DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

(Affiliated to Adikavi Nannaya University)

Accredited by NAAC at 'A^{+}' Grade

For 2024-2027 Batch [w.e.f. 2023-2024 (Revised in May 2023)]

I B.Sc. SEMESTER – I

MULTIDISCIPLINARY COURSE SYLLABUS

PRINCIPLES OF PHYSICAL SCIENCES

Credits: 2 **2hrs/week**

UNIT 1: INTRODUCTION TO PHYSICS

Nature of Physics: Overview of physics as a discipline, its scope, and its relationship to other sciences. Scientific Method in Physics: Introduction to the scientific method and its application in the study of physics. Measurement and Units: Understanding the principles of measurement, SI units, and the importance of accurate and precise measurements. Scalars and Vectors: Differentiating between scalars and vectors, understanding vector addition and subtraction.

UNIT 2: MECHANICS FOR ARTS STUDENTS

Motion and Forces: Introduction to the principles of motion, including velocity, acceleration, and thelaws of motion. Energy and Work: Understanding the concept of energy, different forms of energy, and the relationship between work and energy. Circular Motion: Exploring the principles of circular motion, centripetal force, and applications in real-world scenarios. Gravity: Introduction to the concept of gravity, Newton's law of universal gravitation, and its implications.

UNIT 3: WAVES AND OPTICS FOR ARTS STUDENTS

Waves: Understanding the properties and characteristics of waves, including wave types, wave motion, and wave interference. Sound Waves: Exploring the nature of sound waves, including properties of sound, sound propagation, and the Doppler Effect. Light and Optics: Introduction to the behavior of light, reflection, refraction, and the formation of images by mirrors and lenses. Wave Optics: Understanding the principles of interference, diffraction, and polarization of light waves.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

1."Principles of Physics" by David Halliday, Robert Resnick, and Jearl Walker: This textbook covers the fundamental principles of physics, including mechanics, electromagnetism, thermodynamics, andmodern physics. It provides a comprehensive introduction to the subject and includes numerous examples and exercises for practice.

2. "University Physics" by Hugh D. Young and Roger A. Freedman: This textbook is widely used in university-level physics courses. It covers a wide range of topics in classical physics, modern physics, and thermodynamics. It is known for its clear explanations and problem-solving approach.

3. "Concepts of Modern Physics" by Arthur Beiser: This book provides an introduction to the principles and concepts of modern physics, including quantum mechanics, atomic and nuclear physics, and relativity. It is suitable for students with a basic background in physics and mathematics.

4. "The Feynman Lectures on Physics" by Richard P. Feynman, Robert B. Leighton, and Matthew Sands: This three-volume set is based on the famous lectures given by physicist Richard Feynman. It covers a wide range of topics in physics, including mechanics, electromagnetism, quantum mechanics, and statistical mechanics. The lectures are known for their engaging style and intuitive explanations.

5. "Physical Science" by Bill Tillery: This textbook provides a comprehensive introduction to the principles of physical science, covering topics such as motion, forces, energy, waves, electricity, and magnetism. It is designed for introductory-level courses and includes numerous examples, illustrations, and practice problems.

6. "Fundamentals of Physics" by Jearl Walker, David Halliday, and Robert Resnick: This textbook iswidely used in physics courses and covers the fundamental principles of classical physics. It includesa strong emphasis on problem-solving and conceptual understanding.

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SEMESTER – 1I
PRINCIPLES OF PHYSICAL SCIENCES

Chapter / Unit	**Section A** (**5** marks)	**Section – B** (**10** marks)
UNIT-I Introduction to Physics	**2**	**2**
UNIT-II Mechanics for Arts Students	**2**	**2**
UNIT-III Waves and Optics for Arts Students	**2**	**2**

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B.Sc. (HONOURS) PHYSICS SINGLE MAJOR

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I B.Sc. SEMESTER – I

MULTIDISCIPLINARY COURSE

PRINCIPLES OF PHYSICAL SCIENCES

MODEL QUESTION PAPER

Time: **2 Hrs**. Max. Marks: **50M**

Answer any **THREE** questions. **3 x 10 = 30 M**

SECTION –I

01. Explain the scope of physics.
02. Explain S I system?
03. Explain Newton's Law of motion.
04. Explain different forms of energy.
05. Explain the interference of light

SECTION – II

Answer any **FOUR** questions. **4 x 5 = 20 M**

06. What are fundamental and derived quantities?
07. What are the properties of vector addition?
08. Explain Work-energy theorem
09. What is torque and give some examples.
10. Explain transverse wave?
11. Explain refraction of light?

DEPARTMENT OF PHYSICS

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For 2024-2027 Batch [w.e.f. 2023-2024 (Revised in May 2023)]

I B.Sc. PHYSICS SEMESTER – I-MAJOR

COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Hours: 60 **Credits: 4** **4 hrs/week**

UNIT I: ESSENTIALS OF MATHEMATICS: 9hrs

Complex Numbers: Introduction of the new symbol i – General form of a complex number Modulus-Amplitude form and conversions

Trigonometric Ratios: Trigonometric Ratios and their relations – Problems on calculation of angles **Vectors:** Definition of vector addition – Cartesian form – Scalar and vector product and problems **Statistical Measures**: Mean, Median, Mode of a data and problems

UNIT II: ESSENTIALS OF PHYSICS: 9hrs

Definition and Scope of Physics- Measurements and Units - Motion of objects: Newtonian Mechanics and relativistic mechanics perspective - Laws of Thermodynamics and Significance- Acoustic waves and electromagnetic waves- Electric and Magnetic fields and their interactions- Behaviour of atomic and nuclear particles- Wave-particle duality, the uncertainty principle- Theories and understanding of universe

UNIT III: ESSENTIALS OF CHEMISTRY: 9hrs

Definition and Scope of Chemistry - Importance of Chemistry in daily life - Branches of chemistry and significance – PERIODIC TABLE:- Significance, Electronic Configuration, Periodic properties like Atomic size and Ionization potential and their trend. Types of chemical changes-Classification of matter. BIOMOLECULES:- Classification & Functions of Carbohydrates, Proteins, Fats & Vitamins.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 9hrs

Applications of Mathematics in Physics & Chemistry: Calculus, Differential Equations & Complex Analysis

Application of Physics in Industry and Technology: Electronics and Semiconductor Industry, Robotics and Automation, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies.

Application of Chemistry in Industry and Technology: Chemical Manufacturing, Pharmaceuticals and Drug Discovery, Materials Science, Food and Beverage Industry.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE 9hrs

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, IP, Domain Name Services, applications.

Ethical and social implications: Network and security concepts- Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques-Privacy and Data Protection.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

Recommended books:

1. Functions of one complex variable by John.B.Conway, Springer- Verlag.
2. Elementary Trigonometry by H.S.Hall and S.R.Knight
3. Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media (P)Ltd.
4. 4.Basic Statistics by B.L.Agarwal, New age international Publishers
5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
7. Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway andJohn W. Jewett Jr.
8. Physics for Technology and Engineering" by John Bird
9. Chemsitry in daily life by Kirpal Singh
10. Chemistry of bio molecules by S. P. Bhutan
11. Fundamentals of Computers by V. Raja Raman
12. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

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PHYSICS SEMESTER – 1-MAJOR

COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Chapter / Unit	Section A Multiple Choice Questions (1 mark)	Section – B Fill in the blanks (1 mark)	Section – C Matching Questions (1 mark)
UNIT I: ESSENTIALS OF MATHEMATICS	**Q.No 1 to Q.No. 8**	**Q.No.41 and Q.No.42**	**Q.No.51 and Q.No.52**
UNIT II: ESSENTIALS OF PHYSICS	**Q.No 9 to Q.No. 16**	**Q.No.43 and Q.No.44**	**Q.No.53 and Q.No.54**
UNIT III: ESSENTIALS OF CHEMISTRY	**Q.No 17 to Q.No.24**	**Q.No.45 and Q.No.46**	**Q.No.55 and Q.No.56**
UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY	**Q.No 25 to Q.No.32**	**Q.No.47 and Q.No.48**	**Q.No.57 and Q.No.58**
UNIT V: ESSENTIALS OF COMPUTER SCIENCE	**Q.No 33 to Q.No. 40**	**Q.No.49 and Q.No.50**	**Q.No.59 and Q.No.60**

DEPARTMENTOFPHYSICS

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B.Sc. (HONOURS) PHYSICS SINGLE MAJOR
For 2024-2027 Batch [w.e.f. 2023-2024 (Revised in May 2023)]
I B.Sc. SEMESTER– I
COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES
MODEL QUESTION PAPER

Time: **3Hrs**. Max.Marks:**60 M**

SECTION – A

I. Answer All Multiple Choice Questions. Each one carries one mark. 40x1=40 M

Unit-1: Q.No 1 to Q.No. 8

Unit-II: Q.No 9 to Q.No. 16

Unit-III: Q.No 17 to Q.No.24

Unit-IV: Q.No 25 to Q.No.32

Unit-V: Q.No 33 to Q.No. 40

SECTION-B

II. Answer all fill in the blanks questions. Each one carries one mark. 10x1=10 M

Unit-1: Q.No.41 and Q.No.42

Unit-II: Q.No.43 and Q.No.44

Unit-III: Q.No.45 and Q.No.46

Unit-IV: Q.No.47 and Q.No.48

Unit-V: Q.No.49 and Q.No.50

SECTION –C

III. Answer all Matching Questions. Each one carries one mark. 10x1=10 M

Unit-1: Q.No.51 and Q.No.52

Unit-II: Q.No.53 and Q.No.54

Unit-III: Q.No.55 and Q.No.56

Unit-IV: Q.No.57 and Q.No.58

Unit-V: Q.No.59 and Q.No.60

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I B.Sc. SEMESTER – I-MAJOR

COURSE 2: ADVANCES OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Hours: 60 **Credits: 4** **4hrs/week**

UNIT I: ADVANCESIN BASICS MATHEMATICS 9hrs

Straight Lines: Different forms – Reduction of general equation into various forms –Point of intersection of two straight lines

Limits and Differentiation: Standard limits – Derivative of a function –Problems on product ruleand quotient rule

Integration: Integration as a reverse process of differentiation – Basic methods of integration

Matrices: Types of matrices – Scalar multiple of a matrix – Multiplication of matrices – Transpose ofa matrix and determinants

UNIT II: ADVANCES IN PHYSICS: 9hrs

Renewable energy: Generation, energy storage, and energy-efficient materials and devices. **Recent advances in the field of nanotechnology**: Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics- Shape Memory Materials.

UNIT III: ADVANCES IN CHEMISTRY: 9hrs

Computer aided drug design and delivery, Nanosensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal - Catalysis method.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 9hrs

Mathematical Modelling applications in physics and chemistry Application of Renewable energy: Grid Integration and Smart Grids,

Application of nanotechnology: Nanomedicine,

Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics,

Application of medical physics: Radiation Therapy, Nuclear medicine

Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: ADVANCED APPLICATIONS OF COMPUTER SCIENCE 9hrs

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check and CRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

RECOMMENDED BOOKS

1. Coordinate Geometry by S.L.Lony, Arihant Publications
2. Calculus by Thomas and Finny, Pearson Publications
3. Matrices by A.R.Vasishtha and A.K.Vasishtha, Krishna Prakashan Media(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
6. "Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A. Bohara
7. "Biophysics: An Introduction" by Rodney Cotterill
8. "Medical Physics: Imaging" by James G. Webster
9. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
10. Nano materials and applications by M.N.Borah
11. Environmental Chemistry by Anil.K.D.E.
12. Digital Logic Design by Morris Mano
13. Data Communication & Networking by BahrouzForouzan.

