DEPARTMENT OF PHYSICS

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Rathinam Techzone, Pollachi Road, Eachanari, Coimbatore – 641021

Syllabus for

B.Sc. Physics

2024 - 25 Batch on-wards

Vision and Mission of the Institution

Vision

To emerge as a world-renowned Institution that is integrated with industry to impart Knowledge, Skills, Research Culture and Values in youngsters who can accelerate the overall development of India

Mission

To provide quality education at affordable cost, build academic and research excellence, maintain eco-friendly and robust infrastructure, and to create a team of well qualified faculty who can build global competency and employability among the youth of India

Motto

Transform the youth into National Asset

Vision and Mission of the Department:

VISION

The department focuses to build a foundation for excellence in education and develop the student community of the Institution as per the need of Industries by igniting the interest in the field of Physics through teaching, experimenting and Research.

MISSION

The Department strives to provide purposeful curriculum and the highest quality laboratory facilities to educate and empower students through "student centric" approaches for their Career prospects and personal growth in a continuous fashion.

Program Educational Objectives (PEO)

PEO1	**:**	Pursue a career as a globally competent and universally employable professional in core and related fields in diverse sectors who accelerates the overall development of India.
PEO2	**:**	Pursue lifelong learning opportunities including graduate degrees to improve and expand domain specific and professional skills.
PEO3	**:**	Advance personally and professionally by accepting professional and societal responsibilities, and pursuing leadership roles.

Mapping of Institute's Mission to PEO

Institute's Mission	**PEO's**
To provide quality education at affordable cost, build academic and research excellence maintain eco-friendly and robust infrastructure	PEO1, PEO2
To create a team of well qualified faculty who can build global competency and employability among the youth of India.	PEO2, PEO3

Mapping of Department Mission to PEO

Department Mission	**PEO's**
The Department strives to provide purposeful curriculum and the highest quality laboratory facilities to educate and empower students through "student centric" approaches for their Career prospects and personal growth in a continuous fashion.	PEO1, PEO2, PEO3

Program Outcomes (PO):

PO1	**:**	Demonstrate knowledge competency in core discipline
PO2	**:**	Apply the appropriate knowledge and suitable skills in solving the complex problems
PO3	**:**	Conduct investigations of complex problems through various scientific approaches
PO4	**:**	Design solutions for complex and open ended real-life or real-time problems
PO5	**:**	Use appropriate and advanced tools for wide range of practices with an understanding on its associated limitations
PO6	**:**	Work effectively and responsibly as a member or a leader in a team
PO7	**:**	Express complex concepts within the profession and with society at large
PO8	**:**	Understand the professional roles and responsibilities
PO9	**:**	Analyze social and environmental aspects of the professional practices
PO10	**:**	Practice higher moral and ethical standards during the discharge of professional duties
PO11	**:**	Incorporate finer finance and business practices in all professional engagements
PO12	**:**	Identify and address their professional development through lifelong learning

Program Specific Outcomes (PSO)

PSO1	**:**	Identify, formulate and analyze complex problems using principles of, physics and mathematics.
PSO2	**:**	Ability to find out, articulate and solve the local industrial needs by applying Physics concepts.
PSO3	**:**	Able to become an entrepreneur by establishing small scale industries the leading sectors such as electronics components, LED, LASER, Solar power panel manufacturing,

Correlation between the PO/PSO and the PEOs

Program Outcomes		PEO 1	PEO 2	PEO 3
PO1	:	3	1	3
PO2	:	3	2	3
PO3	:	1	2	3
PO4	:	3	1	3
PO5	:	3	3	2
PO6	:	2	3	3
PO7	:	2	3	1
PO8	:	3	2	1
PO 9	:	2	2	3
PO 10	:	3	2	1
PO 11	:	2	1	1
PO 12	:	3	2	2
PSO1	:	2	3	1
PSO2	:	3	2	2
PSO3	:	2	3	3
PSO4	:	3	2	2

3 – Strong correlation; 2-moderate correlation; 1-Less correlation; Blank-no correlation

Components considered for Course Delivery is listed below:

a. Class room Lecture
b. Laboratory class and demo
c. Assignments
d. Mini Project
e. Project
f. Online Course
g. External Participation
h. Seminar
i. Internship

Mapping of POs with Course Delivery:

Program Outcome	Course Delivery								
	a	**b**	**c**	**D**	**e**	**f**	**g**	**h**	**i**
PO1	3	3	1	1	2	1	3	3	1
PO2	3	3	2	3	3	1	1	2	3
PO3	3	3	1	3	1	1	1	2	3
PO4	2	3	2	3	3	1	1	3	1
PO5	3	2	1	3	1	3	3	3	3
PO6	2	3	1	3	3	1	2	3	3
PO7	2	3	1	3	1	1	2	3	3
PO8	2	2	1	2	3	3	2	3	3
PO9	1	1	2	3	3	3	2	3	3
PO10	2	1	2	3	2	2	2	2	2
PO11	1	1	2	2	2	3	3	3	3
PO12	1	2	3	2	2	2	3	3	3
PSO1	3	2	2	3	3	2	2	3	2
PSO2	2	3	3	2	2	3	3	2	3
PSO3	3	2	2	1	3	2	2	1	2

3 – Strong correlation; 2-moderate correlation; 1-Less correlation; Blank-no correlation

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)
B.Sc. Physics Curriculum Structure - Regulation - 2024
(For the students admitted from 2024 onwards)

S. No.	Sem	Part	Sub Type	Sub Code	Subject	Credit	Hours	INT	EXT	Total
1	1	1	L1		Language – I	3	5	50	50	100
2	1	2	L2		English – I	3	5	50	50	100
3	1	3	Core		Core Course – I Theory	4	4	50	50	100
4	1	3	Core		Core Course – II Theory	4	4	50	50	100
5	1	3	Allied		Allied-I	4	4	50	50	100
6	1	4	SEC		Skill Enhancement Courses – I Practical / Training	4	4	50	50	100
7	1	4	AEC		Ability Enhancement Course I Environmental Studies **or** Universal Human Values & Professional Ethics	2	2	50	0	50
					Core Practical	0	2	0	0	0
						24	**30**	**350**	**300**	**650**
1	2	1	L1		Language - II	3	5	50	50	100
2	2	2	L2		English – II	3	5	50	50	100
3	2	3	Core		Core Course – III Theory	4	6	50	50	100
4	2	3	Core		Core Course – IV Practical	4	3	50	50	100
5	2	3	Elective		Elective - I Entrepreneurship Development	4	4	50	50	100
6	2	3	Allied		Allied-II	4	5	50	50	100
7	2	4	AEC		Ability Enhancement Course II Design Thinking	2	2	50	0	50
8	2	5	Ext		Extension Activity - I (NASA)	1	0	25	0	25
						25	**30**	**375**	**300**	**675**
1	3	1	L1		Language - III	3	4	50	50	100
2	3	2	L2		English – III	3	4	50	50	100
3	3	3	Core		Core Course – V Theory	4	5	50	50	100
4	3	3	Core		Core Course – VI Theory	4	4	50	50	100
5	3	3	Allied		Allied-III	4	5	50	50	100
6	3	4	SEC		Skill Enhancement Courses – II Practical / Training	4	3	50	50	100
7	3	4	AEC		Ability Enhancement Course III Soft Skill-1	2	2	50	0	50
8	3	3	ITR		Internship / Industrial Training	2	0	50	0	50

					(Summer vacation at the end of II semester activity)					
9	3	5	Ext		Extension Activity - II (NASA)	1	0	25	0	25
					Practical	0	3	0	0	0
						27	**30**	**425**	**300**	**725**
1	4	1	L1		Language - IV	3	4	50	50	100
2	4	2	L2		English – IV	3	4	50	50	100
3	4	3	Core		Core Course – VII Theory	4	6	50	50	100
4	4	3	Core		Core Course – VIII Practical	4	3	50	50	100
5	4	3	Allied		Allied-IV	4	5	50	50	100
8	4	3	Elective		Elective - II	4	6	50	50	100
7	4	4	AEC		Ability Enhancement Course IV Soft Skill-2	2	2	50	0	50
8	4	5	Ext		Extension Activity - III (NASA)	1	0	25	0	25
						25	**30**	**375**	**300**	**675**
1	5	3	Core		Core Course – IX Theory	4	5	50	50	100
2	5	3	Core		Core Course – X Theory	4	5	50	50	100
3	5	3	Elective		Elective - III	4	5	50	50	100
4	5	3	PRJ		Project	0	6	0	0	0
5	5	4	SEC		Skill Enhancement Courses – III Practical / Training	4	6	50	50	100
6	5	3	ITR		Internship / Industrial Training (Summer vacation at the end of IV semester activity)	2	0	50	0	50
7	5	5	Ext		Extension Activity - IV (NASA)	1	0	25	0	25
					Practical	0	3	0	0	0
						19	**30**	**275**	**200**	**475**
1	6	3	Core		Core Course – XI Theory	4	6	50	50	100
2	6	3	Core		Core Course – XII Practical	4	3	50	50	100
3	6	3	Elective		Elective – IV	4	6	50	50	100
4	6	3	PRJ		Core Project	8	8	100	100	200
5	6	4	SEC		Skill Enhancement Courses – IV Practical / Training	4	7	50	50	100
						24	**30**	**300**	**300**	**600**
					Total credit	**144**	**180**	**2100**	**1700**	**3800**

Additional Credits										
S.No.	**Sem**	**Part**	**Sub Type**	**Course Code**	**Course Name**	**Credit**	**Hours**	**INT**	**EXT**	**Total**
1	2	6	VAC		VAC - Microsoft CoE Course / NPTEL	2	2	50	0	50
3	4	6	IDC		VAC - Microsoft CoE Course / NPTEL	2	2	50	0	50
4	5	6	VAC		VAC - Microsoft CoE Course / NPTEL	2	2	50	0	50

Certificate on Minor Discipline										
S. No.	**Sem**	**Part**	**Sub Type**	**Course Code**	**Course Name**	**Credit**	**Hours**	**INT**	**EXT**	**Total**
1	2	6	MD		Course - I Electronics	5	2	0	100	100
2	3	6	MD		Course - II Applied Electronics	5	2	0	100	100
3	4	6	MD		Course - III Basic Instrumentation Skills	5	2	0	100	100
4	5	6	MD		Course - IV Bio Medical Instrumentation	5	2	0	100	100

Core - Theory						
S.No.	**Sem**	**Pre-requisite**	**Course Code**	**Course Name**	**Offering Department**	**Type Theory / Practical**
1				Mechanics, Properties of matter and Sound		
2				Heat and thermodynamics		
3				Optics		
4				Electricity and Magnetism		
5				Classical Mechanics		
6				Solid State Physics		
7				Atomic Physics and Spectroscopy		
8				Nuclear Physics		
9				Quantum Mechanics and Relativity		

Core - Theory / Practical						
S.No.	**Sem**	**Pre-requisite**	**Course Code**	**Course Name**	**Offering Department**	**Type Theory / Practical**
1				Core Practical - I General Lab - I		
2				Core Practical - II General Lab -II		
3				Core Practical - III Electronics and Digital Electronics lab		

Allied						
S.No.	**Sem**	**Pre-requisite**	**Course Code**	**Course Name**	**Offering Department**	**Type Theory / Practical**
1				Mathematics - I	**Maths**	**Theory**
2				Mathematics –II	**Maths**	**Theory**
3				Chemistry - I		**Theory**
4				Chemistry – II		**Theory**

Skill Enhancement Course						
S.No.	**Sem**	**Pre-requisite**	**Course Code**	**Course Name**	**Offering Department**	**Type Practical / Training**
1				Basic Instrumentation Skill		Theory & mini project
2				Introduction to Matlab		Theory & Practical
3				MS - office and Programming in C Lab		Theory & Practical
4				Biomedical Instrumentation		Theory &mini project
5				Renewable Energy Sources/Energy Physics		Theory &mini project
6				IoT and Ardino		Theory & Practical

Elective						
S.No.	**Sem**	**Pre-requisite**	**Course Code**	**Course Name**	**Offering Department**	**Type Practical / Training**
1				Mathematical Physics		**Theory**
2				Digital Electronics and Microprocessor		**Theory**
3				Characterisation of nanomaterials and its Applications		**Theory**
4				Principles of Communication Systems		**Theory**
5				Fibre Optics Communication Systems		**Theory**
6				Electronics		**Theory**
7				Research methodolgy		**Theory**
8				Astrophysics		**Theory**
9				Basics of Electromagnetic Theory		**Theory**

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3			12
Part II	3	3	3	3			12
Part III	12	16	15	16	15	20	94
Part IV	6	2	6	2	4	4	24
Part V		1	1	1	1		4
Total	**24**	**25**	**28**	**25**	**20**	**24**	**146**

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	Core I:Mechanics, Properties of matter and Sound	4	4	0	0	Theory

Subject description

To stimulate the key concepts underpinning the physical interpretations of different properties of matter and apply them in real world problems.

