KANNUR UNIVERSITY

BOARD OF STUDIES -PHYSICS (UG)

SYLLABUS FOR PHYSICS CORE, COMPLEMENTARY ELECTIVE & GENERIC ELECTIVE COURSES FOR BSc PROGRAMME

CHOICE BASED CREDIT SEMESTER SYSTEM

(2019 ADMISSION ONWARDS)

Complementary Elective: Complementary
Generic Elective: Open

Kannur University

Vision and Mission Statement*

Existing Vision and Mission

Vision: "The vision of the Kannur University is to establish a teaching, residential and affiliating University promoting the development of higher education in Kasargode and Kannur revenue Districts and the Manandavadytaluk of Wayanad district.

Mission: "The mission of the Kannur University is to establish, maintain, manage and develop campuses at Kannur, Kasaragod, Manantavady, Payyannur, Thalassery, Nileshwar, Mangattuparamba and such other places as are necessary for providing study and research facilities to promote advanced knowledge in Science and Technology and other relevant disciplines and campus in the university headquarters at Kannur shall be the main campus"

Proposed Vision: To establish a teaching, residential and affiliating University and to provide equitable and just access to quality higher education involving the generation, dissemination and application of knowledge with special focus on the development of higher education in Kasargode and Kannur Revenue Districts and the Manandavadytaluk of Wayanad Revenue District.

Proposed Mission:

- To produce anddisseminate new knowledge and to find novel avenues for application of such knowledge.
- To adopt critical pedagogic practices which uphold scientific temper, the uncompromised spirit of enquiry and the right to dissent.
- To uphold democratic, multicultural, secular, environmental and gender sensitive values as the foundational principles of higher educationand to cater to the modern notions of equity, social justice and merit in all educational endeavors.
- To affiliate colleges and other institutions of higher learning and to monitor academic, ethical, administrative and infrastructural standards in such institutions.
- To build stronger community networks based on the values and principles of higher education and to ensure the region's intellectual integration with national vision and international standards.
- To associate with the local self-governing bodies and other statutory as well as non-governmental organizations for continuing education and also for building public awareness on important social, cultural and other policy issues.

Kannur University
Programme Outcomes*

PO 1.Critical Thinking:

1. Acquire the ability to apply the basic tenets of logic and science to thoughts, actions and interventions.
2. Develop the ability to chart out a progressive direction for actions and interventions by learning to recognize the presence of hegemonic ideology within certain dominant notions.
3. Develop self-critical abilities and also the ability to view positions, problems and social issues from plural perspectives.

PO 2.Effective Citizenship:

1. Learn to participate in nation building by adhering to the principles of sovereignty of the nation, socialism, secularism, democracy and the values that guide a republic.
2. Develop and practice gender sensitive attitudes, environmental awareness, the ability to understand and resist various kinds of discriminationsand empathetic social awareness about various kinds of marginalisation.
3. Internalise certain highlights of the nation's and region's history. Especially of the freedom movement, the renaissance within native societies and the project of modernisation of the post-colonial society.

PO 3.Effective Communication:

1. Acquire the ability to speak, write, read and listen clearly in person and through electronic media in both English and in one Modern Indian Language
2. Learn to articulate analysis, synthesis, and evaluation of situations and themes in a well-informed manner.
3. Generate hypothesis and articulate assent or dissent by employing both reason and creative thinking.

PO 4.Interdisciplinarity:

1. Perceive knowledge as an organic comprehensive, interrelated and integrated faculty of the human mind
2. Understand the issues of environmental contexts and sustainable development as a basic interdisciplinary concern of all disciplines.
3. Develop aesthetic, social, humanistic and artistic sensibilities for problem solving and evolving a comprehensive perspective.

PREFACE

Chairperson

Board of Studies, ---------- (UG)

Kannur University

Kannur University
Programme Specific Outcome of BSc Physics Programme*

PSO1: Understand and apply the principles of Classical mechanics, Quantum mechanics, Thermodynamics, Nuclear physics and Electrodynamics

PSO 2: Understand and apply the principles of Solid state physics, Optics, Photonics and Spectroscopy

PSO 3: Understand the principles of Electronics, Design and test electronic circuits

PSO 4: Understand and apply the principles of Mathematical Physics and Computational Physics and do Error analysis in measurements

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KANNUR UNIVERSITY BSC PHYSICS PROGRAMME

WORK AND CREDIT DISTRIBUTION STATEMENT

(BSc: Common English : 22, Additional Common:16, Core:56,

First complimentary Elective: 12, Second complimentary: 12, Generic Elective: 2)

Semester	Course Title*	Credits	Hours per week	Total Credits	Total Hours
I	Common Course(English)I	4	5	19	25
	Common Course(English)II	3	4		
	Common Course (Addl Lang) VII	4	4		
	Core Course(Theory 1B01PHY)	3	2		
	Core Course(Practical 4B05PHY*)	-	2		
	First Complementary Elective Theory Maths I	3	4		
	Second Complementary Elective Theory II –	2	2		
II	Common Course(English)III	4	5	19	25
	Common Course(English)IV	3	4		
	Common Course (Addl Lang) VIII	4	4		
	Core Course(Theory 2B02PHY)	3	2		
	Core Course(Practical 4B05PHY*)	-	2		
	First Complementary Elective Theory Maths II	3	4		
	Second Complementary Elective Theory II –	2	2		
	Second Complementary Elective Practical I *	-	2		
III	Common Course(English)V	4	5	16	25
	Common Course (Addl Lang) IX	4	5		
	Core Course(Theory 3B03PHY)	3	3		
	Core Course(Practical 4B05PHY*)	-	2		
	First Complementary Elective Theory Maths III	3	5		
	Second Complementary Elective Theory III –	2	3		
	Second Complementary Elective Practical I *	-	2		
IV	Common Course(English)VI	4	5	24	25
	Common Course (Addl Lang) X	4	5		
	Core Course(Theory 4B04PHY)	3	3		
	Core Course(Practical 4B05PHY)	4	2		
	First Complementary Elective Theory Maths IV	3	5		
	Second Complementary Elective Theory IV –	2	3		
	Second Complementary Elective Practical I	4	2		
V	Generic Elective Course	2	2		

	Core Course (Theory-5B06PHY)	4	4	17	25
	Core Course (Theory-5B07PHY)	4	4		
	Core Course (Theory-5B08PHY)	4	4		
	Core Course (Theory-5B09PHY)	3	3		
	Core Course (Practical II-6B15PHY*)	-	4		
	Core Course (Practical III 6B16PHY*)	-	4		
VI	Core Course (Theory-6B10PHY)	4	4	25	25
	Core Course (Theory-6B11PHY)	4	4		
	Core Course (Theory-6B12PHY)	4	4		
	Core Course (Theory-6B13PHY)	3	3		
	Discipline Specific elective 6B14PHY)	2	2		
	Core Course (Practical II-6B15PHY)	4	4		
	Core Course (Practical III 6B16PHY)	4	4		
	Core Course Project 6B17PHY	1	-		
	Project&Study Tour*** 6B17PHY	2			
Total				120	150

* External examination will be conducted at the end of Fourth Semester
** External examination will be conducted at the end of Sixth Semester
*** Study tour report (Industrial visit/ Scientific Institution visit) should be submitted along with the project report

First Complementary Elective (Compulsory): Mathematics

Second Complementary Elective: Chemistry/ Electronics/ Computer Science / Statistics

PART A:
PHYSICS CORE COURSES
WORK AND CREDIT DISTRIBUTION

(2019 ADMISSION ONWARDS)

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HRS
1B01PHY	MECHANICS I	I	2	3	3
2B02PHY	MATHEMATICAL PHYSICS & ERROR ANALYSIS	II	2	3	3
3B03PHY	MECHANICS II	III	3	3	3
4B04PHY	ELECTRONICS I	IV	3	3	3
4B05PHY	GENERAL PHYSICS PRACTICAL I	IV	2	2	3
5B06PHY	QUANTUM MECHANICS	V	4	4	3
5B07PHY	ELECTROSTATICS & MAGNETOSTATICS	V	4	4	3
5B08PHY	THERMODYNAMICS & STATISTICAL MECHANICS	V	4	4	3
5B09PHY	ELECTRONICS II	V	3	3	3
6B10PHY	SOLID STATE PHYSICS & SPECTROSCOPY	VI	4	4	3
6B11PHY	OPTICS & PHOTONICS	VI	4	4	3
6B12PHY	NUCLEAR, PARTICLE & ASTROPHYSICS	VI	4	4	3
6B13PHY	ELECTRODYNAMICS & CIRCUIT THEORY	VI	3	3	3
6B14PHY	DISCIPLINE SPECIFIC ELECTIVE	VI	2	2	2
6B15PHY	GENERAL PHYSICS PRACTICAL II	VI	4	4	3
6B16PHY	ELECTRONICS PRACTICAL III	VI	4	4	3
6B17PHY	PROJECT** &STUDY TOUR	VI	-	2	

EVALUATION

ASSESSMENT	WEIGHTAGE
EXTERNAL	80%
INTERNAL	20%

CONTINUOUS INTERNAL ASSESSMENT -THEORY

COMPONENT*	WEIGHTAGE**	REMARKS
COMPONENT 1 Test paper	60%	
COMPONENT 2 Open book problem solving/Seminar/Viva	40%	

CONTINUOUS INTERNAL ASSESSMENT- PRACTICAL

COMPONENT*	WEIGHTAGE**	REMARKS
COMPONENT 1 Lab Skill	25%	
COMPONENT 2 Punctuality	25%	
COMPONENT 3 Record	25%	
COMPONENT 4 TEST PAPER	25%	

CORE COURSE I : MECHANICS I

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
I	1B01PHY	2	2	3

COURSE OUTCOME

CO 1: Understand Newton's laws of motion, the concepts of linear and angular momentum and torque

CO2: Determine the Centre mass of a given configuration

CO3: Understand the principle of work, energy and power

CO4: Determine angular momentum of a body about any given axis

Unit I – Newton's Laws-The foundations of Classical Mechanics 10Hrs

Newton's First Law, Second Law and Third Law – Standards and units – Some applications of Newton's laws – The everyday forces of physics
Dynamics of a system of particles – Centre of mass – Conservation of momentum – Centre of mass coordinates
[From the book of study by Kleppner and Kolenkow, sections 2.1 – 2.5, 3.1 – 3.3]

Unit II – Work and Energy 12Hrs

Integrating the equation of motion in one dimension – Work-energy theorem in one dimension – Integrating the equation of motion in several dimensions – work-energy theorem – applying the work-energy theorem – Potential energy – What potential energy tells us about force – energy diagrams – Small oscillations in a bound system – Non conservative forces – General law of conservation of energy – Power – Conservation laws and particle collisions
[,Kleppner and Kolenkow, sections 4.1 – 4.14].

Unit III – Angular Momentum 10Hrs

Angular momentum of a particle – Torque – Angular momentum and fixed axis rotation – Dynamics of pure rotation about an axis – The physical pendulum – Motion involving both translation and rotation – The vector nature of angular velocity and angular momentum – Conservation of angular momentum
[Kleppner and Kolenkow, sections6.1 – 6.7, 7.1 -7.2, 7.5]

Book of Study :

1. An Introduction to Mechanics, 1st Edn. – Special Edition 2009 .-Daniel Kleppner and Robert J. Kolenkow – McGraw-Hill

Books for Reference :

1. Berkeley Physics Course : Vol.1 : Mechanics, 2nd Edn. – Kittel *et al.* – McGraw-Hill
2. Fundamentals of Physics by Resnick and Halliday

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MARKS INCLUDING CHOICE

Unit	**Marks**
I	18
II	24
III	18

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -60**
- **Maximum marks of the course-40**

CORE COURSE II: MATHEMATICALPHYSICS AND ERROR ANALYSIS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
II	2B02PHY	2	2	3

COURSE OUTCOME

CO 1: Understand vector operations and vector algebra

CO2: Determine derivative and integral of various functions

CO3: State fundamental theorems of calculus

CO4: Compare differential operators in various coordinate systems

CO5: Understand the basic concepts of modeling

CO6: Solve first order and second order ODEs

CO7: Estimate uncertainties in measured values

Unit I– Vector Calculus **10 Hrs**

VectorAlgebra: Vector operations-Vector algebra:Component form–Triple products–Position, Displacement and Separation vectors– How vectors transform

DifferentialCalculus:"Ordinary"derivatives–Gradient–The Del operator–Divergence–Curl–Product rules– Second derivatives

Integral Calculus:Line integral,surface integral and volume integral–Fundamental theorem of calculus–Fundamental theorem for Gradients–Fundamental theorem for divergences:Gauss's Divergence Theorem(no proof needed)–Fundamental theorem for curls:Stoke's theorem(no proof needed)—Divergence-less vector fields–Curl-less vector fields– Potentials.