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SEMESTER – 1

COURSE 2: ADVANCES OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Chapter / Unit	Section A Multiple Choice Questions (1 mark)	Section – B Fill in the blanks (1 mark)	Section – C Matching Questions (1 mark)
UNIT I: ADVANCESIN BASICS MATHEMATICS	**Q.No 1 to Q.No. 8**	**Q.No.41 and Q.No.42**	**Q.No.51 and Q.No.52**
UNIT II: ADVANCES IN PHYSICS	**Q.No 9 to Q.No. 16**	**Q.No.43 and Q.No.44**	**Q.No.53 and Q.No.54**
UNIT III: ADVANCES IN CHEMISTRY	**Q.No 17 to Q.No.24**	**Q.No.45 and Q.No.46**	**Q.No.55 and Q.No.56**
UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY	**Q.No 25 to Q.No.32**	**Q.No.47 and Q.No.48**	**Q.No.57 and Q.No.58**
UNIT V: ADVANCED APPLICATIONS OF COMPUTER SCIENCE	**Q.No 33 to Q.No. 40**	**Q.No.49 and Q.No.50**	**Q.No.59 and Q.No.60**

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I B.Sc. SEMESTER – I
COURSE 2: ADVANCES OF MATHEMATICAL, HYSICALANDCHEMICALSCIENCES
MODEL QUESTION PAPER

Time: **3 Hrs**. Max. Marks: **60 M**

SECTION – A

I. Answer All the Multiple Choice Questions. Each one carries one mark. 40x1=40 M

Unit-1: Q.No.1 to Q.No.8

Unit-II: Q.No.9 to Q.No.16

Unit-III: Q.No.17 to Q.No.24

Unit-IV: Q.No.25 to Q.No.32

Unit-V: Q.No.33 to Q.No.40

SECTION-B

II. Answer all fill in the blanks questions. Each one carries one mark. 10x1=10 M

Unit-1: Q.No.41 and Q.No.42

Unit-II: Q.No.43 and Q.No.44

Unit-III: Q.No.45 and Q.No.46

Unit-IV: Q.No.47 and Q.No.48

Unit-V: Q.No.49 and Q.No.50

SECTION –C

III. Answer all the Matching questions. Each one carries one mark. 10x1=10 M

Unit-1: Q.No.51 and Q.No.52

Unit-II: Q.No.53 and Q.No.54

Unit-III: Q.No.55 and Q.No.56

Unit-IV: Q.No.57 and Q.No.58

Unit-V: Q.No.59 and Q.No.60

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I B.Sc. SEMESTER– I

COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Internal Assessment Examination Model Question Paper

Time: 1.30 Hours **Max. Marks: 28 M**

SECTION-A

I. Answer All the Multiple Choice Questions. Each one carries one mark. **20x1=20 M**

Unit-1: Q.No.1 to Q.No.4

Unit-II: Q.No.5 to Q.No.8

Unit-III: Q.No.9 to Q.No.12

Unit-IV: Q.No.13 to Q.No.16

Unit-V: Q.No.17 to Q.No.20

SECTION-B

II. Answer all fill in the blanks questions. Each one carries one mark. **4x1=4 M**

Unit-1: Q.No.21

Unit-II: Q.No.22

Unit-III: Q.No.23

Unit-V: Q.No.24

SECTION –C

III. Answer all the Matching questions. Each one carries one mark. **4x1=4 M**

Unit-1: Q.No.25

Unit-II: Q.No.26

Unit-III: Q.No.27

Unit-V: Q.No.28

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I B.Sc. PHYSICS SEMESTER– II-MAJOR

COURSE 2: ADVANCES OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Internal Assessment Examination Model Question Paper

Time: 1.30 Hours **Max. Marks: 28 M**

SECTION-A

I. Answer All the Multiple Choice Questions. Each one carries one mark. 20x1=20 M

Unit-1: Q.No.1 to Q.No.4

Unit-II: Q.No.5 to Q.No.8

Unit-III: Q.No.9 to Q.No.12

Unit-IV: Q.No.13 to Q.No.16

Unit-V: Q.No.17 to Q.No.20

SECTION-B

II. Answer all fill in the blanks questions. Each one carries one mark. 4x1=4 M

Unit-1: Q.No.21

Unit-II: Q.No.22

Unit-III: Q.No.23

Unit-V: Q.No.24

SECTION –C

III. Answer all the Matching questions. Each one carries one mark. 4x1=4 M

Unit-1: Q.No.25

Unit-II: Q.No.26

Unit-III: Q.No.27

Unit-V: Q.No.28

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B.Sc. (HONOURS) PHYSICS MINOR

For 2024-2027 Batch [w.e.f. 2023-2024 (Revised in May 2023)]

I B.Sc. SEMESTER – II PHYSICS SYLLABUS

COURSE 1: MECHANICS AND PROPERTIES OF MATTER

Hours: 45 **Credits: 3** **3hrs/week**

UNIT-I VECTOR ANALYSIS 9hrs

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems.

UNIT-II MECHANICS OF PARTICLES 9hrs

Laws of motion, motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions, Concept of impact parameter, scattering cross-section, Rutherford scattering-derivation.

UNIT-III MECHANICS OF RIGID BODIES AND CONTINUOUS MEDIA 9hrs

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, Precession of a top, Gyroscope, Precession of the equinoxes. Elastic constants of isotropic solids and their relations, Poisson's ratio and expression for Poisson's ratio. Classification of beams, types of bending.

UNIT-IV CENTRAL FORCES 9hrs

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force. Derivation of Kepler's laws.

UNIT-V SPECIAL THEORY OF RELATIVITY 9hrs

Galilean relativity, Absolute frames. Michelson-Morley experiment, the negative result. Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

1. BSc Physics -Telugu Akademy, Hyderabad
2. Mechanics - D.S. Mathur, Sulthan Chand & Co, New Delhi
3. Mechanics - J.C. Upadhyaya, Ramprasad & Co., Agra
4. Properties of Matter - D.S. Mathur, S.Chand & Co, New Delhi,11th Edn., 2000
5. Physics Vol. I - Resnick-Halliday-Krane, Wiley, 2001
6. Properties of Matter – Brijlal & Subramanyam, S.Chand &Co. 1982
7. Dynamics of Particles and Rigid bodies– Anil Rao, Cambridge Univ. Press, 2006
8. Mechanics-EM Purcell, Mc Graw Hill
9. University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi
10. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
11. Mechanics, S.G.Venkatachalapathy, Margham Publication, 2003.

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SEMESTER – 1I
COURSE 3: MECHANICS AND PROPERTIES OF MATTER

Chapter / Unit	Section A (**4** marks)	Section – B (**8** marks)	Section – C (**8** marks)
UNIT-I Vector Analysis	**1** (Problem)	**1**	**1**
UNIT-II Mechanics of Particles	**1+1** (Problem)	**1**	**1**
UNIT-III Mechanics of Rigid Bodies and Continuous Media	**1**	**1**	**1**
UNIT-IV Central Forces	**2**	**1**	**1**
UNIT-V Special Theory of Relativity	**1+1** (Problem)	**1**	**1**

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I B.Sc. SEMESTER II PHYSICS

COURSE 1: MECHANICS AND PROPERTIES OF MATTER

MODEL QUESTION PAPER

Time: **3 Hrs**. Max. Marks: **60M**

SECTION – A

Answer any **FIVE** questions. **5 x 4 = 20 M**

01. Show that $\nabla . (\nabla x\ A) = 0$
02. Explain the Motion of a system of variable mass.
03. A rocket of mass 40 kg has got a fuel of mass 360 kg inside it. The exhaust velocity of the fuel is 2km/s. The fuel burning at the rate of 4Kg/s. Find the final velocity of rocket.
04. Explain the working of gyroscope. What are its applications?
05. Prove conservative force as a negative gradient of potential energy?
06. Write the characteristics of central forces.
07. A Clock showing correct time when at rest, loses one hour in a day when it in moving. What is its velocity?
08. Explain time dilation.

Answer any **FIVE** questions from sections B and C choosing atleast **TWO** questions from each section. Each question carries **8** marks. **5 x 8 = 40 M**

SECTION –B

09. Define curl of a vector and explain its physical significance. State and Prove stoke's theorem.
10. Obtain the equation for the angle of scattering of α particle in Rutherford scattering.
11. Define precession? Derive an expression for precessional velocity of a symmetric top
12. Define central force. Give three examples. Obtain the equation of motion of a body under central forces.
13. Describe Michelson–Morley Experiment and discuss the negative result.

SECTION –C

14. State and prove Gauss's theorem of Divergence. Give its physical significance.
15. Derive the expression for final velocity of a rocket.
16. Define y, n and k. Obtain the relation between them.
17. State Kepler's laws of planetary motion. Prove First law of planetary motion.
18. State postulates of special theory of relativity and deduce Lorentz transformation equation.

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I B.Sc. SEMESTER – II PHYSICS SYLLABUS

COURSE 3: MECHANICS AND PROPERTIES OF MATTER

Hours: 45 **Credits: 3** **3hrs/week**

UNIT-I VECTOR ANALYSIS 9hrs

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems.

UNIT-II MECHANICS OF PARTICLES 9hrs

Laws of motion, motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions, Concept of impact parameter, scattering cross-section, Rutherford scattering-derivation.

UNIT-III MECHANICS OF RIGID BODIES AND CONTINUOUS MEDIA 9hrs

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, Precession of a top, Gyroscope, Precession of the equinoxes. Elastic constants of isotropic solids and their relations, Poisson's ratio and expression for Poisson's ratio. Classification of beams, types of bending.

UNIT-IV CENTRAL FORCES 9hrs

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force. Derivation of Kepler's laws.

UNIT-V SPECIAL THEORY OF RELATIVITY 9hrs

Galilean relativity, Absolute frames. Michelson-Morley experiment, the negative result. Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

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3. Mechanics - J.C. Upadhyaya, Ramprasad & Co., Agra
4. Properties of Matter - D.S. Mathur, S.Chand & Co, New Delhi ,11th Edn., 2000
5. Physics Vol. I - Resnick-Halliday-Krane ,Wiley, 2001
6. Properties of Matter – Brijlal & Subramanyam, S.Chand &Co. 1982
7. Dynamics of Particles and Rigid bodies– Anil Rao, Cambridge Univ. Press, 2006
8. Mechanics-EM Purcell, Mc Graw Hill
9. University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi
10. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
11. Mechanics, S.G.Venkatachalapathy, Margham Publication, 2003.

BLUE PRINT
SEMESTER – 1I
COURSE 3: MECHANICS AND PROPERTIES OF MATTER

Chapter / Unit	**Section A** (**4** marks)	**Section – B** (**8** marks)	**Section – C** (**8** marks)
UNIT-I Vector Analysis	**1** (Problem)	**1**	**1**
UNIT-II Mechanics of Particles	**1+1** (Problem)	**1**	**1**
UNIT-III Mechanics of Rigid Bodies and Continuous Media	**1**	**1**	**1**
UNIT-IV Central Forces	**2**	**1**	**1**
UNIT-V Special Theory of Relativity	**1+1** (Problem)	**1**	**1**

DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

(Affiliated to Adikavi Nannaya University)

Accredited by NAAC at 'A^{+}' Grade

B.Sc. (HONOURS) PHYSICS SINGLE MAJOR

For 2024-2027 Batch [w.e.f. 2023-2024 (Revised in May 2023)]

I B.Sc. SEMESTER II PHYSICS

COURSE 3: MECHANICS AND PROPERTIES OF MATTER

MODEL QUESTION PAPER

Time: **3 Hrs**. Max. Marks: **60M**

SECTION – A

Answer any **FIVE** questions. **5 x 4 = 20 M**

01. Show that $\nabla . (\nabla x\ A) = 0$
02. Explain the Motion of a system of variable mass.
03. A rocket of mass 40 kg has got a fuel of mass 360 kg inside it. The exhaust velocity of the fuel is 2km/s. The fuel burning at the rate of 4Kg/s. Find the final velocity of rocket.
04. Explain the working of gyroscope. What are its applications?
05. Prove conservative force as a negative gradient of potential energy?
06. Write the characteristics of central forces.
07. A Clock showing correct time when at rest, loses one hour in a day when it in moving. What is its velocity?
08. Explain time dilation.

