin wire by Air wedge – test for optical flatness – Newton's rings by reflected light – Determination of wavelength of light - Michelson's Interferometer – theory – Measurement of wavelength – Jamin's interferometers – determination of refractive index of gases.

Unit III: Diffraction **(12 Hours)**

Fresnel's diffraction – diffraction at circular aperture –Fraunhofer diffraction at single slit – Double slit – Plane diffraction grating – theory of plane transmission grating - experiment to determine wavelength (Normal incidence method) –resolving power– Rayleigh's criterion for resolution – resolving power of a prism - resolving power of grating.

Unit IV: Polarisation **(12 Hours)**

Double refraction –Nicol Prism – Nicol Prism as polarizer and analyzer –Huygens's explanation of double refraction in uniaxial crystals– Plane, elliptically and circularly polarized light– Quarter wave plates and Half wave plates – Production and detection of plane, circularly and elliptically polarized light- Optical activity– Fresnel's explanation of optical activity – Specific rotatory power –Laurent's half shade polarimeter.

Unit V: Spectroscopy **(12 Hours)**

Infrared spectroscopy – sources and detector –applications– ultraviolet spectroscopy– sources – quartz spectrograph - applications - Raman Spectroscopy – Quantum theory of Raman effect – applications – Nuclear magnetic resonance— Electron spin resonance spectroscopies (Qualitative study).

Course Outcome

On completion of the course, the student will be able to

CO 1	know the aberration and dispersion in lenses and eyepieces.
CO 2	understand the phenomenon of interference and interferometers.
CO 3	get the sufficient knowledge on diffraction and its application to grating.
CO 4	acquire knowledge of different types of polarization and its applications.
CO 5	gain knowledge on spectroscopic instrumentation and theory.

Text books:

1. R.Murugeshan and Kiruthiga Sivaprasath, *Optics and Spectroscopy* , S. chand & co, New Delhi (2006).
2. Dr. N. Subramaniyam, Brijlal and Dr.M.N. Avathanulu, *Optics, S.* Chand &Co. Pvt.Ltd the revised edition, New Delhi, (2012) .
3. Dr. N. Subramaniyam, Brijlal and Dr.M.N. Avathanulu, *Optics*, S. Chand Co. Pvt. Ltd.- 9th revised edition. New Delhi ,(2014).
4. Krishnapada Ghosh Anandamoy Manna, *Text book of Physical Optics*, McMillan India Ltd., First edition, (2007).
5. S.L. Gupta, V.Kumar and R.C.Sharma, *Elements of Spectroscopy*, Pragati Prakashan, 13th Edition, Meerut, (1997).

Supplementary readings:

1. Sathyaprakash, *Optics*, Ratan Prakashan Mandhir, VIIth Edition, New Delhi, (1990).
2. C.N.Banewell, *Introduction to Molecular Spectroscopy*,TMH publishing co. IV Edition, New Delhi (2006).
3. Ajoy Ghatak, *Optics*, (TMH), New Delhi, Fourth edition, (2009).
4. Singh & Agarwal, *Optics and Atomic Physics*, Pragati Prakashan Meerut, Nineth edition, (2002).
5. D.Halliday, R. Resnick and J. Walker, *Fundamentals of Physics*, Wiley, 6thEdition New York (2001).
6. G.Aruldhass, *Molecular structure and spectroscopy*, PHI Pvt Ltd, , II Edition, New Delhi, (2007).
7. S.L.Kakani and K.C.Bhandari, *A Text book of Optics*, Sultan Chand & Sons, Delhi, (2002).

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	3	3	3	2
CO3	3	2	3	2	2
CO4	3	3	2	3	3
CO5	3	3	2	2	3

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SEMESTER: V	TITLE: ELECTRICITY AND ELECTROMAGNETISM	CREDITS: 4
PART: CORE COURSE VII	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To expose students to the fundamentals and applications of electrostatics.
LO 2	To learn the current electricity and its magnetic effect.
LO 3	To understand laws of electromagnetic induction and measurement of self and mutual inductance.
LO 4	To get knowledge on growth and decay of current in resistance, capacitance and inductance and their combination in circuits.
LO 5	To know basics of electromagnetic waves.

Unit I: Electrostatics (12 Hours)

Coulomb's Law – Electric field- Electric field due to a point charge - Electric flux - Gauss's Law and its applications: Electric Field due to a uniformly charged sphere – Electric Potential – Potential at a point due to a point charge – Principle of a capacitor– Capacity of a spherical and cylindrical capacitors – Energy stored in a charged capacitor– Loss of energy on sharing of charges between two capacitors – Capacitors in series and parallel.

Unit II: Current electricity and Magnetic Effects of Current (12 Hours)

Kirchhoff's laws- Wheatstone bridge - Carey Foster bridge – theory – determination of temperature coefficient of resistance- Biot Savart law- magnetic induction at a point on the axis of a circular coil carrying current - Moving coil Ballistic galvanometer-theory - experiment to find charge sensitivity and absolute capacity of a capacitor - calibration of ammeter and voltmeter using a potentiometer.

Unit III: Electromagnetic Induction (12 Hours)

Laws of electromagnetic induction- self induction –self inductance of a long solenoid – toroidal solenoid - determination of self inductance by Anderson's and Rayleigh's methods - mutual induction-mutual inductance between two co-axial solenoids- experimental determination of mutual inductance – co-efficient of coupling- energy stored in a coil- eddy currents - uses - search coil- induction coil and its uses

Unit IV: DC and AC circuits (12 Hours)

Growth and decay of current in LC, LR and CR circuits with d.c. source - determination of high resistance by leakage –growth and decay of charge in LCR circuit- conditions for the discharge to be oscillatory – frequency of oscillation - AC through an inductance and resistance in series-capacitance and resistance in series – LCR series resonance circuit -sharpness of resonance-parallel resonance circuit - Wattless Current - power factor.

Unit V: Maxwell's Equation & Electromagnetic Waves (12 Hours)

Introduction- Maxwell's equations - Displacement current- Electromagnetic waves in free space-Hertz experiment for production and detection of EM waves - Wave equations for Electric field and Magnetic field- Poynting vector - monochromatic plane waves - EM waves in a matter-Reflection and Transmission at normal incidence and oblique incidence-Polarization by reflection.

Course Outcome

On completion of the course, the student will be able to

CO 1	expose students to the fundamentals and applications of electrostatics.
CO 2	know the current electricity and its magnetic effect.
CO 3	understand laws of electromagnetic induction and measurement of self and mutual inductance.
CO 4	get knowledge on growth and decay of current in resistance, capacitance and inductance and their combination in circuits.
CO 5	know basics of electromagnetic waves.

Text books

1. BrijLal & Subramanyam M, *Electricity and Magnetism*, Ratan Prakashan Mandir Publishers(2005).
2. Murugeshan R, *Electricity and Magnetism*, S Chand & Co, New Delhi (2017).

Supplementary readings:

1. D.N.Vasudeva, *Electricity and Magnetism*, (Twelfth revised edition)
2. K.K.Tiwari, *Electricity and Magnetism*, S.Chand &Co., (2007)
3. D.C. Tayal, *Electricity and Magnetism*, Himalalaya Publishing Co.
4. E.M.Pourcel, *Electricity and Magnetism*, Berkley Physics Cource, Vol.2,Mc Grraw-Hill.
5. D.Halliday, R.Resnick and J.Walker, *Fundamentals of Physics*, Electicity and Magnetism Wiley India,Pvt Ltd (2011).
6. David J. Griffith, *Introduction to Electrodynamics*, PHI, New Delhi (2012).

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	2	2	3
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	2	3	2	3
CO5	3	2	3	2	3

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SEMESTER: V	TITLE: CLASSICAL MECHANICS, RELATIVITY AND QUANTUM MECHANICS	CREDITS: 4
PART:CORE COURSE VIII	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To understand the Lagrangian formulation for system of particles.
LO 2	To get knowledge of Hamilton canonical equation and its applications.
LO 3	To acquire idea about transformation equations and special theory relativity.
LO 4	To know the de Broglie wave and uncertainty principle.
LO 5	To study the Schroedinger equations and its application to particle in a box.

Unit I: Lagrangian Formulation (12 Hours)

Mechanics of a particle and system of particles – conservation of laws – Degrees of freedom – Constraints – Types of constraints – Generalized coordinates –principle of virtual work – D' Alembert 's principle – Derivation of Lagrange 's equation D' Alembert 's principle - Applications of Lagrange equation – Atwood 's machine – simple pendulum.

Unit II: Hamiltonian Formulation (12 Hours)

Phase space – Hamilton's canonical equation of motion –physical significance of H – Hamilton's variation principle - Deduction of canonical equations from variation principle – Applications of Hamilton's equation of motion –Harmonic oscillator – compound pendulum - Cyclic or ignorable.

Unit III: Relativity (12 Hours)

Frames of reference - Galilean transformation - Michelson - Morley experiment -Postulates of special theory of relativity - Lorentz transformation - length Contraction – time dilation - Relativity of simultaneity - addition of velocities -variation of mass with velocity– Mass energy relation - Elementary ideas of general relativity.

Unit IV: Wave Nature of Matter (12 Hours)

De Broglie concept of matter waves – De Broglie wavelength - wave velocity and group velocity – relation between them – Experimental study of matter waves – Davisson and Germer experiment – G.P Thomson's experiment - Heisenberg's uncertainty principle – Illustration - Gamma ray microscope.

Unit V: Schrodinger Equation (12 Hours)

Inadequacy of classical mechanics - Basic postulates of quantum mechanics - Schrodinger equation - Time independent and Time dependent equations - Properties of wave function- Eigen function and Eigen values –Application of Schrödinger equation for a particle in a box.

Course Outcome

On completion of the course, the student will be able to

CO 1	understand the Lagrangian formulation for system of particles.
CO 2	get knowledge of Hamilton canonical equation and its applications.
CO 3	acquire idea about transformation equations and special theory relativity.
CO 4	know the de Broglie wave and uncertainty principle.
CO 5	study the Schroedinger equations and its application to particle in a box.

Text books

1. S.L. Gupta, V. Kumar and H.V.Sharma, Pragathi Prakasan, *Classical Mechanics, Educational Publi*sher, Meerut, 25th edition, (2011)
2. . Murughesan. R., *Modern Physics,* S.Chand & Co., New Delhi, (2006)

Supplementary readings:

1. Arthur Beiser, *Concept of Modern Physics:* McGraw Hill Ed. V (1999).
2. *H. Goldstein, Classical Mechanics,* Narosa Book distributors, New Delhi 1980.
3. N.C. Rana and P.S.Joag, *Classical Mechanics,* Tata Mc Graw Hill, New Delhi 1991.
4. P.M. Mathews and K. Venkatesan, *A Text Book of Quantum Mechanics* ,Tata McGrawHill, New Delhi, 1987.

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	2
CO2	3	3	3	2	2
CO3	3	3	2	2	3
CO4	3	2	3	2	2
CO5	3	3	3	2	2

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SEMESTER: V	TITLE: ANALOG ELECTRONICS	CREDITS: 4
PART: CORE COURSE IX	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To get adequate knowledge on semiconductor diodes, rectifier circuits and filters.
LO 2	To understand the transistor operation and its applications as amplifiers.
LO 3	To know the principle of feedback and working of Oscillators and multivibrators.
LO 4	To study the special devices such as FET, MOSFET, UJT and SCR.
LO 5	Understanding the Operational amplifier and its applications.

