



SRI Y N COLLEGE (A), NARSAPUR
SYLLABUS



2023-2024

DEPARTMENT OF PHYSICS
SRI Y.N.COLLEGE (A)
NARSAPUR



SRI Y.N.COLLEGE (Autonomous)

(Affiliated to Adikavi Nannaya University)

Thrice Accredited by NAAC at 'A' Grade

NARSAPUR-534 275, W.G.Dt., A.P.,

Date: 13-10-2023

NOTICE

All the Heads of the Departments are requested to go through the agenda for the Board of Studies meeting for the academic year 2023-2024 of your respective departments and see that they are discussed thoroughly and the respective resolutions are recorded in the minutes book of the respective departments.

AGENDA:

1. To prepare the syllabi and model question papers for the degree I, II, III and IV years for the academic year 2023-24 by making appropriate modifications (above or equal to 20%) to the University syllabus.
2. To discuss about the ratio of CIA and SEE from the present ratio 25:75 to 40:60 for the 2023-2024 admitted batch onwards.
3. To discuss about the division of marks among the sections in CIA and SEE.
4. To prepare the syllabi and model question papers for Add-on courses, Certificate courses for the academic year 2023-2024.
5. To prepare syllabus for Bridge course for the newly admitted students.
6. To prepare course outcomes, programme outcomes and programme specific outcomes for the degree I, II, III & IV years for the academic year 2023-2024.
7. To discuss the modalities for conducting the Social Immersion Programme (Community Service Project) at the end of the 1st year degree, short-term Internship/Project at the end of second year degree and Semester Internship during V (or) VI semester in III year degree course.
8. To discuss the modalities and topics for conducting Seminars/Workshops & Faculty Development Programmes (FDP).
9. To discuss about online courses to be done by the students and staff.
10. To discuss about staff research work and publications in the UGC recognised journals.
11. To discuss about getting functional MOUs with the industry.
12. To discuss the feasibility of developing collaborations with other Colleges.
13. To evolve a plan of action for the Consultancy activity.
14. To discuss about ICT enabled teaching to the students.
15. To discuss to utilise Media Centre for delivering lectures online by the teaching staff members.
16. Any other item with permission of the chair.

Ch. R. V. Rathi Prasad
MEMBER SECRETARY

Ch. K. S. Prasad
PRINCIPAL

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Date: 13-10-2023

Model Paper for I Year - Semester End

Time: 3 hours

Max. Marks: 60

Section - I

(5x4 = 20 Marks)

Answer any five questions from the following.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

Answer any five questions choosing at least two questions from Sections II & III

(5x8 = 40 Marks)

Section - II

- 9.
- 10.
- 11.
- 12.
- 13.

Section - III

- 14.
- 15.
- 16.
- 17.
- 18.

Ch. Kameswari
PRINCIPAL

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Date: 13-10-2023

Model Paper for I Year - Mid Semester

Time: 1 hour 15 minutes

Max. Marks: 28

Section - I

(2x8 = 16 Marks)

ANSWER ANY TWO QUESTIONS

- 1.
- 2.
- 3.

Section - II

(3x4 = 12 Marks)

ANSWER ANY THREE QUESTIONS

- 4.
- 5.
- 6.
- 7.
- 8.

Ch. Lakshmi

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Date: 13-10-2023

Model Paper for I Year

CIA (Continuous Internal Assessment)

40 Marks

Mid Semester	28 Marks
Assignments	6 Marks
Seminars	6 Marks

SEE (Semester End Examinations)

60 Marks

Ch. Chandrababu Naidu
PRINCIPAL
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2023-2024

[For I, II, III & VI BSc students 2020-21 Batch onwards
& for I BSc Students w.e.f. 2023-2024 of NEP 2020]

BOARD OF STUDIES MEETING ON 17-10-2023 AT 3 PM

B.Sc., Physics syllabus as prescribed by APSCHE and Adikavi Nannaya University, Rajamahendravaram w.e.f 2021-2022 and ratify the minutes of department meeting held on 17-10-2023 at 3.15 PM through online Mode.