Course focus on : **Skill Development** / Entrepreneurship / Employability / Research

Course Outcomes

CO1 : To understand the conservation laws and its applications

CO2 : To understand the motion of rigid bodies.

CO3 : To remember the basic laws of Newton and Kepler's law . To understand the applications of the elastic properties of solids

CO4 : To determine the Viscosity and surface tension of various liquids.

CO5 : To classify the sound waves and its properties.

UNIT I 12 periods

Conservation Law – Impulse – Impact – Direct and oblique impact – Final velocity and loss of kinetic energy –Motion of a particle in a vertical circle – friction – Laws of friction – angle of friction – resultant reaction – cone of friction – Equilibrium of a body on a rough inclined plane to the horizontal and when the inclination in greater than the angle of friction.

UNIT II 12 periods

Motion of rigid body : Moment of inertia(M.I) – Parallel and perpendicular axes theorem – M.I. of rectangular Lamina and triangular lamina – M. I of a solid sphere about an axis through it C.G. – Compound pendulum –Karter's pendulum torque and angular momentum – Relation – Kinetic rotation – conservation of angular momentum

UNIT III 12 periods

Gravitation: Kepler's Law of Planetary motion – Laws of gravitation – Boy's method for G – Gravitational potential – Gravitational field at a point due to spherical shell – Variation of 'g' with latitude, altitude and depth.

Elasticity: Elastic modules – Poisson's ratio – relation between them – Expression for bending moment – determination of Young's modulus by uniform and non-uniform bending - I section girders – Static Torsion – Expression for couple per unit twist – Torsional oscillation.

UNIT IV 12 periods

Surface Tension: Definition and dimension of surface Tension – Excess of Pressure over a curved surface – Variation of S.T. with temperature – Jaeger's Experiment.

Viscosity: Definition – Rotation viscometer- viscosity of gases, Meyer's Modification of Poiseuille's formula – Rankine's method for viscosity of a gas.

UNIT V 12 periods

Sound: Simple Harmonic vibration – Progressive waves – properties – Composition of two S.H.M. and beats – stationary waves – Properties - Melde's Experiment for the frequency of electrically maintained tuning fork – Transverse and longitudinal modes – Ultrasonics – Magnetostriction and peizo – electric method - Properties and application.(speaker as applications of sound)

***Industrial visit**

Textbooks

1. D.S. Mathur, "Elements of Properties of Matter", S.Chand and Company, 2021 (Unit I to Unit–IV)
2. Brijlal and N. Subramaniam, "Text Book of Sound", Vikas Publishing, 2021. (Unit–V).

Reference books

1. R.Murugesan, "Properties of matter", S. Chand and Co, 2015.
2. Holiday Resnick
2. D.S. Mathur, "Elements of Properties of Matter" S. Chand and Co, Edi 2014

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3									3		2	
CO2	3									3		2	
CO3	3			2						3		2	
CO4	3		2	2	1					3	2	2	
CO5	3				2					3	2	2	

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	Core II: Heat and Thermodynamics	4	4	0	0	Theory

Subject description

The aim of this course is to acquire knowledge in heat transfer, entropy, production of low temperature and liquefaction of gases, thermal radiation.

Course focus on : **Skill Development** / Entrepreneurship / Employability / Research

Course Outcomes

CO1 : To recognize the difference between heat and thermodynamics

CO2 : To understand the fundamental laws and principles of specific heat.

CO3 : To acquire working knowledge on low temperature physics, heat transfer and its domestic applications

CO4 : To apply the laws of thermodynamics for various applications(like refrigerator etc).

CO5 : To analyze various thermodynamics cycles used for energy productions.

Objectives

The aims is to provide the students to understand the principles of calorimetry understand the basic principle and laws of thermodynamics understand the concepts of entropy

UNIT I

Definitions – Newton's law of cooling – specific heat of a liquid by Calendar and Barne's continuous flow method – two specific heats of a gas – specific heat of a gas by Joly's differential steam calorimeter – Regnault's method – Dulong and Petit's law – variation of specific heat ad atomic heat with temperature.

UNIT II

Transmission of heat : Conduction – Co-efficient of the thermal conductivity – Cylindrical flow of heat- Determination of thermal conductivity of rubber and bad conductor – Lee's disc method- Convection – Radiation- Black body –Wein's law –Rayleigh and Jean's law –Stefan' s law – Experimental Determination of Stefan's constant – Mathematical derivation of Stefan's law

UNIT III

Kinetic theory of gases: Maxwell's law of distribution of molecular velocities – Experimental verification – equilibrium speed distribution of velocities. Mean free path – transport phenomena – Diffusion – viscosity and thermal conduction of gases – van der Waals equation – relation between van der Waal's constant and critical constants.

UNIT IV

Laws of Thermodynamics: First law of thermodynamics – Isothermal and Adiabatic process – gas equation during an adiabatic process – Work done an adiabatic expansion of gas – equation of an adiabatic curve – isothermal processes – Determination of γ by Clement and Desorme's method – second law of thermodynamics – Carnot's engine- Working efficiency – Carnot's refrigerator –

Carnot's Theorem.

UNIT V

Concept of entropy: Entropy - Change in entropy in a reversible process and irreversible process – Temperature entropy diagram – Entropy of a perfect gas – increase of entropy in any irreversible process – Thermo dynamics functions – Maxwell's thermodynamics relations and applications – Joule – Kelvin effect (theory)- Clausius and Clapeyron equation.

Books for Study

1. Brijlal, N. Subramaniam and P.S.Hemne "Heat and Thermodynamics &Statistical Physics", S.Chand & co 2016.

Reference Books

1. R. Murugeshan and Er.Kiruthiga Sivaprasath, "Thermal Physics", S.Chand & co 2018
2. Zemensky – heat and thermodynamic

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3									3		2	
CO2	3									3		2	
CO3	3			2						3		2	
CO4	3		2	2	1					3	2	2	
CO5	3				2					3	2	2	

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	SEC: Basics Instrumentation Skill	2	5	0	0	Theory

Subject Description:

This course is to get exposure with various aspects of instruments and their usage through hands-on mode. Experiments listed below are to be done in continuation of the topics.

Course focus on : Skill Development / Entrepreneurship / **Employability** / Research

Course Outcomes

CO1 : To understand the basics of measurement.

CO2 : To apply the basic concept to understand the electronic voltmeter.

CO3 : To know the construction, principle, working and application of CRO

CO4 : To draw the block diagram of signal generator.

CO5 : To apply the concept of analog meters to know the working of digital instruments

Unit I: BASICS OF MEASUREMENTS 6 periods

Instrument's accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance

Unit II: ELECTRONIC VOLTMETER 6 periods

Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance.

Unit III: CATHODE RAY OSCILLOSCOPE 6 periods

Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance.

Unit IV: SIGNAL GENERATORS AND ANALYSIS INSTRUMENTS 6 periods

Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

Unit V: DIGITAL INSTRUMENTS 6 periods

Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Textbooks

1. A text book in Electrical Technology - B L Theraja - S Chand and Co, 2015.

Reference Books

1. Performance and design of AC machines - M G Say ELBS Edn.
2. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
3. Logic circuit design, Shimon P. Vingron, 2012, Springer.
4. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
5. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	DSC - Optics	4	4	0	0	Theory

Introduction

The paper aims to provide knowledge on optical instrument, nature and behavior of light, propagation of light, vibration of light laser and its application. To inspire interest for the knowledge of concepts is physical and geometrical optics.

Course focus on : **Skill Development** / Entrepreneurship / Employability / Research

Course Outcomes

CO1	:	To gain knowledge about fundamental properties light, electromagnetic spectrum and Splitting of spectral lines.
CO2	:	To apply the energy transfer for absorption and emission spectra
CO3	:	To determine the wavelength refractive index of the liquid
CO4	:	To recall the basic concept of polarization
CO5	:	To know the concept of Fiber Optics

Unit I: GEOMETRICAL OPTICS 12 periods

Dispersion by a prism – Cauchy's dispersion formula – dispersive power– achromatism in prism – deviation without dispersion – dispersion without deviation – Aberrations – Spherical aberrations in lens – chromatic aberration – chromatic aberrations in a lens – circle of least confusion – achromatic lens – condition for achromatism of two thin lenses separated by a finite distances– coma – Astigmatism.

Unit II: INTERFERENCE 12 periods

Characteristics of wave motion – Transverse and longitudinal wave motion – Theory of interference – Fresnel's biprism experiment – Determination of wavelength – Interference due to reflected light – Colours of thin films – Air wedge – Testing the planeness of surfaces – Newton's rings – Determination of wavelength and refractive index of a liquid

UNIT III: DIFFRACTION 12 periods

Fresnel's explanation of rectilinear propagation of light – Zone plate – Zone plate as converging lens – Fresnel's diffraction at a circular aperture – Fraunhofer diffraction at a single slit – Theory of the plane transmission grating-Determination of wavelength.

UNIT IV: POLATISATION 12 periods

Polarisation of transverse waves – Plane of polarization – Brewster's law and Brewster's window – Polarization by refraction – Double refraction – Principal section and principal plane – Nicol prism – Nicol prism as an analyser – Theory of circularly and elliptically polarised light – Optical activity – Fresnel's explanation of rotation – Specific rotation – Laurent's half shade Polarimeter – CO_2 LASER – Resonant cavities – Threshold condition for LASER

UNIT V: FIBER OPTICS 12 periods

Fiber optics: Total Internal Reflection – Optical fiber(Step and Multi-mode) – Numerical aperture – Attenuation in optical fiber - multimode fibers – pulse dispersion – power law profile – fiber optic sensors.

Textbooks

1. Subrahmanyam, N. Brijlal, Avathanulu M, "A Textbook Of Optics" , S.Chand and Co Ltd., New Delhi, (2008). (Units I – III).
2. Colin N .Banwell, Elaine M. Mc Cash, "Fundamentals Of Molecular Spectroscopy" , Tata McGraw– Hill, New Delhi, (2004). (Unit – IV).
3. Gupta S.L. Kumar V. Sharma R.C, "Elements of Spectroscopy", 16thedition, Pragati Prakashan, Meerut, (2001). (Unit – V).