Unit I: Semiconductor Diodes (12 Hours)

Semiconductor - PN junction theory - V-I characteristics of a PN junction diode - Half wave rectifier – Full wave rectifier -Bridge rectifier - Efficiency - filters – inductance filter - capacitor filter – pi filter - Zener diode - equivalent circuit - voltage regulator.

Unit II: Transistor Amplifier (12 Hours)

Transistor - Different modes of operations-CB mode &CE mode - h parameter - AC equivalent circuit using h parameters- analysis of amplifiers using h parameters (CE only) - RC coupled amplifier - transformer coupled amplifier - power amplifier -classification of amplifiers - Class A, Class B and Class C - Push pull amplifier – Emitter follower.

Unit III: Oscillators And Multivibrator (12 Hours)

Feedback principle -effect negative feedback-and Barkhaussen criterion – Hartley and Colpitt's oscillators -Phase shift and Wien Bridge oscillators using transistors – Expression for frequency-Multivibrators - Astable , Monostable and Bistable multi vibrators using transistors - Schmitt trigger.

Unit IV: Special Semiconductor Devices (12 Hours)

Clipping and clamping circuits - Differentiating circuit - Integrating circuit- - Field effect Transistor FET-MOSFET- UJT-SCR -characteristics - UJT relaxation oscillator-SCR as a switch and rectifier.

Unit V: Operational Amplifier (12 Hours)

Operational Amplifier- characteristics-parameters-applications- Inverting amplifier - Non inverting amplifier - Voltage follower- Adder - Subtractor - Integrator – Differentiator- comparator -square wave generator -Schmitt trigger.

Course Outcome

On completion of the course, the student will be able to

CO 1	get adequate knowledge on semiconductor diodes, rectifier circuits and filters.
CO 2	understand the transistor operation and its applications as amplifiers.
CO 3	know the principle of feedback and working of Oscillators and multivibrators.
CO 4	study the special devices such as FET, MOSFET, UJT and SCR.
CO 5	understand the Operational amplifier and its applications.

Text books

1. Gupta and Kumar, *Hand Book of Electronics*, PragatiPrakashan , Meerut(2002).
2. V.K. Mehta, *Principles of Electronics*, Rohit Mehta S. Chand & Co (2006).
3. M. Arul Thalapathi, *Electronics*, Comptek Publishers (2005).
4. M.K.Bagde and Singh S.P, *Elements of Electronics*, S. Chand & Co., New Delhi(1990).
5. A. Subramanyam, *Applied Electronics*, National Publishing Co (1997).
6. Ramakant A. Gayakwad, *OP - AMPs and Linear Integrated Circuits*, Prentice Hall of India (1994).

Supplementary readings:

1. Mittal.G.K., *Electronic Devices*, G.K. Publishers Pvt. Ltd., (1993).
2. B.L. Theraja, *Basic Electronics*, S. Chand & Co., (2008).
3. Ambrose and Vincent Devaraj, *Solid State Electronics* , Meera Publication.
4. R.S. Sedha, *Applied Electronics*, S. Chand & Co.(1990).

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	3	2	2
CO2	3	2	3	2	2
CO3	3	3	3	2	2
CO4	3	3	2	2	2
CO5	3	3	3	2	2

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SEMESTER: III	TITLE: MAJOR PRACTICAL – III (GENERAL)	CREDITS: 3
PART: CORE COURSE X	COURSE CODE:	Hours/Week: 3

Learning Objectives:

LO 1	To understand the concept of physical quantities.
LO 2	To acquire experimental skill to measure physical quantities using measuring instruments.
LO 3	To know the problem solving.
LO 4	To understand concepts related with Optics and electrical experiments.
LO 5	To know programming with 'C' in physics problems.

LIST OF EXPERIMENTS

(Any Twelve Experiments)

1. Spectrometer i-d curve
2. Spectrometer i-i' curve
3. Spectrometer- Dispersive power of prism.
4. Field along the axis of a coil – determination of M.
5. Potentiometer - EMF of a thermocouple.
6. Potentiometer Temperature coefficient of thermistor.
7. Ballistic Galvanometer-Figure of merit
8. Anderson's bridge - self inductance of a coil.
9. Series and Parallel resonant circuits.
10. Koenig's method-Uniform bending
11. Spectrometer-Grating-Normal incidence.-wave length
12. Spectrometer - Grating dispersive power. minimum deviation
13. Spectrometer ~ Cauchy's constants.
14. M and H - Absolute determination using deflection and vibration magnetometer.
15. Potentiometer - High range voltmeter calibration
16. B.G. Absolute capacity of condenser.
17. B.G.-Absolute determination of M.
18. Conversion of centigrade to Fahrenheit- using C programming.
19. Arranging numbers in ascending order/descending order- using C programming.
20. Calculation of volume of sphere/cone/cube/rectangular cubiod- using C programming
21. Solving quadratic equation- using C programming.
22. Sum of digits of a number- using C programming

Course Outcome

On completion of the course, the student will be able to

CO 1	understand the concept of physical quantities.
CO 2	acquire experimental skill to measure physical quantities using measuring instruments.
CO 3	know the problem solving.
CO 4	Tunderstand concepts related with Optics and electrical experiments.
CO 5	know programming with 'C' in physics problems.

Text Books

3. Dr. S. Somasundaram, *"Practical Physics,* Apsara publications, Tiruchirapalli, 2012.
4. Department of Physics, *Practical Physics,* (B.Sc. Physics Main), St. Joseph's College, Tiruchirapalli 1998.

Books for Reference:

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

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	3	3	2	3
CO2	3	3	3	2	3
CO3	2	3	3	2	3
CO4	3	3	3	2	2
CO5	2	3	3	2	3

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SEMESTER: III	TITLE: MAJOR PRACTICAL – IV (ELECTRONICS)	CREDITS: 3
PART: CORE COURSE XI	COURSE CODE:	Hours/Week: 3

Learning Objectives:

LO 1	To understand the concept of physical quantities.
LO 2	To acquire experimental skill to measure physical quantities using measuring instruments.
LO 3	To know the problem solving.
LO 4	To understand perform experiments in analog and digital electronics.
LO 5	To know programming with assembly language in microprocessor 8085.

LIST OF EXPERIMENTS

(Any Twelve Experiments)

1. Regulated power supply using Zener diode- Percentage of voltage regulation.
2. Single stage - CE amplifier – Transistor
3. Hartley oscillator using transistor.
4. FET Characteristics.
5. AND, OR and NOT gates using discrete components – verification of Truth table
6. AND, OR and NOT gates using Integrated circuits
7. Op-Amp -Adder and Subtractor.
8. Op - Amp - Integrator and Differentiator
9. Emitter follower amplifier — Frequency response.
10. Colpitt's oscillator using transistor.
11. Astable multivibrator using Op.Amp
12. Monostable Multivibrator-Transistor
13. Monostable – Op.Amp
14. FET amplifier.
15. Universality of NAND and NOR gates
16. Demorgan's theorem and Boolean algebra- verification
17. SR Flip Flop circuit using gates.
18. Half Adder using logic gates
19. Half Subtractor using logic gates.
20. 8-bit addition and 8-bit subtraction- using µp 8085.
21. 8-bit multiplication and Division- using µp 8085.
22. Conversion from decimal to hexadecimal system- using µp 8085.
23. Conversion from hexadecimal to decimal system- using µp 8085.
24. 16-bit addition- using µp 8085.
25. Conversion of binary to hexadecimal - using µp 8085.
26. Conversion of hexadecimal to binary- using µp 8085.

Course Outcome

On completion of the course, the student will be able to

CO 1	understand the concept of physical quantities.
CO 2	acquire experimental skill to measure physical quantities using measuring instruments.
CO 3	know the problem solving.
CO 4	understand perform experiments in analog and digital electronics.
CO 5	know programming with assembly language in microprocessor 8085.

Text Books

1. Dr. S. Somasundaram, *Practical Physics,* Apsara publications, Tiruchirapalli, 2012.
2. Department of Physics, *Practical Physics*, (B.Sc. Physics Main), St. Joseph's College, Tiruchirapalli 1998.

Books for Reference:

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

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	2	3	3	2	2
CO3	2	2	3	2	3
CO4	2	2	2	2	2
CO5	2	3	3	2	3

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SEMESTER: VI	TITLE: ATOMIC PHYSICS	CREDITS: 5
PART: CORE COURSE XII	COURSE CODE:	Hours/Week: 5

Learning Objectives:

LO 1	To get the fundamentals of cathode, positive rays and mass spectrograph
LO 2	To know atomic structure and atom models.
LO 3	To study the atomic spectra and effect of magnetic and electric fields on spectra.
LO 4	To acquire knowledge of X-rays and its application to crystal structure determination.
LO 5	To understand the photoelectric effect and its theories.

Unit : I Cathode And Positive Rays (12 Hours)

Properties of cathode rays - Mass of an electron - Determination of the electronic charge: Milikan's oil drop method - Dunnington's method for determining e/m - Properties of positive rays - Positive ray analysis - Thomson's parabola method - Aston's Mass spectrograph - Bain bridge Mass spectrograph

Unit :II Atomic Structure (12 Hours)

Thomson model-Rutherford model - Rutherford formula - Bohr Atom Model - Spectral series of hydrogen atom - Bohr Correspondence Principle - Critical potentials - Experimental determination of critical potentials - Drawbacks of Bohr Atom model - Sommerfeld's relativistic atom model - Vector atom model - Quantum numbers associated with the vector atom model - Coupling schemes

Unit: III Atomic Spectra (12 Hours)

Pauli's exclusion principle - Periodic table - Magnetic dipole moment due to orbital motion of the electron - Magnetic dipole moment due to spin - Optical spectra - Fine structure of H_α line - Zeeman effect - Larmor's theorem - Quantum mechanical explanation of Zeeman effect - Anomalous Zeeman effect – Paschen - Back effect - Stark effect.

Unit :IV X-Rays (12 Hours)

Production of X-rays – properties-absorption of X-rays - Bragg's law – Bragg's X-ray spectrometer –the powder crystal method –Laue's method – Rotating crystal method –X-ray spectra- continuous spectra-characteristic spectra-Moseley's law –importance –X-ray Detectors-scintillation detector-semiconductor detectors Compton effect- theory and experimental verification.

Unit:IV Photoelectric Effect (12 Hours)

Introduction - Lenard's method to determine e/m - Richardson and Compton experiment - Experimental investigations on the photoelectric effect - Laws of photoelectric emission - Einstein's photoelectric equation - determination of Planck's constant – Photo emissive cell - Photo voltaic cell – Photo conductive cell - Applications of photoelectric cells.

Course Outcome

On completion of the course, the student would be capable of

CO 1	knowing the properties of cathode and positive rays, the experiments for finding the specific charge, and the principle and working of mass spectrograph.
CO 2	understanding the structure of the atom and the spectral lines.
CO 3	analyzing the effects of magnetic field on atomic spectra
CO 4	understanding photoelectric effect and derive the Einstein's photoelectric equation.
CO 5	recognizing various energy levels viz., rotational, vibrational etc. And learned the principle of Infrared spectroscopy, Raman effect and Laser

Text Books:

1. Murugeshan R. and KiruthigaSivaprasath (2016) ModernPhysics, S. Chand & CO. Ltd, New Delhi,
2. Theraja, B.L. (2016), Modern Physics, S. Chand & CO Ltd, New Delhi,
3. Murugeshan, R. (2016) Optics & Spectroscopy, S. Chand & Co. Ltd, New Delhi,

Reference Books

1. Rajam, J.B. 2009, Atomic Physics, S. Chand & Co Ltd., New Delhi.
2. Sehgal, Chopra and Sehgal, Modern physics, Sultan Chand & Sons, New Delhi.
3. Ghoshal, S. N. 2004, Atomic Physics, S. Chand & Co Ltd., New Delhi.
4. Arora, C.L. 1992, Modern Physics and Electronics, S. Chand & Co Ltd., New Delhi.
5. Banwell, C.N. 2017, Fundamentals of Molecular Spectroscopy, McGraw Hill Education Fourth edition.
6. Aruldhas, G. 2005, Molecular structure and Spectroscopy, Prentice Hall of India,NewDelhi.