Resolutions:

1

- a) It is resolved to adopt and implement NEP 2020, I B.Sc., Physics (Theory, Practical, Model Question paper and Question Bank) Semester-I, Course-1 i.e., "**Essentials and Applications of Mathematical, Physical and Chemical Sciences**" and Semester-I, Course-2 i.e., "**Advances of Mathematical, Physical and Chemical Sciences**" & Multidisciplinary Course i.e., "**Principles of Physical Sciences**" and Semester-II, Course-3 i.e., "**Mechanics and Properties of Matter**" and Course-4 i.e., "**Waves and Oscillations**" w.e.f. academic year 2023-2024 by making with 20% modifications to University syllabus as prescribed by the APSCHE and ANUR.
 - b) It is resolved to approve II B.Sc., Physics syllabus with 20% modifications to University syllabus as prescribed by APSCHE and ANUR in the Semester-III, Paper-III i.e., "**Heat and Thermodynamics**", and Semester-IV, Paper-IV i.e., "**Electricity, Magnetism and Electronics**", Paper-V "**Modern Physics**" w.e.f. academic year 2021-2022.
 - c) It is resolved to continue the III B.Sc., Physics syllabus with 20% modifications to University syllabus as prescribed by APSCHE and ANUR in the Semester-V, Paper-VIB i.e., "**Low temperature Physics & Refrigeration**" and Paper-VIIB i.e., "**Solar Energy and Applications**" w.e.f. the academic year 2022-2023.
 - d) It is resolved to continue the syllabus of "**Solar Energy**" the Skill Development Course (SDC) in the II Semester of all I B.Sc., courses w.e.f. the academic year 2020-21.
2. Discussed and approved the ratio of Continuous Internal Assessment (CIA) and Semester End Examinations (SEE) from the present ratio 25:75 to 40:60 for the 2023-2024 admitted batch onwards.
 3. Discussed approved the division of marks among the sections in CIA and SEE.
 4. Discussed and approved the syllabi and model question paper for Certificate Course "**Refrigeration and Air conditioning**" for the academic year 2023-2024.
 5. Discussed and approved syllabus for Bridge Course for the newly admitted students.
 6. Discussed and Approved Course Outcomes, Programme Outcomes and programme specific Outcomes for the year I,II,III & IV for the academic year 2023-2024.
 7. Discussed the modalities for conducting the social immersion program (Community Service Project) which is scheduled to be conducted at the end of 1st year degree. Short Term Internship/Project at the end of second year degree and Semester Internship during V (or) VI semester in III year degree course.

8. Discussed the modalities and various topics for conducting Seminars/Workshops & Faculty Development Programme (FDP) and resolved to conduct a Seminar/Workshop on **"Nanomaterials" (or) "Renewable Energy"**.
9. It is resolved that the online courses like MOOCS, SWAYAM & LinkedIn courses should be done by the students and Staff.
10. Discussed regarding the staff publications. It is resolved that the staff members should make good effort to have their publications in the Scopus, Web of Science, SCI and peer reviewed journals recognized by UGC.
11. It is resolved for getting functional MoU's with the industry and make field visits by taking the students to companies and also invite industry people to the college for giving awareness to the students on job opportunities.
12. The College has entered into the Academic Collaboration with Sir C. R. Reddy College (A), Eluru on 27-10-2021. Hence, it is resolved to organize Guest lectures/ Student Seminars/Student Exchange Programs. It resolved to evolve a plan of action for the consultancy activity by approaching the business organizations in the district and discussed about the feasibility of developing collaborations with other Colleges.
13. Discussed about a plan of action for the Consultancy activity.
14. It is resolved to the staff members are advised to make use of ICT enabled classrooms twice per week.
15. Discussed how to utilize Media Centre for delivering lectures online by the teaching staff members.
16. It is resolved to authorize the Chairman, Board of Studies to strengthen the syllabus and model papers of theory and practical examinations keeping in view the latest developments in consultation with other members of the department. Any further guidelines/instructions from APSCHE/ University are to be adopted as communicated.