Reference books

1. Halliday, Resnick, "Physics Part I & II"4th Edition, Wiley Eastern Ltd, New Delhi.(1999)
2. Jenkins, White, "Fundamentals of Optics", 4th Edition, Mc Graw–Hill., New York,(1981)
3. Manas Chanda, " Atomic Structure And Chemical Bond," 2nd edition, Tata McGraw Hill, New Delhi,(2000).
4. Gurdeep Chatwal, Sham Anand,. "Spectroscopy", 3rd edition, Himalaya Publishers, Mumbai. (1987)

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3									3			
CO2	3	2								3	3		
CO3	3		2							3			
CO4	3			2	1					3		2	
CO5	3					2				3	2	3	3

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	Core III: Electricity & Magnetism	4	5	0	0	Theory

Introduction

This paper presents the basic principle of charged body, when they are in rest and also under motion. This paper gives the knowledge regarding the electrical energy and magnetic energy and to enable the students in order to learn the basic principles theory and concepts of electricity and magnetism

Course focus on : **Skill Development** / Entrepreneurship / Employability / Research

Course Outcomes

CO1 : To acquire the knowledge on fundamental concepts of electric and magnetic field

CO2 : To understand the concept of electric field, potential and electromagnetic induction

CO3 : To implement the ideas for making the electrical devices such as capacitor, inductor, resistance, etc.,

CO4 : To evaluate the basic and advanced problems in the field of electromagnetic theory

CO5 : To gain the knowledge about derivation of Maxwell's equations

Unit I: ELECTRIC FIELD AND POTENTIAL 12 periods

Concept of charge – Electric Field (E) – Potential difference (V) – Relation between E and V – Equipotential surfaces – Poisson's and Laplace equations – Potential and field due to an electric dipole – Potential and field due to a quadrupole – Potential and field due to uniformly charged disc – Potential due to two concentric spherical shells of charge – Potential energy due to charge distribution.

Unit II: CAPACITORS AND DIELECTRICS 12 periods

Capacitors – Parallel plate capacitor – Cylindrical capacitor – Spherical capacitor – Guard ring capacitor – Energy stored in a capacitor – Force of attraction between capacitor plates – Dielectric constant – Polar and nonpolar molecules – Polarisation of dielectric – Capacity of a parallel plate capacitor partially and completely filled with dielectric – Electric polarization vector P – Electric displacement vector D – Relation between D, E and P – Dielectric susceptibility and permittivity – Physical meaning of polarization – Dielectric strength.

Unit III: MAGNETOSTATICS AND MAGNETIC FIELD 12 periods

Magnetic effect of current – Lorentz force – Force on a current carrying wire – Magnetic flux – Gauss law in magnetostatics – Torque on a current carrying coil in uniform magnetic field – Potential energy of a current loop – Ballistic galvanometer – Deadbeat condition – Comparison of emfs and capacitances – Biot Savart law– field due to steady current in a long straight wire – Interaction between two long parallel wire carrying currents – Magnetic field along the axis of a circular coil – Field along the axis of a solenoid – Magnetic dipole – Ampere's law – Application to a current carrying conductor and solenoid.

UNIT IV: ELECTROMAGNETIC INDUCTION 12 periods

Faraday's laws of Electromagnetic induction – Deduction of Faraday's laws from Lorentz's force – Self-inductance– Calculation of self-inductance for a solenoid – Energy stored in magnetic field – Mutual inductance – Energy stored in two interacting circuits – DC circuit: Simple RL circuit – Growth and decay of current – RC circuit – Charging and discharging of a condenser – Ideal LC circuit – Series LCR circuit – Discharge of a condenser through inductance and resistance

UNIT V: MAXWELL'S EQUATIONS AND ELECTROMAGNETIC THEORY 12 periods

Basic equations – Types of current – Vacuum displacement current – Maxwell's equations (No derivations) – Maxwell's equations in free space – Electromagnetic waves in free space – Electromagnetic waves in isotropic non– conducting media – Refractive index – Impedance of dielectric media – Energy density of – electromagnetic wave – Poynting theorem (statement only) – Energy per unit volume.

Textbooks

1. Tewari K.K, "Electricity And Magnetism", Sultan Chand and Co Ltd, New Delhi, (Units I – V), (2002).

Reference books

1. Tayal T.C, "Electricity And Magnetism", Himalaya publication house, Mumbai,(2001).
2. Murugesan R, "Electricity And Magnetism", S. Chand & Company Ltd, New Delhi,(1998)

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3									3			
CO2	3			2								2	
CO3	3	2	2		1							2	3
CO4	3			2				2		3		2	
CO5	3		2	2						3		1	

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	Core : Classical mechanics	4	5	0	0	Theory

Introduction

This course introduces the mathematical structure of theoretical physics. The students should able to correlate the conservation of fundamental physical concepts with symmetries

Course focus on : **Skill Development** / Entrepreneurship / Employability / Research

Course Outcomes

CO1 : Explain the concepts such as degrees of freedom, constraints, needed for Newtonian mechanics and apply them to mechanical systems

CO2 : Explain the concept of generalized coordinates, Phase space and understand the physical principle of Lagrange and Hamilton's equations, and the advantages of these formulations.

CO3 : Construct the Lagrangian and Hamiltonian and solve equations of motion for simple one and two body system, rigid bodies, coupled oscillators.

CO4 : Relate symmetries to conservation laws in physical systems, and apply these concepts to practical situations,

CO5 : Solve orbit problems using the conservation of angular momentum and total energy

Unit I: 12 periods

Newton’s laws of motion, Mechanics of a particle, Equation of motion of a particle - Motion of a particle under constant force, the law of gravitational and electrostatic forces, motion under a force which depends on time only and motion of a particle subjected to resistive force. Mechanics of systems of particles - Angular momentum of the system - Potential and kinetic energies of the system- Degrees of freedom - Constraints - Motion in a central force field - Motion of two particles equivalent to single particle - Equation of motion of center of mass with respect to center of force - Motion in an inverse-square law force field equation of the orbit, - differential equation of trajectory - Kepler’s Law of planetary motion

Unit II: 12 periods

Elastic and inelastic scattering - Laboratory and center of mass systems - Relations between different quantities in the laboratory and center of mass systems –Kinematics of elastic scattering in the laboratory system, Loss of kinetic energy - Inelastic scattering in the laboratory frame - Motion of a rigid body -Euler’s theorem - Angular momentum and kinetic energy - Inertia tensor

- Euler's equation of motion – Torque Free Motion – Euler's angles.

Unit III: 12 periods

Generalized coordinates - Hamilton's variational principle - Lagrange's equations of motion – Conservation theorems and symmetry properties – Cyclic coordinates - Application of Lagrange's equation; Linear harmonic oscillator, particle moving under a central force, Atwood's machine - Hamilton's equations of motion - Application of Hamiltonian's equations of motion; Particle moving in an electromagnetic field - Phase space - Principle of Least action.

UNIT IV: 12 periods

Canonical transformations – Generating function – Properties of canonical transformations, condition for a transformation to be canonical, Poisson brackets – Properties of Poisson brackets, Equations of motion in Poisson bracket, Angular momentum and Poisson brackets, Poisson's Second Theorem, Invariance of Poisson bracket under canonical transformation, Motion as successive canonical transformation (Infinitesimal generators), Liouville's theorem, The Hamilton Jacobi Equation,- Principal and characteristic function - Solution of harmonic oscillation problem by H-J method, Action and angle variables.

UNIT V: 12 periods

Small oscillations - Stable and unstable equilibrium - Lagrange's equation of motion for small oscillations - Normal coordinates and normal frequencies - Small oscillations of particles on string - Free vibrations of a linear triatomic molecule – Two carts connected with three springs, Double pendulum.

Textbooks

1. Classical Mechanics G. Aruldass, PHI Learning Private Ltd, 2009
2. Classical Mechanics J.C. Upadhyaya , Himalaya Publishing House , 2005

Reference books

1. Classical Mechanics Gupta, Kumar and Sharma, Pragati Prakashan, 2001
2. Classical Mechanics R. Douglas Gregory ,Cambridge University press, 2008

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3									3			
CO2	3			2								2	
CO3	3	2	2		1							2	3
CO4	3			2				2		3		2	
CO5	3		2	2						3		1	

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	DSC: Solid State Physics	4	5	0	0	Theory

Subject Description

This paper presents the fundamentals of solids and its bond theory which will be used for studying solids and how they are formed.

Course focus on : Skill Development / Entrepreneurship / Employability / **Research**

Course Outcomes

CO1 : To know the basic concept of the crystal and study its structure.

CO2 : To know the characterization technique to study the structure of the material

CO3 : To acquire knowledge about the different types of bonding between the atoms and the molecules

CO4 : To study the basic properties of the crystal by studying its properties by characterization techniques

CO5 : To know the basic types of magnetic materials and classification according to its properties.

Unit I: CRYSTAL STRUCTURE 12 periods

Crystal Structures: Distinction between crystalline and amorphous solids - Chemical bonding (Qualitative ideas) - Crystal lattice – primitive and unit cell – seven types of crystal – Bravais Lattice –Miller Indices – Structure of crystals – simple cubic, hexagonal close packed structure, face centred cubic structure, body centred cubic structure – Sodium chloride structure - Zinc Blende structure - Diamond structure.

Unit II: DIELECTRIC PROPERTIES 12 periods

Dielectric materials - Polarization, susceptibility and dielectric constant - Local field or internal field - Clausius- Mossoti relation - Sources of polarizability – Electronic polarizability - lonic polarizability - Orientational polarizability - Frequency and temperature effects on polarization - Dielectric breakdown – Properties of different types of insulating materials.

Unit III: MAGNETIC PROPERTIES 12 periods

Different types of magnetic materials - classical theory of diamagnetism (Langevin theory) -

Langevin theory of paramagnetism - Weiss theory of paramagnetism - Heisenberg interpretation on internal field and quantum theory of ferromagnetism - Antiferromagnetism - Hard and soft magnetic materials.

Unit IV: DEFECTS IN SOLIDS 12 periods

X ray diffraction – Bragg's law in one dimension – Experimental methods – Laue Method, powder crystal method and rotating crystal method. Defects in solids – Point defects - Frenkel and schottky defects - Equilibrium concentrations - Line defects – Edge dislocation and screw dislocation - Surface defects - Grain boundary - Effects of Crystal imperfections.

UNIT V: SUPERCONDUCTORS 12 periods

Superconductivity - General properties - Type I and II Superconductors – High–Temperature Super Conductor- Meissner effect - BCS theory - London equations- Superconductivity at high frequencies- applications of super conductors (squid, cryotron, magnetic levitation)

Textbooks

1. S.O.Pillai "Solid State Physics", New Age International (P) Ltd., 2002.
2. Kittel "Introduction to Solid State Physics", Willey Eastern Ltd. 2003.

Reference books

1. A. J.Dekker "Solid State Physics", Macmillan India, 1985.
2. HC Gupta "Solid State Physics", Vikas Publishing House Pvt. Ltd., New Delhi, 2001.
3. M.Arumugam "Materials Science", Anuradha Agencies Publishers, 2002.
4. R L Singhal" Solid State Physics", Kedarnath Ram Nath & Co., Meerut, 2003.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3				1		1	1	1	3	2		2
CO2	3	1	3		3					3		3	
CO3	3	1	3	2	3	2	3	3	3	3	2	3	2
CO4	3		3		3				3	3	2	3	2
CO5	3	1		2	3		3	3	1	3	2		2

Subject code	Title	**Credit**	**Lecture**	**Tutorial**	**Practical**	**Type**
	Elective – Atomic physics and spectroscopy	5	5	0	0	Theory

Introduction

Analysis of positive rays, isotopes, atomic structures, models in various aspects, spectral lines subjected to magnetic fields, light inducing electron emission, x –rays and their diffraction.

Course focus on : Skill Development / Entrepreneurship / Employability / **Research**

Course Outcomes

CO1 : To understand the concept of positive ray and its applications.

CO2 : To predict the properties of atom through the existing theories.

CO3 : To implement the theories to study about the atoms in magnetic field.

CO4 : To apply the concept of light to study about the interaction between atom and light.