Answer any **FIVE** questions from sections B and C choosing atleast **TWO** questions from each section. Each question carries **8** marks. **5 x 8 = 40 M**

SECTION –B

09. Define curl of a vector and explain its physical significance. State and Prove stoke's theorem.
10. Obtain the equation for the angle of scattering of α particle in Rutherford scattering.
11. Define precession? Derive an expression for precessional velocity of a symmetric top
12. Define central force. Give three examples. Obtain the equation of motion of a body under central forces.
13. Describe Michelson–Morley Experiment and discuss the negative result.

SECTION –C

14. State and prove Gauss's theorem of Divergence. Give its physical significance.
15. Derive the expression for final velocity of a rocket.
16. Define y, n and k. Obtain the relation between them.
17. State Kepler's laws of planetary motion. Prove First law of planetary motion.
18. State postulates of special theory of relativity and deduce Lorentz transformation equation.

DEPARTMENT OF PHYSICS

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B.Sc. (HONOURS) PHYSICS SINGLE MAJOR

For 2024-2027 Batch [w.e.f. 2023-2024 (Revised in May 2023)]

I B.Sc. SEMESTER II PHYSICS SYLLABUS

COURSE 4: WAVES AND OSCILLATIONS

Hours: 45 **Credits: 3** **3hrs/week**

UNIT-I SIMPLE HARMONIC OSCILLATIONS 9hrs

Simple harmonic oscillator and solution of the differential equation-Physical characteristics of SHM, torsion pendulum-measurements of rigidity modulus, compound pendulum- measurement of 'g', Principle of superposition, beats, combination of two mutually perpendicular simple harmonic vibrations of same frequency. Lissajous figures.

UNIT-II DAMPED AND FORCED OSCILLATIONS 9hrs

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance.

UNIT-III COMPLEX VIBRATIONS 9hr

Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, saw tooth wave, **simple problems on evolution of Fourier coefficients**.

UNIT-IV VIBRATING STRINGS AND BARS 9hrs

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones and harmonics. Energy transport and transverse impedance. Longitudinal vibrations in bars-wave equation and its general solution. Special cases (i) bar fixed at both ends (ii) bar fixed at the midpoint. Tuning fork.

NIT-V ULTRASONICS 9hrs

Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostrictive methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Applications and uses of ultrasonic waves.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

- BSc Physics Vol.1, Telugu Academy, Hyderabad.
- Fundamentals of Physics. Halliday/Resnick/Walker, Wiley India Edition 2007.
- Waves & Oscillations. S.Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.
- College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
- Science and Technology of Ultrasonics- Baldevraj, Narosa, New Delhi,2004
- Introduction to Physics for Scientists and Engineers. F.J. Buche. McGraw Hill.

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SEMESTER – 1I
COURSE 4: WAVES AND OSCILLATIONS

Chapter / Unit	Section A (**4** marks)	Section – B (**8** marks)	Section – C (**8** marks)
UNIT-I Simple Harmonic Oscillations	**1**	**1**	**1**
UNIT-II Damped and Forced Oscillations	**1+1** (Problem)	**1**	**1**
UNIT-III Complex Vibrations	**1**	**1**	**1**
UNIT-IV Vibrating Strings and Bars	**1+1** (Problem)	**1**	**1**
UNIT-V Ultrasonics	**1+1** (Problem)	**1**	**1**

DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

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Accredited by NAAC at 'A^{+}' Grade

B.Sc. (HONOURS) PHYSICS SINGLE MAJOR

For 2024-2027 Batch [w.e.f. 2023-2024 (Revised in May 2023)]

I B.Sc. SEMESTER II PHYSICS

COURSE 4: WAVES AND OSCILLATIONS

MODEL QUESTION PAPER

Time: **3** Hrs. Max. Marks: **60M**

SECTION – A

Answer any **FIVE** questions. **5 x 4 = 20** M

01. Write the differential equation and solution of simple harmonic oscillator.
02. An under damped oscillator has its amplitude reduced to 1/10th of its initial value after 100 oscillations, if the time period is 2 sec. Calculate the damping constant and decay modulus.
03. Write a short note on logarithmic decrement and relaxation time.
04. State Fourier Theorem. What are its limitations.
05. Explain Energy Transport in the wave motion along a string.
06. A string of length 8m fixed at both the ends has a tension of 49N and a mass of 0.04 Kg. Find the speed of transverse waves on this string.
07. Thickness of a Piezo electric crystal is 0.002 m. Velocity of sound wave in the crystal is 5750 m/sec. Calculate its fundamental frequency.
08. Mention any five applications of Ultrasonics.

Answer any **FIVE** questions from sections B and C choosing atleast **TWO** questions from each section. Each question carries **8** marks. **5 x 8 = 40 M**

SECTION – B

09. Explain with necessary theory what happens when two Simple Harmonic Motions of same frequency simultaneously acts on a body at right angles to each other.
10. What are damped oscillations? Derive the equation of motion of damped oscillator and find its solution?
11. Using Fourier theorem, analyze a 'Square Wave'.
12. Obtain the equation for the velocity of transverse wave in a stretched string and discuss the solution of the wave equation.
13. What is Ultrasonics? Describe the Piezo electric method of producing Ultrasonic waves.

SECTION – C

14. What is compound pendulum? Explain with necessary theory, how the value of acceleration due to gravity (g) can be determine using compound pendulum.
15. What are forced oscillations? Derive the differential equation of forced harmonic oscillator and deduce the expression for the amplitude.
16. State Fourier's theorem and use it to analyse a sawtooth wave.
17. Derive the general solution for longitudinal wave in a bar. Show the modes of vibrations for a bar free at both ends.
18. Describe how ultrasonic waves are produced by magnetostriction method with diagram.

DEPARTMENT OF PHYSICS

SRI Y. N. COLLEGE (A), NARSAPUR

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II B.Sc. SEMESTER – III

(*MINOR*) COURSE 2: OPTICS

SYLLABUS *{for 2023-2027 Batch (w.e.f. 2024-2025)}*

UNIT-I: Aberrations (9Hrs)

Introduction – Monochromatic aberrations: Spherical aberration, methods of minimizing Spherical aberration: Coma, Astigmatism, Distortion and Curvature of field. Chromatic aberration, Achromatic doublet, Achromatism for two lenses when (i) in contact and (ii) separated by a distance.

UNIT-II: Interference (9Hrs)

Principle of superposition – Coherence, Conditions for interference of light, Fresnel's bi-Prism experiment and determination of wavelength of light –change of phase on Reflection, Oblique incidence of a plane wave on a thin film - Interference due to reflected light (cosine law) – Colors of thin films -- Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film), Determination of diameter of wire, Newton's rings in reflected light -- Determination of wavelength of monochromatic light, Michelson Interferometer -- Determination of wavelength of monochromatic light.

UNIT-III: Diffraction (9Hrs)

Introduction, Distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer Diffraction due to single slit -- Fraunhoffer diffraction pattern with N slits (diffraction grating), Resolving power of a grating, Determination of wavelength of light in normal incidence using diffraction grating, Fresnel's half period zones -- Area of the half period zones -- Zone plate -- Comparison of Zone plate with Convex lens -- Difference between Interference and Diffraction.

UNIT-IV: Polarization (9Hrs)

Introduction, Methods of polarization by reflection, refraction, double refraction, Brewster's law, Mauls la, Nicol prism – Construction and working as a Polarizer and Analyzer, Quarter wave plate, Half wave plate, Optical activity, Determination of specific rotation by Laurent's half shade Polarimeter.

UNIT-V: Lasers and Holography (9Hrs)

Lasers: introduction, Spontaneous emission, Stimulated emission, Population Inversion, Laser principle, Einstein Coefficients, Types of lasers: He-Ne laser, Ruby laser, Applications of lasers.
Holography: Basic principle of holography, Gabor hologram and its limitations, Applications of holography.

.REFERENCE BOOKS:

1. BSc Physics, Vol.2, Telugu Academy, Hyderabad
2. A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand& Co.
3. Unified Physics Vol.II Optics & Thermodynamics – Jai Prakash Nath&Co.Ltd., Meerut
4. Optics,F.A. Jenkins and H.G. White, Mc Graw-Hill
5. Optics, AjayGhatak,Tata Mc Graw-Hill.
6. Introduction of Lasers – Avadhanulu, S.Chand& Co.
7. Principles of Optics- BK Mathur, Gopala Printing Press, 1995

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SEMESTER – III

COURSE 2: OPTICS

Unit	**Section A** (4 marks)	**Section – B** (8 marks)	**Section – C** (8 marks)
UNIT-I: Aberrations	1	1	1
UNIT-II: Interference	1+1 (Problem)	1	1
UNIT-III: Diffraction	1+1 (Problem)	1	1
UNIT-IV: Polarization	1+1 (Problem)	1	1
UNIT-V: Lasers and Holography	1	1	1

DEPARTMENT OF PHYSICS

SRI Y. N. COLLEGE (A), NARSAPUR

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II B.Sc. SEMESTER – III

(MINOR) COURSE 2: OPTICS

{for 2023-2027 Batch (w.e.f. 2024-2025)}

MODEL QUESTION PAPER

Time: 3 Hrs. **Max. Marks: 60**

SECTION – A

Answer any FIVE questions. Each question carries 4 marks. **5 x 4 = 20M**

1. Explain the formation of colors in thin films.
2. Write any five differences between Fresnel and Fraunhoffer diffraction.
3. State and explain Malus law.
4. Explain about Spherical aberration.
5. Explain about the principle of LASER
6. In a Newton's rings experiment, the diameter of 5^{th} ring was 0.3cm and the diameter of 25^{th} ring was 0.8cm. If the radius of curvature of the Plano convex lens is 100cm, find the wave length of light used.
7. Find the radius of first zone in a zone plate of focal length 20cm. for a light of wave length $5000A^{o}$.
8. Calculate the minimum thickness of quarter wave plate made of quartz to be used for a light of wavelength 600nm. Given that $\mu_0 = 1.544$ & $\mu_e = 1.533$.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 8 **marks.** **5 x 8 = 40M**

SECTION -- B

9. Derive conditions for achromatism when two lenses are (1) in contact and (2) separated by a distance.
10. Explain interference due to reflected light by division of amplitude due to oblique incidence of a Plane wave on a thin parallel film.
11. Explain Fraunhofer diffraction due to single slit with necessary theory.
12. Describe the construction and working of a Nicol prism.
13. Explain the construction and working of Helium-Neon gas laser.