[Book Isections1.1,1.2,1.3,1.6 check]

Unit II – Curvilinear co-ordinates **6Hrs**

Spherical polar coordinates–Cylindrical coordinates–Their relationship to Cartesian coordinates– Expressing differential displacement vector,differential area vectors,differential volume element, gradient operator, divergence operator and curl operator in spherical polar and cylindrical coordinates.

[Book I sections 1.4]

Unit III– Differential Equations **10Hrs**

Basic concepts-modelling-geometric meaning-direction field –eulers method-separable ODE-

modelling-exact ODE-integrating factors –linear ODEs –Bernouli equation-Population dynamics Homogenous linear ODEs of second order-homogenous linear ODEs with constant coefficients-modelling of fee oscillations of mass spring system

(Book II sections 1.1-1.5,2.1-2.2,2.4 check)

.Unit IV– Error Analysis **6Hrs**

Uncertainties, estimating uncertainties, significant figures, discrepancy, measured and accepted values, checking relationship with graph, significant figures and fractional uncertainties – combination of two measured values.

Propagation of Uncertainties- Square root rule for counting experiments, Sums and differences, products and quotients, special cases, independent uncertainties, functions of one variable, Propagation step by step, Examples, General formula for error propagation.

Random and systematic errors, mean and standard deviation, standard deviation as uncertainty, standard deviation of the mean, systematic errors

[Book III Chapters 1,2,3 &4 include sections]

Books of Study:

1. Electrodynamics – David Griffiths
2. Advanced Engineering Mathematics, 10th Edn.– ErwinKreyszig– John Wliey&sons
3. An Introduction to Error Analysis, J R Taylor, (University Science Books).

Books for Reference :

1. A first course in Differential equations with applications–A.H.Siddiqui,P.Manchanda– Macmillan India Ltd
2. Mathematical Methods for Physics and Engineering, 3rdEdn.–K. F.Riley, M. P.Hobson, S. J.Bence

MARKS INCLUDING CHOICE

Unit	Marks
I	18
II	12
III	18
IV	12

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)
• **Total marks including choice -60** • **Maximum marks of the course-40**		

CORE COURSEIII: MECHANICS II

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
III	3B03PHY	3	3	3

COURSE OUTCOME

CO1: Understand the concept of Galilean transformations and uniformly accelerating systems

CO2: Determine the trajectory of a body in central force problem using Newton's laws

CO3: Understand Keplers laws of planetary motion

CO4: Formulate the mathematical equation of waves

CO5: Understand the concept and consequences of special theory of relativity

Unit I – Noninertial Systems and Fictitious Forces **6Hrs**

Galilean transformations – Uniformly accelerating systems – The principle of equivalence – Physics in a rotating coordinate system

[Kleppner and Kolenkow, sections 8.1 – 8.5]

Unit II – Central Force Motion **8 Hrs**

Central force motion as a one-body problem – General properties of central force motion – Finding the motion in real problems – The energy equation and energy diagrams – Planetary motion – Kepler's laws

[Kleppner and Kolenkow, sections 9.1 – 9.7]

Unit III – Harmonic Oscillator **8 Hrs**

Introduction and review – Damped harmonic oscillator – Energy and Q-factor – Solution of the equation of motion for the damped oscillator – Forced harmonic oscillator – Undamped forced oscillator – Resonance

[Kleppner and Kolenkow, sections 10.1 – 10.3]

UnitIV-Waves **6Hrs**

Waves-Progressive wave-General equation of wave motion- plane progressive harmonic wave-Energy density-Transverse waves in stretched strings-longitudinal waves in rodslongitudinal waves in gases-Fouriers theorem-mathematical expression-conditions

(Book2 add sections)

Unit V – Special Theory of Relativity **20Hrs**

The need for a new mode of thought – Michelson-Morley experiment – Postulates of Special Relativity – Galilean transformations – Lorentz transformations – Simultaneity and the order of events – Lorentz length contraction and time dilation – Relativistic transformation of velocity – Doppler effect – Twin paradox – Relativistic Momentum and Energy – Massless particles – Does light travel at the velocity of light ?

[Kleppner and Kolenkow, sections 11.1 – 11.5, 12.1 – 12.6, 13.1 – 13.4]

Books of Study :

1. An Introduction to Mechanics, 1st Edn. – Daniel Kleppner and Robert J. Kolenkow – McGraw- Hill
2. Mechanics by J C Upadhyaya

Books for Reference:

1. Berkeley Physics Course : Vol.1 : Mechanics, 2nd Edn. – Kittel *et al.* – McGraw-Hill

MARKS INCLUDING CHOICE

Unit	Marks
I	8
II	10
III	10
IV	8
V	24

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -60**
- **Maximum marks of the course-40**

CORE COURSE IV: ELECTRONICS I

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
IV	4B04PHY	3	3	3

COURSE OUTCOME

CO 1: Understand the basics of PN junction diode, Zener diode and their applications

CO2: Understand the structure, operations and characteristics of BJT and FET

CO3: Understand the biasing methods and design of BJT and FET circuits

CO4: Understand the different number systems, arithmetic operations and conversions.

CO5 : Understand the basic combinational circuits.

Unit 1: Semiconductor diodes and Applications 10 Hrs.

pn junction diode, Characteristics and parameters, Diode approximations, DC load line analysis, Zener diodes, Half wave rectification, Full wave rectification, Half wave rectifier power supply, Full wave rectifier power supply, Zener diode voltage regulators. (Book 1, Chapters 2 & 3 add sections)

Unit 2: Bipolar Junction Transistors and Field Effect Transistors 20 Hrs

BJT Operation, BJT Voltages and Currents, BJT amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, DC Load line and Bias point, Base bias, Collector to base bias, Voltage divider bias, Comparison of basic bias circuits, Bias circuit design, Thermal stability of bias circuits, Switching circuits.

Junction field effect transistors, JFET characteristics, DC load line and bias point, Gate bias, Self bias and Voltage divider bias, Comparison of basic JFET bias circuits.

(Book 1, Chapters 4, 5, 9 & 10 add sections)

Unit 3: Number Systems and Logic gates 18 Hrs

Binary numbers, Decimal to Binary Conversion, Binary Arithmetic, 1's and 2's Complements of Binary Numbers, Signed Numbers, Arithmetic Operations with Signed Numbers, Hexadecimal Numbers, Octal Numbers, Binary Coded Decimals, Gray code, ASCII code

The inverter, AND, OR, NAND, NOR, Exclusive- OR and Exclusive - NOR Gates, Basic combinational Logic circuits, The universal property of NAND and NOR gates, Combinational logic using NAND and NOR gates.

(Book 2, Chapter 2, 3 & 5 add sections)

Books for Study:

1. Electronic Devices and Circuits - 5th Edition, David A Bell (Oxford University Press)

2. Digital Fundamentals - 10th Edition, Thomas L. Floyd (Pearson Education)

Books for Reference:

1. Electronic Devices and circuit theory - Robert L Boylestad& Louis Nashelsky (Pearson Eduaction)

2. Principles of Electronics - V K Mehta (S Chand & Co.)

3. The Art of Electronics - Paul Horowitz and Winfield Hill (Cambridge University Press)

4.Digital Principles and Applications - D P Leach and A P Malvino (TMH)

MARKS INCLUDING CHOICE:

Unit	**Marks**
I	16
II	20
III	24

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problems**	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)

	Answer any 2 questions	(2 questions x Marks 5 each=10)
• **Total marks including choice -60** • **Maximum marks of the course-40**		

CORE COURSE V: -PRACTICAL GENERAL PHYSICS I

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
IV	**4B05PHY**	**2**	**4**	**3**

COURSE OUTCOME

Course Outcome for Practical I and Practical II

CO1: Familiarize with apparatus for mechanical, electrical, magnetic and optical experiments.

CO2: Develop skill in setting up of apparatus for accurate measurement of physical quantities.

CO3: Understand multiple experimental techniques for determining physical quantities.

CO4: Develop skill in systematic way of measurements by minimizing possible errors.

CO5: Develop skill to analyze by plotting graphs using software.

CO6: Develop skill for systematic trouble shooting.

CO7: Perform error analysis for experiments.

Note: A brief theoretical back ground of each experiment must be given to the students before each cycle of experiments and assess it. Students have to maintain a practical log book regularly signed by the teacher in charge and should be submitted at the time of University Examination. Fair record is not required. All the 20 experiments have to be performed.

1. Flywheel- Moment of inertia
2. Torsion pendulum- Moment of inertia of a disc and rigidity modulus (using two identical masses)
3. Compound pendulum- To find ‘g’ and radius of gyration
4. Young’s modulus of the material of bar-Non-uniform bending using pin & microscope
5. Young’s modulus of the material of bar -Uniform Bending using optic lever
6. Surface Tension by capillary rise method
7. Coefficient of viscosity –Poiseuille’s formula (by measuring radius of capillary tube using mercury)
8. Rigidity modulus of a material-Static torsion
9. Spectrometer – Refractive index of the material of a prism
10. Spectrometer –Dispersive power of a prism
11. Melde’s String- Frequency of a tuning fork

12. Lee's disc- Thermal conductivity of a bad conductor

13. Newton's law of cooling- Specific heat of a liquid

14. Potentiometer- - resistance &resistivity

15. Potentiometer- Calibration of low range voltmeter (null Method)

16. Carey Fosters Bridge- resistance &resistivity

17. Deflection Magnetometer- Tan A , Tan B and Tan C

18. Deflection Magnetometer & Box type vibration magnetometer- m and B_0

19. Searle's Vibration magnetometer- moment and ratio of moments

20. Liquid Lens I –Refractive index of a liquid and material of the lens
    (i) using mercury and
    (ii) using another liquid of known refractive index

MARKS DISTRIBUTION

Sections	**Marks**
I Principle with theory	10
II Performance	8
III Observation	14
IV Calculation ,Graph etc	8

CORE COURSE VI: QUANTUM MECHANICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5B06PHY	4	4	3

COURSE OUTCOME

CO 1: Understand the limitations of classical mechanics

CO2: Explain Blackbody radiation problem, Photoelectric effect and Compton effect using quantum theory of radiation

CO3: Understand Rutherford, Bohr atom models and concept of energy and angular momentum quantisation

CO4: Understand de-Broglie hypothesis, concept of wave nature of matter and Heisenberg uncertainity principle

CO5: Determine probability of finding a particle and expectation values of variable using its wavefunction

CO6: Write and solve Schrodinger equation for simple quantum mechanical systems

CO7: State and explain Pauli's exclusion principle

Unit I – Particle like Properties of Electromagnetic Radiation 12 Hrs

Review of electromagnetic waves – Photoelectric effect – Blackbody radiation – Compton effect – Other photon processes – What is a photon ?