Signatures


17/10/2023



CHAIRMAN
BOARD OF STUDIES
DEPARTMENT OF PHYSICS
SRI Y.N. COLLEGE (AUTONOMOUS)
'AAC ACCREDITED 'A' GRADE COLLEGE'
NARSAPUR - 534 275



SRI Y N COLLEGE (A), NARSAPUR

**B.SC (HONOURS)
I SEMESTER INTERDISCIPLINARY
PHYSICAL SCIENCES
SYLLABUS**



2023-2024

**DEPARTMENT OF PHYSICS
SRI Y.N.COLLEGE (A)
NARSAPUR**



DEPARTMENT OF PHYSICS

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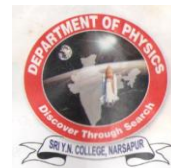
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For 2023-2024 Batch [w.e.f. 2023-2024 (Revised in May 2023)]

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 the laws 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, and modern 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 is widely used in physics courses and covers the fundamental principles of classical physics. It includes a 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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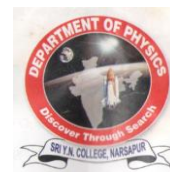
B.Sc. (HONOURS) PHYSICS SINGLE MAJOR

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

I B.Sc. SEMESTER – I MODEL PAPER

MULTIDISCIPLINARY COURSE SYLLABUS

PRINCIPLES OF PHYSICAL SCIENCES



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.

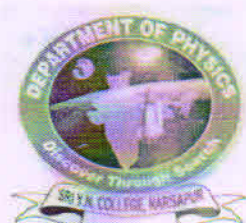
4 x 5 = 20 M

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?



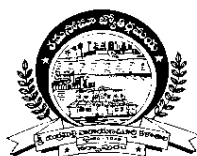
SRI Y N COLLEGE (A), NARSAPUR

**B.SC (HONS.) PHYSICS MINOR
SYLLABUS**



2023-2024

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SRI Y.N.COLLEGE (A)
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B.Sc. (HONOURS) PHYSICS MINOR
For 2023-2024 Batch [w.e.f. 2023-2024 (Revised in May 2023)]
I B.Sc. SEMESTER – II PHYSICS SYLLABUS UNDER CBCS
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, point load, distributed load.

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, equations of motion under a . Derivation of Kepler's laws. Motion of satellites

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:

❖ 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.

BLUE PRINT

SEMESTER – II

COURSE 3: MECHANICS AND PROPERTIES OF MATTER

Chapter / Unit	Section A (5 marks)	Section – B (10 marks)	Section – C (10 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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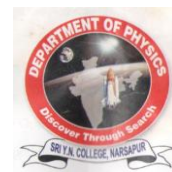
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B.Sc. (HONOURS) PHYSICS MINOR

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

I B.Sc. SEMESTER II PHYSICS MODEL QUESTION PAPER

COURSE 1: MECHANICS AND PROPERTIES OF MATTER



Time: **3 Hrs.**

Max. Marks: **60M**

SECTION – A

Answer any **FIVE** questions.

5 x 4 = 20 M

01. Show that $\nabla \cdot (\nabla \times \mathbf{A}) = 0$
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 is 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 **10** marks.