CO5 : To understand the concept of spectroscopy by studying the IR and Rama spectra.

Unit I: 12 periods

POSITIVE RAYS AND PARTICLE PROPERTIES OF WAVES

Discovery – Properties – Positive ray analysis : Thomson's Parabola method – determination of mass – discovery of stable isotopes– Limitations – Dempster's mass spectrograph –Aston's mass spectrograph- mass defect and packing fraction – polarization of X –rays – scattering of X- rays (Thomson's formula)

Unit II STRUCTURE OF THE ATOM 12 periods

The Bohr atom model – Basic postulates – Evidences in favour of Bohr's theory - Rutherford Alpha scattering experiment- Method of excitation of atoms – Critical Potentials - Experimental determination of critical potentials by Franck and Hertz's method - Sommerfeld's relativistic model– Vector atom model – Quantum numbers associated with Vector atom model – coupling schemes (LS, JJ coupling) – Correspondence principle Pauli's exclusion principle – Periodic classification of elements

Unit III MAGNETO OPTICAL PROPERTIES OF SPECTRUM 12 periods

Magentic dipole moment due to orbital motion of the electron – Magnetic dipole moment due to spin – The Stern and Gerlach experiment – Optical spectra – Fine Structure of the sodium D line – Zeeman effect – Experiments – Lorentz classical theory – Expression for the Zeeman shift – Larmor's theorem – Quantum mechanical explanation of the normal Zeeman effect – Anomalous Zeeman effect – Paschen – Back effect– Stark effect

Unit IV PHOTOELECTRIC EFFECT 12 periods

Introduction – Richardson and Compton experiment: Relation between photoelectric current and retarding potentials – Relation between velocity of Photo electrons and the frequency of light –Experimental investigations on the photoelectric effect - Laws of Photoelectric emission – Failure of electromagnetic theory – Einstein's Photoelectric equation – Experimental verification Einstein's Photsoelectric equation by Millikan's Experiments – Photo electric cells –Photo emission cell – Photo Voltaic cell – Photo conductive cell – Applications of Photo electric cell.

Unit V SPECTROSCOPY 12 periods

UV Spectroscopy: Introduction – Quartz spectrograph for near UV region – Littrow spectrograph – Concave grating vacuum spectrograph – IR Spectroscopy: Introduction - Absorption spectroscopy – Block diagram of an absorption spectrometer – Double beam infrared spectrometer – Raman Spectroscopy: Raman Spectrometer – Classical theory of Raman Effect – Vibrational Raman spectra of diatomic molecules.

Textbooks

1. R.Murugeshan. Er. Kiruthiga Siva Prasath, "Modern Physics", S.Chand and Company Pvt. Ltd., New Delhi, 2016.

Reference Books

1. N.K. Sehgal , K.L. Chopra , D.L. Sehgal, " Modern physics", Sultan Chand And Sons, 2014.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1		1		2		2			3	2		1	
CO2		2	2				3	3			2		1
CO3	1		3	2		3			2	1		3	
CO4		3			3	2	2				2		3
CO5	2		1		2	3		1	3	2		3	

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	DSC-Nuclear physics	4	0		4	Theory

Subject Description:

This paper presents the fundamentals of formation of nucleus, composition of nucleus with their energy.

Course Outcome:

CO1	:	To highlight the properties of nucleus and its constituent particles
CO2	:	To predict the particle by using the detector and accelerator
CO3	:	To understand the concept of natural radioactivity and its constituent particles
CO4	:	To examine the fission and fusion reaction of radioactive materials
CO5	:	To deduce the concept of cosmic rays and elementary particles.

UNIT I: INTRODUCTIONTOTHE NUCLEUS [12Periods]

General properties of Nucleus (Size, Mass, Density, Charge, Spin, Angular momentum, Magnetic dipole moment) – Binding energy – BE/A and stability of Nucleus – Packing fraction – Nuclear stability – Nuclear forces – Definition – Properties – Meson theory – Model of Nuclear Structure – The Liquid Drop model – Semi-Empirical mass formula – The Shell model – Evidence for Shell model –The collective model.

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UNIT II: DETECTOR AND PARTICLE ACCELERATORS [12Periods]

Interaction between the energetic particles and matter : Heavy charged particles – Electrons – Gamma ray- Ionization chamber – Solid State detector: GM counter – Wilson Cloud chamber – Nuclear emulsion – Linear accelerators – Cyclotron – Betatron

UNIT III: RADIOACTIVITY [12Periods]

Natural Radioactivity – Alpha, Beta and Gamma rays– Properties – Determination of e/m of Alpha particles – Determination of Charge of Alpha particles – Determination of e/m of Beta particle – determination of Wavelength of Gamma rays (Dumond Spectrometer) – Origin of Gamma rays – Laws of Radioactivity – Soddy - Fajan's displacement law – Law of Radioactive disintegration – Half life period – Mean life period– Units of Radioactivity – Artificial Radioactivity –Application of radio isotopes.

UNIT IV : NUCLEAR FISSION AND FUSION REACTIONS [12Periods]

Nuclear fission – Energy released in Fission – Bohr and Wheelers theory of Nuclear fission – Chain reaction: Multiplication factor – Critical size – Natural Uranium and chain reactions – Atom Bomb. Nuclear reactor – Nuclear fusion – Source of Stellar energy – Carbon Nitrogen cycle – Proton-Proton cycle – Hydrogen bomb – Controlled thermo nuclear reactions – Radioactive dating.

UNIT V: COSMIC RAYS AND ELEMENTARY PARTICLES [12 Periods]

Zeroth law of thermodynamics – Thermal equilibrium – Comparison of heat and work – First law of thermodynamics – Isothermal and Adiabatic process – Work done during Isothermal and Adiabatic process– Reversible and Irreversible process – Carnot's reversible engine – Carnot's theorem – Second law of thermodynamics –Entropy : Reversible and Irreversible process – Third law of thermodynamics – Temperature – Entropy diagram.

Text Book:

1. R.Murugeshan. Er. Kiruthiga Siva Prasath, "Modern Physics", S.Chand and Company Pvt. Ltd., New Delhi, 2016.

Reference Books:

1. D.C.Tayal, "Nuclear Physics", Himalaya Publishing House, Mumbai, 2017.
2. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, " Concepts of modern Physics", Mc Graw Hill Education (India) Pvt. Ltd., New Delhi, 2016.

Mapping of Course Outcomes with

Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	1	3		1	1	2	3	1	1	
CO2	3	1			3					3	1	2	1

CO3	3	3		3		2	2	2		3	1	2	
CO4	3	3		1		3		1		3	1	2	1
CO5	3		1	3					1	3	1	2	

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	Core VI: Quantum Mechanics and Relativity	4	6	0	0	Theory

Subject Description

This paper presents the fundamentals of wave mechanics, Schrödinger's wave equation and its applications.

Objectives

To acquire knowledge and apply it to various physical problems
To enhance the problem solving ability.
To motivate the students to apply Schrödinger's equation or solving problems in wave mechanics, nuclear physics etc.,

Course focus on : **Skill Development** / Entrepreneurship / Employability / Research

Course Outcomes

CO1 : To acquire basic knowledge about wave properties of matter

CO2 : To get the idea about uncertainty principles and its applications

CO3 : To acquire knowledge about Schrödinger equations and postulates of quantum mechanics

CO4 : To effectively apply Schrödinger equations

CO5 : To acquire knowledge about Relativity

Unit I: WAVE PROPERTIES OF MATTER 12 periods

Introduction – Phase velocity and Group velocity – Analytical expression for a group of waves – Nature of De'Broglie relation – Derivation of the De'Broglie relation – Phase velocity of De'Broglie waves – Relation between the Phase velocity and the wavelength of De'Broglie wave– De'Broglie wavelength associated with a particle of mass M and kinetic energy – Verification of De'Broglie relation – Davission and Germer's experiments – G P Thomson's experiments.

Unit II: UNCERTAINTY PRINCIPLE 12 periods

Introduction – Heisenberg's Uncertainty Principle – Elementary proof between displacement and momentum – Energy and Time – Simple problems - Physical Significance – Illustration – Diffraction of electrons – Gamma ray microscope – Application – Non-existence of free electrons in the nucleus – Size and Energy in the ground state of Hydrogen atom

Unit III: SCHRÖDINGER'S WAVE EQUATION 12 periods

Introduction – Wave function for a free particle – Schrödinger's One dimensional wave equation – Time- dependent and Time independent – Schrodinger's equation: steady state form- Physical interpretation – Physical significance of ψ - Orthogonal and normalized wave function **-** Eigen function – Eigen Value – Eigen equation – Operator for Momentum, Kinetic Energy and Total Energy – Postulates of Quantum Mechanics –Proof

UNIT IV: APPLICATIONS OF QUANTUM MECHANICS 12 periods

Particle in a box – Particle in a rectangular three dimensional box – Simple Harmonic oscillator – Reflection at a step potential – transmission across a potential barrier: the Tunneling effect

UNIT V: RELATIVITY 12 periods

Introduction – Galilean Transformation equations – Ether Hypothesis – Michelson - Morley experiment – Explanation of the Negative results – Special theory of Relativity – Lorentz transformation equations – Length contraction – Time dilation – Addition of Velocities – Variation of Mass with velocity – Mass energy equivalence - General theory of relativity

Textbooks

1. Kamal Singh, S.P.Singh, "Elements of Quantum Mechanics", S. Chand and Company Pvt. Ltd., New Delhi, 2016. (unit I-IV)
2. R.Murugeshan. Er. Kiruthiga Siva Prasath, "Modern Physics", S.Chand and Company Pvt. Ltd., New Delhi, 2016(unit V)

Reference books

1. Leonard, Schiff, Jayendra Bandhyopadhyay, "Quantum Mechanics", Mc Graw Hill

Education (India) Pvt. Ltd., New Delhi, 2016.
2. Gupta, Kumar and Sharma, "Quantum Mechanics", Jai PRakash Nath publications, Meerut, 2017.
3. J P Singh, "Relativistic Quantum Mechanics", I.K International Publishing House Pvt. Ltd, 2013.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1					2				3		2	2	3
CO2			2	2					3		2		3
CO3		2	2	2					3		2		3
CO4			2						3		2		3
CO5	2		2						3		2		3

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	Core practicals: General Practical - I	4	0	0	2	Practical

Subject Description

The list of experiment given in this lab is help to understand the concepts of heat and thermodynamics

Course focus on : **Skill Development** / Entrepreneurship / Employability / Research

List of Experiments
(Choose any 15 experiments)

1. Co-efficient of Thermal conductivity – Lee's disc method
2. Determination of specific heat - Spherical calorimeter
3. Temperature co- efficient of a resistance of a thermistor – post office box
4. Temperature co- efficient of resistance – Carey Foster's bridge
5. Potentiometer – E.M.F of a Thermocouple
6. Determination of specific heat of liquid – Joule's calorimeter
7. Verification of Ohms law by Joule's Calorimeter.
8. Refractive index of a solid prism – Spectrometer
9. Wavelength of a spectral lines- Grating – Normal incidence method- Spectrometer
10. Spectrometer – hollow prism
11. Newton's ring – refractive index of lens
12. Wavelength of Mercury Spectral lines – grating – minimum deviation – Spectrometer
13. Dispersive power of grating – spectrometer
15. Young's modulus – non uniform bending –Pin and microscope.
16. Young's modulus –uniform bending –Pin and microscope.
17. Torsional pendulum-Rigidity modulus.
18. Viscosity by capillary flow method.
19. Young's Modulus – Koenig's Method – Uniform bending
20. Moment of a magnet – Circular coil – Deflection magnetometer
21. To determine acceleration due to gravity (g) and velocity (v) for a freely falling body using digital timing technique.
22. To determine mechanical equivalent of heat by Callender and Barner's constant flow method
23. To determine gravitational constant by Karter's Pendulum