[Sections 3.1 to 3.6 of Modern Physics by Kenneth Krane]

Unit II – Rutherford-Bohr Model of the Atom 10Hrs

Basic properties of atoms – Thomson model – Rutherford nuclear atom – Line spectra – Bohr model – Frank-Hertz experiment – Correspondence principle – Deficiencies of Bohr model

[Sections 6.1 to 6.8 of Modern Physics by Kenneth Krane]

Unit III – Wavelike Properties of Particles 10 Hrs

De Broglie hypothesis – Uncertainty relationships for classical waves – Heisenberg uncertainty relationships – Wave packets – Probability and randomness – Probability amplitude

[Sections 4.1 to 4.6 of Modern Physics by Kenneth Krane]

Unit IV – The Schrodinger Equation **14 Hrs**

Justification of the Schrodinger equation – The Schrodinger recipe – Probabilities and normalization – Applications – Free particle, Particle in a box (one dimension), Particle in a box (two dimensions), Simple harmonic oscillator – Time dependence – Potential energy steps and potential energy barriers
[Sections 5.1 to 5.7 of Modern Physics by Kenneth Krane]

Unit V– Hydrogen Atom in Wave Mechanics **12Hrs**

Schrodinger equation in spherical coordinates – Hydrogen atom wave functions – Radial probability densities – Angular momentum and probability densities – Intrinsic spin –Stern –Gerlach expt– Energy levels and spectroscopic notation – Zeeman effect – Fine structure
[Sections 7.1 to 7.8 of Modern Physics by Kenneth Krane]

UnitVI-Many electron atom **6hrs**

Pauli's Exclusion principle-Electronic states in many electron atoms-X-Rays-Optical spectra-Addition of angular momenta
[Sections Concepts of Modern physics by (Arthur Beiser)]

Book of study :

1. Modern Physics, 2nd Edn. – Kenneth S. Krane – John Wiley & sons
2. Concepts of Modern Physics ,7th Edn–Arthur Beiser

Books of Reference:

1. Modern Physics, 3rd Edn. – Raymond A. Serway, Clement J. Moses, Curt A. Moyer – Cengage
2. Modern Physics, 2nd Edn – Randy Harris – Pearson
3. Modern Physics for Scientists and Engineers, 2nd Edn. – John R. Taylor, Chris D. Zafiratos, Michael A. Dubson – Prentice-Hall of India Pvt. Ltd.

MARKS INCLUDING CHOICE

Unit	Marks
I	12
II	10
III	10
IV	14
V	10
VI	4

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)
• **Total marks including choice -60** • **Maximum marks of the course-40**		

CORE COURSE VII : ELECTROSTATICS AND MAGNETOSTATICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5B07 PHY	4	4	3

COURSE OUTCOME

CO1: Understand the concept of Electric field, electric potential, magnetic field and magnetic potentials

CO2: Use the principle of superposition and Gauss's law to calculate electric field intensity

CO3: Determine Electric potential of charge distributions and hence electric field intensity

CO4: Understand the basic properties of conductors and capacitors

CO5: Calculate the magnetic fields due to currents using Biot-Savart and Ampere laws.

CO6: Compare Magnetostatics and Electrostatics.

CO7: Understand Diamagnets,Paramagnets and Ferromagnets.

Unit 1: **Electric field and Electric potential.** **16 hrs**

Coulomb's law for a group of point charges, Idea of electric field , Electric field for (i) a point charge, (ii) group of point charges,(iii)continuous charge distributions, Electric Field lines, Gauss's law - its differential form and proof using Dirac delta function, Applications of Gauss's Law : E due to (1) a Uniformly charged sphere ,(2) an Infinite sheet of charge and Two parallel charged sheets, (3) a Charged conductor.The curl of E .Electric potential V due to (i) a point charge, (ii) a group of point charges, (iii)charge distribution. Relation between E and V in differential and integral form,Poisson's equation and Laplace's equation, Potential inside and outside a spherical shell,Electrostatic boundary conditions.(Book 1 Chapter 2,add sections)

Unit 2: **Work and Energy in Electrostatics.** **6hrs**

Work done to move a charge,The energy of a point charge distribution ,The energy of a continuous charge distribution ,Electrostatic energy of a (i)uniformly charged spherical shell and (ii)uniformly charged solid sphere, Comments on electrostatic energy, Capacitors: capacitance of a parallel plate capacitor , work done to charge up a capacitor.(Book 1 Chapter 2 add sections,)

Unit 3: **Electrostatic Fields in Matter**. **14hrs**

Induced charges,Faradaycage,Dielectrics :induced dipoles - Alignment of polar molecules,Polarization P, Bound charges, Physical interpretation of bound charges,The field inside a dielectric.Electric displacement vector D, Gauss's law in the presence of a dielectric, A deceptive parallel between E and D, Boundary conditions, Electrical susceptibility,permittivity& dielectric constant, Relation between E,P and D. (Book 1 Chapters 2 & 4 add sections,)

Unit 4: **Magnetostatics.** **16hrs**

The Lorenz force law, Cyclotron motion,Cycloidmotion,Magnetic force on (i)a Line current ,(ii) Surface current & (iii)Volume current, Continuity equation,Steady currents, The BiotSavart law, Magnetic field due to (i) Infinitely long current carrying wire, (ii) circular loop carrying current, The Divergence & Curl of B, Ampere's law, Applications of Ampere's law: (i) B due to a long straight current carrying wire, (ii) Magnetic field of a very long solenoid. Comparison of magnetostatics &electrostatics, Magnetic vector potential,Magnetostatic boundary conditions, Multipole expansion of vector potential , magnetic dipole moment. (Book 1 Chapter 5 add sections)

Unit 5: **Magnetostatic Fields in Matter** **12hrs**

Diamagnets,Paramagnets and Ferromagnets,Torques and forces on magnetic dipoles, Effect of a magnetic field on atomic orbits.Magnetization,The field of a magnetized object,Bound currents and its Physical interpretation.The magnetic field inside matter,The auxiliary field **H**, Amperes law in Magnetized material,Deceptive parallel between **B** and **H**, Magnetostatic Boundary conditions. Linear and Nonlinear Media,magnetic susceptibility and permeability.Ferromagnetism(Book 1 Chapter 6 add sections)

Book for Study:

1. Introduction to electrodynamics -David .J .Griffiths ,3rd Edn,1999,Prentice Hall of India

Books for Reference:

1.Electricity and Magnetism, J.H.Fewkes&J.Yarwood. Vol.I, 1991, Oxford Univ. Press.

2.Feynman Lectures Vol.2, R.P.Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education

MARKS INCLUDING CHOICE

Unit	Marks
I	14
II	6
III	14
IV	16
V	10

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problems**	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)

	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -60**
- **Maximum marks of the course-40**

CORE COURSE VIII: THERMODYNAMICS & STATISTICAL MECHANICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5 B09PHY	4	4	3

COURSE OUTCOME

CO 1: Understand the concept of temperature and the thermodynamic state and equilibrium.

CO2: Explain the first law of thermodynamics through work and heat and its mathematical formulation

CO3: Understand the ideal gas equation and kinetic theory of gases

CO4: Understand the second law of thermodynamics and thermodynamic temperature scale.

CO5: Define entropy and thermodynamic potentials

CO6: Understand the basic concepts of Statistical mechanics

Unit I: **Temperature & Zeroth law of Thermodynamics** **8 hrs**

Macroscopic and microscopic point of view- Macroscopic vs. microscopic point of view –scope of Thermodynamics-thermal equilibrium- zeroth law-concept of temperature-thermo meters & measurement of temperature- ideal gas temperature –Celsius temperature scale-Celsius & Fahrenheit temperature scale-thermodynamic equilibrium –equation of state-hydrostatic systems-mathematical theorems -intensive and extensive parameters

(Book 1 sections 1.1 – 1.7,1.10-1.11,1.17,2.1-2.4,2.10)

Unit II: Work, heat and first law of thermodynamics **14 hrs**

Work- Quasistatic process- work in changing volume of a hydrostatic system-PV diagram-hydrostatic work depends on path-calculation of $\int pdv$ for Quasistatic process- generalized work-composite systems-work & heat-Adiabatic work-internal energy function-mathematical formulation of first law-concept of heat – concept of path and state function -differential form of first law-heat capacity & measurements – sp heat of water: the calorie-equations for a hydrostatic system- heat reservoir- conduction- convection-radiation- Kirchoff& Stefan-Boltzmann law.

(Book 1 sections 3.1-3.6,3.12-3.13,4.1-4.11,4.13-4.16)

Unit III: Ideal gas **8 hrs**

Equation of state of a gas –internal energy of a real gas-ideal gas-quasistatic adiabatic process-kinetic theory of the ideal gas.

(Book 1 sections 5.1-5.3, 5.5, 5.9)

Unit IV: The second law of thermodynamics, Carnot cycle& Thermodynamic temperature scale

15 hrs

Conversion of work into heat and vice-versa- principle of heat engines , cyclic process- gasoline engine and its efficiency, Diesel engine and its efficiency- heat engine kelvin Planck statement of second law-refrigerator ; clausius statement of second law – equivalence of both- reversibility & irreversibility –external-internal mechanical irreversibility- external-internal thermal irreversibility-chemical irreversibility-conditions for reversibility- Carnot cycle- Carnot Refrigetor- Carnot's theorem & corollary- the thermodynamic temperature scale-Absolute zero & Carnot efficiency- equality of ideal gas & thermodynamic temperatures.
(Book 1 sections 6.1-6.3, 6.6-6.14, 7.1.7.3-7.7)

Unit V: ? **14 hrs**

Entropy , thermodynamic potentials & open systems Reversible part of second law- Entropy- entropy of an ideal gas - T-S diagram –entropy & reversibility - entropy & irreversibility- irreversible part of second law- heat & entropy in irreversible processes-entropy & non equilibrium states-principle of increase of entropy-entropy & disorder Thermodynamic potentials-Internal energy, Enthalpy- Helmholtz free energy, Gibbsfunction-Maxwells relations,-joule Thomson expansion-first order phase transition ;clausiusclapeyron equation-clausiusclapeyron equation& phase diagrams.
(Book 1 sections 8.1-8.2, 8.4-8.11,8.13,12.1,12.3-12.4)

Unit **VI**: **Statistical mechanics** **5hrs**

Statistical distribution-MB statistics-Molecular Energies in an ideal gas-quantum statistics- Specific heat of solids(Section 9.1-9.4 Modern Physics by Arthur Beiser)

Books for study:

1. Heat and Thermodynamics-Mark W Zemansk,Richard H Dittman (8th Edn.)
2. .Modern Physics by Arthur Beiser

Books for Reference:

1. Basic thermodynamics by E V Guha
2. Statistical Physics by F.Reif

MARKS INCLUDING CHOICE

Unit	Marks
I	8
II	12
III	6
IV	14
V	14

VI	6

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -60**
- **Maximum marks of the course-40**

CORE COURSE IX: ELECTRONICS II

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	5B09PHY	3	3	3

COURSE OUTCOME

CO 1: Understand the AC analysis of BJT circuits and CE amplifiers

CO2: Understand the feedback circuits, oscillators and power amplifiers

CO3: Understand basic OPAMP and different OPAMP circuits

CO4: Understand the Boolean Expressions, Functions of Combinational Logic and K map simplifications.

Unit 1: AC analysis of BJT circuits and Small signal amplifiers **10 Hrs.**

Coupling and bypass capacitors, AC load lines, transistor models, r-parameters, h-parameters, CE circuit analysis, Decibels and half power points, BJT circuit Frequency response, Single stage CE amplifier, Capacitor coupled and Direct coupled two stage CE amplifiers. (Book 1, Chapters 6, 8 & 12 add sections)

Unit 2: Feedback in amplifiers, Signal generators and Power amplifiers **14 Hrs**.

Types of feedback-Series voltage negative feedback - advantages, Concept of positive feedback, Barkhausen criterion, Phase shift, Hartley, Colpittts and Wien bridge Oscillators, Audio power amplifiers - Transformer coupled Class A, Class B and Class AB amplifiers, Class C tuned amplifier. (Book 1, Chapters 13, 16 & 19)

Unit 3: Operational Amplifiers and its applications **10 Hrs.**

Integrated circuit operational amplifiers, Differential and common mode operation, CMRR, Ideal Operational Amplifier, Op-Amp 741, Voltage follower circuits, Non Inverting, Inverting, Summing and Difference

amplifiers using Op-Amp, Integrator and differentiator circuits using Op-Amp. (Book 1, Chapter 14 add sections)

Unit 4: Standard forms of Boolean Expressions and Functions of Combinational Logic **14 Hrs.**

The SOP and POS forms, Conversion of a general expression to SOP and POS, converting standard SOP to POS and vice versa, Boolean Expressions and Truth Tables, Karnaugh Map (up to 4 variables), Karnaugh Map SOP and POS minimization.