SECTION – C

14. Explain about the mono chromatic aberrations - (i) Coma and (ii) Astigmatism.
15. Describe the construction and working of Michelson's Interferometer to determine the wavelength of Mono-chromatic light.
16. Explain how a Zone plate is constructed. Obtain the formula for the focal length of Zone plate.
17. Explain about the determination of Specific rotation by Laurent's half shade polarimeter.
18. Write the basic principle of Holography. Describe the construction of Gabor Hologram.

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DEPARTMENT OF PHYSICS

SRI Y. N. COLLEGE (A), NARSAPUR

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II B.Sc. SEMESTER – III

(*MAJOR*) COURSE 5: OPTICS

SYLLABUS {*for 2023-2027 Batch (w.e.f. 2024-2025)*}

UNIT-I: Aberrations (9Hrs)

Introduction – Monochromatic aberrations: Spherical aberration, methods of minimizing Spherical aberration: Coma, Astigmatism, Distortion and Curvature of field. Chromatic aberration, Achromatic doublet, Achromatism for two lenses when (i) in contact and (ii) separated by a distance.

UNIT-II: Interference (9Hrs)

Principle of superposition – Coherence, Conditions for interference of light, Fresnel's bi-Prism experiment and determination of wavelength of light –change of phase on Reflection, Oblique incidence of a plane wave on a thin film - Interference due to reflected light (cosine law) – Colors of thin films -- Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film), Determination of diameter of wire, Newton's rings in reflected light -- Determination of wavelength of monochromatic light, Michelson Interferometer -- Determination of wavelength of monochromatic light.

UNIT-III: Diffraction (9Hrs)

Introduction, Distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer Diffraction due to single slit -- Fraunhofer diffraction pattern with N slits (diffraction grating), Resolving power of a Grating, Determination of wavelength of light in normal incidence using diffraction Grating, Fresnel's half period zones -- Area of the half period zones -- Zone plate -- Comparison of Zone plate with Convex lens -- Difference between Interference and Diffraction.

UNIT-IV: Polarization (9Hrs)

Introduction, Methods of polarization by reflection, refraction, double refraction, Brewster's law, Mauls la, Nicol prism – Construction and working as a Polarizer and Analyzer, Quarter wave plate, Half wave plate, Optical activity, Determination of specific rotation by Laurent's half shade Polarimeter.

UNIT-V: Lasers and Holography (9Hrs)

Lasers: introduction, Spontaneous emission, Stimulated emission, Population Inversion, Laser principle, Einstein Coefficients, Types of lasers: He-Ne laser, Ruby laser, Applications of lasers.

Holography: Basic principle of holography, Gabor hologram and its limitations, Applications of holography.

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REFERENCE BOOKS:

1. BSc Physics, Vol.2, Telugu Academy, Hyderabad
2. A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand& Co.
3. Unified Physics Vol.II Optics & Thermodynamics – Jai Prakash Nath&Co.Ltd., Meerut
4. Optics,F.A. Jenkins and H.G. White, Mc Graw-Hill
5. Optics, AjayGhatak,Tata Mc Graw-Hill.
6. Introduction of Lasers – Avadhanulu, S.Chand& Co.
7. Principles of Optics- BK Mathur, Gopala Printing Press, 1995

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SEMESTER – III

COURSE 5: OPTICS

Unit	**Section A** (4 marks)	**Section – B** (8 marks)	**Section – C** (8 marks)
UNIT-I: Aberrations	1	1	1
UNIT-II: Interference	1+1 (Problem)	1	1
UNIT-III: Diffraction	1+1 (Problem)	1	1
UNIT-IV: Polarization	1+1 (Problem)	1	1
UNIT-V: Lasers and Holography	1	1	1

DEPARTMENT OF PHYSICS

SRI Y. N. COLLEGE (A), NARSAPUR

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II B.Sc. SEMESTER – III

(*MAJOR*) COURSE 6: HEAT AND THERMODYNAMICS
SYLLABUS {*for 2023-2027 Batch (w.e.f. 2024-2025)*}

UNIT-I: THERMODYNAMICS (9 hrs)

Introduction— Reversible and Irreversible processes, Carnot's Engine and its Efficiency, Carnot's theorem, Thermodynamic Scale of Temperature, Second law of thermodynamics, Entropy -- Physical significance, Change in Entropy in Reversible and Irreversible processes, Temperature-Entropy (T-S) diagram and its uses,Change of Entropy when ice changes into Steam.

UNIT-II: THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS (9 hrs)

Thermodynamic Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their significance, Derivation of Maxwell's thermodynamic relations from Thermodynamic potentials, Applications: (i) Claussius - Clayperon's equation (ii) Joule – Kelvin coefficient for Ideal and Vander Waals' gases.

UNIT-III: LOW TEMPERATURE PHYSICS (9hrs)

Methods for producing very low temperatures, Joule-Kelvin effect -- Porous plug experiment, Joule expansion, Distinction between Adiabatic and Joule-Thomson expansion, Expression for Joule-Thomson cooling, Production of low temperatures by Adiabatic demagnetization (Qualitative).

UNIT-IV: QUANTUM THEORY OF RADIATION (9 hrs)

Ferry's Black Body -- Spectral energy distribution of black body radiation, Wien's displacement law and Rayleigh- Jean's law (No derivations), Planck's law of black body radiation – Derivation, Deduction of Wien's law and Rayleigh- Jean's law from Planck's law, Solar constant and its determination using Angstrom Pyrheliometer, Estimation of surface temperature of Sun.

UNIT-V: KINETICTHEORY OF GASES (9hrs)

Introduction, Maxwell's law of distribution of molecular velocities, Mean free path, Principle of equi-partition of energy, Transport phenomenon in ideal gases: Viscosity and Thermal conductivity.

REFERENCE BOOKS

1. BScPhysics,Vol.2, TeluguAkademy,Hyderabad
2. Thermodynamics,R.C.Srivastava,S.K.Saha & Abhay K.Jain,Eastern EconomyEdition.
3. UnifiedPhysicsVol.2,Optics&Thermodynamics,JaiPrakash Nath & Co. Ltd.,Meerut
4. FundamentalsofPhysics.Halliday/Resnick/Walker. C. WileyIndiaEdition 2007
5. HeatandThermodynamics-N BrijLal,PSubrahmanyam, S.Chand&Co.,2012
6. HeatandThermodynamics-MSYadav,AnmolPublicationsPvt. Ltd,2000
7. UniversityPhysics,HDYoung,MWZemansky,FWSears,NarosaPublishers,NewDelhi

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SEMESTER – III

COURSE 6: HEAT AND THERMODYNAMICS

Unit	**Section A** (4 marks)	**Section – B** (8 marks)	**Section – C** (8 marks)
UNIT-I: Thermodynamics	1+1 (Problem)	1	1
UNIT-II: Maxwell's Thermodynamic Potentials and Equations	1	1	1
UNIT-III: Low Temperature Physics	1+1 (Problem)	1	1
UNIT-IV: Quantum Theory of Radiation	1+1 (Problem)	1	1
UNIT-V: Kinetic Theory of Gases	1	1	1

DEPARTMENT OF PHYSICS

SRI Y. N. COLLEGE (A), NARSAPUR

(Affiliated to Adikavi Nannaya University, Rajamahendravaram)
Accredited by NAAC at 'A+' Grade (IV cycle)

II B.Sc. SEMESTER – III

(MAJOR) COURSE 7: ELECTRONIC DEVICES AND CIRCUITS SYLLABUS {*for 2023-2027 Batch (w.e.f. 2024-2025)*}

UNIT I: P-N JUNCTION DIODES (9 hrs)

P-N junction Diode, Formation of depletion region, Forward and Reverse bias of Ideal Diode, Tunnel Diode – Construction and working, V-I characteristics and Applications, Zener diode – V-I characteristics, Zener Diode as a Voltage Regulator -- Applications.

UNIT –II: BI-POLAR JUNCTION TRANSISTOR AND ITS BIASING (D.C) (9 hrs)

Transistor construction, Working of PNP and NPN Transistors, CB, CE, and CC Configurations of Transistor, Input and Output Characteristics of CB and CE configurations, Hybrid parameters of a Transistor and equivalent circuit, Bi-Polar Junction Transistor Biasing – Need for stabilization, Biasing methods – Voltage - Divider Bias.

UNIT-III: FIELD EFFECT TRANSISTORS & POWER ELECTRONIC DEVICES (9 hrs)

Difference between JFET and BJT, Construction and working of JFET, Drain and Transfer Characteristics, MOSFET - Depletion-type, and Enhancement-Type MOSFETs. UJT - Construction, working and V-I characteristics, SCR – Construction, Working and Characteristics.

UNIT IV: PHOTO ELECTRIC DEVICES (9 hrs)

Light-Emitting Diodes (LEDs) - Construction, working, characteristics and Applications, Photo diode - Construction, working characteristics and Applications, Photo-Transistors - Construction, working, characteristics and Applications, Structure and operation of LDR and its Applications

UNIT-V: POWER SUPPLIES (9 hrs)

Rectifiers: Half wave, Full wave and Bridge rectifiers - Efficiency (with derivations), R i p p l e factor - Filters - Choke input (inductor), L-section, π-section filters. Three terminal fixed voltage IC- regulators (78XX and 79XX)

REFERENCE BOOKS:

1. Electronic Devices and Circuit Theory --- Robert L. Boylestad & Louis Nashelsky.
2. Electronic Devices and Circuits I – T.L.Floyd- PHI Fifth Edition
3. Integrated Electronics – Millmam & Halkias.
4. Electronic Devices & Circuits – Bogart.
5. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd

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SEMESTER – III

COURSE 7: ELECTRONIC DEVICES AND CIRCUITS

Unit	**Section A** (4 marks)	**Section – B** (8 marks)	**Section – C** (8 marks)
Unit I: P-N Junction Diodes	1	1	1
Unit –II: Bi-Polar Junction Transistor and its Biasing (D.C)	2	1	1
Unit-III: Field Effect Transistors & Power Electronic Devices	2	1	1
Unit IV: Photo Electric Devices	1	1	1
Unit-V: Power Supplies	2	1	1

DEPARTMENT OF PHYSICS

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II B.Sc. SEMESTER – III

(MAJOR) COURSE 8: ANALOG AND DIGITAL ELECTRONICS

SYLLABUS *{for 2023-2027 Batch (w.e.f. 2024-2025)}*

UNIT-I: OPERATIONAL AMPLIFIERS (9 hrs)

a) Concept of feedback in CE amplifier, Negative and Positive feedback, Advantages and Disadvantages of Negative feedback, Basic concepts of differential amplifier, Block diagram of Op-Amp and its equivalent circuit, IC Diagram (IC 741), Ideal voltage transfer curve, Open loop Op-Amp configurations- differential, inverting and non-inverting Op-Amps.

b) Voltage Series Feedback Amplifier (Non-Inverting Op amp): Gain and Bandwidth derivations, VoltageShunt Feedback Amplifier (Inverting Op amp): Gain and Bandwidth derivations

UNIT-II: PRACTICAL OPERATIONAL AMPLIFIER AND APPLICATIONS (9 hrs)

a) Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Input offset voltage, Input bias current, Input offset current, Total output offset voltage, CMRR, Slew rate and concept of Virtual ground.

b) Applications of Op-Amp: Linear Applications: Voltage Follower, Summing Amplifier, Subtracting Amplifier, Averaging Amplifier, Difference Amplifier, Integrator and Differentiator, Square Wave responseof Integrator and Differentiator (Brief explanation only)