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	Core practicals: General Practical - II	4	0	0	2	Practical

Subject Description

The list of experiment given in this lab is help to understand the concepts of heat and thermodynamics

Course focus on : **Skill Development** / Entrepreneurship / Employability / Research

List of Experiments
(Choose any 15 experiments)

1. Co-efficient of Thermal conductivity – Lee's disc method
2. Determination of specific heat - Spherical calorimeter
3. Temperature co- efficient of a resistance of a thermistor – post office box
4. Temperature co- efficient of resistance – Carey Foster's bridge
5. Potentiometer – E.M.F of a Thermocouple
6. Determination of specific heat of liquid – Joule's calorimeter
7. Verification of Ohms law by Joule's Calorimeter.
8. Refractive index of a solid prism – Spectrometer
9. Wavelength of a spectral lines- Grating – Normal incidence method- Spectrometer
10. Spectrometer – hollow prism
11. Newton's ring – refractive index of lens
12. Wavelength of Mercury Spectral lines – grating – minimum deviation – Spectrometer
13. Dispersive power of grating – spectrometer
14. Young's modulus – non uniform bending –Pin and microscope.
15. Young's modulus –uniform bending –Pin and microscope.
16. Torsional pendulum-Rigidity modulus.
17. Viscosity by capillary flow method.
18. Young's Modulus – Koenig's Method – Uniform bending
19. Moment of a magnet – Circular coil – Deflection magnetometer
20. To determine acceleration due to gravity (g) and velocity (v) for a freely falling body using digital timing technique.
21. To determine mechanical equivalent of heat by Callender and Barner's constant flow method
22. To determine gravitational constant by Karter's Pendulum

Subject code	Title	Credit	Lecture	Tutorial	Practical	Type
	Core practicals: Electronics and Digital Electronics lab	4	0	0	2	Practical

Subject Description

The list of experiment given in this lab is help to understand the concepts of heat and thermodynamics

Course focus on : **Skill Development** / Entrepreneurship / Employability / Research

List of Experiments
(Choose any 15 experiments)

1. Construction and study of IC Regulated Power Supply
2. Voltage doubler.
3. Characteristics of transistor- common base mode
4. Characteristics of transistor- common emitter mode
5. RC-Coupled Amplifier –Single Stage
6. Feedback Amplifier
7. Emitter Follower
8. Hartley Oscillator
9. Astable multivibrator using Transistor
10. Monostable multivibrator using Transistor
11. FET characteristics
12. UJT Characteristics

Any 6 from each section

Section – A Digital Electronics

1. Logic gates using IC – Verification of truth tables and DeMorgan's theorem
2. NOR and NAND gates – Universal building blocks
3. Half adder and Full adder
4. Half subtractor and Full subtractor
5. Analog to Digital convertor
6. Digital to Analog convertor.
7. Op-Amp LM741 as adder, subtractor and scalar.
8. Op-Amp LM741 as inverting and non inverting amplifier

Section – B Microprocessor

1.8085-ALP for 8 Bit addition, Subtraction

2.8085-ALP for one's compliment, masking off most significant 4 bits and setting bits.
3.8085-ALP for 8 Bit Multiplication and Division
4.8085-ALP for finding the biggest element in the array and sum the element in the array
5.8085-ALP to sort the array in descending order and ascendingorder
6.8085-ALP to count the number of zeros, +ve, -ve number and square of a number
7. ALP- Matrix addition.
8.8085-ALP for ASCII to decimal conversion, BCD to Hex conversion, Hex to Decimal conversion and Hex to binary form

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	Basics Instrumentation Skill	5	0	0	2	Skill

Subject Description

This course is to get exposure with various aspects of instruments and their usage through hands-on mode. Experiments listed below are to be done in continuation of the topics.

Course Outcome:

CO1	:	To understand the basics of measurement.
CO2	:	To apply the basic concept to understand the electronic voltmeter.
CO3	:	To know the construction, principle, working and application of CRO
CO4	:	To draw the block diagram of signal generator.
CO5	:	To apply the concept of analog meters to know the working of digital instruments

UNIT I: BASICS OF MEASUREMENTS [12 Periods]

Instrument's accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance

UNIT II: ELECTRONIC VOLTMETER [12 Periods]

Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance.

UNIT III: CATHODE RAY OSCILLOSCOPE [12 Periods]

Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance.

UNIT IV: SIGNAL GENERATORS AND ANALYSIS INSTRUMENTS [12 Periods]

Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

UNIT V: DIGITAL INSTRUMENTS [12 Periods]

Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Text Books

2. A text book in Electrical Technology - B L Theraja - S Chand and Co.
3. Performance and design of AC machines - M G Say ELBS Edn.
4. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
5. Logic circuit design, Shimon P. Vingron, 2012, Springer.
6. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.

Reference Books

1. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill
2.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	2			3	2					3		1	
CO2	2	2	2		2					3	2	1	
CO3	2	2	2	2						3	2	1	
CO4	2	1	2		2	2				3	2	1	
CO5	2	2	2			2				3		1	

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	Introduction to MALAB	5	0	0	2	Skill

Subject Description:

This paper aims to provide a first approach to the subject of Mechanics, which is one of the important aspects of advanced mathematics.

Objectives:

To Study this Paper is to introduce you to the software MATLAB for numerical computations and in particular familiarizing yourself with the Matlab Desktop, basic commands through the Command window and output through the Graph window.

Course Outcome:

CO1	:	To introduce the concepts in MATlab
CO2	:	To understand the concept of functions in MATlab
CO3	:	To apply the concept of plots in MATlab
CO4	:	To create new programs using the basic knowledge in programming
CO5	:	To get overall knowledge about the Matlab comments

UNIT I [12 Periods]

Introduction- Basics of MATLAB, Input – Output, File types – Platform dependence – General commands. Interactive Computation: Matrices and Vectors – Matrix and Array operations

UNIT II [12 Periods]

Programming in MATLAB: Scripts and Functions – Script files – Functions files

UNIT III [12 Periods]

Plotting: Two-dimensional plots - Three-dimensional plot

Text Books

1. William John Palm “Introduction to Matlab 7 for Engineers”, McGraw-Hill Professional, 2005.

Reference Books

1. Dolores M. Etter, David C. Kuncicky "Introduction to MATLAB 7", Prentice Hall, 2004

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1		2		2						3		2	
CO2			2	2						3		2	
CO3		2		2		1		2		3		2	
CO4			2	2		2		2		3		2	
CO5		2	2	2		2		2		3		2	

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH3ZA	**Skill Enhancement Course-I MS Office and C**	**4**	**5**	**1**	**-**	**S1**

Subject Description

This subject deals with MS office and the programming concepts of C language**.** On successful completion of this subject the student should have to writing programming ability on scientific and mathematical problems It is very useful to the students in many ways like their higher studies and research etc., because of its versatility.

Course Outcome:

CO1	:	To acquire knowledge on Formatting documents while creating web pages.
CO2	:	To apply and understand the need of spreadsheet for sharing the data.
CO3	:	To analyze operators and variables to write C - program.
CO4	:	To understand the need of loops and its types such as if, else, nested for completion of program.
CO5	:	To apply the Array statements to write down C – Program.

Unit I: **[12 Periods]**

MS-WORD

Word processing overview-creating and editing documents-formatting document-working with header and footnotes.

Creating report and news letter-creating table and merging document-creating web page-macros-keyboard shortcuts-menus-custom toolbars.

Unit II: **[12 Periods]**

MS-EXCEL:

Spread sheet overview-creating worksheet-managing and analyzing complex worksheet-creating charts form template-sharing data between applications.

MS-POWERPOINT:

Basics-using text-adding visual elements-charts and tables-drawing- clip art-sounds-animation-apply time transitions to slides.

Unit III: **[12 Periods]**

Introduction – character sets – constants – keywords and identifiers – variables – variables – data types – declaration of variables –assigning values to variables – defining symbolic constants – Arithmetic operators – relational operators – logical operators – assignment operators – increment and decrement operators – conditional operators – special operators – arithmetic expression – evaluation of expression – precedence of arithmetic operators – some computer problems – type conversion in expression – operator mathematical functions

Unit IV: **[12 Periods]**

Reading and writing character – formatted input an d output – decision making : IF statement : Simple IF – IF ELSE – Nesting of IF- ELSE - IF Ladder – Switch Statement– operator – go to statement – while – do - while – For loop – Jumps in loops – simple programs

Unit V: **[12 Periods]**

Arrays : Introduction – One dimensional array – declaration of array – Initiating on two and multidimensional arrays – declaring and initializing string variables – reading strings from terminal – writing strings on the screen – Arithmetic operations on characters – simple programs. Need for user defined functions – A multifunction program – RETURN values and their types – functions calls – category of functions – no arguments and no return values – simple programs.

Book for Study :

1. E. Balagurusamy, "Programming in ANSI C", Mcgraw Higher Ed., 6thEdition, 2012 (Unit-III to Unit-V)
2. Joan Lambert, Curtis Frye,"Microsoft Office 2016 Step by Step", Microsoft Press, Washington, 2015, (Unit-I and Unit-II)

Book for Reference :

1. Ashok N. Kamthane ,"Programming in C", Pearson, First Indian Print 2004

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	P01	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		3			
CO2		1	3			

CO3		3		1
CO4	3			1
CO5			3	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH4ZP	**Skill enhancement course lab – II- MS Office and Programming in C**	**4**	**-**	**-**	**6**	**SP1**

Subject Description

To make aware of working with documents, editing text, and formatting text in Microsoft Word, Excel, and power point. To write programs that performs operations using derived data types.

Course Outcome:

CO1	:	To demonstrate working with documents, navigating, editing text, and formatting text in Microsoft Word.
CO2	:	To demonstrate working with cells, rows, and columns and using formulas and calculations in Excel
CO3	:	To demonstrate entering data, managing data, and formatting data and cells in Excel.
CO4	:	Demonstrate creating presentations, editing, and formatting text and working with objects in PowerPoint.
CO5	:	To write programs that performs operations using derived data types.

MS- WORD:

1. Illustrate the mail merge concepts to apply for a suitable job for atleast 5 companies.
2. Using ms- word performs the following:
 a) Change the font size to 20
B) Change the font type to Garamond
C) Align the text to left, right, justify and center
D) Underline the text

MS- EXCEL:

3. Built a worksheet to perform correlation and regression coefficients using formula and check the answer with built-in functions
4. Worksheet preparation for electricity bill preparation
5. Draw graphs to illustrate class performance

MS-POWER POINT:

6. Prepare an organization chart for a college environment in power point.
7. Perform frame movement by inserting clip arts to illustrate running of a car automatically.
8. Prepare a power point presentation with all the slide translation facilities

MS -ACCESS:

9. Perform sorting on name, place and pincode of student's database and list them in the sorted order.
10. Create mailing labels for employee database.

List of c program

1. Write a program to initialize, assignment and printing variables of different data
2. Write a program to demonstrate arithmetic operators.(+,-,*,/,%)
3. Write a program to convert temperature (Fahrenheit - centigrade and vice – versa)
4. Write a program to calculate electricity bill. Read starting and ending meter reading.

The charges are as follows.

No. Of units consumed rate in (rs)

1-100 1.50 per unit

101 -300 2.00 per unit for excess of 100 units

301-500 2.50 per unit for excess of 300 units

501-above 3.25 per unit for excess of 500 units

5. Write a program to display colours using switch case(VIBGYOR)
6. Write a program to check whether given number is palindrome or not by using while and do –while loop
7. Write a program to perform matrix addition and matrix subtraction
8. Write a program to perform matrix multiplication by checking the compatibility.
9. Calculation of half lifetime of a radioactive element.
10. Verification of Bolyle's law
11. Develop a c program to conversion of distance
12. Develop a c program to conversion of temperature.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1			H		H	
CO2	H	L			H	
CO3			H			H
CO4	L		H		H	
CO5		H			H	H

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	Biomedical instrumentation	5	-	-	4	Theory

Subject Description:

To give a complete exposure of various recording mechanism and physiological parameters measured for diagnostic application.