Basic Adders - Half Adder, Full Adder, Parallel Binary Adder, 4 Bit Parallel Adder, Comparators, decoders, encoders. (Book 2, Chapters 4 & 6 add sections)

Books for Study:

1. Electronic Devices and Circuits- 5th Edition, David A Bell (Oxford University Press)

2. Digital Fundamentals- 8th Edition, Thomas L. Floyd (Pearson Education)

Books for Reference:

1. Electronic Devices and circuit theory - Robert L Boylestad& Louis Nashelsky (Pearson Eduaction)

2. Op-Amps & Linear Integrated Circuits- Ramakant A. Gayakwad (Pearson Eduaction)

3. Principles of Electronics - V K Mehta (S Chand & Co.)

6. Digital Principles and Applications - D P Leach and A P Malvino (TMH)

MARKS INCLUDING CHOICE:

Unit	**Marks**
I	14
II	18
III	14
IV	14

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)

Part C	**Problems**	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)
• **Total marks including choice -60** • **Maximum marks of the course-40**		

CORE COURSE X : S0LID STATE PHYSICS & SPECTROSCOPY

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	**6B10PHY**	**4**	**4**	**3**

COURSE OUTCOMES

CO 1: Understand basic crystal structure and compare various crystal systems

CO2: State and prove Bragg's law

CO3: Explain X-ray diffraction and various methods to obtain diffraction pattern

CO4: Understand basic properties of semiconductors and band structure of solids

CO5: Discuss Hall Effect and list its applications

CO6: Describe various regions of EM spectrum

CO7: Distinguish between microwave and infrared spectroscopy

CO8: Define Raman Effect and explain its quantum theory

Unit I **14Hrs**

Structural study of crystalline solids – Introduction – Lattice points and space lattice – The basis and crystal structure – Unit cells and lattice parameters – Unit cell verses primitive cell – Crystal systems – Symmetry elements in crystals – Metallic crystal structures SC, BCC, FCC and HCP structures – Directions, planes and Miller indices – Important features of Miller indices

(Book 1 Chapter 4 add sections)

Unit II **6Hrs**

X-Ray diffraction – Bragg's law – Bragg's X Ray Spectrometer – Powder crystal method – Rotating Crystal method

(Book 1 Chapter 5 add sections)

Unit III **12hrs**

Semiconducting properties of materials – Semiconductors – Intrinsic and extrinsic semiconductors – Band structure of semiconductors – Fermi level of intrinsic and extrinsic semiconductors - Fermi level and carrier concentration in semiconductors – Mobility of charge carriers – Electrical conductivity in semiconductors – Hall effect – Applications of Hall effect

(Book 2: Chapter 13 add sections)

Unit IV **12 hrs**

Spectroscopy: Regions of the spectrum-Microwave spectroscopy-The rotation of molecules-Rotational spectra-The rigid diatomic molecule-Intensities of spectral lines-The effect of isotopic substitution-The microwave oven (Book 3)

Unit V **12 hrs**

Infrared spectroscopy: The vibrating diatomic molecule-The energy of diatomic molecule-The Simple Harmonic Oscillator - The Anharmonic Oscillator-The diatomic Vibrating Rotator-The vibration-rotation spectrum of carbon monoxide. (Book 3)

Unit VI **8hrs**

Raman Effect-Discovery-Experimental study- Quantum Theory of Raman Effect (Book 4 add sectionsl)

Books for Study:

1. Solid State Physics by S O Pillai, New age international Publishers
2. Solid State Physics Structure and Properties of materials 2nd Edition,MA Wahab
3. Fundamentals of Molecular Spectroscopy-Colin N. Banwell and Elaine M. Mc Cash, Tata McGraw-Hill Publishing Company Ltd.
4. Optics by Brijlal and Subrahmniam

Books for Reference

1. Introduction to Solid State Physics, Charles Kittel, Wiley and Sons, 8th Edition.
2. Solid state Physics, Saxena, Guptha, Mandal, Pragathi Prakashan
3. Solid State Physics by J.Dekker, MacMillan India Ltd
4. Elementary Solid State Physics by M.A.Omar, Pearson Education

5. Introduction to Spectroscopy, Donald L PaviaCengage Learning Pvt Ltd

MARKS INCLUDING CHOICE

Unit	Marks
I	14
II	5
III	11
IV	11
V	11
VI	8

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -60**
- **Maximum marks of the course-40**

CORE COURSE XI : OPTICS&PHOTONICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B11PHY	4	4	3

COURSE OUTCOME

CO 1: Understand the concept of interference and diffraction

CO2: Distinguish between Fresnel and Fraunhoffer diffraction

CO3: Analyse mathematically diffraction pattern due to slits and apertures

CO4: Understand the concept of polarization and double refraction

CO5: Understand the basic principle and working of lasers

CO6: Explain different types of lasers

CO7: Understand the principle of holography and its applications

CO8: Understand the principle of total internal reflection and propagation of light through optical fibres

CO9: Compare different types of optical fibres and their applications

Unit 1: **Two beam interference by division of wave front** **8hrs**

Introduction-Interference pattern produced on the surface of water-Coherence—Interference of light waves- The interference pattern-Intensity distribution-Fresnel biprism-Interference with white light-Displacement of fringes-The lloyd's mirror- Phase change on reflection. (Book1 Chapter 14)

Unit 2: **Interference by division of amplitude** **10hrs**

Introduction-Interference by a parallel film when illuminated by a plane wave-The cosine law-Non-reflecting films-Highly reflecting films by thin film deposition-Interference by a film with two non-parallel reflecting surfaces-Colour of thin films-Newton's Rings (reflected system)-Michelson's Interferometer-determination of wavelength of monochromatic source (Chapter15)

Unit 3: **Fraunhoffer Diffraction** **8hrs**

Introduction-Single slit diffraction pattern-Position of maxima and minima-Two slit Fraunhoffer diffraction pattern-position of maxima and minima-N slit diffraction pattern- position of maxima and minima-Width of principal maxima-The plane diffraction grating- Grating spectrum-Resolving power of a grating. (Chapter 18)

Unit 4: **Fresnel Diffraction** **7hrs**

Introduction-Fresnel half period zones-Diffraction by a circular aperture-Diffraction by an opaque disc-The zone plate- comparison between zone plate and convex lens-Diffraction by a straight edge (Book1 Chapter 20)

Unit 5 : **Polarization and Double refraction** **11Hrs**

Introduction-Polarization by reflection-Brewster's law- Nicol prism-Polarization by scattering-Malus's law -Superposition of two disturbances-Mathematical analysis-The phenomenon of double refraction-Interference of polarized lights-Quarter wave and Half wave plates-Analysis of polarized light.(Book1Chapter 22)

Unit 6: Photonics **20hrs**

Lasers-Interaction of light with matter-Einsteins coefficients and their relations-light amplification-meeting the three requirements-components of a laser-principal pumping schemes-role of resonant cavity-types of lasers-semiconductor laser-laser beam characteristics-applications (Book2)

Holography-principle of holography-recording and reconstruction-holograms-important properties of holograms-applications (Book2)

Fibre optics-optical fibre-total internal reflection-propagation of light through optical fibre-fractional refractive index-the three types of fibres-applications-fibre optic communication system-merits of optical fibres (Book2)

Book for study:

1. Optics by Ajoy Ghatak (6th Edition) -Tata MC Grow hill publishing company
2. A text book of Optics by N.Subramhaniam and Brijlal

Books for Reference :

1. Optics –L .Pedrotti,
2. Geometrical and Physical optics by P.K.Chakroborthy (Type edition and publishers)
3. Optics by E. Hecht.

MARKS INCLUDING CHOICE

Unit	Marks
I	8

II	10
III	6
IV	6
V	12
VI	18

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -60**
- **Maximum marks of the course-40**

CORE COURSE XII : NUCLEAR, PARTICLE & ASTROPHYSICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
6	6B12PHY	4	4	3

COURSE OUTCOME

CO 1: Understand the structure nucleus of and nuclear constituents

CO2: Define nuclear forces and nuclear reactions

CO3: Familiarize elementary particles and their properties

CO4: Understand stellar classifications

CO5: Explain life cycle of a star

CO6: Identify different stars in HR diagrram

CO7: CO8: Define white dwarf, neutron star and black hole

UnitI – Nuclear Structure and Radioactivity **14Hrs**

Nuclear Constituents – Nuclear sizes and shapes – Nuclear masses and binding energies – Nuclear force – Radioactive decay – Conservation laws in radioactive decay – Alpha decay – Beta decay – Gamma decay – Natural radioactivity – Mossbauer effect [Book 1; Sections 12.1 to 12.11]

Unit II– Nuclear Reactions and Applications **10 Hrs**

Types of nuclear reactions – Radioisotope production in nuclear reactions – Low-energy reaction kinematics – Fission – Fission reactors – Fusion – Fusion processes in stars – Fusion reactors – Applications of nuclear physics – Neutron activation analysis, Medical radiation physics, Alpha decay applications, Synthetic elements [Book 1; Sections 13.1 to 13.6]

Unit III - Elementary Particles **10 Hrs**

The four basic forces – Particles and antiparticles – Families of particles – Conservation laws – Particle interactions and decays – Resonance particles – Energetics of particle decays – Energetics of particle reactions – The Quark Model – The Standard Model [Book 2; Sections 14.
1 to 14.9]

Unit IV Basic Tools of Astronomy **12Hrs**

Stellar distance-relationship between stellar parallax and distance -– brightness and luminosity – relation between luminosity, brightness and distance Magnitudes-Apparent magnitude and brightness ratio-relationship between apparent magnitude and absolute magnitude-Colour and temperature of the star-relationship between flux, luminosity and radius-stellar spectra-stellar classification-Hertzprung Russel diagram-H-R diagram and stellar radius- -H-R diagram and stellar luminosity-H-R diagram and stellar mass [Book 2 sections 1.1 to 1.12]
[sections 1.1.1,1.3.1,1.4.1,1.5.1and 1.8.1 are excluded]

Unit V Stellar Evolution **10Hrs**

The Birth of a Star - Pre-Main-Sequence Evolution and the Effect of Mass- Star Formation Triggers - The Sun—The Nearest Star - Binary Stars and Stellar Mass -Lifetimes of Main-Sequence Stars- Red Giant Stars - Helium-Burning and the Helium Flash- Star Clusters, Red Giants, and the H-R Diagram
[Book 2 sections 3.1,3.2,3.5,3.6,3.6.1,3.6.2,3.6.3,3.71,3.7.2,3.8,3.9,3.101,3.102,3.11,3.12]
[sections 3.7.1.1,3.9.1,3.12.1 are excluded]

Unit VI ?(name of chapter) **8Hrs**

The Death of Stars-The Asymptotic Giant Branch- Dredge-Ups- Mass Loss and Stellar Winds-Infrared Stars-The End of an AGB Star's Life.- White Dwarf Stars- High-Mass Stars and Nuclear Burning - The End Result of High-Mass Stars' Evolution: Pulsars, Neutron Stars, and Black Holes
[Book 2 sections 3.14,3.15,3.16,3.17,3.18,3.19,3.21,3.2.1.1,3.21.2,3.21.3,3.21.4,3.22,3.24.1,3.24.2]
[sections 3.19.1,3.21.2 are excluded]

Books for study

1. Modern Physics (second edition) by Kenneth Krane, Wiley student edition
2. Astrophysics is Easy: An introduction for the Amateur Astronomer- Mike Ingis- Springer

Books for reference

1. Modern Physics by R. Murugeshan ,Er. Krithiga Sivaprasath-(revised Edition), S.Chand
2. Nuclear Physics by S.N.Ghoshal- S.Chand and Co
3. The Atomic nucleus by R.D Evans -Mc Graw Hill,Newyork

MARKS INCLUDING CHOICE

Unit	Marks
I	9
II	9
III	12
IV	12
V	9
VI	9

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -60**
- **Maximum marks of the course-40**

CORE COURSE XIII : ELECTRODYNAMICS AND CIRCUIT THEORY

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B13PHY	3	3	3

COURSE OUTCOME

CO 1 : Understand the basic concepts of Electrodynamics

CO2 : Exaplain the mathematical theroy of Electromagnetic waves

CO3 : Understand different Network theorems

CO4 : Understand the basic concepts of Transient currents

Unit 1: Electrodynamics: 16Hrs

Ohm's law - Electromotive force – Motional e.m.f - Electromagnetic induction-Induced electric field - Inductance –Self inductance and mutual inductance –Inductance of coupled coils – Energy in a magnetic field –Electrodynamics before Maxwell-How Maxwell fixed Ampere's law– Maxwell's equations – 'Magnetic charge' –Maxwell's equations inside matter - -boundary conditions-Conservation laws-Charge and energy-The continuity equation – Poynting's theorem- Newton's third law in electrodynamics – Potential formulations of electrodynamics – Scalar & vector potentials-Gauge transformations-Coulomb Gauge and Lorenz Gauge .