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	2
CO2	3	3	3	2	2
CO3	3	3	2	2	3
CO4	3	2	3	2	3
CO5	3	2	3	2	2

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SEMESTER: VI	TITLE: NUCLEAR PHYSICS	CREDITS: 5
PART: CORE COURSE XIII	COURSE CODE:	Hours/Week: 5

Learning Objectives:

LO 1	To get knowledge of Nuclei and nuclear models.
LO 2	To know radioactivity and properties of alpha, beta and gamma rays.
LO 3	To understand working of particle detectors and accelerators.
LO 4	To study the different types of nuclear reactions and their applications.
LO 5	To know basics of elementary particles and cosmic rays.

Unit :I Properties of Nuclei and Nuclear Models (12 Hours)

Introduction to nucleus- Constituents of nuclei - Nuclear mass – Nuclear size – Binding energy - Mass defect - Binding energy/mass number curve - significance - Packing fraction - stability of nucleus – Nuclear spin - Nuclear magnetic moment - Nuclear forces – Yukawa potential.

Nuclear models- Liquid drop model - Semi - empirical mass formula - shell model and magic numbers.

Unit:II Radioactivity (12 Hours)

Fundamental laws of radioactivity- half life - Average life – strength of radioactive sample - successive disintegration - α rays - properties - α - decay - Geiger-Nuttal experiment and law – β - rays - properties - β - decay – continuous β - spectrum - Inverse β - decay - Neutrino hypothesis - γ rays – properties - Nuclear isomers – applications - Radio carbon dating- radio isotopes – uses.

Unit :III Detectors and Particle Accelerators (12 Hours)

Detectors – Ionization chamber – G. M. counter – Scintillation Counter –Wilson Cloud chamber- Bubble chamber – Particle accelerators: Linear accelerators – Cyclotron – Betatron-synchrotron.

Unit: IV Nuclear Reactions and Nuclear Reactors (12 Hours)

Nuclear reactions- Types of nuclear reactions – Q value of nuclear reaction – Cross section of nuclear reactions.

Nuclear Fission- Energy released per nucleon in fission – Nuclear chain reaction – Multiplication factor – Nuclear materials - Nuclear reactor – Types of reactors – Atom bomb - Nuclear reactors in India – Nuclear Fusion –source of stellar energy P - P cycle – Thermonuclear reactions - Hydrogen bomb.

Unit :V Elementary Particles And Cosmic Rays (12 Hours)

Classification of elementary particles- Particles and Antiparticles – Pions and Muons - K - Mesons – Hyperons - Fundamental interactions – Elementary particle quantum numbers – Conservation laws and Symmetry – Quark model.

Cosmic rays-introduction -latitude and altitude effects - cosmic ray showers-Van Allen belt- origin of cosmic radiation.

Course Outcome

On completion of the course, the student would be capable of

CO 1	getting knowledge of Nuclei and nuclear models.
CO 2	knowing radioactivity and properties of alpha, beta and gamma rays.
CO 3	understanding working of particle detectors and accelerators.
CO 4	studying the different types of nuclear reactions and their applications.
CO 5	knowing basics of elementary particles and cosmic rays.

Text books:

1. Murugeshan and KiruthigaSivaprasath,(2008), *Modern Physics* S. Chand &Co.
2. Sathya Prakash,*Nuclear Physics*, Pragati Prakashan, Meerut.
3. Gupta and Roy (2011), *Physics of the nucleus*, Books and Allied (P) Ltd Kolkata.
4. Schlumberger (1991), *Basic Principles of logging*, Schlumberger Wireline & Testing, Texas

Supplementary readings:

1. Pandya,M.L. and Yadav, 2000,*Elements of Nuclear Physics*, Kedarnath& Ramnath.
2. Tayal,D.C.2009,*Nuclear Physics*, Himalaya Publishing House.
3. Ghoshal S. N.2003,*Nuclear Physics* S. Chand & Co.
4. Devanathan.V.2016, *Nuclear Physics*, Narosa Publications, New Delhi,.

Web Resources:

https://www.pdfdrive.com/schlumberger - log - interpretation - principles - applicationspdf - e20509665.html

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	3	2
CO2	3	2	3	2	3
CO3	3	2	2	2	2
CO4	3	3	3	3	2
CO5	3	2	2	3	2

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SEMESTER: VI	TITLE: SOLID STATE PHYSICS	CREDITS: 4
PART:CORECOURSE XIV	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To understand the different types of bonding in solids.
LO 2	To study the basics concept of Crystal Structure and Crystal Diffraction
LO 3	To acquire knowledge on the basics of magnetic phenomena on materials.
LO 4	To study the concept of Dielectric Properties of materials.
LO 5	To know the properties of superconducting materials.

Unit I: Bonding in Solids (12 Hours)

Interatomic forces – Different types of chemical bond – Electrovalent bond – Covalent bond or Homopolar bond – Metallic bond – Dispersion bond – Dipole bond – Hydrogen bond – Lattice energy of ionic crystals.

Unit II: Crystal Structure and Crystal Diffraction (12 Hours)

Crystal Lattice -Primitive and unit cell-seven classes of crystal-Bravais Lattice-Miller Indices- Symmetry elements - Structure of crystals- Simple cubic, Face centered cubic, Body centered cubic and Hexagonal close packed structure - Diamond Structures

Unit III: Magnetic Properties (12 Hours)

Spontaneous Magnetization – Weiss Theory – Temperature dependence of Magnetization -classical Theory of Diamagnetism – Weiss theory of Para magnetism – Ferromagnetic domains – Bloch wall – Basic ideas of anti-ferromagnetism – Ferrimagnetisms – Ferrites in computer Memories.

Unit IV: Band theory and Dielectric Properties (12 Hours)

Band theory of solids –Insulators, Semiconductors, conductors – intrinsic and extrinsic semiconductor – Rectifier Equation- Dielectrics:Polarization – frequency and temperature effects on polarization-dielectric loss-Clausius Mosotti relation-determination of dielectric constants.

Unit V: Super Conductivity (12 Hours)

Introduction - General Properties of Superconductors - Meissner effect - London equations - AC & DC Josephson effects -applications – Type –I and Type–II Superconductors - Explanation for the Occurrence of Super Conductivity - BCS theory - Application of Superconductors - High T_c superconductors.

Course Outcome

On completion of the course, the student will be able to

CO 1	understand the different types of bonding in solids.
CO 2	study the basics concept of Crystal Structure and Crystal Diffraction
CO 3	acquire knowledge on the basics of magnetic phenomena on materials.
CO 4	study the concept of Dielectric Properties of materials.
CO 5	know the properties of superconducting materials.

Text books

1. Solid State Physics by R L Singhal, Kedarnath Ram Nath& Co., Meerut (2003)
2. Material Science by M. Arumugam, Anuradha Publishers. 1990 idayalkaruppur, Kumbakonam.
3. Dr. M.N. Avadhanulu, Material science S. Chand & Company, New Delhi, 2014
4. Introduction to Solid State Physics by Kittel, Willey Eastern Ltd(2003).
5. Materials Science and Engineering by V. Raghavan, Prentice Hall of India PrivateLimited, New Delhi(2004).

Supplementary readings:

1. Solid State Physics by S.O.Pillai, New Age International (P) Ltd.,(2002).
2. Solid State Physics by A. J.Dekker, Macmillan India(1985).
3. Solid State Physics by HC Gupta, Vikas Publishing House Pvt. Ltd., New Delhi (2001).

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	3	2	2	2
CO3	3	2	2	2	3
CO4	3	2	2	2	3
CO5	3	3	2	3	2

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SEMESTER: VI	TITLE: DIGITAL AND COMMUNICATION ELECTRONICS	CREDITS: 4
PART:CORECOURSE XV	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To improve knowledge about the basics of number system, logic gates.
LO 2	To understand the Boolean algebra and of combinational logic cicuits
LO 3	To know the timer IC, various flip flops, D/A and A/D converters.
LO 4	To get knowledge on digital counters and registars.
LO 5	To develop skill about the Modulation and Demodulation circuits.

Unit I: Number Systems and Logic Gates (12 Hours)

Introductions to decimal. binary, octal, hexadecimal number systems - Inter conversions - One's and two's complements - Simple binary arithmetic operations QBS - Addition, subtraction, multiplication and division - Binary subtraction using one's and two's complements - Positive and negative logic-Basic and derived logic gates, symbols and their truth tables - AND, OR, NOT, NAND, NOR, XOR, and XNOR gates - Universality of NAND and NOR gates.

Unit II: Boolean Algebra (12 Hours)

Boolean algebra - Basic laws of Boolean algebra -De Morgan's theorems- Reducing Boolean expressions using Boolean laws - SOP and POS forms of minterms and maxterms - Karnaugh map simplification.

Unit III: Timer and Flip Flops (12 Hours)

555 timer - monostable multivibrator - Astable multivibrator -Flip flop - RS flip flop - clocked RS flip flop-JK flip flop- J-K master slave flip flop- T flip flop and D flip flop-D/A converter-Binary weighted method – A/D converter – Successive approximation method.

Unit IV: Counters and Registers (12 Hours)

Binary Counter - ring Counter - Four bit asynchronous Counter - ripple counter - Mod - 10 counter - Synchronous counter - Shift registers – shift left register - shift right register – up/down counter.

Unit V: Modulation And Demodulation (12 Hours)

Amplitude modulation - Frequency modulation, Phase Modulation and Pulse Width Modulation - Detectors of AM, FM, PM and PWM - Noise in Communication Systems.

Course Outcome

On completion of the course, the student will be able to

CO 1	know about the basics of number system, logic gates.
CO 2	understand the Boolean algebra and of combinational logic cicuits
CO 3	know the timer IC, various flip flops, D/A and A/D converters.
CO 4	get knowledge on digital counters and registars.
CO 5	acquire knowledge on Modulation and Demodulation circuits.

Text Books

1. Digital Principles and Application by Malvino Leach, Tata McGraw Hill, 4thEdition(1992).
2. Digital Fundamentals by Thomas L. Floyd, Universal Book Stall, New Delhi(1998).
3. Introduction to Integrated Electronics by V.Vijayendran, S. Viswanathan (Printersand Publishers) Pvt. Ltd., Chennai(2005).