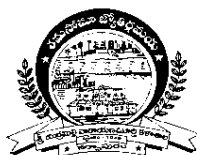
5 x 8 = 40 M

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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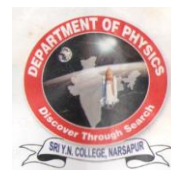
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Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	II	1	Mechanics and Properties of Matter	3	3
			Mechanics and Properties of Matter Practical Course	2	1
II	III	2	Optics	3	3
			Optics Practical Course	2	1
	IV	3	Electricity and Magnetism	3	3
			Electricity and Magnetism Practical Course	2	1
		4	Modern Physics	3	3
			Modern Physics Practical Course	2	1
III	V	5	Applications of Electricity & Electronics	3	3
			Applications of Electricity & Electronics Practical Course	2	1
		6	Electronic Instrumentation	3	3
			Electronic Instrumentation Practical Course	2	1



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SEMESTER – II

I B.Sc.: PHYSICS SYLLABUS UNDER CBCS

PRACTICAL COURSE 3: MECHANICS AND PROPERTIES OF MATTER

Hours: 30

Credits: 1

2 hrs/week



Minimum of 6 experiments to be done and recorded

- 1. Viscosity of liquid by the flow method (Poiseuille's method)**
- 2. Young's modulus of the material of a bar (scale) by uniform bending**
- 3. Young's modulus of the material a bar (scale) by non- uniform bending**
- 4. Surface tension of a liquid by capillary rise method**
- 5. Determination of radius of capillary tube by Hg thread method**
- 6. Viscosity of liquid by Searle's viscometer method**
- 7. Bifilar suspension –moment of inertia of a regular rectangular body.**
- 8. Determination of moment of inertia using Fly-wheel**
- 9. Determination of the height of a building using a sextant.**
- 10. Rigidity modulus of material of a wire-dynamic method (torsional pendulum)**



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I B.Sc. SEMESTER – I

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

Hours: 60

Credits: 4

4hrs/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:

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. 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 and John W. Jewett Jr.
8. Physics for Technology and Engineering" by John Bird
9. Chemistry 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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SEMESTER – 1

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

Chapter / Unit	Section A (5 marks)	Section – B (10 marks)	Section – C (10 marks)
UNIT I: ESSENTIALS OF MATHEMATICS	2	1	1
UNIT II: ESSENTIALS OF PHYSICS	2	1	1
UNIT III: ESSENTIALS OF CHEMISTRY	2	1	1
UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY	1	1	1
UNIT V: ESSENTIALS OF COMPUTER SCIENCE	1	1	1



DEPARTMENT OF PHYSICS

SRI Y.N. COLLEGE (AUTONOMOUS)-NARSAPUR

(Affiliated to Adikavi Nannaya University) Tirumala

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B.Sc. (HONOURS) PHYSICS SINGLE MAJOR

For 2023-2024 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

Time: **3Hrs.**

Max. Marks: **60 M**

SECTION – A

Answer any **FIVE** questions.

5 x 4 = 20 M

01. Express $1 + i\sqrt{3}$ in Modulus- Amplitude form.
02. If $3 \sin a + 5 \cos a = 5$, then show that $5 \sin a - 3 \cos a = \pm 3$.
03. Write the applications of Physics in automotive industries?
04. What are fundamental and derived units?
05. What are the differences between simple and complex carbohydrates?
06. Explain any two chemical changes.
07. Write the applications of Internet.
08. Explain briefly Information assurance.

Answer any **FIVE** questions from sections Band choosing atleast **TWO** questions from each section. Each question carries 8 marks.

5x8=40 M

SECTION-B

9. Consider the following distribution of daily wages of 50 workers of a factory

Daily wages in Rs.	200-250	250-300	300-350	350-400	400-450
No. of workers	12	14	8	6	10

Find the mean wages of the workers of the factory by using an appropriate method.

10. Explain Newton's Laws of Motion.
11. Write an essay on importance of chemistry in everyday life?
12. What are the applications of Physics in Robotics and automation?
13. What is a Network? Explain various types of Networks.

SECTION-C

14. If $x + iy = \frac{3}{2 + \cos\theta + i\sin\theta}$, then show that $x^2 + y^2 = 4x - 3$.
15. What is First law of thermodynamics and give its significance.
16. What is the significance of Periodic table and explain the periodicity of Atomic size and ionization energy
17. Given Applications of complex analysis in Mathematics.
18. Explain various malwares.