Course Outcome:

CO1	:	To know different types of electrodes used in biopotential recording
CO2	:	To understand the characteristics of bioamplifiers and different types of recorders.
CO3	:	To apply the known concept to construct the biomedical instruments
CO4	:	To acquire knowledge about the biomedical instrument by using the physics principle
CO5	:	To acquire knowledge about blood flowmeter

UNIT I BIO-POTENTIAL ELECTRODES [12 Periods]

Electrode electrolyte interface, half-cell potential, polarisation and non- polarisable electrode, calomel electrode, needle and wire electrode, microelectrode-metal micropipete.

UNIT II RECORDING SYSTEM [12 Periods]

Low-Noise preamplifier, main amplifier and driver amplifier, inkjet recorder, thermal array recorder, photographic recorder, magnetic tape recorder, X-Y recorder, medical oscilloscope.

UNIT III BIO-CHEMICAL MEASUREMENT [12 Periods]

pH, pO_2, pCO_2, $pHCO_3$, Electrophoresis, colorimeter, spectro photometer, flame photometer, auto analyser.

UNIT IV NON-ELECTRICAL PARAMETER MEASUREMENTS [12 Periods]

Respiration, heart rate, temperature, pulse blood pressure, cardiac output, O_2, CO_2 measurements.

UNIT V BLOOD FLOW AND BLOOD CELL COUNTING [12 Periods]

Electromagnetic and ultrasonic blood flowmeter - indicator dilution method - thermo dilution method - manual and automatic counting of RBC, WBC and platelets - Electro Cardiography - Electro Myograph (EMG) - Ultrascan

Text Book

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 1997.

References:

1. John G.Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 1998.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 1997.
3. Joseph J.carr and John M. Brown, "introduction to Biomedical equipment technology", John Wiley and sons, New York, 1997.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1		3				1		3		3		
CO2		1	3					1	3		3		3
CO3		3			1			3				3	
CO4	3				1		3				3		1
CO5			3		1				3		3	3	

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	Energy Physics	5	-	-	4	Theory

Subject Description:

This paper presents the fundamentals of electrical, optical, atomic and molecular, thermal and non conventional energies

Course Outcome:

CO1	:	To know about the conventional energy uses and its advantages
CO2	:	To learn about the renewable energy sources and its applications in home appliances
CO3	:	To gain knowledge about biomass energy and its fundamentals
CO4	:	To acquire knowledge about biomass and its utilization
CO5	:	To know about all forms of energy and its waves and tides.

UNIT I : CONVENTIONAL ENERGY SOURCES [12 Periods]

World's reserve - commercial energy sources and their availability – various forms of energy – renewable and conventional energy system – comparison – Coal, oil and natural gas – applications – Merits and Demerits

UNIT II SOLAR ENERGY [12 Periods]

Renewable energy sources – solar energy – nature and solar radiation – components – solar heaters – crop dryers – solar cookers – water desalination (block diagram) Photovoltaic generation – merits and demerits

UNIT III : BIOMASS ENERGY FUNDAMENTALS [12 Periods]

Biomass energy – classification – photosynthesis – Biomass conversion process

UNIT IV : BIOMASS UTILIZATION [12 Periods]

Gobar gas plants – wood gasification – advantages & disadvantages of biomass as energy source

UNIT V : OTHER FORMS OF ENERGY SOURCES [12 Periods]

Wind energy : power in wind – types of wind energy systems – horizontal axis wind turbine -vertical axis wind turbine – Solar thermal – solar photovoltaic - Geothermal energy – Ocean thermal energy conversion – energy from waves and tides (basic ideas)

Text Book

1. D.P. Kothari, K.C. Singal & Rakesh Ranjan, -"Renewable energy sources and emerging Technologies", by Prentice Hall of India pvt. Ltd., New Delhi (2008)

References:

1. S.A. Abbasi and Nasema Abbasi , "Renewable Energy sources and their environmental impact" – PHI Learning Pvt. Ltd., New Delhi (2008)
2. Donald H.Perkins, "Introduction to High Energy Physics", Fourth Edition, Addison Welsey Publishing Company, 2013.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1		3										
CO2		1	3										
CO3		3			1								
CO4	3				1								
CO5			3		1								

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH6ZD	**Skill based Subject – Internet of Things and Arduino**	**4**	**5**	**1**	**-**	**S4**

Subject Description:

This paper presents the fundamentals Internet of things, Microcontroller and Arduino.

Objectives

- To acquire knowledge about Internet of things.
- To acquire knowledge about Microcontroller and Arduino.

Course Outcome:

CO1	:	To learn and understand the basic concept of Internet of things
CO2	:	To know the basics of microcontroller and its input and output ports
CO3	:	To acquire new knowledge about interfacing the devices for applications using microcontroller chips.
CO4	:	To know the installation of software and run it by programs
CO5	:	To apply the program in Arduino to make an application product

Unit I Internet of things [12 Periods]

Introduction to IOT – Definitions – Enabling technologies – open problems – future challenges – Applications IOT PROTOCOLS, IOT Communication Models, IOT Communication APIs, IOT Enabling Technologies

Unit II Microcontroller [12 Periods]

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

Unit III Interfacing Microcontroller [12 Periods]

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

Unit IV Arduino [12 Periods]

Introduction – install the software – The integrated development environment (IDE) – operators – statements: IF, ELSE, WHILE, FOR – Arrays – library functions - Circuits and programs

Unit V Programming in Arduino
[12 Periods]

Programs using IF, ELSE, WHILE, FOR statements – programs using Arrays – Circuit and program: one button and an LED, two buttons and an LED, potentiometer, RGB LEDs, Simple note, music

Books for Study

1. Kenneth J. Ayala, Dhananjay V.Gadre, "The 8051 Microcontroller and Embedded systems using Assembly and C", Cengage Learning Pvt. Ltd., New Delhi. 2010.
2. Alan G. Smith," Introduction to Arduino",2011.

Books for Reference

1. Arshdeep Bahga & Vijay audisetti ,"Internet of Things: A Hand - on Approach", UniversityPress,2010.
2. Marco Schwartz, "Internet of Things", PackT Open Source publishers, 2016.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		3			
CO2		1	3			
CO3		3			1	
CO4	3				1	
CO5			3		1	

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH53A	**Core paper V - Mathematical physics and Classical Mechanics**	**4**	**5**	**1**	**-**	**C5**

Subject Description:

This paper presents the fundamentals of matrices, vectors, tensors and classical mechanics which will be used for studies solving problems during research work.

Objectives

To acquire knowledge and apply it to various physical problems

- To apply and develop the problem solving ability.
- To motivate the students to apply matrices or solving problems in spectroscopy, nuclear physics etc.,
- To gain knowledge about basics of classical mechanics.

Course Outcome:

CO1	:	To develop knowledge in the basics of matrix.
CO2	:	To understand the vector and its derivatives.
CO3	:	To acquire knowledge about tensor and its types.
CO4	:	To get knowledge about generalized coordinates and its applications.
CO5	:	To acquire knowledge about the application of Hamiltonian function.

Unit I Vector [**12 Periods]**

Directional derivatives and normal derivatives - Gradient of a scalar field and its geometrical interpretation - Divergence of a vector field- Curl of a vector field - Gauss' divergence theorem(Proof)- Deductions from Gauss' theorem- Simple problems.

Unit II Matrices **[12 Periods]**

Introduction – special types of Matrices – Transpose of a Matrix –Conjugate of a Matrix – Conjugate Transpose of a Matrix – Symmetric and Anti symmetric – Hermitian and skew Hermitian – Orthogonal and Unitary Matrices - Singular and Non-Singular matrices - Trace of a Matrix- Inner product- Properties – Simple problems.

Unit III Tensor **[12 Periods]**

Transformation of Co-ordinates- Einstein's Summation Convention- Kronecker Delta- Contravariant &Covariant Vectors - Contravariant, Covariant and Mixed Tensors- Algebra of Tensors. Sum, Difference & Product of Two Tensors - Quotient Law of Tensors- Symmetric and Antisymmetric Tensors.

Unit IV Classical Mechanics – I **[12 Periods]**

Constraints and Degrees of Freedom – Generalized co-ordinates – Generalized displacement , Velocity, Acceleration

, Momentum, Force and Potential Energy – D'Alembert's Principle – Lagrangians equation from D'Alembert's principle – Application of Lagrange's equation of motion to linear harmonic oscillator, simple pendulum and compound pendulum.

Unit V Classical Mechanics – II **[12 Periods]**

Phase Space – Hamiltonian function – Hamiltonian Principle – Hamilton's canonical equations of motion- Physical significance of H – Applications of Hamiltonian equations of motion to simple pendulum, compound pendulum and linear harmonic oscillator.

Books for Study

1. Sathyaprakash, "Mathematical Physics with Classical Mechanics", Sultan & Sons Educational Publishing, New Delhi, 2013.
2. B D Gupta, "Mathematical Physics", Vikas Publishing House Pvt Ltd., Noida, 2016.
3. Gupta, Kumar & Sharma, "Classical Mechanics", Pragati publisher, 2015.

Book for Reference

1. B. S. Rajput, "Mathematical Physics" Pragati Editions, 2015
2. G. Aruldhas, "Classical Mechanics", PHI Learning Pvt. Ltd., New Delhi, 2016.

3. H.K. Dass , Rama Verma "Mathematical Physics", S Chand & Co Ltd**,** eight edition,2018.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	1		3			
CO2		1	3			
CO3		3			1	
CO4	3				1	
CO5			3		1	

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	DSC - Digital Electronics	5	0		4	Theory

Subject Description:

The aim of this course is to acquire knowledge about Boolean algebra, logic circuits, designing counters and the basic concepts of memory and programmable logic device.

Course Outcome:

CO1	:	To understand the concepts and techniques in digital electronics
CO2	:	To understand various number system and its importance in digital designing
CO3	:	To acquire knowledge about internal circuitry and logic behind any digital system
CO4	:	To analyze and construct various digital circuits
CO5	:	To Design a combination and sequential circuits

UNIT I: NUMBER SYSTEMS [12Periods]

Logic gates and Boolean algebra 12 Hrs Number Systems-Binary-octal-Hexadecimal and its conversions-Binary Codes- BCD codes-8421 code-Excess 3 code-Grey code-*Logic gates – AND, OR, NOT, NAND, NOR gates* – Boolean algebra- operators – logic expressions De-Morgan's theorem – laws and rules PS16C04 FUNDAMENTALS OF DIGITAL ELECTRONICS PS025 of Boolean algebra – truth table – reducing Boolean expressions – Karnaugh maps – simplification of digital circuits.

UNIT II: ARITHMETIC CIRCUITS AND FLIP FLOPS [12Periods]

Half adder- full adder* – Parallel binary adder, half subtractor – full subtractor – Parallel binary Subtractor, parity generator – encoder – decoder. Flip flop – RS Flip Flop- Edge triggered RS Flip Flop, D and T Flip Flop - JK Flip Flop, Master Slave Flip Flop

UNIT III: REGISTERS AND COUNTERS [12Periods]

Registers – Shift registers-Shift left and Shift right registers – Ring Counter – Johnson's Counter - Asynchronous / Ripple counters – modulus counter- Mod 8, 3, 5, 6, 7 and 9 counters - Decade counter - Synchronous Counters

UNIT IV A/D & D/CONVERTERS [12Periods]

Digital to Analog (D/A) converter- Binary weighted resistor method – R / 2R Ladder Network - Analog to Digital (A/D) Converter – counter type - Dual slope integrator –- successive approximation A/D Converter.