Books for Reference:

1. Digital Electronics by Practice Using Integrated Circuits - R.P.Jain - Tata McGrawHill(1996).
2. Linear Integrated Circuits by D. Roy Choudhury and Shail Jain - New AgeInternational (P) Ltd.(2003).
3. Electronics - Analog and Digital by I.J. Nagrath - Prentice - Hall of India, NewDelhi(1999).
4. Integrated Electronics by J.Millman and C.Halkias, Tata McGraw Hill, New Delhi(2001)

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	3	3	2	2
CO3	3	3	3	2	3
CO4	3	2	3	2	2
CO5	3	2	2	2	3

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SEMESTER: III	TITLE: ENERGY PHYSICS	CREDITS: 4
PART:MAJOR BASED ELECTIVE- I (1)	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To know the different energy sources.
LO 2	To get the knowledge on methods to harvest solar thermal energy.
LO 3	To study about solar cells and photovoltaic power generation and its utilization.
LO 4	To acquire knowledge on extracting energy from biomass.
LO 5	To understand various energy sources.

Unit I: Introduction to Energy Sources (10 Hours)

World's reserve of Commercial energy sources and their availability-India's production and reserves-Conventional and non-conventional sources of energy-comparison – Coal- Oil and natural gas –Applications - merits and demerits.

Unit II: Solar Thermal Energy (10 Hours)

Solar constant -Solar spectrum-Solar radiations outside earth's atmosphere –at the earth surface- on tilted surfaces -Solar Radiation geometry-Basic Principles of Liquid flat plate collector-Construction and working- Solar distillation–Solar disinfection – Solar crop dryer - Solar cooker-box type-Solar water heating systems.

Unit III: Photovoltaic Systems (10 Hours)

Introduction-Photovoltaic principle-Basic Silicon Solar cell- Power output and conversion efficiency-Limitation to photovoltaic efficiency-Basic photovoltaic system for power generation-Advantages and disadvantages-Types of solar cells- Application of solar photovoltaic systems - PV Powered fan – PV power - lighting system – A Hybrid System.

Unit IV: Biomass Energy (10 Hours)

Introduction-Biomass classification- Biomass conversion technologies-Biogas generation-Factors affecting biodigestion -Working of biogas plant- floating and fixed dome type plant -advantages and disadvantage of -Biogas from plant wastes-Methods for obtaining energy from biomass- Thermal gasification of biomass-Working of downdraft gasifier.

Unit V: Other Energy Sources (10 Hours)

Wind Energy Conversion-Classification and description of wind machines, wind energy collectors-Energy storage- Energy from Oceans and Chemical energy resources-Ocean thermal energy conversion-tidal power, advantages and limitations of tidal power generation-Energy and power from waves- wave energy conversion devices.

Course Outcome

On completion of the course, the student will be able to

CO 1	know the different types of energy sources.
CO 2	get the knowledge on methods to harvest solar thermal energy.
CO 3	tudy about solar cells and photovoltaic power generation and its utilization.
CO 4	acquire knowledge on extracting energy from biomass.
CO 5	understand various energy sources such as wind, ocean and tidal.

Text Books

1. Kothari D.P., K.C. Singal and Rakesh Ranjan, Renewable energy sources and emerging Technologies, Prentice Hall of India, 2008.
2. Solar Energy-principles of thermal collection and storage-S.P.SUKHAME-tata- McGraw-Hill publishing company ltd.

Books for Reference:

1. Chetan Singh Solanki, Solar Photvoltaics Fundamentals, Technologies and Applications, 2ndEdition, PHI Learning Private Limited, 2011.
2. Rai G. D, Non conventional Energy sources, 4th Edition, Khanna Publishers,2010.
3. Jeffrey M. Gordon, Solar Energy: The State of the Art, Earthscan, 2013.
4. Kalogirou S.A., Solar Energy Engineering: Processes and Systems , 2nd
5. Edition, Academic Press, 2013.
6. Zobaa A.F.and Ramesh Bansal, Handbook of Renewable Energy Technology, World Scientific, 2011.

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	2	3	3
CO2	3	2	2	3	2
CO3	3	2	2	3	3
CO4	3	2	2	3	3
CO5	2	2	2	3	2

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SEMESTER: III	TITLE: FUNDAMENTALS OF PHYSICS	CREDITS: 4
PART:MAJOR BASED ELECTIVE- I (2)	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To know the units, dimensions and measurement of various physical quantities.
LO 2	To acquire knowledge on different states of matter and conversion between them.
LO 3	To know different types of energy.
LO 4	To know about pressure, temperature and their simple measuring devices.
LO 5	To understand principles of mirrors and lenses

Unit I: Units and Measurements (10 Hours)

S.I.Units–measurements of length,mass, time and other physical quantities - Dimensional formula for area, volume ,density, velocity, acceleration, momentum and force– Impulse – Torque – couple – angular momentum - Uses of dimension.

Unit II: States of matter (10 Hours)

Matter – Solid, Liquid, Gas and Plasma – Application of Plasma – change of state – specific heat capacity – specific heat capacity of gas - latent heat of fusion and vaporisation - specific latent heat of ice and steam.

Unit III: Energy (10 Hours)

Kinds of energy – Mechanical energy, Thermal energy, Optical energy, Sound energy, Electrical energy, atomic and nuclear energy, (Examples) – Conservation of energy – work energy theorem.

Unit IV: Pressure and Temperature (10 Hours)

Pressure – atmospheric pressure – Fortin barometer – Aneroid barometer - Concept of heat and temperature – Centigrade, Fahrenheit and Rankine scale – relation between temperature scales - Mercury thermometer – Error and corrections in mercury thermometers – Platinum wire resistance thermometer.

Unit V:Optics (10 Hours)

Mirror–Laws of reflection – total internal reflection – Image formation (Concave and Convex mirror) - Lens –Laws of refraction – Image formation (Concave and Convex lens) – Defects of eye and rectification – Rayleigh, Mie, Tyndall and Raman scattering of light.

Course Outcome

On completion of the course, the student will be able to know

CO 1	units and dimensions of various fundamental physical quantities
CO 2	different states of matter and conversion between them.
CO 3	types of energy and its conservation.
CO 4	pressure and temperature and their measurement using simple devices.
CO 5	principle and use of mirrors, lenses and scattering of light.

Text Books

1. Narayan Rao, (1998), B V, First *Year B. Sc. Physics*, New Age International (P) Lt.

Books for Reference:

1. Halliday, D, ResnickR andWalker J, (2011),*FundamentalsofPhysics*, Wiley India, Pvt Ltd.
2. Mathur,D S (2002), *Mechanics*, S. Chand&Co.,
3. Mathur,D S (2002), *Propertiesofmatter*,S.Chand&Co.,
4. Brijlal and Subramanian, (2006), *Propertiesofmatter*,S.Chand&Co.,
5. Rai, G D, *Solar energy utilization*, Khanna Publishers.
6. SubramanyamandBrijlal (2004), *Atextbook ofOptics*, S. Chandandco., 22nd Edition.
7. Murugeshan, R (2008), *Optics and Spectroscopy*, S. Chand and co., 6th Edition.

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	2	3	3
CO3	3	2	3	3	3
CO4	3	3	2	2	3
CO5	3	2	2	2	2

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SEMESTER: III	TITLE: ASTROPHYSICS	CREDITS: 4
PART:MAJOR BASED ELECTIVE- I (3)	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To understand the basics of astronomy and celestial bodies.
LO 2	To know about the telescope and its types.
LO 3	To learn about the physical properties of Sun and planets.
LO 4	To understand the classification of star.
LO 5	To understand the galaxy and its types.

Unit I: Fundamentals of Astronomy (10 Hours)

Birth of Modern Astronomy – Geocentric and Heliocentric theories —– Kepler's laws of planetary motion – Newtonian gravitation – Celestial objects – Planets – Terrestrial and Jovian planets (Planets individual description is not required in detail) - Asteroids- Meteorites – Comets..

Unit II: Telescopes (10 Hours)

Telescopes – Elements of telescope – Properties of images – Types of Optical telescopes – Refracting and Reflecting telescopes- Radio telescope –Spectrograph – Limitations – Photographic photometry – Photoelectric photometry – Spectrophotometry – Detectors and image processing.

Unit III: Sun and Planets (10 Hours)

Sun – Physical properties – Composition – Core – Nuclear Reactions – Photosphere – Chromosphere – Corona – Sunspots – Sunspot cycle – Solar Wind – Auroras – space weather effects – History of the Earth – Temperature of a planet – The atmosphere – Pressure and Temperature distribution –Magnetosphere – Eclipses – Solar and Lunar Eclipses.

Unit IV: Stars (10 Hours)

Classification of Stars – The Harvard Classification system – Luminosity of a Star – Hertzprung-Russel Diagram – Stellar evolution using the HR diagram –Theoretical evolution of stars – White Dwarfs – Neutron stars-Black holes –Event horizon – Basic physics of Black Holes.

Unit V: Galaxy (10 Hours)

Galaxy nomenclature – Types of Galaxies – Spiral – Elliptical – irregular galaxies – Milky Way Galaxy and its structure – Rotation and Mass Distribution – Rotation curve and Doppler shift – Star clusters – Galactic clusters – Pulsars – Cosmological Models – Big bang theory – Steady state theory – Hubble's law –Olber's paradox.

Course Outcome

On completion of the course, the student will be able to

CO 1	understand the basics of astronomy and celestial bodies.
CO 2	know about the telescope and its types.
CO 3	learn about the physical properties of Sun and planets.
CO 4	understand the classification of star.
CO 5	understand the galaxy and its types.

Text Books

1. Niclolas. A. Pananides and Thomas Arny, 1979, Introductory Astronomy, Addison Wesley Publ. Co.
2. A. Mujiber Rahman, Concepts to Astrophysics, scitech Publications, Chennai.

Books for Reference:

1. Abell, Morrison and Wolf, 1987, Exploration of the Universe, 5th ed., Saunders College Publ.
2. Carrol and Ostlie, 2007, Introduction to Modern Astrophysics, 2nd ed., Pearson International.
3. William J. Kaufmann, III, 1977, Macmillan Publishing company, London.
4. Abhyankar, K.D., Universities Press.

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	2	3	3
CO2	3	3	3	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	2
CO5	3	2	2	3	3

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SEMESTER: V	**TITLE: LASER PHYSICS**	**CREDITS: 4**
PART:MAJOR BASED ELECTIVE- II (1)	**COURSE CODE:**	**Hours/Week: 4**

Learning Objectives:

LO 1	To learn the principle of Laser and its characteristics
LO 2	To get the knowledge of different types of Lasers
LO 3	To know the various applications of Laser in Industry
LO 4	To learn the uses of Laser in Medical field
LO 5	To understand the application of laser in fiber optic communication

Unit I: Fundamentals of LASER (10 Hours)

Spontaneous emission – Stimulated absorption and emission – Meta stable state – Population inversion – Pumping – types of pumping- -principle of Laser - components of Laser - Laser Characteristics of Laser.

Unit II: Production of LASER (10 Hours)

Classification of lasers – Solid State Lasers – Ruby Lasers - Nd : YAG laser – Gas lasers – Helium-Neon laser – CO2 laser – Semiconductor lasers – Diode laser.

Unit III: Industrial Applications of LASER (10 Hours)

Laser cutting – Welding – Drilling – Hologram – Recording and reconstruction of hologram -Laser in material processing – Laser in electronic industry – Laser in nuclear energy-LIDAR.

Unit IV: Lasers in Medicine (10 Hours)

Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment - Laser in dentistry-Laser angioplasty - Endoscopy.

Unit V: Laser in fiber optics (10 Hours)

Optic fibre communication – Total internal reflection – single mode fibres-fibre attenuation- optical window- band width - Block diagram of fibre optic communication system – Wavelength Division Multiplexing - Advantages of fibre optic communication.