(Chapter 7,8,10, Book 1)**add sections**

Unit 2: Electromagnetic Waves: **12Hrs**

Introduction –The wave equation in one dimension – Sinusoidal waves –Boundary conditions – Reflection and transmission – Polarization - Electromagnetic waves in vacuum- The wave equation for E & B –Monochromatic plane waves –Energy and momentum in electromagnetic waves –Propagation in linear media –Reflection and transmission at normal incidence. (Chapter 9, Book 1) **add sections**

Unit 3: **Network Theorems** **10Hrs**

DC Network theorems:-Kirchoff's laws –voltage and current sources-source conversion-superposition theorem- Maximum power transfer theorem- Reciprocal theorem- Thevenin's and Norton's theorems –equivalent circuits-star/delta ,delta/star transformations. (Book 2 , Chapters 2) **add sections**

Unit 4: **Transient Currents** **10Hrs**

Transients and ac circuits:- Charging and discharging of capacitor- time constants-ac through R,L and C-choke coil-skin effect-ac through LR, CR and LCR series and parallel circuits-Resonance-Power in ac circuits-Power factor (Book 2 , Chapters 5,11,13,14) **add sections**

Books for study:

1. Introduction to electrodynamics -David .J .Griffiths
2. A text book of Electrical Technology, Volume 1, 22nd Edn., B.L.Theraja & A.K.Theraja.

Books for Reference:

1. Feynman lectures on Physics VolumeII
2. Schaum's outline of Theory and Problems of Electromagnetism.

MARKS INCLUDING CHOICE

Unit	Marks
I	20
II	15
III	13
IV	12

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -60**
- **Maximum marks of the course-40**

CORE COURSE XIV: DISCIPLINE SPECIFIC ELECTIVE

COURSE CODE	COURSE TITLE
6B14 PHY(1)	PYTHON PROGRAMMING
6B14 PHY(2)	NANOSCIENCE
6B14 PHY(3)	MATERIAL SCIENCE
6B14 PHY(4)	COSMOLOGY
6B14 PHY(5)	PLASMA PHYSICS

6B14PHY(1).PYTHON PROGRAMMING

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B14PHY 1	2	2	3

COURSE OUTCOME

CO 1: Develop skills in creating program sketches of scientific problems

CO2:Develop basic skills in logical thinking and programming

CO3: To make real-life scientific problems easier on a computer with user interaction and graphics

Unit I: Introduction to Python Programming **12 hrs**

Introduction to Python language- Python interpreter -interactive and script modes-Variables and data types-Numbers, None, Sequences-string (create, access and manipulate string)-list (create, access and manipulate list

objects)-tuple-Mutable and immutable variables-Operators and Operands-arithmetic, relational, logical and assignment operators-Expressions and Statements-Precedence of operators-Input and Output-Comments in python- File input/output-*Programming exercises with applications in Physics*

Unit II: Functions in Python **6 hrs**

Functions- Parameters and Arguments-Modules (NumPy and Mathplotlib modules)-Use of Modules in Program (Import and From)-Python packages-Built-in and User defined functions- Composition of functions-Recursion-Vectorised functions- *Programming exercises with applications in Physics*

Unit III Conditional and Looping constructs in Python **5 hrs**

Control flow structure- if, elif and else-Nested condition- Looping Constructs- While and For loops- Nested loops-Break and Continue statements- *Programming exercises with applications in Physics*

Unit IV: Arrays and Matrices in Python **5 hrs**

Creating arrays and Matrices using functions Arrange, Linspace, Zeros, Ones, Reshape-Arithmetic operations-cross product- dot product - Matrix inversion-Saving and Restoring arrays - *Programming exercises with applications in Physics*

Unit V: Data visualization and Introduction to Numerical Methods **4 hrs**

Plotting functions- Plot, Show, Subplot, Polar and Pie functions-Plotting Sine function-Derivative of a function-*Programming exercises with applications in Physics*

Suggested Programming exercises (2 hours from each module; 10 hours):

Calculate the solar mass, Moment of inertia about center of mass (Sphere and Cylinder), Half-life period of a radioactive material, Calculate Rydberg's constant, Newton's law of gravitation, Heisenberg's uncertainty relation, Capacitor discharge in an RC circuit, Plot relativistic and classical momentum against velocity (velocity range 0c to 0.9c, where c is the velocity of light), Planck's law – plot 'Planck curves', Planetary motion - plot the actual orbits of the planet for three eccentricities, Projectile motion – plot x(t) and y(t) for different values of θ, Emission lines of hydrogen atom using Rydberg's formula (wavelengths), Derivative of Sine function.

Books for reference:

Any standard book can be used as reference. Use of GNU/Linux platforms may be encouraged.

1. Python for Informatics, Charles Severance
2. Core Python Programming, Wesley J Chun, Pearson Education
3. Python Essential Reference, David M. Beazley, Pearson Education
4. A Primer on scientific Programming with Python by Hans PetterLangtangen ; Springer

5. Python tutorial release 2.6.1 by Guido Van Rossum, Fred L Drake (http://www.altway.com/resources/python/tutorial.pdf)
6. How to Think Like a Computer Scientist: Learning with Python, Allen Downey , Jeffrey Elkner, Chris Meyers, http://www.greenteapress.com/thinkpython/thinkpython.pdf
7. Numerical Methods in Engineering and Science, Dr. B S Grewal, Khanna Publishers, New Delhi
8. Introductory methods of numerical analysis, S.S.Shastry , (Prentice Hall of India,1983)
9. Programming exercises with applications in physics - Morten Hjorth-Jense (https://www.uio.no/studier/emner/matnat/ifi/IN1900/h17/ressurser/physics_exer.pdf)

Note: *This course introduces programming in the high level language Python. Examples and exercises must be taken from natural science, and instructors must show how problems in physics can be solved by means of mathematics and programming. Instructors can select suitable exercises from the list provided to introduce the content of different modules.*

MARKS INCLUDING CHOICE:

Unit	**Marks**
I	18
II	10
III	10
IV	12
V	10

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)

Part C	**Problems**	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)
• **Total marks including choice -60** • **Maximum marks of the course-40**		

6B14PHY(2) NANOSCIENCE

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	**6B14PHY 2**	**2**	**2**	**3**

COURSE OUTCOME

CO 1: Understand the basic concepts of Nanoscience

CO2: Understand the properties of materials in the nano range

CO3: Identify different techniques for the production of nanomaterials

CO4: Understand characterization techniques & applications of nanomaterial.

Unit I-Nanoscience: Introduction **4hrs**

History of nanoscience- Definition of nanometer, nanomaterials and nanotechnology-classification of nanostructured materials with examples-increased surface area of nanoparticles (Book 1, Chapter 1)**add sections**

Unit II- Properties of materials in the nano-regime **9hrs**

Effect of size reduction on bulk materials- Optoelectronic property of bulk and nanostryuctures- relation between optical properties and electronic structure- electronic structure and Fermi surfaces-

electron –Phonon coupling- size effect on physical properties- Luminescence from nanoparticles-thermodynamics of nanoparticles (Book 1, Chapter 2) **add sections**

Unit III- Synthesis of Nanomaterials **6hrs**

hrsBottom Up approaches- Sol-gel technique- thin film growth-physical vapour deposition-chemical vapour deposition- top-down approaches-ball milling-lithography (Book 1, Chapter 4) **add sections**

Unit IV-Characterization of Nanomaterials **8hrs**

Scanning Electron Microscopy-Transmission Electron Microscopy-Scaning Probe Microscopy-Atomic force Microscopy (Book 1, Chapter 8) **add sections**

Unit V- Application of Nanotechnology **5hrs**

Applications in: Material Science- Biology and Medicine-Energy and Environment.Carbon Nanotechnology: Different carbon structures (fullerenes, Carbon nanotubes- Graphene- Graphite and Diamond) - Applications of different carbon structures (Book 1, Chapter 10) **add sections**

Books for Study:

1. Nanoscience and Nanotechnology: Fundamentals to Frontiers by M S Ramachandra Rao, Shubra Singh, Wiley India Pvt. Ltd.

Book for References:

1. T. Pradeep, "Nano: The Essentials", Tata-McGraw Hill Publishers 2007.
2. Introduction to Nanotechnology, Charles P. Poole, Jr. and Frank J. Owens, Wiley

Introduction to Nanoscience & Nanotechnology by K. K. Chattopadhyay and A. N.Banerjee, PHI L earning and Private Limited

MARKS INCLUDING CHOICE:

Unit	Marks
I	10
II	16
III	12
IV	12
V	10

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)

Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problems**	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)
• **Total marks including choice -60** • **Maximum marks of the course-40**		

6B14PHY(3) MATERIAL SCIENCE

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B14PHY (3)	2	2	3

COURSE OUTCOME

CO 1: Understand the basic concepts of material science

CO2: Understand the properties of materials

CO3: Identify different engineering materials & their properties

CO4: Understand the properties & characteristics of semiconducting, insulating &magnetic materials

Unit I -Materials Science: Introduction **3hrs**

Definition –Classification of Engineering materials- Levels of structure- Material Structure (Book 1, Chapter 1)sections

Unit II- Mechanical Properties of metals **4hrs**

Types of mechanical properties- Technological properties-Factors affecting mechanical properties (Book 2, sections 6.1-6.30)

Unit III-Engineering materials **14hrs**

Organic materials-types of organic materials-polymers- types of polymerization-strengthening mechanism of polymers-Plastics—Types of plastics-comparison between thermoplastics and thermosetting plastics-rubber-types of rubbers-vulcanization-composite materials-types of composite materials (in detail)-ceramics-classification of ceramics (in detail)

(Book 2, sections 14.1-14.14,14.22-14.31,15.1-15.3,)

Modern Engineering materials-Metallic Glasses-types of mewtallic glasses-Shape memory alloys-types of shape memory alloys-Application- Nonlinear materials (qualitative) (Book 1, Chapter 20)

Unit IV –Semiconductors, Insulators & magnetic material **11hrs**

Bonding ,classification of semiconductors-expression for conductivity-P-N junction-Applicton of voltage across P-N junction-flow of current & V –I Characteristic of a P-N junction.-semiconducting materials –semiconductor devices

Insulating materials-electric field-flux density-permittivity-dielectric polarization-polarization mechanisms-capacitor-dielectric properties-dielectric loss-dielectric strength-ferroelectric materiaks-hysterisis curve

Magnetic materials -Magnetic field-magnetic moment – Origin of magnetic moment-magnetic field strength- flux density-permeability-magnetization- susceptibility-classification of magnetism – magnetic hysteresis-eddy current loss ferrimagnetism- ferrites-classification of magnetic materials.

(Book 2, sections 18.1-18.28)

Books for Study:

1. Materials Science, S L Kakkani, Amit Kakkani, New Age International Publishers, Second Edition
2. Material Science, R S Kurumi, R S Sedha, S Chand & Company Fifth Edition

Book for References:

1. Materials Science and Engineering: An introduction, Wiiliam D Callister Jr., John Wiley and Sons,Inc.

MARKS INCLUDING CHOICE

Unit	Marks
I	6
II	10

III	24
IV	20

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -60**
- **Maximum marks of the course-40**

6B14PHY(4): COSMOLOGY

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	6B14PHY (4)	2	2	3

COURSE OUTCOME

CO 1: Understand history of cosmology at different era

CO2: Explain general theory of relativity and curvature of space

CO3: Understand cosmological principle and Friedmann model

CO4: Explain expansion of universe based on Hubbles law

Unit 1 **6Hrs**

A brief History-the universe in myth - the Greek-the renaissance-towards the modern era-cosmology today

8Hrs

Unit II

Einstein and all that-universal gravitation – the Einstein revolution- the equivalence principle – the generaltheory of relativity- the curvature of space- black holes and the universe

8Hrs.

Unit III

First principles- simplicity and symmetry- the cosmological principle- the Friedman models-the singular nature of gravity

10Hrs.