UNIT V : SEMICONDUCTOR MEMORY [12 Periods]

Read only memory – Random access memory – PROM – EPROM-SRAMs - DRAMs. Digital IC Characteristics –Resistor Transistor Logic (RTL) – Transistor Transistor Logic (TTL) – Schottky TTL – Emitter Coupled Logic (ECL).

Text Book:

1. Malvino & Leach Digital principles and applications Tata Mc Graw Hill 1995 5 th Edition 2
2. M. Morris Mano Digital Logic & Computer Designs Prentice Hall Of India. 2014 4 th Edition 3
3. Vijayendran V Introduction to Integrated electronics S.Viswanathan (Printers & Publishers,Chennai)

Reference Books:

2. Chatterji B.N - Digital Computer technology Khanna Publishers, Delhi 1986 2 nd Edition 2
3. Puri V K Digital Electronics circuits and systems Tata McGraw Hill Publishing Company Limited New Delhi 1997 1 st Edition
4. S Salivahanan S Arivazhagan Digital Circuits and Design Vikas Publishing House Private Limited

Problems. Mapping of Course

Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1		2		2						3		2	
CO2			2	2						3		2	
CO3		2		2		1		2		3		2	
CO4			2	2		2		2		3		2	
CO5		2	2	2		2		2		3		2	

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	Characterization Nanomaterials and its Applications	5	-	-	4	Theory

Subject Description:

This paper presents the fundamentals of Fibre optic and its applications in communications

Course Outcome:

CO1	:	To understanding the different methods of biological sample preparation
CO2	:	To examine structure of nanomaterials using most powerful techniques.
CO3	:	To summarize the different types of Electron microscopy methods.
CO4	:	To summarize the different types of Spectroscopy Techniques.
CO5	:	To determine the properties of a materials by using various spectroscopic and microscopic techniques

UNIT I METHODS OF SAMPLE PREPARATION [12 Periods]

Introduction – Chemical fixation technique – Cyro Fixation Technique – Dehydration – Embedding Biological samples Sectioning – Staining – Mechanical milling – Chemical etching – Ion etching – Conductive coating

UNIT II STRUCTURE OF NANOMATERIALS [12 Periods]

Introduction – Structure of Nanomaterials – X - ray diffraction (XRD) – The Laue method – The rotating crystal method – The powder method – Determination of grain size/ crystallite size using X - ray line broadening studies (Scherrer's formula) – Determination of crystallite size distribution using X - ray line Shape analysis – X- ray diffraction pattern and analysis of some commercially important oxides – Small angle X- ray scattering - Simple problems (XRD parameters)

UNIT III ELECTRON MICROSCOPY [12 Periods]

Introduction – Principles of electron microscopy – Scanning electron microscope (SEM) – Strength and limitations of Scanning electron microscopy – Energy dispersion X-ray Analysis (EDX) – Transmission Electron microscope (TEM) – Scanning Tunneling Microscope – Atomic Force microscope (AFM)

UNIT IV SPECTROSCOPY TECHNIQUES [12 Periods]

Introduction – The regions of spectrum – Characterization of electromagnetic radiations – The quantization of energy – Absorption spectroscopy – Photoluminescence – Fourier transform infrared spectroscopy – Raman spectroscopy

UNIT V APPLICATIONS OF NANOMATERIALS [12 Periods]

Introduction – Nanomaterials in medicine – Longer - lasting medical implants – Nanomaterials in energy sector – Kinetic energy (KE) penetrators with enhanced lethality – High energy density batteries- Nanomaterials in catalysis – High - sensitivity sensors – Nanomaterials for water purification – Nanomaterials in food –Nanomaterials for the environment – Elimination of pollutants - Nanomaterials in fabric industry, automobile and ceramic industries

Text Book:

1. M.A.Shah, Tokeer Ahmad, " Principles of Nanoscience and Nanotechnology", Narosa publishing House Pvt. Ltd., 2015.

Reference Books:

1 . Nils O. Petersen, "Foundations for Nanoscience and Nanotechnology**"**, CRC Press; 1 edition (19 April 2017).

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1		2		2						3		2	
CO2			2	2						3		2	
CO3		2		2		1		2		3		2	
CO4			2	2		2		2		3		2	
CO5		2	2	2		2		2		3		2	

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	Elective - Principles of Communication systems	5	-	-	4	Theory

Subject Description:

This paper presents the fundamentals of electronics and its communication principles.

Course Outcome:

CO1	:	To gain basic knowledge about modulation and its different types.
CO2	:	To know about the demodulation of signals and the receivers
CO3	:	To acquire the basic knowledge about television and its transmission
CO4	:	To study about the different types of antenna and transmission lines
CO5	:	To know about the digital codes and LEDs and its uses in communication.

UNIT I AMPLITUDE AND FREQUENCY MODULATION [12 Periods] Modulation - Definition - Types of modulation AM-FM- PM – Expression for amplitude modulated voltage - Wave form of amplitude modulated wave - Collector modulation circuit - Single side band generation - Balanced modulator - AM transmitter - Block diagram and explanation - Frequency modulation - Expression for frequency modulated voltage - Side bands in FM- AM production by transistor modulator - Comparison of AM-FM- PM.

UNIT II TRANSMISSION LINES [12 Periods]

Demodulation - Definition - Diode detection of AM signals - FM detection - Foster Seely discriminator - Radio receivers - Straight receivers - TRF receivers - Super heterodyne receivers - Block diagram - Explanation of each stage - FM receivers – Block diagram – Single and independent side band receiver- Demodulation of SSB and receiver types - Transmission Lines – Characteristics impedance - Losses in transmission line - Standing waves - Smith chart and its applications.

UNIT III TELEVISION FUNDAMENTALS [12 Periods]

Television systems and standards – Black and white transmission - Black and white reception - Plumbicon - Vidicon- Scanning and interlaced scanning – Block diagram of TV transmitter and receiver - Colour TV - Generation R, G, B signals - Simplified block diagram of colour TV transmitter and receiver – TV transmitting antennas - dipole panel - TV receiving antenna - Yagi antenna - Log antenna - Log periodic antenna.

UNIT IV RADAR SYSTEMS [12 Periods]

RADAR - Principle of radar – Radar performance factors - Radar equation – Radar - Pulsed systems - Basic pulsed radar system - Antennas and scanning - Display methods - Pulsed radar systems - Moving target indication - Radar beacons - Transmitting systems - Radar antennas - Duplexer - Radar receivers uses of radar - Optoelectronic devices-

Photoconductive cell - Solar cell - Phototransistor - LED -LCD construction and working and other radar systems.

UNIT V DIGITAL COMMUNICATIONS [12 Periods]

Digital communications - Digital technology - Fundamentals of data communication systems - Binary number system - Digital electronics – Emergence of data communication systems - Characteristics of data transmission circuits – Digital codes - Error detection and correction - Data sets and inter connection - Requirements - Modern classification - Modern interfacing- Network organizations- Switching systems – Network Protocols.

Text Book:

1. Gupta and Kumar, "Hand book of Electronics", Pragati Prakhasan, 2005.
2. Kennedy and Davis, "Electronics Communication Systems", TMH, 2009.

Reference Books:

Wayne Tomasi, "Electronic communication systems", Dorling Kindersely India Pvt Ltd., 2009.
1. Roy Blake, "Electronic communication system", Delmar/Thomson Learning, 2002.
2. Bakshi U.A. and Godse A.P, "Basic Electronics Engineering", Technical Publication, 2009.
3. Godse A.P.and Bakshi U.A, " Basic Electronics" ,Technical Publication,2009.
4. Tomasi, Wayne, "Advanced Electronic Communication System" Prentice Hall PTR, 1993
5. Haykin Simon S, "Communication Systems", Wiley , Fifth edition, 2007.
6. K.N. Hari Bhat D. Ganesh Rao "Principles of Communication Systems" ,Cengage India Private Limited,February 2017.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1		2		2						3		2	
CO2			2	2						3		2	
CO3		2		2		1		2		3		2	
CO4			2	2		2		2		3		2	
CO5		2	2	2		2		2		3		2	

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	Elective- Fiber Optic Communication Systems	5	-	-	4	Theory

Subject Description:

This paper presents the fundamentals of Fibre optic and its applications in communications

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Course Outcome:

CO1	:	To develop knowledge in the basics of fibre optics
CO2	:	To understand the fabrication technique
CO3	:	To acquire knowledge about losses and dispersion in optics
CO4	:	To get idea about LED
CO5	:	To acquire knowledge about the applications of fibre optics in satellite link.

UNIT I FIBRE CLASSIFICATION [12 Periods]

Propagation of light waves in an optical fibre – Acceptance angle and Acceptance cone of a fibre – Numerical Aperture (NA) – NA of a graded Index fibre – Mode of propagation- Fibres – classification – stepped index fibre – stepped index mono mode fibre – Graded index multimode fibre – Comparison of step and graded index fibres.

UNIT II FIBRE FABRICATION AND CABLES [12 Periods]

Classification of Techniques – External chemical vapour deposition – Characteristics – Internal chemical vapour deposition (1^{st} method only) – Characteristics – Phasil system - Fibre cable construction – losses incurred during installation of cable – Testing of cables– cable selection criteria.

UNIT III FIBRE LOSSES AND DISPERSION IN OPTICS [12 Periods]

Attenuation in optic fibre– Rayleigh Scattering losses – Absorption losses – Bending losses – Radiation induced losses – Inherent defect losses – Core and Cladding losses-Dispersion in an Optical Fibre – Inter-modal dispersion – Material Chromatic Dispersion– Dispersion Power penalty – Total Dispersion delay.

UNIT IV LIGHT SOURCES FOR OPTICAL FIBRES [12 Periods]

LED – The process involved in LEDS – Structures of LED – Fibre – LED Coupling Modulation bandwidth and Spectral Emission of LEDS.

UNIT V APPLICATIONS **[12 Periods]**

Introduction – Video Link Satellite Link – Computer Link – Nuclear Reaction Link – Community Antenna Television – Switched Star CATV – Networking

Text Book:

1 . Deshpande N.D, Deshpande D.A and Rangole P.K ,"Communication Electronics", Tata McGraw Hill Publishers Ltd (1996).
2. Dr. Subir Kumar Sarkar, " Optical Fibres and Fibre optics Communication System", S.Chand and Company Pvt. Ltd., New Delhi, 2014.
3. A.M.Dhake, "Television and Video Engineering ", Tata Mc Graw Hill Education Pvt. Ltd., New Delhi, 2012.

Reference Books:

1. MGeorge Kennedy ," Electronic Communication Systems", TataMcGraw Hill Publishers Ltd, New Delhi (2008).
2. Sanjeeva Gupta ,"Electronics Communication Systems", Khanna Publications, Salem (1992).
3. Bernard Grob , "Basic Television and Video Systems", McGraw Hill, New York(1997).
4. Govind P. Agrawal, "Fiber-Optic Communication Systems",3rd Edition, Kindle Edition.April 2008.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1		2		2						3		2	
CO2			2	2						3		2	
CO3		2		2		1		2		3		2	
CO4			2	2		2		2		3		2	
CO5		2	2	2		2		2		3		2	

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	DSC - Electronics	5	0		4	Theory

Subject Description:

This paper presents the fundamentals of electronics and its applications.