Course Outcome

On completion of the course, the student will be able to

CO 1	know the principle of Laser and its characteristics
CO 2	explore the different types of Lasers
CO 3	get knowledge on various applications of Laser in Industry
CO 4	acquire the knowledge of uses of Laser in Medical field
CO 5	understand the application of laser in telecommunication

Text Books

1. Avadhanulu, N. 2001, *An introduction to LASERS*, S. Chand & Company.

Books for Reference:

1. William T. Silfvast, 1998, *Laser fundamentals*, University Press, Published in South Asia by Foundation books, New Delhi.

2. ThyagarajanK. and Ghatak,A.K. 1984, *LASER Theory and Application*, Mc Millan, India Ltd.

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	2	3	2
CO2	3	3	2	2	2
CO3	2	3	2	3	2
CO4	2	2	2	3	2
CO5	2	2	3	3	2

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SEMESTER: V	TITLE: MATERIALS SCIENCE	CREDITS: 4
PART:MAJOR BASED ELECTIVE- II (2)	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To study electron theory of solids and related properties of resistivity of materials.
LO 2	To understand electrical and thermal conductivities of conducting materials.
LO 3	To know the new materials such as metallic glass, ceramics, SMART materials.
LO 4	To gain the basic knowledge on different types of non destructive testing of materials
LO 5	To get adequate knowledge on classification, types, and applications of nano materials.

Unit I: Electron Theory of Solids (10 Hours)

Classical free electron theory – quantum free electron theory – Fermi energy of metal-Density of states – Electron in a periodic potential – Brillouin zone – Resistivity, Fermi surface movement and band gap – Hall effect.

Unit II: Conducting Materials (10 Hours)

Drude – Lorentz theory of electrical conductivity – Relaxation time, collision time and mean free path – Thermal conductivity of metal – Comparison between electrical and thermal conductivities – Wiedmann-Franz law – Types of conducting matrials.

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Unit III: New Materials (10 Hours)

Metallic glasses – Surface Acoustic Wave (SAW) materials –Biomaterials – Ceramics – Cermets – High temperature materials – Thermoelectric materials – Electrets – Nuclear engineering materials – shape memory alloys – SMART materials – conducting polymers.

Unit IV: Non Destructive Testing (10 Hours)

Liquid penetrant method – magnetic method – Radiographic technique – X-ray radiographic technique – X-ray fluoroscopy – Gamma radiographic technique – Comparison between X-ray and gamma ray techniques – Ultrasonic method – different modes – metallurgical microscope.

Unit V: Nano Materials (10 Hours)

Nano materials – Classification of nano materials - Properties of nano materials – (Size dependent) – Synthesis of nanomaterials – Application of nanomaterials – Carbon nanotubes – types of CNTs – Comparison of SWCNT and MWCNT – Synthesis – Electric discharge – Laser ablation - CVD – Properties of carbon nanotubes - Applications CNT's.

Course Outcome

On completion of the course, the student will be able to

CO 1	study electron theory of solids and related properties of resistivity of materials.
CO 2	understand electrical and thermal conductivities of conducting materials.
CO 3	know the new materials such as metallic glass, ceramics, SMART materials.
CO 4	gain the basic knowledge on different types of non destructive testing of materials
CO 5	get adequate knowledge on classification, types, and applications of nano materials.

Text Books

1. Dr. M.N. Avadhanulu, *Material science* S. Chand & Company, New Delhi, 2014
2. M.Arumugam,*Material Science* Anuradha Publishers. 1990 idayalkaruppur, Kumbakonam

Books for Reference:

1. V. Raghavan, Material Science and Engineering, Printice Hall India, 2004.
2. V. Rajendran, Material Science, Tata McGraw Hill Ltd., New Delhi, 2001.

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	2	3	2
CO2	3	3	2	2	3
CO3	2	2	2	3	2
CO4	2	3	2	3	2
CO5	3	3	2	3	3

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SEMESTER: V	TITLE: INTEGRATED ELECTRONICS	CREDITS: 4
PART:MAJOR BASED ELECTIVE- II (3)	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To study the number system and conversion between them and Boolean algebra.
LO 2	To understand combinational logic circuits.
LO 3	To know the sequential circuits and their applications.
LO 4	To gain the basic knowledge Op – Amp and its applications
LO 5	To get adequate knowledge on analog to digital, digtal to analog converters.

Unit I: Fundamental Digital Electronics (10 Hours)

Number systems – binary – hexadecimal – Binary addition – subtraction (1's and 2'scompliment method) – multiplication - division - BCD – Conversion – simplification of logic circuits - using (i) Boolean algebra, (ii) Karnaugh map – Demorgan's theorems -NAND and NOR as universal building blocks.

Unit II: Combinational Logic Circuits (10 Hours)

Half adder, full adder, half subtractor and full subtractor – 4 bit adder/subtractor -decoder, encoder - multiplexer - demultiplexer..

.

Unit III: Sequential Logic Circuits (10 Hours)

R,S flip flop, D flip flop and JK flip flops - JK Master Slave flip flop – synchronousand ripple counters - BCD counter – Up/Down counters - shift registers - serial and parallel registers - ring and twisted ring counter.

Unit IV: OP-AMP Basic Applications (10 Hours)

Characteristics parameters – differential gain – CMRR – Slew rate – bandwidth -applications – inverter, non-inverter, integrator, differentiator, summing, difference and averaging amplifiers - solving simultaneous equations -comparator - square wave generator -Wien's bridge oscillator - Schmitt trigger.

Unit V: Timer, DAC/ADC (10 Hours)

Timer 555 - Internal block diagram and working - astablemultivibrator–Schmitt trigger.D/A converter - binary weighted method - A/D converter – successive approximation method.

Course Outcome

On completion of the course, the student will be able to

CO 1	know the number system and conversion between them and Boolean algebra.
CO 2	understand combinational logic circuits.
CO 3	know the sequential circuits and their applications.
CO 4	gain the basic knowledge Op – Amp and its applications
CO 5	get adequate knowledge on analog to digital, digtal to analog converters.

Text Books

1. Digital Principles and Application by Malvino Leach, Tata McGraw Hill, 4thEdition(1992).
2. Digital Fundamentals by Thomas L. Floyd, Universal Book Stall, New Delhi(1998).
3. Introduction to Integrated Electronics by V.Vijayendran, S. Viswanathan (Printersand Publishers) Pvt. Ltd., Chennai(2005).
4. OP - AMPs and Linear Integrated Circuits by Ramakant A. Gayakwad, PrenticeHall of India(1994)..

Books for Reference:

1. Digital Electronics by Practice Using Integrated Circuits - R.P.Jain - Tata McGrawHill(1996).
2. Linear Integrated Circuits by D. Roy Choudhury and Shail Jain - New AgeInternational (P) Ltd.(2003).
3. Electronics - Analog and Digital by I.J. Nagrath - Prentice - Hall of India, NewDelhi(1999).
4. Integrated Electronics by J.Millman and C.Halkias, Tata McGraw Hill, New Delhi(2001)

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	3	2	3
CO2	3	2	3	2	2
CO3	3	2	2	2	3
CO4	3	2	2	2	2
CO5	3	2	3	2	2

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SEMESTER: V	TITLE: OPTOELECTRONICS AND FIBRE OPTICS	CREDITS: 4
PART:MAJOR BASED ELECTIVE- III (1)	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To understand absorption and emission of light in matter.
LO 2	To study optoelectronics materials, LED, LCD, Photo diode etc.,
LO 3	To know the properties, working and applications of LASERs.
LO 4	To gain the basic knowledge on optical fiber communication system.
LO 5	To get adequate knowledge on optical data storage, and hologram.

Unit I Interaction of Light with Matter (10 Hours)

Introduction - Absorption - optical absorption in metals, dielectrics and semiconductors Reflection - trap - excitons - colour centers - Generation of colour centers - Luminescence - photo Luminescence.

Unit II Opto electronic Materials (10 Hours)

Introduction – PN junction as a light source-Construction of LED - Advantages of LEDs in electronic display - LCD -Characteristics of LCD materials - Action of LCD display device - Photodetectors - Expression for photo conductivity gain - Detector performance - HMsce parameters - Photo conductive materials - Photo diode - LDR -Phototransistors.

Unit III Lasers (10 Hours)

Introduction – Characteristics of laser – spontaneous - Stimulated emission - Einstein's coefficients-condition for population inversion-three level scheme-semiconductor- Absorption and amplification of radiation - Optical feed back - Threshold condition for lasing -

Properties of lasers - Radiant power, Coherence - Coherence length – Laser spot size - Beam divergence, - CO_2 laser, semiconductor laser - Applications.

Unit IV Fiber optic Communication (10 Hours)

Introduction- step index-graded index-Principle of light transmission in a fiber - Numerical aperture-Fiber profiles - Modes of propagation - Losses in fibers - Light sources -Laser diode - Light detector - Avalanche photo diode - Fiber optic communication link (Block diagram)- Advantages of fiber optics communication.

Unit V Optical Data Storage (10 Hours)

Surface Storage - Phase change recording - Magneto optical data storage -Hi- tech evolwed in system development - Automatic focussing - Automatic track following capacity of CD - advantages of CD - holographic storage -Construction of a hologram - Reconstruction of a hologram.

Course Outcome

On completion of the course, the student will be able to

CO 1	understand absorption and emission of light in matter.
CO 2	study optoelectronics materials, LED, LCD, Photo diode etc.,.
CO 3	know the properties, working and applications of LASERs.
CO 4	gain the basic knowledge on optical fiber communication system.
CO 5	get adequate knowledge on optical data storage, and hologram.

Text Books

1. Palanisamy P,K.Semiconductor Physics and Opto electronics, Ed II Scitech - Publications. (2003)
2. Palanisamy P.K. Material Science Ed If Scitech (2003).
3. Tripathi K.N, Mathur P.C, Ainashi Kapoor Yinod K. Sharma, Opto electronics - BS Publications (2004).

Books for Reference:

1. Optical fibres and Fibre Optic Communication – Sabir Kumar Sarkar IV Revised Edition 2003.
2. Opto Electronics – Wilson & Hawker, Prentice Hall of India 2004

COURSE OUTCOME MAPPING:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	2	3	2
CO2	3	2	2	3	2
CO3	3	3	2	3	2
CO4	3	2	2	3	2
CO5	2	2	3	2	2

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SEMESTER: V	TITLE: WEATHER FORECASTING	CREDITS: 4
PART:MAJOR BASED ELECTIVE- III (2)	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To understand the composition, pressure and temperature of atmosphere.
LO 2	To explore the methods to measure the weather.
LO 3	To know the weather system of globe.
LO 4	To get the knowledge of climate and its change.
LO 5	To understand the weather forecasting techniques.

Unit 1: Introduction to atmosphere

Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors: types; atmospheric pressure: its measurement; cyclones and anticyclones: its characteristics.

Unit 2: Measuring the weather

Wind; forces acting to produce wind; wind speed direction:units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws.

Unit 3: Weather systems

Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: classification; tornadoes; hurricanes.

Unit 4: Climate and Climate Change

Climate: its classification; causes of climate change;global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain,environmental issues related to climate.

Unit 5: Basics of weather forecasting:

Weather forecasting: analysis and its historicalbackground; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.

Course Outcome

On completion of the course, the student will be able to

CO 1	understand the composition, pressure and temperature of atmosphere.
CO 2	explore the methods to measure the weather.
CO 3	know the weather system of globe.
CO 4	get the knowledge of climate and its change.
CO 5	understand the weather forecasting techniques.