Unit IV

The expanding universe-Hubble's law -Doppler shift – Interpreting the- Hubble Law – the quest for H_o – the age of the universe-the big bang

Books for study

1. Cosmology – A Very Short Introduction by Peter Coles(Oxford University Press)

MARKS INCLUDING CHOICE

Unit	**Marks**
I	2
II	10
III	10
IV	8

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)

	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)
• **Total marks including choice -60** • **Maximum marks of the course-40**		

6B14PHY(5). PLASMA PHYSICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
VI	**6B14PHY(5)**	**2**	**2**	**3**

COURSE OUTCOME

CO 1: Define plasma and plasma parameters

CO2: Understand applications of plasma

CO3: Determine the behavior of plasma in various E and B Fields

CO4: Determine the nature of plasma as a fluid

Unit I **8Hrs**

Introduction

Definition of plasma –Concept of temperature-Debye shielding-the plasma parameter-Criteria for Plasma-Applications of Plasma Physics-M.H.D Energy Conversion and ion propulsion-solid state plasmas- Gas Lasers

Unit II **12Hrs**

Single Particle Motion

Introduction-Uniform E and B fields- gravitational field-non uniform B field- time varying E field-time varying B field- summary of guiding centre drifts-

Unit III **12Hrs**

Plasma as Fluids

Introduction-Relation of plasma physics to ordinary electromagnetics- the flequation of motion-the convective derivative-collisions-equation of continuity-equation of state- the complete set of fluid equations

Book for study

1. Introduction to Plasma Physics and Controlled Fusion by Francis F.Chen (3rd edition) -Springer

Books for reference

1. Plasma Physics by S.N.Sen
2. Plasma Physics –an Introduction by Richard Fitzpatrick

MARKS INCLUDING CHOICE

Unit	Marks
I	18
II	22
III	20

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6)
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(8 questions x Marks 2 each =16
	Answer any 6 questions	(6questions x Marks 2 each=12)
Part C	**Problem**s	(6 questions x Marks 3 each =18)
	Answer any 4 questions	(4 questions x Marks 3 each=12)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -60**
- **Maximum marks of the course-40**

CORE COURSE XV: Practical II General Physics II

semester	course code	hours per week	credit	Exam hrs
VI	**6B15PHY**	**4**	**4**	**3**

COURSE OUTCOME

CO1: Familiarise with apparatus for mechanical, electrical, magnetic and optical experiments.

CO2: Develop skill in setting up of apparatus for accurate measurement of physical quantities.

CO3: Understand multiple experimental techniques for determining physical quantities.

CO4: Develop skill in systematic way of measurements by minimising possible errors.

CO5: Develop skill to analyse by plotting graphs using software.

CO6: Develop skill for systematic trouble shooting.

CO7: Perform error analysis for experiments.

Note: A brief theoretical back ground of each experiment must be given to the students before each cycle of experiments and assess it. Students have to maintain a practical log book regularly signed by the teacher in charge and to be submitted at the time of University Examination. Fair record is not required. All the 20 experiments have to be performed.

Special Instructions

1. For plotting graphs of experiments mentioned, any software (excel, origin etc) must be used.
2. Error analysis should be done for the mentioned experiments.

LIST OF EXPERIMENTS

1. Spectrometer –i-d curve (Graph using software)
2. Spectrometer –i-i' curve (Graph using software)
3. Spectrometer-Cauchy's constants assuming wavelengths
4. Spectrometer –grating-normal incidence
5. Spectrometer –grating- minimum deviation
6. Air Wedge-Diameter of a thin wire
7. Newton's Rings- wavelength of sodium light
8. Laser-Slit width from diffraction pattern
9. Potentiometer- Calibration of ammeter (Graph using software)
10. Potentiometer-Calibration of High range voltmeter (Graph using software)
11. Potentiometer-Reduction factor of TG and B_0 (Error analysis is required)
12. Circular coil - Determination of m and B_0 (Error analysis is required)
13. Carey Fosters' Bridge-Temp-coefficient of resistance
14. Conversion of Galvanometer into voltmeter- calibration using potentiometer
15. Conversion of Galvanometer into ammeter- calibration using potentiometer
16. Verification of Thevenin's and Norton's theorem
17. Verification of Maximum Power Transfer Theorem
18. Mirror Galvanometer-Figure of Merit

19. Ballistic Galvanometer- absolute capacity of a capacitor

20. Ballistic Galvanometer- high Resistance by Leakage (Error analysis is required)

MARK DISTRIBUTION

Section	**Marks**
Formulae with theory	10
Performance	8
Observation	14
Calculation ,Graph,result etc	8

CORE COURSE XVI: PRACTICAL III ELECTRONICS

SEMESTER	**COURSE CODE**	**HOURS PER WEEK**	**CREDIT**	**EXAM HRS**
VI	**6B16PHY**	**4**	**4**	**3**

COURSE OUTCOME

CO1: Familiarise active and passive electronic components.

CO2: Familiarise multimeter, power supply, signal generator and cathode ray oscilloscope.

CO3: Develop skill in soldering and use of breadboard.

CO4: Develop skill in construction of rectifiers, voltage regulators, amplifiers and oscillators.

CO5: Observe, measure and analyse electrical signals.

CO6: Develop skill for trouble shooting circuits and components.

CO7: Develop skill to analyse by plotting graphs using software.

Note: A brief theoretical back ground of each experiment must be given to the students before each cycle of experiments and assess it. Students have to maintain a practical log book regularly signed by the teacher in charge and to be submitted at the time of University Examination. Fair record is not required. All the 20 experiments have to be performed. Students may refer the diode/transistor/IC data manual to get details of the components in all electronic experiments.

LIST OF EXPERIMENTS

1. Characteristics of a semiconductor diode
2. Half wave & Full wave (2 diodes) Rectifiers - Study of ripple factor with and without filter (by soldering)
3. Bridge Rectifier- Study of ripple factor with and without filter (by soldering)
4. Voltage multiplier circuit (by soldering)
5. Construction of a voltage regulator using Zener diode after finding Zener voltage (Line and Load regulations)
6. Common Emitter characteristics of BJT
7. Realization of logic gates using transistors (by soldering)
8. Common Emitter amplifier (single stage) - Gain and Frequency response (by soldering)
9. Power amplifier - Frequency response and band width
10. Feedback circuits - voltage series and current series
11. Verification of De Morgan's theorem using basic gates
12. Construction of a Single transistor voltage regulator (Line and Load regulations)
13. Multi vibrator (astable) using Transistors
14. Half and full adders using NAND gates – Construction and verification
15. Hartley Oscillator using Transistor (by soldering)
16. Phase Shift Oscillator using Transistor
17. Inverting amplifier, Non-inverting amplifier and voltage follower using Op-amp
18. Differentiator and Integrator using Op-amp
19. Wien Bridge Oscillator using Op-amp
20. Multi vibrator (astable) using Op-amp

References:

1. Electronics Lab Manual by Dr. K A Navas (Rajath Publishers, Vol. I)

2. Advanced Practical Physics by S P Singh (Pragati Prakashan Meerut, Vol. II)

3. A text book of Advanced Practical Physics by Samir Kumar Ghosh (New Central Book Agency)

4. Core Course Practical Physics by C J Babu & K Vijayalakshmi (Calicut University Central Co-Operative Stores).

5. Core course Experimental Physics by Dr. P Sethumadhavan & Dr. A K Anila (Manjusha publication)

MARK DISTRIBUTION

Sections	**Marks**
I Principle	8
Performance	12
Observation	12
I Calculation ,Graph ,Result etc	8

PART B:

PHYSICS COMPLEMENTARY ELECTIVE COURSES

[FOR BSc PROGRAMMES]

WORK AND CREDIT DISTRIBUTION

(2019 ADMISSION ONWARDS)

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HOURS
1C01PHY	MECHANICS	I	2	2	3
2C02PHY	ELECTRICITY, MAGNETISM AND THERMODYNAMICS	II	2	2	3
3C03PHY	OPTICS AND PHOTONICS	III	3	3	3
4C04PHY	ELECTRONICS AND MODERN PHYSICS	IV	3	3	3
4C05PHY	PHYSICS PRACTICAL	IV	2	2	3

EVALUATION

ASSESSMENT	WEIGHTAGE
EXTERNAL	80%
INTERNAL	20%

INTERNAL ASSESSMENT THEORY

COMPONENT*	WEIGHTAGE**	REMARKS
COMPONENT 1 Test paper	60%	
COMPONENT 2 Open book problem solving/Seminar/Viva	40%	

CONTINUOUS INTERNAL ASSESSMENT PRACTICAL

COMPONENT*	WEIGHTAGE**	REMARKS
COMPONENT 1 Lab Skill	25%	
COMPONENT 2 Punctuality	25%	

COMPONENT 3 Record	25%	
COMPONENT 3 TEST PAPER	25%	

COMPLEMENTARY ELECTIVE COURSE I: -MECHANICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
I	ICO1PHY	2	2	3

COURSE OUTCOME

CO 1: Understand the basic concepts of Properties of matter

CO2: Explain the dynamics of rigid bodies.

CO3: Understand the basic concepts of wave motion and oscillations

Unit I: Properties of matter: 14 Hours

Elasticity: Hooke's law, moduli of elasticity Poisson ratio, Twisting Couple on a cylindrical

rod Torsional Oscillations, Bending of BeamsBending Moment, Cantilever, Transverse vibration s of aloaded cantilever, Uniform and Nonuniform Bending, Determination of Young modulus using uniform bending – mirror and telescope method

Viscosity: Viscocity , Critical velocity, Flow of liquid through a capillary tube , Poiseulle's fo rmula , Stokes formula.

Surface tension: Surface energy - expression for excess pressure on a curved surface – Capillary action – Explanation of capillary action - Measurement of surface tension by capillary tube method

Unit II: Dynamics of Rigid Bodies: - **7Hrs**

Rigid body , Centre of mass , Angular momentum and Torque, Moment of inertia , Radi us of gyration, Theorems on moment of Inertia, Moment of inertia of thin Rod, Circular Disc, Annular Ring, Cylinder (solid and hollow) and Sphere (solid). Moment of inertia of fly wheel

Unit III: Oscillation and waves 15 Hrs

Harmonic Oscillator : Periodic motion, Simple harmonic oscillator Energy of Simple harmonic oscillator, Compound Pendulum , Torsion pendulum, Damping force , Damped Harmonic oscillator , Quality factor, Galvanometer with low damping , LCR circuit

Wave Motion : General equation of wave motion, Plane progressive harmonic wave, Energy density and Energy flow/current for plane progressive wave, Transverse waves in stretched strings, Longitudinal waves in rods and gases, Stationary waves, Waves in a linear bounded medium , Flow of energy in stationary waves.

Books for study:

1. Mechanics – J.C. Updhyaya

2. Mechanics - D.S.Mathur

Books for reference:

1. Feynman lectures on Physics by Richard Feynman

2. Fundamentals of Physics by Resnick & Haliday

MARKS INCLUDING CHOICE:

Unit	**Marks**
I	20
II	10
III	22

PATTERN OF QUESTIONS

Part A	**Short answer**	(5 questions x Mark 1 = 5**)**
	Answer all questions	(5 questions x Mark 1 = 5)
Part B	**Short Essay**	(6 questions x Marks 2 each =12)
	Answer any 6 questions	(4questions x Marks 2 each=8)

Part C	**Problems**	(5questions x Marks 3 each =15
	Answer any 4 questions	(3questions x Marks 3 each=9)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)
• **Total marks including choice -52** • **Maximum marks of the course-32**		

COMPLEMENTARY ELECTIVE COURSE II: ELECTRICITY, MAGNETISM AND THERMODYNAMICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
II	2CO2PHY	2	2	3

COURSE OUTCOME

CO 1: Understand the basic concepts of electromagnetism

CO2: Explain the magnetic effects of electric currents

CO3: Understand the basic principles of Thermodynamics

Unit I : Magnetism and Electricity **12 Hrs**

Magnetism: Earths magnetism, magnetic elements, Dia magnets, paramagnets and Ferr magnets ,magnetic moment, deflection magnetometerTan A , Tan B and Tan C , Searle's vibration ma gnetometer, Box type vibration magnetometer, Tangent galvanometer.

Electricity : Carey Foster bridge-theory, determination of resistance, resistivity and temperature coefficient, Potentiometer theory, Calibration of Ammeter, Calibration of Voltmeter (low &Hi gh Range) conversion of galvanometer into ammeter and voltmeter.

Unit II: Magnetic effect of electric current **10 Hrs**

BiotSavart law, Magnetic induction at a point due to a straight conductor carrying current, Magnetic in duction at a point on the axis of a circular coil, Lorentz force, Force on a current carrying conductor, Torque on a current loop in a uniform magnetic field, Theory and working of moving coil B allistic Galvanometer, figure of merit of B.G and its determination.