UNIT-III: NUMBER SYSTEMS, CODES AND LOGIC GATES (9 hrs)

a) Number Systems and Codes: Decimal, Binary, Octal and Hexadecimal number systems, conversions, Binary addition, Binary subtraction using 1's and 2's complement methods, BCD code and Gray code – Conversions

b) Logic Gates: Construction and truth tables of OR, AND, NOT gates, Universal gates – Basic construction and truth tables of NOR & NAND, Realization of logic gates using NAND and NOR, XOR and XNOR Logic gates symbol and their truth tables. De Morgan's Laws, Boolean Laws, Simplification of Boolean Expressions using Boolean Laws

UNIT-IV: ARITHMETIC CIRCUITS & DATA PROCESSING CIRCUITS (9 hrs)

a) Half Adder and Full Adder: Explanation of truth tables and Circuits. Half Subtractor and Full Subtractor: Explanation of truth tables and Circuits, 4 - bit binary Adder/Subtractor.

b) Multiplexers - 2 to 1 Multiplexer, 4 to 1 multiplexer, De-multiplexers: 1 to 2 Demultiplexer, 1 to 4 Demultiplexer, Applications of Multiplexers and Demultiplexers Decoders: 1 of 2 decoders, 2 of 4 decoders,Encoders: 4 to 2 Encoder, 8 to 3 Encoder, Applications of decoders and encoders

UNIT-V: SEQUENTIAL LOGIC CIRCUITS & CODE CONVERTERS 9 hrs

a) Combinational Logic vs Sequential Logic Circuits, Sequential Logic circuits: Flip-flops, Basic NAND, NOR Latches, Clocked SR Flip-flop, JK Flip-flop, D Flip-flop, Master-Slave Flip- flop, Conversion of Flipflops.

b) Code Converters: BCD to Decimal Converter, BCD to Gray Code Converter, BCD to 7 segment Decoders

Reference Books:

1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
2. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011,
3. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., TMH
4. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
5. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
6. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

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SEMESTER – III

COURSE 8: ANALOG AND DIGITAL ELECTRONICS

Unit	**Section A** (4 marks)	**Section – B** (8 marks)	**Section – C** (8 marks)
Unit-I: Operational Amplifiers	2	1	1
Unit-II: Practical Operational Amplifier And Applications	1	1	1
Unit-III: Number Systems, Codes And Logic Gates	2	1	1
Unit-IV: Arithmetic Circuits & Data Processing Circuits	1	1	1
Unit-V: Sequential Logic Circuits & Code Converters	2	1	1

DEPARTMENT OF PHYSICS

SRI Y. N. COLLEGE (A), NARSAPUR

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II B.Sc. SEMESTER – III

(*MAJOR*) COURSE 5: OPTICS

{for 2023-2027 Batch (w.e.f. 2024-2025)}

MODEL QUESTION PAPER

Time: 3 Hrs. **Max. Marks: 60**

SECTION – A

Answer any FIVE questions. Each question carries 4 marks. **5 x 4 = 20M**

1. Explain the formation of colors in thin films.
2. Write any five differences between Fresnel and Fraunhoffer diffraction.
3. State and explain Malus law.
4. Explain about Spherical aberration.
5. Explain about the principle of LASER
6. In a Newton's rings experiment, the diameter of 5^{th} ring was 0.3cm and the diameter of 25^{th} ring was 0.8cm. If the radius of curvature of the Plano convex lens is 100cm, find the wave length of light used.
7. Find the radius of first zone in a zone plate of focal length 20cm. for a light of wave length $5000A^{o}$.
8. Calculate the minimum thickness of quarter wave plate made of quartz to be used for a light of wavelength 600nm. Given that $\mu_0 = 1.544$ & $\mu_e = 1.533$.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 8 **marks.** **5 x 8 = 40M**

SECTION -- B

9. Derive conditions for achromatism when two lenses are (1) in contact and (2) separated by a distance.
10. Explain interference due to reflected light by division of amplitude due to oblique incidence of a plane wave on a thin parallel film.
11. Explain Fraunhoffer diffraction due to single slit with necessary theory.
12. Describe the construction and working of a Nicol prism.
13. Explain the construction and working of Helium-Neon gas laser.

SECTION – C

14. Explain about the mono chromatic aberrations - (i) Coma and (ii) Astigmatism.
15. Describe the construction and working of Michelson's Interferometer to determine the wavelength of Mono-chromatic light.
16. Explain how a Zone plate is constructed. Obtain the formula for the focal length of Zone plate.
17. Explain about the determination of Specific rotation by Laurent's half shade polarimeter.
18. Write the basic principle of Holography. Describe the construction of Gabor Hologram.

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DEPARTMENT OF PHYSICS

SRI Y. N. COLLEGE (A), NARSAPUR

(Affiliated to Adikavi Nannaya University, Rajamahendravaram)
Accredited by NAAC at 'A+' Grade (IV cycle)

II B.Sc. SEMESTER – III

(*MAJOR*) COURSE 6: HEAT AND THERMODYNAMICS

{for 2023-2027 Batch (w.e.f. 2024-2025)}

MODEL QUESTION PAPER

Time: 3 Hrs. **Max. Marks: 60**

SECTION – A

Answer any FIVE questions. Each question carries 4 marks. **5 x 4 = 20M**

1. Explain the physical significance of Entropy.
2. Derive Clausius – Clayperon equation.
3. A reversible engine works between two temperatures whose difference is 100^0 C. If it absorbs 746 J of heat from the source and gives 546 J of heat to the sink, then calculate the temperatures of source and sink.
4. Write any five differences between Joule Thomson and adiabatic expansions.
5. Calculate the Inversion temperature of Helium gas. Given a = 3.44×10^{-3} newton-m^4 / mol^2 , b=0.0237×10^{-3} m^3 / mol and R=8.31 joule /(mol-k)
6. Describe Ferry's black body.
7. Calculate the temperature of the Sun from the following data. Solar constant S=1340 W/m^2 ; radius of the Sun R = 7.92×10^8 m; Distance of the Sun from the earth r = 1.5×10^{11} m and Stefan constant $\sigma = 5.7 \times 10^{-8}$ Wm^{-2} K^{-4}.
8. Write a short note on Transport Phenomenon in Ideal gases.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 8 **marks.** **5 x 8 = 40M**

SECTION -- B

9. State and prove Carnot's theorem.
10. Derive Maxwell's Thermodynamic equations from thermodynamic potentials.
11. Derive an expression for Joule Thomson Cooling.
12. Derive Wien's displacement law.
13. Derive an expression for Maxwell's law of distribution of molecular speeds in a gas.

SECTION – C

14. Describe T-S diagram for Carnot's cycle. Derive an expression for the Efficiency of Carnot's engine from the T-S diagram.
15. Derive the equations for (1) Difference & (2) Ratio of the two Specific heats of a perfect gas using Maxwell's Thermodynamic equations.
16. Explain how low temperatures are produced by Adiabatic demagnetization.
17. Describe how to determine Solar Constant by using Angstrom Pyrheliometer.
18. Derive an expression for the Viscosity of a gas on the basis of kinetic theory of gases.

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DEPARTMENT OF PHYSICS

SRI Y. N. COLLEGE (A), NARSAPUR

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II B.Sc. SEMESTER – III

(*MAJOR*) COURSE 7: Electronic Devices and Circuits

{for 2023-2027 Batch (w.e.f. 2024-2025)}

MODEL QUESTION PAPER

Time: 3 Hrs. **Max. Marks: 60**

SECTION – A

Answer any FIVE questions. Each question carries 4 marks. **5 x 4 = 20M**

1. Explain briefly the working of Zener Diode as Voltage Regulator.
2. Explain the need of 'Stabilization' in Bi-Polar Junction Transistor (BJT).
3. Write the Output characteristics of a Transistor in CB and CE configurations.
4. Write any four differences between JFET and BJT.
5. Write the characteristics of Silicon Controlled Rectifier (SCR)
6. Write any four applications of Photo Diode.
7. Write any four applications of Photo Transistors.
8. Briefly explain about the working of 'π-section filters'.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 8 **marks.** **5 x 8 = 40M**

SECTION – B

9. Discuss in detail, the behavior of a P-N junction diode under Forward and Reverse bias connections.
10. Explain the working of PNP and NPN transistors.
11. Explain the construction and working of Junction-gate Field-effect Transistor (JFET)
12. Explain the construction and working of Light Emitting Diodes (LEDs). Write their applications.
13. Explain the working of Full Wave Rectifier. Derive an expression for its efficiency.

SECTION – C

14. Explain the construction and working of Zener Diode. Write its V-I characteristics.
15. Explain the Hybrid Parameters of a Transistor and equivalent circuit.
16. Describe the construction and explain the working of Silicon Controlled Rectifier.
17. Describe the construction and explain the working of Photo – Transistor.
18. Explain the working of Three terminal fixed voltage IC- regulator (78XX).

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DEPARTMENT OF PHYSICS

SRI Y. N. COLLEGE (A), NARSAPUR

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II B.Sc. SEMESTER – III

(*MAJOR*) COURSE 8: Analog and Digital Electronics

{for 2023-2027 Batch (w.e.f. 2024-2025)}

MODEL QUESTION PAPER

Time: 3 Hrs. **Max. Marks: 60**

SECTION – A

Answer any FIVE questions. Each question carries 4 marks. **5 x 4 = 20M**

1. Write any four advantages of Negative feedback.
2. Derive the expression of Summing Amplifier.
3. Explain 1's and 2's compliment methods with examples.
4. Draw the Truth tables of 'AND' and 'OR' gates with circuit diagrams.
5. Write any four differences of inverting and non-inverting amplifiers.
6. Draw the neat diagrams of Half sub-tractor and Full sub-tractor.
7. Explain the operation of D flip-flop.
8. Explain the working of Clocked SR flip-flop.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 8 **marks.** **5 x 8 = 40M**

SECTION – B

9. Draw the Block diagram of Op Amplifier and explain its working in detail.
10. Explain the applications of Op-amp as (a) Differentiator and (b) Integrator.
11. State and Prove De Morgan's laws and explain the operation with neat diagrams.
12. Explain the operation of 1to 4 De-Multiplexer with neat diagram and write its truth table.
13. With the help of neat circuit diagram, explain the operation of JK and T flip flops.

SECTION – C

14. Draw neat diagrams of Inverting and Non-Inverting amplifiers and explain their operation.
15. Explain the applications of Op-amp as (a) Voltage follower and (b) summing amplifier.
16. Explain the following gates with their truth tables.
    AND (b) OR (c) NOT (d) NOR (e) NAND
17. Explain the operation of Half adder and Full adders with neat diagrams and explain their truth tables.
18. Explain with suitable examples of Binary to Grey code and Grey code to Binary.

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DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

(Affiliated to Adikavi Nannaya University)

Accredited by NAAC at 'A^{+}' Grade

For 2023-2027 Batch [w.e.f 2024-2025]

SEMESTER – IV

II B.Sc.: PHYSICS SYLLABUS-MINOR

COURSE 3: ELECTRICITY AND MAGNETISM

Hours: 45 **Credits: 3** **3 hrs/week**

UNIT-I: ELECTROSTATICS AND DIELECTRICS 9hrs

Gauss's law-Statement and its proof, Electric field intensity due to (i) uniformly charged solid sphere, Electrical potential–Equipotential surfaces, Potential due to a uniformly charged sphere. Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics, Dielectric strength, Electric displacement D, electric polarization Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT-II: CURRENT ELECTRICITY 9hrs

Electrical conduction-drift velocity-current density, equation of continuity, ohms law and limitations, Kirchhoff's Law's, Wheatstone bridge-balancing condition - sensitivity. Superposition Theorem, Norton's Theorem.