Text Books

1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
2. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.

Supplimentary Reading:

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1. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
2. Text Book of Agro meteorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
3. Atmosphere and Ocean, John G. Harvey, 1995, The Artemis Press.

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	2	3	3
CO2	3	2	2	3	3
CO3	2	2	2	3	2
CO4	3	2	2	3	2
CO5	3	2	2	3	2

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SEMESTER: V	TITLE: SPECTROSCOPY	CREDITS: 4
PART:MAJOR BASED ELECTIVE- III (3)	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To understand absorption and emission of light in matter.
LO 2	To study optoelectronics materials, LED, LCD, Photo diode etc.,.
LO 3	To know the properties, working and applications of LASERs.
LO 4	To gain the basic knowledge on optical fiber communication system.
LO 5	To get adequate knowledge on optical data storage, and hologram.

Unit I Microwave Spectroscopy (10 Hours)

Rotation of molecules – Classification of molecules – Rotation spectra of diatomic molecules – Intensities of Spectral lines – Effect of Isotopic Substitution – Polyatomic Molecules – Symmetric Top molecules – Asymmetric Top molecules - Techniques and Instrumentation – Chemical analysis by Microwave spectroscopy..

Unit II Infrared Spectroscopy (10 Hours)

I.R.Spectroscopy – Vibrating diatomic molecules – Simple Harmonic Oscillator –An harmonic oscillator – Diatomic vibrating rotator – IR Spectrum of carbon monoxide – Vibration of Polyatomic molecules.

Unit III Instrumentation (10 Hours)

Instrumentation and Techniques in Infrared spectroscopy – Sources – monochromators – Sample cells – Detectors – Single beam Infra red spectrometer – Double beam Infra red spectrometer

Unit IV Raman Spectroscopy (10 Hours)

Raman effect: Discovery – – Classical theory of Raman effect – Quantum theory of Raman Effect –Pure rotational Raman Spectra- Linear molecules – Raman Spectrum of symmetric top molecules - Vibrational Raman spectra - Rotational Fine Structure – Polarization of light and the Raman Effect - Structure determination from IR and Raman spectroscopy.

Unit V Electronic Spectroscopy ((10 Hours)

Born -Oppenheimer approximation – Vibrational coarse structure: Progressions – Frank-Condon principle– Rotational Fine Structure of Electronic Vibration Transitions -Fortrat diagram-Predissociation.

Course Outcome

On completion of the course, the student will be able to

CO 1	understand absorption and emission of light in matter.
CO 2	study optoelectronics materials, LED, LCD, Photo diode etc.,.
CO 3	know the properties, working and applications of LASERs.
CO 4	gain the basic knowledge on optical fiber communication system.
CO 5	get adequate knowledge on optical data storage, and hologram.

Text Books

1. Fundamentals Of Molecular Spectroscopy - Colin N Banwell Elaine- M MccashFifth Edition Palanisamy P.K. Material Science Ed If Scitech (2003).

Supplimentary Reading:

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1. Molecular structure and spectroscopy - G. Aruldhas, PHI Learning Pvt. Ltd, India.
2. 2.Hand book of Analytical Instruments -R.S. Khandpur, Tata MC Grow Hill Ltd

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	2	3	2
CO2	3	3	2	3	2
CO3	3	3	2	3	2
CO4	3	3	2	2	2
CO5	3	3	2	2	2

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SEMESTER: VI	**TITLE: MICROPROCESSOR AND `C' PROGRAMMING**	**CREDITS: 4**
PART:MAJOR BASED ELECTIVE- IV (1)	**COURSE CODE:**	**Hours/Week: 4**

Learning Objectives:

LO 1	To know the basics digital computer and its hardware, software and memory.
LO 2	To study architecture of Intel 8085 processor.
LO 3	To get skill to write assembly language programmes for mathematical operations.
LO 4	To know the 'C' programming.
LO 5	To get knowledge on functions of 'C' programming.

Unit I: Basics of Digital Computer (10 Hours)

Basic components of a digital computer - Evolution of microprocessors - Important INTEL microprocessors - Hardware, Software and Firmware - Memory : Semiconductor memories - RAM, ROM - Flash memory - CCD memory – Cache memory – Buses.

Unit II: Intel 8085 and its Architecture (10 Hours)

INTEL 8085 - Pin Diagram - Architecture - Various registers - Status Flags - Interrupts and their order of priority - Addressing modes - Direct Register, Register indirect, Immediate and implicit addressing - Instruction set - Data transfer group – Arithmetic Group - Logical group - Branch group, Stack, I/O and Machine control group.

Unit III: Assembly Language Programming (10 Hours)

Addition - subtraction - multiplication -division of two 8 - bit numbers - Finding the largest and smallest number in a data array - Arranging a set of numbers in ascending or descending order

Unit IV: Introduction to C (10 Hours)

Basic structure of C Programs - Character set - C tokens - Keywords and identifiers - constants - variables - Data types - declaration of variables - *Assigning* values to variables - Symbolic constants - Operators and Expressions - Arithmetic operators - Relational, Logical and Assignment operators, Increment and decrement operators.

Unit V: Preliminaries and Functions (10 Hours)

Data input and output - getchar, putchar, scanf, printf, gets, puts functions –Decision making and branching - if, if...else, else if ladder, switch, break, continue, goto - Decision making and looping - while, do... while, for, nested loops – Arrays - Declaration, Initialization of arrays – Programs – To find smallest and largest element in array – Solving quadratic equation.

Course Outcome

On completion of the course, the student will be able to

CO 1	know the basics digital computer and its hardware, software and memory.
CO 2	study architecture of Intel 8085 processor.
CO 3	get skill to write assembly language programmes for mathematical operations.
CO 4	know the 'C' programming.
CO 5	get knowledge on functions of 'C' programming.

Text Books

1. B. Ram - *Fundamentals of Microprocessors and M*icrocontrollers-Dhanpat Rai Publications (P) Ltd., New Delhi, 2013.
2. Balagurusamy - *Programming in ANSI C* - Tata McGraw Hill Education Private Limited, New Delhi,2012.

Supplimentary Reading:

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1. R.S. Gaonkar- *Microprocessor Architecture, Programming, and Applications with the 8085, Penram* International Publishing (India) Private Limited, Mumbai 2007.
2. K.R. Venugopal and S. R. Prasad - *Programming with C*- Tata McGraw-Hill Publishing Company Limited, New Delhi, 2002.

Course outcome mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	2	2	2	3
CO2	3	2	2	2	2
CO3	3	2	2	2	2
CO4	2	2	3	2	2
CO5	2	2	2	2	2

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SEMESTER: VI	**TITLE: MEDICAL PHYSICS**	**CREDITS: 4**
PART:MAJOR BASED ELECTIVE- IV (2)	**COURSE CODE:**	**Hours/Week: 4**

Learning Objectives:

LO 1	To know the basic knowledge about transducers.
LO 2	To develop understanding of basic medical devices that is ECG, CCD etc..
LO 3	To have a better understanding of X-rays in medicine.
LO 4	To learn to apply medical physics concepts in Imaging.
LO 5	To acquire ideas of Nuclear medicine and recent medical devices.

UNIT – I Transducers **(10 Hours)**

Transducers – Classification of Transducers – Active Transducer – Magnetic Induction type – Piezo Electric type – Photovoltaic type – Thermoelectric type – Passive Transducer – Resistive Transducer– Effect and sensitivity of the bridge – Capacitive transducer – Linear variable differential transformer (LVDT).

UNIT – II Medical Instrumentation **(10 Hours)**

Pressure system of the body – Blood pressure measuring device- sphygmomanometer – Digital Blood pressure measuring system - Photoplethysmography - Temperature measuring sensor – CCD device - Electro Cardiograph (ECG) – Block Diagram- ECG leads – Unipolar and Bipolar leads – ECG recording set up – Ventilator and its mode (block diagrams only)

UNIT – III X-Ray in Medicine **(10 Hours)**

X-Rays – Production of X-rays – Coolidge Tube – X-ray generator – Radiation units – Exposure - Absorbed dose - Units : Rad, Gray and Relative biological effectiveness - effective dose- Rem-Sievert Radiation detectors – Dosimeters – Pocket dosimeters.

UNIT – IV Medical Imaging **(10 Hours)**

Ultrasound – Doppler effect with applications- Modes – A and B-TM Scans – X-ray diagnostics and imaging -Computed Tomography – CT scan. Principle – Function – Display – Detectors – Physics of nuclear magnetic resonance – NMR – MRI- Imaging.

UNIT – V Nuclear Medicine **(10 Hours)**

Diagnostic Nuclear medicine – Therapeutic Nuclear medicine – Interaction between radiation and Matter – Thyroid uptake system and gamma camera – Principle, function and Display – Radioisotope Imaging equipment – Single Photon and Positron Emission Tomography-PET – Scan.

Course Outcome

On completion of the course, the student will be able to

CO 1	know the basic knowledge about transducers.
CO 2	develop understanding of basic medical devices that is ECG, CCD etc..
CO 3	have a better understanding of X-rays in medicine.
CO 4	learn to apply medical physics concepts in Imaging.
CO 5	acquire ideas of Nuclear medicine and recent medical devices.

Text books:

1. Lesile Cromwell (1980) *Biomedical instrumentation and Measurement*, Prentice Hall,.
2. KhandhpurR S (2014) *Hand book of Biomedical Instrumentation*, 3rd Edition..
3. Arumugam M (2013) *Biomedical Instrumentation*, Anuradha Publisher,

Supplementary Reading:

1. John G Webster(2009) *Biomedical Instrumentation*, John Wiley Publications, 4th Edition.
2. Thayalan K, *Basic Radiological Physics*, Jayapee brothers Medical Publishing PVT

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	3	2	3	2
CO2	2	3	2	2	2
CO3	2	3	2	3	2
CO4	2	3	2	3	2
CO5	3	3	3	3	2

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SEMESTER: VI	TITLE: NANO PHYSICS	CREDITS: 4
PART:MAJOR BASED ELECTIVE- IV (3)	COURSE CODE:	Hours/Week: 4

Learning Objectives:

LO 1	To studythe basic knowledge in nano materials.
LO 2	To understand the scientific perspective of nanomaterials.
LO 3	To understand synthesis of some nano structures such as CNTs
LO 4	To understand the babic idea about thenano magnetism
LO 5	To acquire ideas of Application of Nanotechnology

Unit- I Introduction To Nanotechnology

Nanoscience – Nanotechnology – Defination - History of nanotechnology -Nanomaterials: Classification - Zero, One and two dimensional nanomaterials - Properties of nanomaterial - Quantum dots Production of quantum dots - Application of quantum dots -Quantum Wires - Properties and applications of quantum Wires.

Unit- II Preparation MethodS

Top – down and Bottom approaches – Top down methods: Ball milling, Chemical etching photolithography – Advantages – Limitations. Bottom – up methods : Vacuum evaporation, Sputter deposition process, Laser ablation – Advantages – Limitations

Unit –III Fullerenes

Fullerenes – Types of fullerenes – Bucky ball /Buckminster fullerene – Carbon nano tubes(CNTs) – single Walled CNTs – Differences – Properties of CNTs : Mechanical, electrical and superconducting properties – Preparation of CNTs Plasma discharge method – Applications.

Unit-IV Characterization Techniques

Construction, Working principle, merits and demerits of X – ray diffractometer – Scanning Electron Microscope (SEM) – Atomic Force Microscope (AFM) – UV – Vis – NIR double beam spectro photometer.