Unit III: Thermodynamics **14 Hrs**

Thermodynamic systems, Thermodynamic equilibrium, Thermodynamic processes , Isothermal process, Adiabatic process, Zeroth law thermodynamics, First Law of thermodynamics, Applications of first law - Specific heat of gas , Isothermal and Adiabatic elasticity, Second law of thermodynamics, Carnot's engine , Derivation of efficiency using Carnot's cycle , Carnot's theorem , Refrigerator, Coefficient of performance , Concept of entropy, Change of entropy in reversible and ir reversible cycles, Principle of increase of entropy, Entropy and disorder.

Books for study:

1. Electricity and Magnetism (2008th edition)-R.Murugeshan

2 Heat and Thermodynamics (16th edition) by Brijlal and Subramanian

Books for reference:

1. Electricity and Magnetism-D.N .Vasudeva

2. Heat and Thermodynamics-D.S.Mathur.

3. Introduction to electrodynamics -David .J .Griffiths

4. Heat & Thermodynamics: W.Zemansky, McGraw Hill

MARKS INCLUDING CHOICE:

Unit	Marks
I	20
II	14
III	18

PATTERN OF QUESTIONS

Part A	**Short answer**	(5 questions x Mark 1 = 5**)**
	Answer all questions	(5 questions x Mark 1 = 5)
Part B	**Short Essay**	(6 questions x Marks 2 each =12)
	Answer any 6 questions	(4questions x Marks 2 each=8)
Part C	**Problem**s	(5questions x Marks 3 each =15
	Answer any 4 questions	(3questions x Marks 3 each=9)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -52**
- **Maximum marks of the course-32**

COMPLEMENTARY ELECTIVE COURSE III: OPTICS AND PHOTONICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
III	**3C03PHY**	**3**	**3**	**3**

COURSE OUTCOME

CO 1: Understand the basic concepts of Interference

CO2: Understand the basic concepts of Diffraction

CO3: Understand the basic concepts of Polarization

CO4: Understand the basic concepts of Photonics and Fibre Optics

Unit I: Interference **13 Hrs**

Interference of light, principle of superposition, Conditions for maximum and minimum intensit ies,Coherent sources, Theory of interference fringes, Colours of thin film,.interferencedue to reflected light, Interference due to transmitted light, Fringes produced by a wedge shaped thin film, Newton's Rings by reflected light, Determination of wave length of sodium light and Refractive index of a transparent liquid by Newton's rings.

Unit II: Diffraction **13 Hrs**

Fresnel and Fraunhofer diffraction - Fresnel's Explanation of Rectilinear Propagation of light- Zoneplate, Diffraction at a straight edge, Fraunhofer Diffraction at a single slit, Plane Transmi ssion,Diffraction Grating, Dispersive power of a Grating, Determination of wavelength of light using Transmission Grating. Comparison between interference and Diffraction

Unit III: Polarization **10 Hrs**

Introduction, Polarized and Unpolarized light, Plane of vibration and Plane of polarization, Polarization by reflectionBrewster's law, Polarization by refraction, Pile of plates, Law of Malus,Double refraction, Uniaxial and Biaxial crystals , Positive and Negative crystals, Huygens expl anation of double refraction in uniaxial crystals, Nicol prism, Plane, Elliptically and Circularly polariz ed light, Half wave and Quarter wave plates.

Unit IV: Photonics **18 Hrs**

Laser: Absorption and emission of light, Induced absorption, Spontaneous emission and Stimulated emission, Einstein's relations , Principle of Laser, Meta stable state, Population inversion, Pumping, Pumping methods – Optical pumping, Electrical pumping and Direct conversion, Types of laser - Ruby laser, Helium Neon laser and Semi conductor laser, Properties of laser beams, Applications of lasers-

Holography (principle, recording and reconstruction)

Fibre Optics: Total internal reflection, Step index fibre, Graded index fibre, Light propagation in

Opticalfibres, Acceptance angle, Numerical Aperture, Applications,Fibre optic Communication syste m, Advantages of Optical fibres.

Books for study:

1. Optics by Subramanayam, Brijlal, MN Avadhanalu, S.Chand
2. An introduction to lasers theory and applications. MN Avadhanulu.S.Chand

Books for reference:

1. Optics and Spectroscopy –R.Murugeshan (S Chand &Company)
2. Modern Physics –R. Murugeshan (S.Chand & Company)
3. Optics- Ajay Ghatak
4. Laser fundamentals – Silfast

MARKS INCLUDING CHOICE:

Unit	Marks
I	12
II	12
III	10
IV	18

PATTERN OF QUESTIONS

Part A	**Short answer**	(5 questions x Mark 1 = 5**)**
	Answer all questions	(5 questions x Mark 1 = 5)
Part B	**Short Essay**	(6 questions x Marks 2 each =12)
	Answer any 6 questions	(4questions x Marks 2 each=8)
Part C	**Problem**s	(5questions x Marks 3 each =15
	Answer any 4 questions	(3questions x Marks 3 each=9)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)

- **Total marks including choice -52**
- **Maximum marks of the course-32**

COMPLEMENTARY ELECTIVE COURSE IV: ELECTRONICS AND MODERN PHYSICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
IV	**4C04PHY**	**3**	**3**	**3**

COURSE OUTCOME

CO 1: Understand the basic concepts of Basic electronics

CO2: Understand the basic concepts of Digital electronics

CO3: Understand the basic concepts of Nuclear Physics

CO4: Understand the basic concepts of Particle physics and Astrophysics

UnitI : Basic Electronics **16 Hrs**

Semiconductors, doping, band structure, PN junction diode , Currentvoltage characteristics of adiode Forward and Reverse bias, Half wave, Full wave and bridge rectifier circuits, Efficiency and ripple factor, Filter circuits,capacitor filter and π filters, Zener diode and its characteristics, Voltage stabilization, Transistors CB, CE, CC Configurations, Characteristics, Current amplification factors,Relation connecting α, β and γ , CE Amplifier, Frequency response, Band width, Basic principle of feedback- L C oscillator Colpit's oscillators and Hartley oscillators.

Unit II: Digital Electronics **12 Hrs**

Different number systems – Decimal, binary, Octal, Hexadecimal number systems- Conversion between different number systems- Binary arithmetic - Addition, Subtraction, Subtraction with 2's complement and 1's complement- BCD code, ASCII code, Basic theorems of Boolean algebra de Morgan's theorems, Logic gates AND, OR, NOT and XOR, Universal gates NAND, NOR - logic symbol and Truth table , Half adder and Full adder

Unit III : Nuclear Physics **10 Hrs**

Nucleus and its properties Size, Mass, Charge, Density, Mass defect, Binding energy, Packi ngfraction , Nuclear force, Stability of nucleus, Radioactivity , Law of radioactive decay , Half life, Meanlife, Radioactivity units, Radioactive series, Radioactive dating Carbon dating, Artifici alradioactivity, Nuclear fission, Nuclear reactors, Effects of radiation, Nuclear waste dispos al, Nuclear fusion, Energy production in stars

Unit IV: Particle physics and Astrophysics **10 Hrs**

Particle Physics: Introduction Particles and Antiparticles, Fundamental interaction, Classification of elementary particles, Elementary particle quantum number, Idea of Quarks, The quark mode l,Compositions of hadrons according to quark model.

Astrophysics : Introduction, Classification of stars The Harvard classification system, Hertzpr ung Russel diagram, Luminosity of a star, Stellar Evolution, Chandrasekhar limit, White dwarfs, Neu tron stars, Black Holes , Supernova Explosion.

Books for study:

1 Principles of Electronics-VK Mehta

2 Basic Electronics – Solid state – B..L. Thereja

3 Modern Physics – R .Murugeshan and Kiruthiga Siva Prasath

Books for reference:

1 Electronic Devices and Circuits- 5th Edition, David A Bell (Oxford)

2 Digital Principles and Applications - D P Leach and A P Malvino (TMH)

3 Concepts of Modern Physics, Arthur Beiser, TMH

MARKS INCLUDING CHOICE:

Unit	Marks
I	16
II	10
III	14
IV	12

PATTERN OF QUESTIONS

Part A	**Short answer**	(5 questions x Mark 1 = 5**)**
	Answer all questions	(5 questions x Mark 1 = 5)
Part B	**Short Essay**	(6 questions x Marks 2 each =12)
	Answer any 6 questions	(4questions x Marks 2 each=8)
Part C	**Problem**s	(5questions x Marks 3 each =15
	Answer any 4 questions	(3questions x Marks 3 each=9)
Part D	**Long Essay**	(4 questions x Marks 5 each =20)
	Answer any 2 questions	(2 questions x Marks 5 each=10)
• **Total marks including choice -52** • **Maximum marks of the course-32**		

COMPLEMENTARY COURSE V – PHYSICS PRACTICAL

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HOURS
4C05PHY	PHYSICS PRACTICAL	IV	2	2	3

COURSE OUTCOME

CO1: Familiarise with apparatus for experiments in mechanics, optics, electricity and

magnetism and electronics and electronics experiments.

CO2: Develop skill in setting up of apparatus for accurate measurement of physical quantities.

CO3: Understand multiple experimental techniques for determining physical quantities.

CO4: Develop skill in systematic way of measurements by minimizing possible errors.

Note: A brief theoretical back ground of each experiment must be given to the students before each cycle of experiments . Students are to maintain a practical log book regularly signed by the teacher in charge. Fair record not required. All the experiments are to be done.

LIST OF EXPERIMENTS

1. Flywheel- Moment of inertia
2. Compound pendulum-determination of g and K
3. Torsion pendulum- Moment of inertia of a disc
4. Young's modulus - Uniform Bending - using optic lever
5. Young's modulus – Non-uniform bending - using pin and microscope
6. Liquid lens - Refractive Index of material of lens using liquid of known refractive index
7. Spectrometer – Refractive index of the material of a prism
8. Spectrometer – grating-normal incidence
9. Surface tension-Determination of surface tension of given liquid
10. Air Wedge-Diameter of a thin wire
11. Newton's Rings- wavelength of sodium light
12. Deflection Magnetometer –Tan A and Tan B
13. Searle's Vibration magnetometer- magnetic moment
14. Carey Fosters Bridge- resistivity
15. Potentiometer- resistance & resistivity
16. Potentiometer- Calibration of ammeter
17. Newton's law of cooling- Specific heat capacity of given liquid
18. Construction of half wave rectifier with and without filter - ripple factor and load regulation
19. Construction of regulated power supply using Zener diode
20. Construction of Logic gates – AND, OR, NOT- verification of truth table

MARK DISTRIBUTION

Section	**Marks**
Principle and formula	6
Performance	6
Observation	14
Calculation ,Graph & Result	6

PART C:

GENERIC ELECTIVE COURSES
WORK AND CREDIT DISTRIBUTION
(2019 ADMISSION ONWARDS)

Each department shall offer a pool of five generic elective courses **at a time and transaction through guidance mode**. Students of other departments can choose **any one of the generic elective courses**

from the pool of five courses. All departments (whether it is a core department or complementary department can offer the course in semester V)

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HOURS
5D 01 PHY	**INTRODUCTION TO CLIMATE AND CLIMATE CHANGE SCIENCE**	**V**	2	2	2
5D 02 PHY	**RENEWABLE ENERGYSOURCES**	**V**	2	2	2
5D 03 PHY	**BIOPHYSICS**	**V**	2	2	2
5D 04 PHY	**JOY OF STAR WATCHING**	**V**	2	2	2
5D 05 PHY	**ELECTRICITY IN DAILY LIFE**	**V**	2	2	2
5D 06 PHY	**INTRODUCTION TO BASIC ELECTRONICS**	**V**	2	2	2

EVALUATION

ASSESSMENT	WEIGHTAGE
EXTERNAL	4
INTERNAL	1

INTERNAL ASSESSMENT

COMPONENT *	WEIGHTAGE**	REMARKS
COMPONENT 1 TEST PAPER	70%	
COMPONENT 2 ASSIGNMENT/VIVA	30%	

5D01PHY: INTRODUCTION TO CLIMATE AND CLIMATE CHANGE SCIENCE

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	**5 D 01 PHY**	**2**	**2**	**2**

COURSE OUTCOME

CO1: Understand the basic concepts of climate change science

CO2: Understand some of the potentially serious consequences of climate change

CO3: Analyse linkages between climate change adaptation and development planning.