UNIT-III: MAGNETOSTATICS 4hrs

Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Ampere's Circuital Law and its application to Solenoid, Hall effect, determination of Hall coefficient and applications.

Electromagnetic Induction 5 hrs

Faraday's laws of electromagnetic induction, Lenz's law, Self-induction and Mutual induction, Self-inductance of a long solenoid, Magnetic Energy density. Mutual inductance of a pair of coils. Coefficient of coupling.

UNIT-IV ELECTROMAGNETIC WAVES-MAXWELL'S EQUATIONS 9hrs

Basic laws of electricity and magnetism- Maxwell's equations-integral and differential forms Derivation, concept of displacement current. Plane electromagnetic wave equation, Hertz experiment-Transverse nature of electromagnetic waves. Electromagnetic wave equation in conducting media. Pointing vector and propagation of electromagnetic waves.

UNIT-V VARYING AND ALTERNATING CURRENTS 9 hrs

Growth and decay of currents in LR, CR, LCR circuits-Critical damping. Alternating current - A.C. fundamentals, and A.C through pure R, L and C. Relation between current and voltage in LR and CR circuits, Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q – factor, Power in ac circuits, Power factor.

REFERENCE BOOKS

1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.
2. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
3. Electricity, Magnetism with Electronics, K.K.Tewari, R.Chand & Co.,
4. Electricity and Magnetism by Brijlal and Subramanyam Ratan Prakashan Mandir, 1966
5. Electricity and Magnetism: Fundamentals, Theory, and Applications" by R. Murugeshan, Kiruthiga Sivaprasath, and M. Saravanapandian
6. Electricity and Magnetism: Theory and Applications" by Ajoy Ghatak and S. Lokanathan
7. Electricity and Magnetism: Problems and Solutions" by Ashok Kumar and Rajesh Kumar
8. Electricity and Magnetism, R.Murugeshan, S. Chand & Co.

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SEMESTER – 1V-MINOR
COURSE 9: ELECTRICITY AND MAGNETISM

Chapter / Unit	Section A (**4** marks)	Section – B (**8** marks)	Section – C (**8** marks)
UNIT-I: Electrostatics and Dielectrics	**1+1** (Problem)	**1**	**1**
UNIT-II: Current electricity	**1**	**1**	**1**
UNIT-III: Magnetostatics Electromagnetic Induction	**1+1** (Problem)	**1**	**1**
UNIT-IV Electromagnetic waves-Maxwell's equations	**1**	**1**	**1**
UNIT-V Varying and Alternating currents	**1+1** (Problem)	**1**	**1**

DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

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Accredited by NAAC at 'A^{+}' Grade

For 2023-2027 Batch [w.e.f 2024-2025]

SEMESTER – IV

II B.Sc.: PHYSICS--MINOR

COURSE 9: ELECTRICITY AND MAGNETISM

MODEL QUESTION PAPER

TIME: 3Hrs **Max. Marks: 60**

SECTION-A

Answer any FIVE questions **5x4=20M**

1. Derive an expression for the potential due to a point charge.
2. Explain drift velocity and current density.
3. Explain Ampere's Circuital Law and give two applications.
4. Show that electromagnetic waves are transverse in nature.
5. Explain Q –factor and Power factor.
6. A solenoid of length 0.50 m wound with 5000 turns / m of wire has a radius 4 cm. Calculate the self inductance of solenoid.
7. The dielectric constant of medium is 4. Electric field in the dielectric is 10^6 V/m. Calculate electric displacement and polarization. Take $\epsilon_0 = 9x10^{-12}$ F/m.
8. A series circuit R= 25 ohms and L= 0.2 H is to be used at a frequency 500 Hz. Find its impedance.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 8 marks. **5 x 8 = 40 M**

SECTION-B

9. State and prove Gauss law in electrostatics.
10. State Kirchhoff's laws. Obtain the conditions of balance of Wheatstone bridge.
11. Explain Biot-Savart's law. Derive an expression for the magnetic induction due to a circular loop carrying current.
12. What is Pointing vector? Explain the Hertz Experiment to produce and detect electromagnetic waves.
13. Derive an expression for current, impedance and phase angle in LR circuit with the help of phase diagram.

SECTION-C

14. Define electric displacement (D), electric polarization (P) & electric intensity (E) and obtain the relation among them.
15. State and Prove Norton's Theorem.
16. Define self induction. Obtain an expression for the self inductance of a long solenoid.
17. Write Maxwell's equation in differential and integral form. Derive Maxwell's wave equation.
18. Explain the theory of series LCR circuit. Obtain its power factor.

DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

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Accredited by NAAC at 'A^{+}' Grade

For 2023-2027 Batch [w.e.f 2024-2025]

SEMESTER – IV

II B.Sc.: PHYSICS SYLLABUS-MINOR

COURSE 4: MODERN PHYSICS

Hours: 45 **Credits: 3** **3 hrs/week**

UNIT-I: INTRODUCTION TO ATOMIC STRUCTURE AND SPECTROSCOPY: (9 hrs)

Bohr's model of the hydrogen atom -Derivation for radius, energy and wave number - Hydrogen spectrum, Vector atom model – Stern and Gerlach experiment, Quantum numbers associated with it, Coupling schemes, Spectral terms and spectral notations, Selection rules. Zeeman effect, Experimental arrangement to study Zeeman effect.

UNIT-II: MOLECULAR STRUCTURE AND SPECTROSCOPY: (9 hrs)

Molecular pure rotational and vibrational spectra, electronic energy levels and electronic transitions, Raman effect, Characteristics of Raman effect, Experimental arrangement to study Raman effect, Quantum theory of Raman effect, Applications of Raman effect. Spectroscopic techniques: IR, UV-Visible, and Raman spectroscopy.

UNIT-III: MATTER WAVES & UNCERTAINTY PRINCIPLE: (9 hrs)

Matter waves, de Broglie's hypothesis, Properties of matter waves, Davisson and Germer's experiment, Heisenberg's uncertainty principle for position and momentum & energy and time, Illustration of uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit) and photons (Gamma ray microscope).

UNIT-IV: QUANTUM MECHANICS: (9 hrs)

Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations- Derivations, Physical interpretation of wave function, Eigen functions, Eigen values, Application of Schrodinger wave equation to (one-dimensional potential box of infinite height (Infinite Potential Well)

UNIT-V: SUPERCONDUCTIVITY: (9 hrs)

Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissner effect, Isotope effect, Type I and Type II superconductors, BCS theory, high Tc superconductors, Applications of superconductors.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

- BSc Physics, Vol.4, Telugu Akademy, Hyderabad
- Atomic Physics by J.B. Rajam; S.Chand& Co.,
- Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
- Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
- Nuclear Physics, D.C.Tayal, Himalaya Publishing House.
- S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publ.Co.)
- K.K.Chattopadhyay&A.N.Banerjee, Introd.to Nanoscience and Technology (PHI LearningPriv.Limited).
- Nano materials, A K Bandopadhyay. New Age International Pvt Ltd (2007)
- Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj,BB Rath and J Murday-Universities Press-IIM

BLUE PRINT
SEMESTER – 1V-MINOR
COURSE 10: MODERN PHYSICS

Chapter / Unit	**Section A** (**4** marks)	**Section – B** (**8** marks)	**Section – C** (**8** marks)
UNIT-I: Introduction to Atomic Structure and Spectroscopy	**1+1** (Problem)	**1**	**1**
UNIT-II: Molecular Structure and Spectroscopy	**1+1** (Problem)	**1**	**1**
UNIT-III: Matter waves & Uncertainty Principle	**1+1** (Problem)	**1**	**1**
UNIT-IV: Quantum Mechanics	**1**	**1**	**1**
UNIT-V: Superconductivity	**1**	**1**	**1**

DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

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Accredited by NAAC at 'A^{+}' Grade

For 2023-2027 Batch [w.e.f 2024-2025]

II B.Sc.: PHYSICS SEMESTER – IV-MINOR

COURSE 10: MODERN PHYSICS

MODEL QUESTION PAPER

TIME: 3Hrs **Max. Marks: 60**

SECTION-A

Answer any FIVE questions **5x4=20M**

1. Explain L-S coupling and J-J coupling.
2. Write the applications of Raman Effect
3. Write about properties of matter waves?
4. Explain the Eigen functions and Eigen values.
5. Explain Meissner effect and Isotope effect.
6. In the normal Zeeman effect, the frequency separation between two consecutive spectral lines is 8.3x108 Hz. Find the magnetic field? (μ_B = 9.3 x 10-24 JT-1).
7. A Sample is excited with a light of wavelength 4358 A^o. Raman lines are observed at 4447 A^0. Calculate the Raman shift in cm^{-1}.
8. If the uncertainty in the position of an electron is 2 x 10-10m. Find the uncertainty in the velocity.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 8 marks. **5 x 8 = 40 M**

SECTION-B

9. Describe stern and Gerlach experiment. What is its importance?
10. Give the elementary theory of the origin of pure rotational spectrum of a molecule and explain how the inter-nuclear distances can be estimated?
11. Explain Devisson and Germer experiment for detection of matter waves.
12. Derive Schrödinger's time independent wave equation.
13. Write an essay on Type I and Type II superconductors.

SECTION–C

14. Describe the concepts of vector atom model and explain the various quantum numbers associated with it.
15. What is Raman Effect? Describe the experimental arrangement to study the Raman Effect.
16. State and explain Heisenberg's uncertainty principle. Explain the consequences of uncertainty principle with regard to diffraction by a single slit and Gamma ray microscope.
17. Calculate the energy of a particle in one-dimensional potential box of infinite height.
18. What is super conductivity? Explain Meissner effect.

DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

(Affiliated to Adikavi Nannaya University)

Accredited by NAAC at 'A^{+}' Grade

For 2023-2027 Batch [w.e.f 2024-2025]

SEMESTER – IV

II B.Sc.: PHYSICS SYLLABUS-MAJOR

COURSE 9: ELECTRICITY AND MAGNETISM

Hours: 45 **Credits: 3** **3 hrs/week**

UNIT-I: ELECTROSTATICS AND DIELECTRICS 9hrs

Gauss's law-Statement and its proof, Electric field intensity due to (i) uniformly charged solid sphere, Electrical potential–Equipotential surfaces, Potential due to a uniformly charged sphere. Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics, Dielectric strength, Electric displacement D, electric polarization Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT-II: CURRENT ELECTRICITY 9hrs

Electrical conduction-drift velocity-current density, equation of continuity, ohms law and limitations, Kirchhoff's Law's, Wheatstone bridge-balancing condition - sensitivity. Superposition Theorem, Norton's Theorem.

UNIT-III: MAGNETOSTATICS 4hrs

Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Ampere's Circuital Law and its application to Solenoid, Hall effect, determination of Hall coefficient and applications.

Electromagnetic Induction 5 hrs

Faraday's laws of electromagnetic induction, Lenz's law, Self-induction and Mutual induction, Self-inductance of a long solenoid, Magnetic Energy density. Mutual inductance of a pair of coils. Coefficient of coupling.

UNIT-IV ELECTROMAGNETIC WAVES-MAXWELL'S EQUATIONS 9hrs

Basic laws of electricity and magnetism- Maxwell's equations-integral and differential forms Derivation, concept of displacement current. Plane electromagnetic wave equation, Hertz experiment-Transverse nature of electromagnetic waves. Electromagnetic wave equation in conducting media. Pointing vector and propagation of electromagnetic waves.

UNIT-V VARYING AND ALTERNATING CURRENTS 9 hrs

Growth and decay of currents in LR, CR, LCR circuits-Critical damping. Alternating current - A.C. fundamentals, and A.C through pure R, L and C. Relation between current and voltage in LR and CR circuits, Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q – factor, Power in ac circuits, Power factor.