Course Outcome:

CO1	:	To recall the basic concept of diodes and transistors
CO2	:	To explain the application of transistor as an amplifier
CO3	:	To utilize the working of diodes as a multivibrator.
CO4	:	To explain about working of diodes as a clipper and clamper.
CO5	:	To discuss about SCR, UJT, Triac and diac

UNIT I: DIODES AND TRANSISTORS [12Periods]

Classification of solids – types of diodes – characteristics of junction diode and Zener diode – transistors Application: half wave and full wave rectifier, Voltage doubler – PNP and NPN transistors – Characteristics of transistor: CB mode, CE mode, CC mode.

UNIT II: AMPLIFIERS [12Periods]

Classification of an amplifier – RC coupled voltage amplifier – Power amplifiers – Class A power amplifier – Transformer coupled class A power amplifier – Collector dissipation – push pull class B power amplifier – Feedback amplifier: feedback and related terms – block diagram of a feedback amplifier.

UNIT III: SOLID STATE SWITCHING CIRCUITS [12Periods]

Introduction - Collector leakage current – Saturation collector current – Switching transistors – Switching action of an transistor – Multivibrator – Types of multivibrator – Astable multivibrator –mono stable multivibrator –Bistable multivibrator.

UNIT IV : WAVE SHAPING CIRCUITS [12Periods]

Differentiating circuit – Integrating circuit – Clipping circuit: positive clipper – negative clipper - biased clipper – combination clipper – applications of clipper- Clamping Circuits: Positive clamper – negative clamper.

UNIT V : POWER ELECTRONICS [12 Periods]

Introduction –SCR – Construction, Working and characteristics – Triac – Construction –

Operations – Characteristics – Applications of Triac – Diac – Operations – Applications of Diac: Lamp dimmer, Heat control – Uni-junction transistor – Constructions – Operations – equivalent circuit of UJT – Characteristics of UJT - advantages of UJT – UJT relaxations Oscillator – A/D and D/A converters.

Text Book:

1. D. Chattopadhyay, P C Rakshit, B.Saha, N.N. Purkait, "Foundations of Electronics", New Age International Publishers, New Delhi, 2015.
2. V.K.Mehta, Rohit Mehta, "Principles of Electronics", S.Chand and company, New Delhi, 2015.

Reference Books:

1. Jacob Millman, Christos Halkias, Chetan D. Pouikh," Integrated Electronics Analog and Digital Criciuts and Systems", Tata Mc Graw Hill Education Pvt. Ltd., New Delhi, 2016.
2. Dr. R.S. Sedha, "A Textbook of Applied Electronics", S.Chand and Company Pvt. Ltd., New Delhi, 2016.
3. Millman and Halkias "Electronics devises and Circuits", Tata McGraw Hill India, 2007
4. Balbir Kumar and Shail B.Jain " Electronic Devices and Circuits" Kindle Edition

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1			1			3	2	2	2
CO2	3	2	2				1			3	2	2	2
CO3	3	2	2	1		2	3			3	2	2	2
CO4	3	2	2							3	2	2	1
CO5	3	2	2	1		2	3		1	3	2	2	1

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	Research Methodology	5	0	0	2	Skill

Subject Description

This course aims to give exposure to the students on research methodology

Course Outcome:

CO1	:	To understand the basics of research methodology
CO2	:	To understand the different types of research design and know the concepts on experimentaldesign
CO3	:	To learn the fundamentals of optical and thermal property related instrumentation techniques.
CO4	:	To Understand the working principles of magnetic property and compositional analysis relatedinstrumentation techniques.
CO5	:	To solve the numerical problems through numerical problems

UNIT I: BASICS OF RESEARCH METHODOLOGY [12 Periods]

Selection of a research problem - literature survey - choosing a problem - current status of the problem - analysis of the problem - inferences - art of publishing research articles, reports.

UNIT II: RESEARCH DESIGN **[12 Periods]**

Meaning of Research Design – Need for Research Design – Features of Good Design – Concepts – Different Research Design – Basic Principles of Experimental Designs

UNIT III: CHARACTERIZATION TECHNIQUES – I [12 Periods]

Infrared, Raman, Ultraviolet, Atomic Absorption Spectroscopy, Thermal Gravimetric Analysis, Differential Thermal Analysis, (all the methods instrumentation and application only).

UNIT IV: CHARACTERIZATION TECHNIQUES – II [12 Periods]

Microhardness, Vibration Sample Magnetometer, Scanning electron microscope , Energy Dispersive X-ray Analysis, Ellipsometry, Photoluminesence (all the methods instrumentation and application only)

UNIT V: NUMERICAL METHODS [12 Periods]

Newton Raphson method- successive approximation method- Gauss elimination method- trapezoidal method-Simpson‘s rule-comparison of trapezoidal and Simpson rule(error analysis).

Text Books

1. Reseach methodlogy, C.R.Kothari, New age international publishers, 2005.

Reference Books

1. Research methodology, A step by step guide for beginners, Ranjit Kumar, Sage, 2005.
2. Instumental methods of chemical analysis, Gurseep R.Chatwal, Sham K. Anand, Himalaya Publishing house, 2007 reprint.
3. Computer oriented numerical methods, V.Rajaram, Prentice hall, 2004.
4. Relevant research articles

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1		2	2			2	2	2		3		2	
CO2		2	2		3	3		2		3		2	
CO3		2								3	2		
CO4						2				3	2		
CO5		2		3				3		3			

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	DSC-Astro Physics	5	0		4	Theory

Subject Description:

This paper presents the fundamentals of universe, galaxies, star and solar systems.

Course Outcome:

CO1	:	To learn about fundamental universe
CO2	:	To acquire knowledge about solar system
CO3	:	To acquire basic knowledge about age and evolution of earth
CO4	:	To calculate the distance and magnitude of stars
CO5	:	To have a basic knowledge about astronomical instruments

UNIT I: THEORIES OF THE UNIVERSE, GALAXIES AND STAR CLUSTERS [12Periods]

Origin of the universe - the big bang theory - the steady state theory - the oscillating universe theory - Hubble's law

Galaxies : Types of galaxies - Milky Way - star clusters - globular clusters

UNIT II: MODERN ENGINEERING MATERIALS [12Periods]

Mass and stability of the sun of the sun - solar constant - temperature of the sun - source of solar energy - solar wind - corona

Other members of the solar system : Mercury - Venus - Earth - Mars - Jupiter - Saturn - Uranus - Neptune- Moon - Bode's law

UNIT III: AGE AND EVALUATION OF EARTH [12Periods]

Solar nebula theory – planet esimials theory – age of earth – radiative dating – exposure age of meteoroids – age of radiative elements – motion of the planets – evaluation of earth's atmosphere – formation of ozone layer – role of life in changing the earth's atmosphere

UNIT IV DISTANCE AND MAGNITUDE OF STARS [12Periods]

Magnitude and brightness - apparent magnitude of stars - absolute magnetic of stars - relation between apparent magnitude and absolute magnitude of stars - Luminosities of stars - measurement of stellar distance

UNIT V ASTRONOMICAL INSTRUMENTS [12 Periods]

Optical telescope – reflecting telescope – types of reflecting telescope – advantages –

antenna requirements for solar observations – parapoloid reflection antenna – broad band antennas – dipole arrays

Text Book:

1. K.S.Krishnaswamy , "Astrophysics: A modern perspective", New Age International Pvt Ltd, New Delhi, 1st Edition (2002)
2. A.B.Bhattacharya, S.Joardar, R.Bhattacharya, "Astronomy and Astrophysics", Overseas Press 2010.

Reference Books:

1. B.Basu , "An introduction to Astrophysics", Hall of India Pvt Ltd (2001)
2. R.Murugeshan. Er. Kiruthiga Siva Prasath, "Modern Physics", S.Chand and Company Pvt. Ltd., New Delhi, 2016.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1		2	2			2	2	2		3		2	
CO2		2	2		3	3		2		3		2	
CO3		2								3	2		
CO4						2				3	2		
CO5		2		3				3		3			

Subject Code	Subject Title	Lecture	Tutorial	Practical	Credit	Type
	DSC- Basics of Electromagnetic Theory	5	0		4	Theory

Subject Description:

To impart knowledge on the concepts of Electrostatic fields, electrical potential, energy density and their applications, Magneto static fields, magnetic flux density, vector potential and its applications. Different methods of emf generation and Maxwell's equations Electromagnetic waves and characterizing parameters

Course Outcome:

CO1	:	To recollect the basic ideas about electric, magnetic fields and fourth state of matter.
CO2	:	To understand the applications of electromagnetic field.
CO3	:	To analyze incompletion of Ampere's law and completion of Maxwell's equation.
CO4	:	To evaluate the basic and advanced problems in the field of electromagnetic theory.
CO5	:	To enhance skill in solving problems by applying electromagnetic field expressions

UNIT I: ELECTROSTATICS AND MAGNETOSTATICS [12Periods]

Electrostatics: Electric intensity – Electric potential – Gauss Law - Dielectric and its polarization - Electric displacement D – Dielectric constant ε_r – Polarisibiltiy α - Clausius- Mossotti relation (Non-polar molecules) – The Langevin equation (Polar molecules) – Electrostatic energy

Magnetostatics: Current density J – Ampere's law of force – Biot-Savart law – Ampere's circuital law – Magnetic scalar potential ϕ_m (no applications) – Magnetic vector potential A – Magnetisation and magnetization current – Magnetic intensity – Magnetic susceptibility and Permeability.

UNIT II: FIELD EQUATION AND CONSERVATION LAWS [12Periods]

Equation of continuity - Displacement currents - The Maxwell's equations derivations - physical significance - Poynting vector - Electromagnetic potentials A and ϕ - Maxwell's equations in terms of Electromagnetic potentials - Concept of gauge - Lorentz gauge - Coulomb gauge

UNIT III: PROPAGATION OF PLANE ELECTROMAGNETIC [12Periods]

Electromagnetic waves in Free space - Isotropic dielectric - Anisotropic dielectric – Conducting media - Ionized gases.

Radiating systems: Oscillating electric dipole – Radiation from an oscillating dipole – Radiation from small current element.

UNIT IV INTERACTION OF E.M.WAVES WITH MATTER (MACROSCOPIC): [12Periods]

Boundary conditions at interfaces - Reflection and refraction – Frenel's laws- Brewster's law and degree of polarization - Total internal reflection and critical angle.

Interaction of E.M.Waves with matter (Microscopic): Scattering and Scattering parameters- Scattering by a free electron (Thomson Scattering) - Scattering by a Bound electron (Rayleigh scattering) – Dispersion Normal and Anomalous – Dispersion in gases (Lorentz theory) – Dispersion in liquids and solids.

UNIT V RELATIVISTIC ELECTRODYNAMICS [12Periods]

Purview of special theory of relativity – 4-vectors and Tensors - Transformation equations for charge and current densities J and □ – For electromagnetic potentials A and □ - Electromagnetic field tensor F□□ - Transformation equations for the field vectors E and B - Covariance of field equations in terms of 4-vectors - Covariance of Maxwell equations in 4- tensor forms – Covariance and transformation law of Lorentz force.

Text Book:

1. Sathyaprakash, (2013). Mathematical Physics. Sultan chand & sons, New Delhi, (Units I –V).

Reference Books:

1. Gupta B.D. (1989). Mathematical Physics. Vikas publication house, Noida, U.P.
2. Louis A.Pipes, Lawrence R. Harvill, (1970). Applied Mathematics For Engineers & Physicsts. McGraw Hill Kogakusha Ltd, New Delhi.
3. Chattopadhyay P.K. (1990). Mathematical Physics. Wiley Eastern Limited, New Delhi.
4. Bose R.K. Joshi M.C. (1984). Methods Of Mathematical Physics. Tata McGraw-Hill, New Delhi.

Problems. Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes									Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1			1			3	2	2	2

CO2	3	2	2				1			3	2	2	2
CO3	3	2	2	1		2	3			3	2	2	2
CO4	3	2	2							3	2	2	1
CO5	3	2	2	1		2	3		1	3	2	2	1