DEPARTMENT OF PHYSICS

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

I B.Sc. SEMESTER – I

COURSE 2: ADVANCES OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Hours: 60

Credits: 4

4hrs/week

UNIT I: ADVANCES IN 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 rule and 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 of a 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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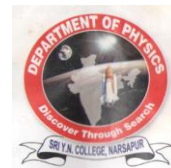
SEMESTER – 1

COURSE 2: ADVANCES OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Chapter / Unit	Section A (5 marks)	Section – B (10 marks)	Section – C (10 marks)
UNIT I: ADVANCES IN BASICS MATHEMATICS	2	1	1
UNIT II: ADVANCES IN PHYSICS	2	1	1
UNIT III: ADVANCES IN CHEMISTRY	2	1	1
UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY	1	1	1
UNIT V: ADVANCED APPLICATIONS OF COMPUTER SCIENCE	1	1	1



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B.Sc.(HONOURS)PHYSICSSINGLEMAJOR
For 2023-2024 Batch [w.e.f. 2023-2024 (Revised in May 2023)]
I B.Sc. SEMESTER – I

COURSE2: ADVANCES OF MATHEMATICAL, HYSICALANDCHEMICALSCIENCES

Time: **3 Hrs.**

Max. Marks: **60 M**

SECTION – A

Answer any **FIVE** questions.

5 x 4 = 20 M

01. Find $\lim_{x \rightarrow \infty} \frac{\sin x}{x}$.

02. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is a symmetric matrix, then find x .

03. What are the advantages of Renewable Energy?

04. What are the applications of Nanotechnology in nanomedicine?

05. What are the applications of Nanosensors?

06. What is the impact of chemical pollutants on human health?

07. Explain about Modem.

08. Explain about Error detection and correction

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

5 x 8 = 40 M

SECTION –B

09. Solve $\int e^{2x} \cos(3x + 4) dx$.

10. Explain energy efficient devices for energy storage.

11. What is computer aided drug design and delivery?

12. Explain dye-removal by using catalysis method.

13. Convert the following Decimal numbers into binary numbers.

i) $(23)_{10}$ ii) $(36)_{10}$ iii) $(347)_{10}$ iv) $(416)_{10}$

SECTION –C

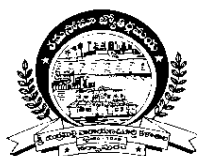
14. Show that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a - b)(b - c)(c - a)$.

15. What are the recent advances in Biophysics of nanotechnology?

16. What are the recent advances in medical physics of nanotechnology?

17. Explain waste water treatment

18. Explain various Network Devices.



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B.Sc. (HONOURS) PHYSICS SINGLE MAJOR

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

I B.Sc. SEMESTER – II PHYSICS SYLLABUS UNDER CBCS

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, point load, distributed load.

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, equations of motion under a . Derivation of Kepler's laws. Motion of satellites

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:

❖ 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 (5 marks)	Section – B (10 marks)	Section – C (10 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

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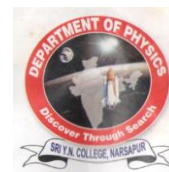
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B.Sc. (HONOURS) PHYSICS SINGLE MAJOR

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

I B.Sc. SEMESTER II PHYSICS MODEL QUESTION PAPER

COURSE 3: MECHANICS AND PROPERTIES OF MATTER



Time: **3 Hrs.**

Max. Marks: **60M**

SECTION – A

Answer any **FIVE** questions.

5 x 4 = 20 M

01. Show that $\nabla \cdot (\nabla \times \mathbf{A}) = 0$
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 is 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 **10** 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 γ , 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.

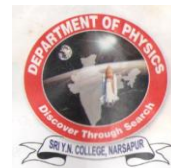


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B.Sc. (HONOURS) PHYSICS SINGLE MAJOR

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

I B.Sc. SEMESTER II PHYSICS SYLLABUS UNDER CBCS

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 and different frequencies. Lissajous figures.