REFERENCE BOOKS

1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.
2. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
3. Electricity, Magnetism with Electronics, K.K.Tewari, R.Chand & Co.,
4. Electricity and Magnetism by Brijlal and Subramanyam Ratan Prakashan Mandir, 1966
5. Electricity and Magnetism: Fundamentals, Theory, and Applications" by R. Murugeshan, Kiruthiga Sivaprasath, and M. Saravanapandian
6. Electricity and Magnetism: Theory and Applications" by Ajoy Ghatak and S. Lokanathan
7. Electricity and Magnetism: Problems and Solutions" by Ashok Kumar and Rajesh Kumar
8. Electricity and Magnetism, R.Murugeshan, S. Chand & Co.

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SEMESTER – 1V
COURSE 9: ELECTRICITY AND MAGNETISM

Chapter / Unit	Section A (**4** marks)	Section – B (**8** marks)	Section – C (**8** marks)
UNIT-I: Electrostatics and Dielectrics	**1+1** (Problem)	**1**	**1**
UNIT-II: Current electricity	**1**	**1**	**1**
UNIT-III: Magnetostatics Electromagnetic Induction	**1+1** (Problem)	**1**	**1**
UNIT-IV Electromagnetic waves-Maxwell's equations	**1**	**1**	**1**
UNIT-V Varying and Alternating currents	**1+1** (Problem)	**1**	**1**

DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

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For 2023-2027 Batch [w.e.f 2024-2025]

SEMESTER – IV

II B.Sc.: PHYSICS-MAJOR

COURSE 9: ELECTRICITY AND MAGNETISM

MODEL QUESTION PAPER

TIME: 3Hrs **Max. Marks: 60**

SECTION-A

Answer any FIVE questions **5x4=20M**

1. Derive an expression for the potential due to a point charge.
2. Explain drift velocity and current density.
3. Explain Ampere's Circuital Law and give two applications.
4. Show that electromagnetic waves are transverse in nature.
5. Explain Q –factor and Power factor.
6. A solenoid of length 0.50 m wound with 5000 turns / m of wire has a radius 4 cm. Calculate the self inductance of solenoid.
7. The dielectric constant of medium is 4. Electric field in the dielectric is 10^6 V/m. Calculate electric displacement and polarization. Take $\epsilon_0 = 9x10^{-12}$ F/m.
8. A series circuit R= 25 ohms and L= 0.2 H is to be used at a frequency 500 Hz. Find its impedance.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 8 marks. **5 x 8 = 40 M**

SECTION-B

9. State and prove Gauss law in electrostatics.
10. State Kirchhoff's laws. Obtain the conditions of balance of Wheatstone bridge.
11. Explain Biot-Savart's law. Derive an expression for the magnetic induction due to a circular loop carrying current.
12. What is Pointing vector? Explain the Hertz Experiment to produce and detect electromagnetic waves.
13. Derive an expression for current, impedance and phase angle in LR circuit with the help of phase diagram.

SECTION-C

14. Define electric displacement (D), electric polarization (P) & electric intensity (E) and obtain the relation among them.
15. State and Prove Norton's Theorem.
16. Define self induction. Obtain an expression for the self inductance of a long solenoid.
17. Write Maxwell's equation in differential and integral form. Derive Maxwell's wave equation.
18. Explain the theory of series LCR circuit. Obtain its power factor.

DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

(Affiliated to Adikavi Nannaya University)

Accredited by NAAC at 'A^{+}' Grade

For 2023-2027 Batch [w.e.f 2024-2025]

SEMESTER – IV

II B.Sc.: PHYSICS SYLLABUS-MAJOR

COURSE 10: MODERN PHYSICS

Hours: 45 **Credits: 3** **3 hrs/week**

UNIT-I: INTRODUCTION TO ATOMIC STRUCTURE AND SPECTROSCOPY: (9 hrs)

Bohr's model of the hydrogen atom -Derivation for radius, energy and wave number - Hydrogen spectrum, Vector atom model – Stern and Gerlach experiment, Quantum numbers associated with it, Coupling schemes, Spectral terms and spectral notations, Selection rules. Zeeman effect, Experimental arrangement to study Zeeman effect.

UNIT-II: MOLECULAR STRUCTURE AND SPECTROSCOPY: (9 hrs)

Molecular pure rotational and vibrational spectra, electronic energy levels and electronic transitions, Raman effect, Characteristics of Raman effect, Experimental arrangement to study Raman effect, Quantum theory of Raman effect, Applications of Raman effect. Spectroscopic techniques: IR, UV-Visible, and Raman spectroscopy.

UNIT-III: MATTER WAVES & UNCERTAINTY PRINCIPLE: (9 hrs)

Matter waves, de Broglie's hypothesis, Properties of matter waves, Davisson and Germer's experiment, Heisenberg's uncertainty principle for position and momentum & energy and time, Illustration of uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit) and photons (Gamma ray microscope).

UNIT-IV: QUANTUM MECHANICS: (9 hrs)

Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations- Derivations, Physical interpretation of wave function, Eigen functions, Eigen values, Application of Schrodinger wave equation to (one-dimensional potential box of infinite height (Infinite Potential Well)

UNIT-V: SUPERCONDUCTIVITY: (9 hrs)

Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissner effect, Isotope effect, Type I and Type II superconductors, BCS theory, high Tc superconductors, Applications of superconductors.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

- BSc Physics, Vol.4, Telugu Akademy, Hyderabad
- Atomic Physics by J.B. Rajam; S.Chand& Co.,
- Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
- Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
- Nuclear Physics, D.C.Tayal, Himalaya Publishing House.
- S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publ.Co.)
- K.K.Chattopadhyay&A.N.Banerjee, Introd.to Nanoscience and Technology (PHI LearningPriv.Limited).
- Nano materials, A K Bandopadhyay. New Age International Pvt Ltd (2007)
- Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj,BB Rath and J Murday-Universities Press-IIM

BLUE PRINT
SEMESTER – 1V
COURSE 10: MODERN PHYSICS

Chapter / Unit	Section A (**4** marks)	Section – B (**8** marks)	Section – C (**8** marks)
UNIT-I: Introduction to Atomic Structure and Spectroscopy	**1+1** (Problem)	**1**	**1**
UNIT-II: Molecular Structure and Spectroscopy	**1+1** (Problem)	**1**	**1**
UNIT-III: Matter waves & Uncertainty Principle	**1+1** (Problem)	**1**	**1**
UNIT-IV: Quantum Mechanics	**1**	**1**	**1**
UNIT-V: Superconductivity	**1**	**1**	**1**

DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

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For 2023-2027 Batch [w.e.f 2024-2025]

II B.Sc.: PHYSICS SEMESTER – IV-MAJOR

COURSE 10: MODERN PHYSICS

MODEL QUESTION PAPER

TIME: 3Hrs **Max. Marks: 60**

SECTION-A

Answer any FIVE questions **5x4=20M**

1. Explain L-S coupling and J-J coupling.
2. Write the applications of Raman Effect
3. Write about properties of matter waves?
4. Explain the Eigen functions and Eigen values.
5. Explain Meissner effect and Isotope effect.
6. In the normal Zeeman effect, the frequency separation between two consecutive spectral lines is 8.3x108 Hz. Find the magnetic field? (μ_B = 9.3 x 10-24 JT-1).
7. A Sample is excited with a light of wavelength 4358 A^o. Raman lines are observed at 4447 A^0. Calculate the Raman shift in cm^{-1}.
8. If the uncertainty in the position of an electron is 2 x 10-10m. Find the uncertainty in the velocity.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 8 marks. **5 x 8 = 40 M**

SECTION-B

9. Describe stern and Gerlach experiment. What is its importance?
10. Give the elementary theory of the origin of pure rotational spectrum of a molecule and explain how the inter-nuclear distances can be estimated?
11. Explain Devisson and Germer experiment for detection of matter waves.
12. Derive Schrödinger's time independent wave equation.
13. Write an essay on Type I and Type II superconductors.

SECTION–C

14. Describe the concepts of vector atom model and explain the various quantum numbers associated with it.
15. What is Raman Effect? Describe the experimental arrangement to study the Raman Effect.
16. State and explain Heisenberg's uncertainty principle. Explain the consequences of uncertainty principle with regard to diffraction by a single slit and Gamma ray microscope.
17. Calculate the energy of a particle in one-dimensional potential box of infinite height.
18. What is super conductivity? Explain Meissner effect.

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For 2023-2027 Batch [w.e.f 2024-2025]

SEMESTER – IV

II B.Sc.: PHYSICS SYLLABUS-MAJOR

COURSE 11: INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS

Hours: 45 **Credits: 3** **3 hrs/week**

UNIT-I: INTRODUCTION TO NUCLEAR PHYSICS (9hrs)

Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces: Characteristics of nuclear forces- Nuclear Models-Liquid drop model-Semi empirical mass formula, nuclear shell model.

UNIT-II: ELEMENTARY PARTICLES AND INTERACTIONS (9hrs)

Discovery and classification of elementary particles, properties of leptons, mesons and baryons; Types of interactions-strong, electromagnetic and weak interactions; Conservation laws – Isospin, parity, charge conjugation

UNIT-III: NUCLEAR REACTIONS AND NUCLEAR DETECTORS (9hrs)

Nuclear Reactions: Types of reactions, Conservation Laws in nuclear reactions, Reaction energetic, Threshold energy, nuclear cross-section; Nuclear detectors: Geiger-Muller counter, Scintillation counter, Wilson's cloud chamber

UNIT-IV: NUCLEAR DECAYS AND NUCLEAR ACCELERATORS (9hrs)

Nuclear Decays: Gamow's theory of alpha decay, Fermi's theory of Beta- decay, Energy release in Beta-decay, selection rules. Nuclear Accelerators: Types-Electrostatic and electrodynamics accelerators; Cyclotron-construction, working and applications; Synchrocyclotron-construction, working and applications.

UNIT-V: APPLICATIONS OF NUCLEAR AND PARTICLE PHYSICS (9hrs)

Medical Applications: Radiation therapy and imaging techniques, nuclear energy: nuclear reactors and power generation, Particle physics in high-energy Astrophysics.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

Reference Books:

1. Nuclear Physics, Irving Kaplan, Narosa Pub. (1998).

2. Nuclear Physics, Theory and experiment – P.R. Roy and B.P. Nigam, New Age Int.1997.

3. Atomic and Nuclear Physics (Vol.2), S.N. Ghoshal, S. Chand & Co. (1994).

4. Nuclear Physics, D.C. Tayal, Himalaya Pub. (1997).

5. Atomic and Nuclear Physics, R.C. Sharma, K. Nath& Co., Meerut.

6. Nuclei and Particles, E. Segre.

7. Introduction to Nuclear Physics, H.A. Enge, Addison Wesley (1975).

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SEMESTER – 1V
COURSE 11: INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS

Chapter / Unit	Section A (**4** marks)	Section – B (**8** marks)	Section – C (**8** marks)
UNIT-I: Introduction to Nuclear Physics	**2**	**1**	**1**
UNIT-II: Elementary Particles and Interactions	**1**	**1**	**1**
UNIT-III: Nuclear Reactions and Nuclear Detectors	**2**	**1**	**1**
UNIT-IV: Nuclear Decays and Nuclear Accelerators	**2**	**1**	**1**
UNIT-V: Applications of Nuclear and Particle Physics	**1**	**1**	**1**

DEPARTMENT OF PHYSICS

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II B.Sc.: PHYSICS SEMESTER – IV-MAJOR

COURSE 11: INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS

MODEL QUESTION PAPER

Answer any <u>FIVE</u> questions **5x4=20M**

1. Explain mass defect and Binding energy.
2. Explain Shell model of the nucleus
3. Explain types of interactions.
4. Mention the conservation laws in nuclear reactions.
5. Explain the construction and working of Scintillation counter.
6. State and Explain Geiger-Nuttal law.
7. Write the applications of Synchrocyclotron.
8. Write any four applications of fundamental particles in high-energy Astrophysics.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 8 marks. **5 x 8 = 40 M**

<u>SECTION-B</u>

9. Describe the basic properties of nucleus.
10. What are elementary particles? Give their classification.
11. What are nuclear reactions? Write different types of nuclear reactions.
12. Explain the Gamow's theory of alpha decay.
13. Explain about nuclear reactors.