Unit-V Applications

Nanoelectronics – Molecular electronics – Nanophotonics – Nanomechanics – Carbon nanotube FETs – Nano MOSFETs – Biomedica applications : Targeted drug delivery – targeted chemotherapy.

Course Outcome

On completion of the course, the student will be able to

CO 1	studythe basic knowledge in nano materials.
CO 2	understand the scientific perspective of nanomaterials.
CO 3	understand synthesis of some nano structures such as CNTs
CO 4	understand the babic idea about thenano magnetism
CO 5	acquire ideas of Application of Nanotechnology

Text Book:

1. Text book of Nanoscience and Nanotechnology – B. S. Moorthy, P. Sankar, Baldev Raj, B. B. Rath and James Murdy University Press – IIM
2. Nanophysics, Sr. Geradin Jayam, Holy Cross College, Nagercoil (2010)
3. K.Ravichandran, K. Swaminathan, P.K.Praseetha, P.Kavitha, *Introduction to nanotechnology*, Jazym Pub(2022)

Supplementary Reading:

1. 'Nanoscience and Nanotechnology: Fundamentals to Frontiers'
2. M.S. Ramachandra Rao, Shubra Singh, Wiley India pvt. Ltd., New Delhi. (2013).
3. 'Nano the Essentials' - T. Pradeep, Tata Mc.Graw Hill company Ltd (2007)
4. '*The Chemistry of Nano materials : Synthesis, Properties and Applications*', Volume 1 C. N. R. Rao, A. Mu¨ller, A. K. Cheetham, , Germany (2004).

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	2	2	3
CO2	3	3	2	2	3
CO3	3	3	2	3	2
CO4	3	3	2	3	2
CO5	3	3	2	3	2

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SEMESTER: II	TITLE: BASIC ELECTRICAL TECHNOLOGY	CREDITS: 2
PART:SKILL BASED ELECTIVE- I	COURSE CODE:	Hours/Week: 2

Learning Objectives:

LO 1	To know the basic principles of electricity
LO 2	To explore the different types of cells and batteries
LO 3	To state the different theorems for DC circuits and know the function of DC motors

Unit-I: Basic Principles **(8 Hours)**

Voltage, Current, Resistance, and electric Power - Ohm's law - Resistors Series, parallel combinations - Charge - Coulomb's law - Capacitors - Capacitance of capacitor–AC Electricity - Application of fuse - MCB, ELCB - relays - Electrical Safety - Electric Shock - Preventive measures of Electrical Shock.

Unit-II: Cell And Batteres **(8 Hours)**

Dry Cell - Voltaic Cell - Daniel cell - Leclanche cell - Secondary Cell and its Classification - Lithium Ion Battery - Disparity between Lead Acid Battery and Lithium Ion Battery - UPS Battery - Solar cell - Principle and design.

Unit-III: DC Circuits **(8 Hours)**

Kirchhoff's Current and Voltage Law - Wheatstone's bridge - Source conversion - Superposition theorem - Thevenin's theorem - Joule's law of electric heating - Electric power - D.C generator - Construction and working - D.C motor - Speed of a D.C motor.

Course outcome:

On completion of the course, the student will be able to

CO 1	know the basic principles of electricity
CO 2	explore the different types of cells and batteries
CO 3	state the different theorems for DC circuits and know the function of DC motors

Text Book:

1. B.L. Theraja, *Basic Electronics,* S. Chand & Co., (2008).
2. V.Ramasamy, Basic Instrumentation, Sowmi Publications,

Supplementary Reading:

1. B.L. Theraja, A.K Theraja, *A Text book of Electrical Technology*, S. Chand & Co., (2007).

Course Outcome Mapping:

	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2
CO2	3	2	2	2	3
CO3	3	2	2	2	2

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SEMESTER: IV	TITLE: ELECTRICAL WIRING	CREDITS: 2
PART:SKILL BASED ELECTIVE- II	COURSE CODE:	Hours/Week: 2

Learning Objectives:

LO 1	To know the skills of basic tools.
LO 2	To get adequate knowledge of different types of wires.
LO 3	To study the different types of switches.

Unit-I: Basic Tools **(8 Hours)**

Tools – Screw Drivers - pliers - packet knife- Hammers- wooden saw-scratch awl - Hand drill - Ratchet bit brace- Auger bits- Raw plug tool- Hacksaw-centre punch- Twist drill - Putty knife-Blow lamp.

Unit-II: Wires **(8 Hours)**

Sizes of wire-standard wire-Types of wires-Rubber covered, tapped, braided, compounded wires-Lead alloy sheathed wires-tough rubber-sheathed wires-weather proof wires-Flexible wire-Method of installing wiring – cleat wiring - Tough rubber sheathed wiring- Lead sheathed wiring - Installation of conduit wiring.

Unit-III: Switches **(8 Hours)**

Switches -surface switch - Flush switches-pull switches-Grid switches-Architrave switch-Rotary snap switches-Push button switches- Wiring system-looping in system- wiring of building-tree system- Ring system-Lamp circuits- simple circuits- series, parallel circuits- Master switch circuits.

Course Outcome

On completion of the course, the student will be able to

CO 1	To know the skills of basic tools.
CO 2	To get adequate knowledge of different types of wires.
CO 3	To study the different types of switches.

Text Book:

1. B.L. Theraja, *Basic Electronics,* S. Chand & Co., (2008).
2. V.Ramasamy, Basic Instrumentation, Sowmi Publications,

Supplementary Reading:

1. B.L. Theraja, A.K Theraja, *A Text book of Electrical Technology,* S. Chand & Co., (2007).

Course Outcome Mapping:

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	2
CO2	3	2	2	3	2
CO3	3	3	2	2	3

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SEMESTER: V	TITLE: ELECTRIC MACHINES	CREDITS: 2
PART:SKILL BASED ELECTIVE- III	COURSE CODE:	Hours/Week: 2

Learning Objectives:

LO 1	To know the working and components of AC generator.
LO 2	To observe knowledge of working and characteristics of DC motors.
LO 3	To study the working of Transformer

Unit-I: AC Generator (8 Hours)

Generation of alternating voltages and currents - Equations of the | alternating voltages and currents - simple waveforms - complex waveforms - cycle -Time period - Frequency-Amplitude - Different forms of equations - Generator principle - simple loop generator – yoke-pole cores and pole shoes - pole coils - Armature core - Armature - commutator - Brushes and Bearings.

Unit-II: DC Motors (8 Hours)

DC Motor - principle-comparison of generator and motor action - significance of back emf - voltage equation of a motor - condition for maximum power - Motor characteristics - characteristics of series motor - characteristics of shunt motor - compound motors - comparison of shunt and series motor - losses and efficiency.

Unit-III: Transformer (8 Hours)

Transformer - working principle of transformer - construction - Types of transformers - core and shell -Type transformer - Theory of ideal transformer - EMF equations - voltage ratio.

Course Outcome

On completion of the course, the student will be able to

CO 1	know the basic principle of transducers
CO 2	get the knowledge of digital instruments
CO 3	understand the working of bio medical instruments

Text Book:

1. B.L. Theraja, *Basic Electronics,* S. Chand & Co., (2008).
2. V.Ramasamy, Basic Instrumentation, Sowmi Publications,

Supplementary Reading:

1. B.L. Theraja, A.K Theraja, *A Text book of Electrical Technology*, S. Chand & Co., (2007).

Course Outcome Mapping:

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2
CO2	3	2	2	3	2
CO3	3	3	3	3	2

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SEMESTER: V	TITLE: BASIC INSTRUMENTATION	CREDITS: 2
PART:SKILL BASED ELECTIVE- IV	COURSE CODE:	Hours/Week: 2

Learning Objectives:

LO 1	To know the basic principle of transducers
LO 2	To observe knowledge of digital instruments
LO 3	To study the working of bio medical instruments

Unit-I: Transducers (8 Hours)

Introduction – Electrical transducer – Advantages of electrical transducers – Parts of transducers – Classification of transducers – Variation of dielectric constant for measurement of liquid level – Frequency response of capacitive transducers – Measurements of strain – Types of strain gauges – Theory of resistance strain gauges – Classification of electrical strain gauge – Construction – Measurement – Applications.

Unit-II: Digital Instruments (8 Hours)

Introduction - Digital multimeter – Operation - Digital frequency meter - Basic circuit - Time base - Ratio and multiple radio modes -Time interval measurements - Universal counter timer - Digital conductivity meter-Principle – Measurement - Digital clock - Construction – Operation - Digital storage oscilloscope(DSO).

Unit-III: Bio Medical Instruments (8 Hours)

Introduction – Resting and action potentials – Characteristics of resting potentials – Action of potentials – Measurements bio potential electrodes – Classification – Pulse transducers – Eletro cardiogram (ECG)

Course Outcome

On completion of the course, the student will be able to

CO 1	know the basic principle of transducers
CO 2	get the knowledge of digital instruments
CO 3	understand the working of bio medical instruments

Text Book:

1. B.L. Theraja, *Basic Electronics*, S. Chand & Co., (2008).
2. V.Ramasamy, Basic Instrumentation, Sowmi Publications,

Supplementary Reading:

1. B.L. Theraja, A.K Theraja, *A Text book of Electrical Technology*, S. Chand & Co., (2007).
2. A.K. Sawhney, Electrical and Electronics Measurement and instrumentation, Dhanpat Rai & Co.,

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	2	2	2
CO2	3	3	2	2	2
CO3	3	3	2	2	3

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SEMESTER: I	TITLE: ALLIED PHYSICS I	CREDITS: 5
PART: FIRST ALLIED I	COURSE CODE: (For Maths And Chemistry Students)	Hours/Week: 3

Learning Objectives

LO 1	To understand the concept of strength of materials and various properties of liquids
LO 2	To study centre of gravity of different shapes and laws of floating.
LO 3	To Study Heat transformation from one place to another
LO 4	To acquire knowledge on thermodynamics.
LO 5	To know basic idea of Interference, diffraction, polarization and their applications.

Unit I Properties Of Matter

Elasticity : Hooke's Law – Elastic Constants – bending of beam – Bending moment –- Depression of cantilever - determination of Young's modulus - non-uniform. bending. Viscosity: Turbulent and streamline flow - Co-efficient of viscosity of a liquid –Poiseuille's formula.Surface Tension: Surface Tension –Surface Tension and interfacial surface tension by drop weight method

Unit II Mechanics

Centre of Gravity – Centre of Gravity of a solid hemisphere – Hollow hemisphere – Centre of Gravity of a solid cone – Centre of Gravity of a solid tetrahedron. States of Equilibrium : Equilibrium of a rigid body – Stable, unstable and neutral equilibrium – Example - Stability of Floating bodies – Metacenter – Determination of Metacentric height of a ship.

Unit III Heat

Specific heat capacity of solids and liquids – Newton's law of cooling – Specific heat capacity of a liquid by cooling - Heat conduction – coefficient of thermal conductivity by Lee's disc method - Black body radiation –Wien distribution law-Rayleigh Jean's law - Planck's radiation law – Stefan's law of radiation

Unit IV Thermodynamics

Zeroth and I Law of thermodynamics – Carnot's engine and Carnot's cycle – Efficiency of a Carnot's engine – II law of thermodynamics – Entropy – Change in entropy in reversible and irreversible process – change in entropy of a perfect gas – change in entropy when ice is converted into steam.