UNIT-II DAMPED AND FORCED OSCILLATIONS

9hrs

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

UNIT-III COMPLEX VIBRATIONS

9hr

Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw tooth wave, simple problems on evaluation 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 (iii) bar fixed at one end. Tuning fork.

UNIT-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 – II

COURSE 4: WAVES AND OSCILLATIONS

Chapter / Unit	Section A (5 marks)	Section – B (10 marks)	Section – C (10 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



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

I B.Sc. SEMESTER II PHYSICS SYLLABUS UNDER CBCS

COURSE 4: WAVES AND OSCILLATIONS

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 **10** 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?

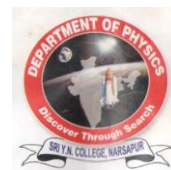
SECTION – C

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?



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For 2023-2024 Batch [2020-21 Batch onwards]



SEMESTER – III PAPER – III

II B.Sc.: PHYSICS SYLLABUS UNDER CBCS
HEAT AND THERMODYNAMICS

UNIT-I: Kinetic Theory of gases: (12 hrs)

Kinetic Theory of gases-Introduction, Maxwell's law of distribution of molecular velocities (qualitative treatment only) and its experimental verification, Mean free path, **Degrees of freedom**, Principle of equipartition of energy (Qualitative ideas only), Transport phenomenon in ideal gases: viscosity, Thermal conductivity and diffusion of gases.

UNIT-II: Thermodynamics: (12hrs)

Introduction- Isothermal and Adiabatic processes, Reversible and irreversible processes, Carnot's engine and its efficiency, Carnot's theorem, **Thermodynamic scale of temperature and its identity with perfect gas scale**, Second law of thermodynamics: Kelvin's and Clausius statements, Entropy, Physical significance, Change in entropy in reversible and irreversible processes; Entropy and disorder-Entropy of Universe; Temperature-Entropy (T-S) diagram and its uses ; change of entropy when ice changes into steam.

UNIT-III: Thermodynamic Potentials and Maxwell's equations: (12hrs)

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 to (i) Clausius-Clayperon's equation (ii) Value of CP-CV (iii) Value of CP/CV (iv) **Joule-Kelvin coefficient for ideal and Van der Waals' gases**

UNIT-IV: Low temperature Physics: (12hrs)

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, **Liquefaction of Helium by Kapitza's method**, Production of low temperatures by adiabatic demagnetization (qualitative), **Principle of refrigeration**, **Vapour Compression method**, **Practical applications of substances at low temperatures.**

UNIT-V: Quantum theory of radiation: (12 hrs)

Blackbody and its spectral energy distribution of black body radiation, Kirchoff's law, Wein's displacement law, Stefan-Boltzmann's law and Rayleigh-Jean's law (No derivations), Planck's law of black body radiation-Derivation, Deduction of Wein's law and Rayleigh-Jean's law from Planck's law, **Solar constant and its determination using Angstrom pyroheliometer**, **Estimation of surface temperature of Sun.**

(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:

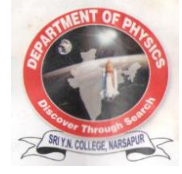
- BSc Physics, Vol.2, Telugu Akademy, Hyderabad
- Thermodynamics, R.C.Srivastava, S.K.Saha&AbhayK.Jain, Eastern Economy Edition.
- Unified Physics Vol.2, Optics & Thermodynamics, Jai PrakashNath&Co.Ltd., Meerut
- Fundamentals of Physics. Halliday/Resnick/Walker.C. Wiley India Edition 2007
- Heat and Thermodynamics -N BrijLal, P Subrahmanyam, S.Chand& Co.,2012
- Heat and Thermodynamics- MS Yadav, Anmol Publications Pvt. Ltd, 2000
- University Physics, HD Young, MW Zemansky,FW Sears, Narosa Publishers, New Delhi

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SEMESTER – 1 PAPER I
HEAT AND THERMODYNAMICS