<u>SECTION–C</u>

14. Describe the Liquid drop model of nucleus
15. Explain different types of interactions.
16. Describe the construction and working of G M counter.
17. Describe the construction and working of a Cyclotron.
18. Write any four medical applications in Radiation therapy and imaging techniques.

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For 2022-2026 Batch [W.e.f. 2022-2023]

SEMESTER – V PAPER – VI B (6B)

III B.Sc.: PHYSICS SYLLABUS UNDER CBCS

LOW TEMPERATURE PHYSICS & REFRIGERATION

UNIT-I PRODUCTION OF LOW TEMPERATURE (9 hrs)

Production of low temperatures-Introduction, Joule-Thomson effect, Regenerative cooling, Different methods of liquefaction of gases, liquefaction of air-Production of liquid hydrogen and **Helium-Kapitza's method**, Adiabatic demagnetization, Properties of materials at low temperatures.

UNIT-II MEASUREMENT OF LOW TEMPERATURE (9 hrs)

Gas thermometer and its correction and calibration, Secondary thermometers, resistance thermometers, thermocouples, Vapour pressure thermometers, Magnetic thermometers, Advantages and drawbacks of each type of thermometer.

UNIT-III PRINCIPLES OF REFRIGERATION (9 hrs)

Introduction to Refrigeration- Stages of refrigeration, Types of refrigeration -Vapor compression and vapor absorption refrigeration systems, Refrigeration cycle and explanation with a block diagram, **applications of Refrigeration**. Refrigerants-Introduction, Ideal refrigerant, Properties of refrigerant, Classification of refrigerants, commonly used refrigerants, Eco-friendly refrigerants.

UNIT-IV COMPONENTS OF REFIGERATOR (9 hrs)

Refrigerator and its working, Block diagram, Coefficient of Performance (COP), Tons of refrigeration (TR) and Energy Efficiency Ratio (EER), ***Refrigerator components:*** Types of compressors, evaporators and condensers, **differences between Heat engine and refrigerator**, Refrigerant leakage and detection.

UNIT-V APPLICATIONS OF LOW TEMPERATURE & REFRIGERATION (9 hrs.)

Applications of Low temperatures: Preservation of biological material, Food freezing, liquid nitrogen and liquid hydrogen in medical field, Superconducting magnets in MRI. Applications of refrigeration: Domestic refrigerators, Ice plants, Food preservation methods, Cold treatment of metals.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS

1. Heat and Thermodynamics by Brij Lal &N.Subramanyam, S.Chand Publishers.
2. Thermal Physics by S C Garg, R M Bansal & C K Ghosh, McGrawHill Education, India
3. Heat and Thermodynamics by M MZemansky, Mc Graw Hill Education (India).
4. Low-Temperature Physics by Christian E. & Siegfried H., Springer.
5. Thermal Engineering by S. Singh, S.Pati, Ch:18 Introduction to Refrigeration.
6. The Physics Hyper Text Book. Refrigerators.https://physics.info/refrigerators/
7. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi
8. A course in Refrigeration and Air Conditioning by S.C. Arora and S. Domkundwar, Dhanpatrai and sons, Delhi
9. https://trc.nist.gov/cryogenics/Papers/Review/2017-Low_Temperature_Applications_And_Challenges.pdf
10. https://nptel.ac.in/content/storage2/courses/112105129/pdf/RAC%20Lecture%203.pdf
11. Other Web sources suggested by the teacher concerned and the reading material. https://nptel.ac.in

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III BSc SEMESTER – V PAPER VI B
LOW TEMPERATURE PHYSICS & REFRIGERATION

Chapter / Unit	Section A (**5** marks)	Section – B (**10** marks)	Section – C (**10** marks)
UNIT-I PRODUCTION OF LOW TEMPERATURE	**1**	**1**	**1**
UNIT-II MEASUREMENT OF LOW TEMPERATURE	**1**	**1**	**1**
UNIT-III PRINCIPLES OF REFRIGERATION	**2**	**1**	**1**
UNIT-IV COMPONENTS OF REFIGERATOR	**2**	**1**	**1**
UNIT-V APPLICATIONS OF LOW TEMPERATURE & REFRIGERATION	**2**	**1**	**1**

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III B.Sc.: PHYSICS

SEMESTER – V PAPER – VI

LOW TEMPERATURE PHYSICS & REFRIGERATION

MODEL QUESTION PAPER

Time: 3 Hrs. **Max. Marks: 75M**

SECTION – A

Answer any <u>FIVE</u> questions. **5 x 5 = 25 M**

1. Discuss properties of materials at low temperature.
2. Write a short note on secondary thermometer.
3. Explain the stages of Refrigeration.
4. Write a short note on Eco-friendly refrigerants.
5. Write different types of compressors.
6. Write the differences between Heat engine and refrigerator.
7. How to preserve the Bio-logical materials.
8. Write about uses of liquid hydrogen in medical field.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 10 marks. **5 x 10 = 50M**

SECTION -- B

09. Derive an expression for Joule-Thomson Cooling.
10. Describe the working of Gas thermometer and write its advantages and disadvantages.
11. What is refrigeration? Explain the principle and working of a vapour compression refrigeration system?
12. Explain refrigeration cycle with block diagram.
13. Explain the importance of liquid hydrogen and liquid nitrogen in medical field.

SECTION – C

14. Explain Kapitza's method for liquefaction of helium gas with a neat diagram.
15. Describe the working of Magnetic thermometer and write its advantages and disadvantages.
16. What is refrigeration? Explain the principle and working of vapour absorption refrigeration system.
17. Discus refrigerator components of **a**) Evaporator **b**) Condenser **c**) Compressor.
18. Explain the importance of superconducting magnet in MRI.

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SEMESTER – V PAPER – VII B (7B)

III B.Sc.: PHYSICS SYLLABUS

SOLAR ENERGY AND APPLICATIONS

UNIT - I: BASIC CONCEPTS OF SOLAR ENERGY (10hrs)

Spectral distribution of solar radiation, Solar constant, zenith angle and Air-Mass, direct, diffuse and total radiations. **Solar energy- importance and global warming, solar pond.** Pyrheliometer - working principle, direct radiation measurement, Pyranometer-working Principle, diffuse radiation measurement, Distinction between the two meters.

UNIT - II: SOLAR THERMAL COLLECTORS (10hrs)

Solar Thermal Collectors-Introduction, Types of Thermal collectors, Flat plate collector – liquid heating type, Energy balance equation and efficiency, Evacuated tube collector, solar water heating system. Concentrating collectors, Solar cookers, Solar dryers, Solar desalinators. **Solar green houses.**

UNIT - III: FUNDAMENTALS OF SOLAR CELLS (10hrs)

Semiconductor interface, Types, homo junction, hetero junction and Schottky barrier, advantages and drawbacks, Photovoltaic Effect, Solar photovoltaic cell-its working principle and applications, Measurement of I-V characteristics, series and shunt resistance of a solar cell, output parameters, conversion efficiency, their effect on efficiency,

UNIT -IV: TYPES OF SOLARCELLS AND MODULES (10 hrs)

Types of solar cells, Crystalline silicon solar cells, poly-Si cells, Thin film solar cells-CdTe/CdS cell configurations, structures, advantages and limitations, Multi junction cells – Double and triple junction cells. Module fabrication steps, Modules in series and parallel. **Solar PV system and its components.**

Unit – V: SOLAR PHOTOVOLTAIC SYSTEMS (10hrs)

Energy storage in PV systems: Need of energy storage, Energy storage modes, Batteries: Primary and secondary, Solid-state battery, Molten solvent battery, lead acid battery and dry batteries-**Nickel Cadmium Batteries,** Electrical storage –Super capacitor. **Role of carbon Nano-tubes in electrodes.**

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

1. Solar Energy Utilization by G. D. Rai, Khanna Publishers
2. Solar Energy- Fundamentals, design, modelling and applications by G.N. Tiwari, Narosa Publications, 2005.
3. Solar Energy-Principles of thermal energy collection & storage by S.P. Sukhatme, Tata Mc-Graw Hill Publishers, 1999.
4. Science and Technology of Photovoltaics, P. Jayarama Reddy, CRC Press (Taylor & Francis Group), Leiden &BS Publications, Hyderabad, 2009.
5. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
6. Web sources suggested by the teacher concerned and the college librarian including reading material.
   (a) https://courses.edx.org/c4x/DelftX/ET.3034TU/asset/solar_energy_v1.1.pdf
   (b) https://www.sku.ac.ir/Datafiles/BookLibrary/45/John%20A.%20Duffie,%20William%20A.%20Beckman(auth.)-Solar%20Engineering%20of%20Thermal%20Processes,%20Fourth%20Edition%20(2013).pdf .

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III BSc SEMESTER – V PAPER VII B

SOLAR ENERGY AND APPLICATIONS

Chapter / Unit	Section A (**5** marks)	Section – B (**10** marks)	Section – C (**10** marks)
UNIT-I: BASIC CONCEPTS OF SOLAR ENERGY	**2**	**1**	**1**
Unit-II: SOLAR THERMAL COLLECTORS	**2**	**1**	**1**
UNIT-III: FUNDAMENTALS OF SOLAR CELLS	**1**	**1**	**1**
Unit-IV: TYPES OF SOLARCELLS AND MODULES	**1**	**1**	**1**
Unit-V: SOLAR PHOTOVOLTAIC SYSTEMS	**2**	**1**	**1**

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III B.Sc.: PHYSICS

SEMESTER – V PAPER – VII B (7B)

SOLAR ENERGY AND APPLICATIONS

MODEL QUESTION PAPER

Time: 3 Hrs. **Max. Marks: 75M**

SECTION – A

Answer any FIVE questions. **5 x 5 = 25 M**

1. Explain about spectral distribution of radiation.
2. Define Solar constant, Air mass?
3. Explain different types of solar cells.
4. Explain solar desalinator and drier?
5. Explain photo voltaic effect?
6. Explain solar hot water system?
7. Discuss different modes of energy storage
8. Discuss need of energy storage.

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 10 marks. **5 x 10 = 50M**

SECTION – B

9. Describe how the solar constant is measured by using pyrheliometer?
10. Explain energy balance equation?
11. Draw solar cell output parameters? Explain series and shunt resistance of a solar cell?
12. Explain Thin film Solar cells?
13. Discuss about Solid – State and molten solvent batteries.

SECTION – C

14. Write about the Importance of Solar Energy?
15. What is flat plate collector? Describe liquid heating type FPC?
16. Explain homo, hetero and schotty interfaces?
17. Explain solar cell modular assembly? What type of steps involved in it?
18. Explain role of carbon nano tubes in electrodes.