Unit V Optics

Interference – Air wedge –thickness of a thin wire – Newton's rings – determination of wavelength – Diffraction: Theory of transmission grating – normal incidence – optical activity – Specific rotatory power – determination of specific rotatory power using Laurent's half shade polarimeter.

Course Outcome

On completion of the course, the student will be able to

CO 1	understand the concept of strength of materials and various properties of liquids
CO 2	study centre of gravity of different shapes and laws of floating.
CO 3	study Heat transformation from one place to another
CO 4	acquire knowledge on thermodynamics.
CO 5	know basic idea of Interference, diffraction, polarization and their applications.

Text Books:

1. R. Murugeshan, *Properties of matter*, S. Chand & Co. Pvt. Ltd., Revised edition (2012).
2. Narayanamoorthyand N. Nagarathinam , *Mechanics – Part II*, The National ublishing Company , Chennai (2005).
3. Dr.N. Subramaniyam,Brijlal and Dr.M.N.Avathanulu,*Optics*, S. Chand &Co. Pvt.Ltd.- 25 th revised edition, New Delhi(2012).
4. Brijlal and Subramanyam, *Properties of matter*, Eurasia Publishing co., New Delhi, III Edition (1983).
5. Brijlal and Subramaniyan., *Thermal Physics*, S. Chand & Co 2001.

Supplementary reading:

1. Brijlal and Subramaniyan, *Properties of Matter*, S. Chand & Co.Pvt.Ltd(2005).
2. Murugeshan and Kiruthiga Sivaprasath., *A Text Book of Optics*., S.Chand & Co. vt.Ltd.- 9 th revised edition Ramnagar 2014, Newdelhi-110055.
3. Mehta V.K., *Principles of Electronics*, S.Chand and company Ltd, 2014

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	2
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	3	2	2	3
CO5	3	3	2	3	3

SEMESTER: I/II	TITLE: ALLIED PHYSICS - II	CREDITS: 3
PART: FIRST ALLIED II	COURSE CODE: (For Maths And Chemistry Students)	Hours/Week: 3

Learning Objectives

LO 1	To understand the concept of physical quantities.
LO 2	To acquire experimental skill to measure physical quantities using measuring instruments.
LO 3	To know the problem solving.
LO 4	To understand concepts related with physics experiments.
LO 5	To know the experiments of basics physics.

LIST OF EXPERIMENTS
(Any Twelve Experiments)

1. Non-Uniform bending – Pin and Microscope.
2. Rigidity modulus – Torsional oscillation method.
3. Coefficient of viscosity of liquid – Variable Pressure head (burette) Method
4. Surface tension and Interfacial Surface tension by Drop weight Method.
5. Specific heat capacity of liquid – Newton's law of cooling Method.
6. Thermal conductivity of a bad conductor – Lee's disc Method.
7. Spectrometer – Refractive index of a solid prism.
8. Spectrometer – Grating – minimum deviation method.
9. Newton's Rings – 'R' determination.
10. Meter bridge – Specific resistance.
11. Carry Foster's Bridge – Resistance Determination.
12. Potentiometer – low range voltmeter.
13. Characteristics of a PN junction diode – Forward resistance and knee voltage.
14. Characteristics of a Zener diode - Break down voltage.
15. Basic logic gates – AND, OR and NOT gates using discrete components.
16. Study of basic logic AND, OR and NOT gates – Integrated circuits (IC)
17. Verification of NAND and NOR as Universal gates.
18. Verification of De Morgan's theorem.

Course Outcome

On completion of the course, the student will be able to know

CO 1	understand the concept of physical quantities.
CO 2	acquire experimental skill to measure physical quantities using measuring instruments.
CO 3	know the problem solving.
CO 4	understand concepts related with physics experiments.
CO 5	know the experiments of basics physics.

Text Books

1. Dr.S.Somasundaram, Practical Physics, Apsara publications, Tiruchirapalli, 2012.
2. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi2011.
3. CL Arora, B.Sc. Practical Physics, S.Chand & Co. limited.

Supplementary Readings

1. S.Srinivasan, A Text Book of Practical physics, S.Sultanch and publications

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	2
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	3	3	2	3
CO5	3	3	3	3	3

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SEMESTER: II	TITLE: ALLIED PHYSICS - III	CREDITS: 4
PART: FIRST ALLIED -III	COURSE CODE: (For Maths And Chemistry Students)	Hours/Week: 5

Learning Objectives

LO 1	To understand the concept and laws of electrostatics working of capacitors.
LO 2	To acquire knowledge on current electricity, electromagnetic induction.
LO 3	To understand the atom models, X-rays and nuclear properties and reactions.
LO 4	To study fundamentals of solid state electronics diode and transistor.
LO 5	To know the number system, logic gates and basic digital circuits.

Unit I: Electrostatics (12 Hours)

Coulomb's inverse square law – Gauss law and its applications (Intensity at a point due to a charged sphere) – Electric potential –Principle of a capacitor – Capacity of a spherical and cylindrical capacitors – Energy stored in a capacitor – Loss of energy due to sharing of charges - Capacitors in series and parallel – Types of capacitors.

Unit II: Current Electricity and Electromagnetism (12 Hours)

Kirchhoff's laws – Wheatstone's network – condition for balance - Carey-Foster's bridge –measurement of specific resistance. Electromagnetic Induction – Faraday's laws – Lenz law – Self Inductance – Mutual Inductance - A.C. Circuits – Mean value – RMS value – Peak value.

Unit III: Atomic and Nuclear Physics (12 Hours)

Bohr's atom model – radius and energy –Vector atom Model – Pauli's exclusion Principle –Various quantum numbers–X-rays – Production – properties – Derivation of Bragg's law – Nucleus – Nuclear properties – Mass defect –Binding energy -– Nuclear fission and Nuclear fusion.

Unit IV: Analog Electronics (12 Hours)

Semiconductor – PN junction diode – Bridge rectifier – Zener diode – Regulated power supply. Transistor – Working of a transistor – CE Configuration –Transistor Characteristics in CE Configuration – CE amplifier – feedback – Hartley oscillator – Colpitt's oscillator.

Unit V: Digital Electronics (12 Hours)

Number system – Decimal – Binary – Octal and Hexadecimal system – Binary addition, subtraction – conversion of one number system to another number system (decimal- binary, decimal – hexa decimal) - Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables – Half adder - Boolean's algebra –Basic laws- De Morgan's theorems

Course Outcome

On completion of the course, the student will be able to

CO 1	various laws involved in the charged systems, electric potential and capacitors principle and its types.
CO 2	laws used in electrical circuits, specific resistance measurement and laws of electromagnetic induction
CO 3	various atom models, nuclear models, fission and fusion reactions.
CO 4	solid state electronic devices diode and transistor, their characteristics and applications.
CO 5	the number systems, conversion between them and logic gates and digital circuits.

Text Books

1. BrijLal & Subramanyam, (2005) 'Electricity and Magnetism', Ratan Prakashan Mandir Publishers.
2. Murugesan R, (2001) 'Electricity and Magnetism', S. chand & co,.
3. Murugesan R, (1998) 'Modern Physics', S. chand & co.
4. Theraja B L, (2003) 'Basic Electronics', S. chand & co,.
5. Sedha R S, (2004) 'A text book of Digital Electronics', S.Chand & co, First edition,.

Supplementary Readings

1. Narayanamurthi, (1988) 'Electricity and Magnetism', The National Publishing Co, First edition,.
2. D.N.Vasudeva, Electricity and Magnetism - (Twelfth revised edition)
3. Rajam J B, (1990) 'Atomic Physics', S. Chand & Company Limited, New Delhi, First edition,.
4. Srivastava B N, (2005) 'Basic Nuclear Physic', Pragati Prakashan, Meerut.
5. Albert Paul Malvino, (2002) 'Digital principles and Applications', McGraw-Hill International Editions, New York.

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	2
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	3	2	2	3
CO5	3	3	2	3	3

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SEMESTER: III	TITLE: ENERGY PHYSICS	CREDITS: 2
PART: NON MAJOR ELECTIVE - I	COURSE CODE: (For other department students)	Hours/Week: 2

Learning Objectives

LO 1	To understand the concepts of Conventional Energy Sources
LO 2	To introduce some basic concept of Biomass Energy and its Utilization
LO 3	To make them aware and understand Other forms of Energy Sources

Unit I: Conventional Energy Sources

World reserve- Commercial energy sources and their availability – Renewable and Conventional energy system – comparison –Coal, oil and natural gas – applications – Merits and Demerits- Solar energy – Solar water heater – Water desalination (block diagram) -Photovoltaic generation – merits and demerits.

Unit II: Biomass Energy and Its Utilization

Biomass energy – classification – Photosynthesis – Biomass conversion process- Gobar gas plants – Wood gasification – advantage & disadvantages of biomass as energy source.

Unit II: Other Forms of Energy Sources

Geothermal energy – Wind energy – Ocean thermal energy conversion –Energy from waves - tides energy- applications- merits - demerits.

Learning outcome:

On completion of the course, the student will be able to

CO 1	understand the concepts of Conventional Energy Sources
CO 2	introduce some basic concept of Biomass Energy and its Utilization
CO 3	make them aware and understand Other forms of Energy Sources

Books for study:

1. D.P. Kothari, K.C. Singal & Rakesh Ranjan, *Renewable energy sources and emerging Technologies*, Prentice Hall of India Pvt. Ltd., New Delhi (2008).
2. Suhas P Sukhatme, *Solar energy- Principles of thermal collection and storage,* Tata McGraw-Hill Publishing company, New Delhi, Second edition, 2012.

Books for References:

1. S.A. Abbasiand Nasema Abbasi, *Renewable Energy sources and their environmental impact*, PHI Learning Pvt. Ltd., New Delhi (2008).

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	2	3	3
CO2	2	2	2	3	2
CO3	2	2	2	3	2

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SEMESTER: IV	TITLE: **LASER PHYSICS**	CREDITS: 2
PART: NON MAJOR ELECTIVE - II	COURSE CODE: (For other department students)	Hours/Week: 2

Learning Objectives

LO 1	To study the fundamental of laser
LO 2	To observe production of laser in industrial application
LO 3	To understand lasers in medicine and communication

Unit I: Fundamentals Of Laser

Spontaneous emission – Stimulated emission – Meta stable state – Einstein's relation - Population inversion - Pumping – Laser characteristics – applications.

Unit II: Production Of Laser And Industrial Applications

Helium – Neon Laser – Ruby Laser – CO_2 Laser – Semiconductor Laser - Laser cutting – Welding – Drilling – Hologram – Recording and reconstruction of hologram.

Unit III: Lasers In Medicine And Communication

Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment - Optic fibre communication – Total internal reflection – Block diagram of fibre optic communication system – Advantages of fibre optic communication.

Learning outcome:

On completion of the course, the student will be able to

CO 1	study the fundamental of laser
CO 2	observe production of laser in industrial application
CO 3	understand lasers in medicine and communication

Text Books:

1. N. Avadhanulu , *An introduction to LASERS*, S. Chand & Company,2001.

Supplementary Readings:

1. William T. Silfvast, *Laser fundamentals*, University Press, Published in South Asia by Foundation books, New Delhi, 1998
2. K. Thyagarajan and A.K. Ghatak, *LASER Theory and Application*, Mc Millan, India Ltd, 1984.

Course Outcome Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	2	2	2	3
CO2	2	2	2	2	2
CO3	3	2	2	3	2

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