CO4: Describe relevant policy approaches and strategic frameworks for climate change mitigation

CO5: Identify international initiatives which support countries to plan for climate change

Unit 1: The basics of climate change science. 8Hrs

An overview of key concepts such as weather, climate, and concept of energy balance; the greenhouse gas effect, and their main sources -the circulation in the atmosphere and ocean, and human contribution to climate change - some of the main observed changes in the climate since the industrial revolution- projected future trends and impacts of climate change on surface temperature, precipitation, ocean pH, sea-level and Arctic sea-ice extent. - overview of main sources of scientific climate information, relevant programmes and institutions.

Unit2: An overview of some of the potential consequences of climate change 5Hrs

sea level rise- flood, drought, extreme weather events and disruption of the global food supply that could have major negative impacts on humanity- the uncertainties in how the future may unfold, the important concept of risk as a means of dealing with uncertainty, and the different levels of risk associated with different consequences.

Unit 3: Climate Change Adaptation 7Hrs

key definitions and some of the expected consequences of climate change on key sectors.-framework for assessing climate vulnerability. -different adaptation measures that can be implemented for various vulnerable sectors- a short introduction to linkages between climate change adaptation and development- important international adaptation initiatives and programmes.

Unit 4: Climate Change Mitigation 5hrs

Key definitions of mitigation and an overview of emissions levels and mitigation targets per country.- ways to integrate mitigation into development planning, through low-emission development strategies. -the main economic sectors where mitigation actions can be applied.-some of the key international mechanisms created to assist countries in planning and implementing mitigation actions.

Unit 5: Planning for Climate Change 7Hrs

overview of different dimensions and entry points for climate change planning.- the roles of national and sectoral, as well as sub-national institutions in climate change planning- five-step methodology for

preparing a low-emission climate- resilient development strategy- some of the main international initiatives to support climate change planning.

References:

1. An Introduction to Atmospheric Physics : D.G. Andrews
2. Descriptive Physical Oceanography : G Dietrich
3. The Physics of Atmospheres : John Houghton
4. The Discovery of Global Warming : Spencer R Weart
5. Storms Of My Grandchildren : James Hansen
6. Evaluating Climate Change Action for SustainableDevelopment: Juha I. Uitto, JyotsnaPuri, Rob D. van den Berg

MARKS INCLUDING CHOICE:

Unit	Marks
I	8
II	4
III	6
IV	4
V	8

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6**)**
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(6 questions x Marks 2 each =12)
	Answer any 6 questions	(4questions x Marks 2 each=8)
Part C	**Essay**	(2questions x Marks 6 each =12
	Answer any 4 questions	(1question x Marks 6 each=6)
• **Total marks including choice -30** • **Maximum marks of the course-20**		

5D02 PHY RENEWABLE ENERGY SOURCES

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	**5 D 02 PHY**	**2**	**2**	**2**

COURSE OUTCOME

CO 1: Understand the sources of renewable energy

CO2: Understand the solar energy measurements & its applications

CO3: Understand the wind energy production &applications

CO4: Identify the energy from biomass, geothermal & ocean

Unit I Introduction **2hrs**

Renewable energy sources- prospects of renewable energy sources

[Book I 1.1,1.5,1.6]

Unit II Solar energy **12hrs**

Solar constant –solar radiation measurements- physical principles of conversion of solar radiation in to heat-solar energy storage system-solar pond-solar water heating-solar thermal electric conversion-solar photo voltaic-solar distillation-solar pumping-solar furnace-solar cooking-solar green houses-solar production of hydrogen

[Book I 2.2,2.5,3.2,4.2,4.3,5.2,5.5,5.8-5.13] 1

Unit III Wind energy **10hrs**

Introduction-basic principles of wind energy conversion-site selection considerations-Basic component of WEC energy conversion systems-Classification of WEC systems-wind energy collectors –energy storage & application of wind energy

[Book I 6.1-6.2,6.4,6.5-6.6,6.8.6.12-6.13]

Unit IV Biomass energy ,geothermal energy &energy from occeans **8hrs**

Biomass conversion technologies-photosynthesis& biogas generation.-geothermal energy-geothermal sources-hydrotheralgeopressured resources-operational &environmental problems-geothermal energy in india-occean thermal energy conversion

[Book I 7.1-7.4,8.1,8.4-8.6,8.17-8.18,9.1-9.2]

Books for Study:

1.Non-conventional energy resources-G D Rai

Books for Reference:

1.Solar energy fundamentals & application-H.PGarg

2. Solar energy-G D Rai

MARKS INCLUDING CHOICE:

Unit	Marks
I	2
II	14
III	8
IV	6

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6**)**
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(6 questions x Marks 2 each =12)
	Answer any 6 questions	(4questions x Marks 2 each=8)
Part C	**Essay**	(2questions x Marks 6 each =12
	Answer any 4 questions	(1question x Marks 6 each=6)

- **Total marks including choice -30**
- **Maximum marks of the course-20**

5 D 03 PHY: BIOPHYSICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
V	**5 D 03 PHY**	**2**	**2**	**2**

COURSE OUTCOME

CO1: Understand the application of Physics in Biology and Medical fields

CO2: Understand the principles behind the movement of snakes, swimming of fishes and flying of birds

CO3: Understand about bioelectricity

CO4: Understand the principles behind EEG and ECG

CO5: Understand the sources of radiation and effects of radiation

CO6: Understand the basic principles of radiation protection and apply it in daily life.

Unit1 Bio-mechanics **12 Hrs**

Types of muscles- striated, cardiac, tonic muscles, properties of muscles-Excitability –conductibility-contractibility – extensibility – tonicity – structure of striated muscles – Newton's laws – centre of mass – Bio-mechanical analysis of movements of snakes –swimming of fishes – aerodynamic basis of flights (Book-1 Chapter 12)

Unit II Bio – medical instrumentation **8 Hrs**,

Electrical Methods to study the brain activity- Electroencephalography (EEG) - Electrocardiography (ECG) (Book 2 Chapter 4))

Unit III Radiological Health and Safety **12 Hrs,**

Sources of Radiation – Natural Background exposure – Medical exposures – Consumer products – Occupational exposure – Biological effects of radiation – Deterministic Effects – Stochastic effects – Acute radiation syndrome – Radiation risk- Principles of radiation protection – Effect of time ,distance and shielding (Book 4 Chapter 13)

Books for study

1 Introduction to Bio-Physics by Pranab Kumar Banerjee (S Chand)

2 Medical Bio- Physics by R N Roy – (Books and allied (P) Ltd)

3 The Physics of Radiology and Imaging – K Thayalan (JAYPEE Jaypee Brothers Medical Publishers (P) Ltd

MARKS INCLUDING CHOICE:

Unit	Marks
I	10

II	9
II	11

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6**)**
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(6 questions x Marks 2 each =12)
	Answer any 6 questions	(4questions x Marks 2 each=8)
Part C	**Essay**	(2questions x Marks 6 each =12
	Answer any 4 questions	(1question x Marks 6 each=6)

- **Total marks including choice -30**
- **Maximum marks of the course-20**

5 D 04 PHY: JOY OF STAR WATCHING

SEMESTER	COURSE CODE	HOURS	CREDIT	EXAM

		PER WEEK		HRS
V	5 D 04 PHY	2	2	2

COURSE OUTCOME

CO 1: Understand Our Universe and its origin

CO2: Understand simple constellations

CO3: Explain the stars in Kerala culture

CO4: Understand the techniques of star watching

Unit I: **12 Hrs**

Astrophysics The study of the Universe - Problems and prospects. The Universe - its origin-_Galaxies__Milkyway. A star is born. The death of a star. The comets–The pole star (Book 1

Unit II: **2 Hrs**

The constellations Orion- Canis major-Taurus—Leo-(Book 2)

Unit III **10Hrs**

Stars in Kerala culture The origin and expansion of Astrology -Stars and constellations in Kerala culture-

Unit IV:

Star watching How to experience star watching — For a better view (Book 2) **8 Hrs**

Books for study:

1. The Great Universe- G.K.Sasidharan- S.Chand
2. Joy of star watching – BimanBasu- National Book Trust , India.

Book for reference:

1. Jyothishavum Jyothisasthravum- K. Pappootty-K.S.S.P

MARKS INCLUDING CHOICE:

Unit	Marks
I	8
II	5
III	8
IV	9

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6**)**
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(6 questions x Marks 2 each =12)
	Answer any 6 questions	(4questions x Marks 2 each=8)
Part C	**Essay**	(2questions x Marks 6 each =12
	Answer any 4 questions	(1question x Marks 6 each=6)

- **Total marks including choice -30**
- **Maximum marks of the course-20**

5 D05PHY : ELECTRICITY IN DAILY LIFE

SEMESTER	COURSE CODE	HOURS	CREDIT	EXAM

		PER WEEK		HRS
V	5 D05PHY	2	2	2

COURSE OUTCOME

CO 1: Understand the sources of Electricity

CO2: Explain the production of Electricity

CO3: Understand the basic concepts of electricity auditing

Unit I **12Hrs**

What is Electricity -Different sources of electricity- non conventional and conventional sources

Unit II **12Hrs**

Methods to produce electricity - How electricity is generated and transmitted-
Uses and misuses of electricity -Methods of electricity conservations-How to save electricity

Unit III **8Hrs**

Electricity Auditing

Books for reference

Hand books on Electricity conservation and Electricity auditing by EMC of Govt of Kerala

MARKS INCLUDING CHOICE:

Unit	Marks
I	10
II	10
III	10

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6**)**
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(6 questions x Marks 2 each =12)
	Answer any 6 questions	(4questions x Marks 2 each=8)
Part C	**Essay**	(2questions x Marks 6 each =12
	Answer any 4 questions	(1question x Marks 6 each=6)

- **Total marks including choice -30**
- **Maximum marks of the course-20**

5 D06PHY : INTRODUCTION TO BASIC ELECTRONICS

SEMESTER	COURSE CODE	HOURS	CREDIT	EXAM

		PER WEEK		HRS
V	5 D06PHY	2	2	2

CO 1: Understand the concepts of Basic electronics.

CO2: Explain the Semiconductor diode

CO3: Understand the basic electronic measurements and the instruments.

Unit I: Introduction to Electronics & Passive components 12 Hrs.

Evolution and impact of electronics, Passive components, Resistors – specifications, colour coding, preferred values, types; Capacitors – action, specifications, colour coding, reactance and q factor, classification; Inductors - self inductance and mutual inductance, specifications, reactance and q factor, comparison of inductors and capacitors, classification; Transformers - transformer efficiency, classification; Electromechanical components.

(Book 1, Chapters 0 & 1)

Unit II: Semiconductor Diodes 10 Hrs.

Energy band diagram, Intrinsic semiconductors, Extrinsic semiconductors, PN junction diode, Breakdown diodes, Varactor diode, Photodiode, Light dependent resistor, Solar cell, Light emitting diode.

(Book 1, Chapter 2)

Unit III: Electronic Measurements and Measuring Instruments 10 Hrs.

Generalized measurement system, Performance and parameters of instruments, Principle of permanent magnet moving coil meter, Galvanometer as ammeter, voltmeter and ohmmeter, Multimeter, Electronic multimeters, Testing of electronic components.

(Book 1, Chapter 6)

Books for Study:

1. Introduction to Electronics Engineering - 5th Edition, Dr. K. Gopakumar (Phasor Books)

Books for Reference:

1. Principles of Electronics - V K Mehta (S Chand & Co.)
2. Basic Electronics – B L Theraja (S Chand & Co.)
3. Basic Electronics – J B Gupta (S K Kataria & Sons)

MARKS INCLUDING CHOICE

Unit	Marks
I	12
II	9
III	9

PATTERN OF QUESTIONS

Part A	**Short answer**	(6 questions x Mark 1 = 6**)**
	Answer all questions	(6 questions x Mark 1 = 6)
Part B	**Short Essay**	(6 questions x Marks 2 each =12)
	Answer any 6 questions	(4questions x Marks 2 each=8)
Part C	**Essay**	(2questions x Marks 6 each =12
	Answer any 4 questions	(1question x Marks 6 each=6)

- **Total marks including choice -30**
- **Maximum marks of the course-20**