Chapter / Unit	Section A (5 marks)	Section – B (10 marks)	Section – C (10 marks)
UNIT-I 1. Kinetic Theory of gases	1	1	1
Unit-II 2. Thermodynamics:	1+1 (Problem)	1	1
UNIT-III 3. Thermodynamic Potentials and Maxwell's equations	1	1	1
Unit-IV 4. Low temperature Physics	1+1 (Problem)	1	1
Unit-V 5. Quantum theory of radiation	1+1 (Problem)	1	1



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II B.Sc DEGREE EXAMINATIONS
PHYSICS MODEL QUESTION PAPER
 For 2023-2024 Batch (w.e.f. 2020-2021)
SEMESTER III PAPER – III
HEAT & THERMODYNAMICS



Time: 3 Hrs.

Max. Marks: 75M

SECTION – A

Answer any **FIVE** questions.

5 x 5 = 25 M

1. Derive an expression for the diffusion of a gas on the basis of Kinetic theory.
అణుచలన సిద్ధాంతము ఆధారముగా వాయు విసరణకు సమీకరణము ఉత్పాదించుము.
2. 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.
ఒక ద్విగత యంత్రము 100^0 C బేధము గల రెండు ఉష్ణోగ్రతల మధ్య పని చేస్తున్నది. ఆ యంత్రము ఉష్ణాశయము నుండి 746J ఉష్ణాన్ని గ్రహించి, సింకుకు 546J ఉష్ణాన్ని విసర్జిస్తున్నది. అయిన ఉష్ణాశయము మరియు సింకుల ఉష్ణోగ్రతలు ఎంత?
3. Explain the physical significance of Entropy.
ఎంట్రోపీ యొక్క భౌతిక భావనను వివరించుము.
4. Derive Clausius – Clayperon equation.
క్లాసియస్ - క్లాపరాన్ సమీకరణమును ఉత్పాదించుము
5. Write any five differences between Joule Thomson and adiabatic expansions.
జౌల్ థామ్సన్ మరియు స్థిరోష్ణక వ్యాకోచముల మధ్య ఏవేని 5 బేధములు వ్రాయుము
6. Calculate the Inversion temperature of Helium gas. Given $a = 3.44 \times 10^{-3}$ newton-m⁴ / mol², $b = 0.0237 \times 10^{-3}$ m³ / mol and $R = 8.31$ joule / (mol-k)
హీలియం వాయువు యొక్క విలోమన ఉష్ణోగ్రతను కనుగొనుము. $a = 3.44 \times 10^{-3}$ newton-m⁴/mol², $b = 0.0237 \times 10^{-3}$ m³/mol మరియు $R = 8.31$ joule/(mol-k)
7. Describe Ferry's black body.
ఫెర్రీ కృష్ణ వస్తువును వర్ణించుము.
8. Calculate the temperature of the Sun from the following data. Solar constant $S = 1340$ W/m²; radius of the Sun $R = 7.92 \times 10^8$ m; Distance of the Sun from the earth $r = 1.5 \times 10^{11}$ m and Stefan constant $\sigma = 5.7 \times 10^{-8}$ Wm⁻² K⁻⁴.
ఇచ్చిన దత్తాంశమును ఉపయోగించి సూర్యుడు ఉష్ణోగ్రతను కనుగొనుము. సౌర స్థిరాంకము $S = 1340$ W/m², సూర్యుని వ్యాసార్థము $R = 7.92 \times 10^8$ m; భూమి నుండి సూర్యుని వరకు గల దూరము $r = 1.5 \times 10^{11}$ m మరియు స్టీఫాన్ స్థిరాంకము $\sigma = 5.7 \times 10^{-8}$ Wm⁻² K⁻⁴.

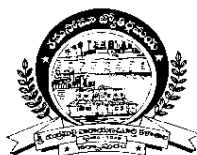
Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 10 marks. 5 x 10 = 50M

SECTION -- B

9. Derive an expression for Maxwell's law of distribution of molecular speeds in a gas.
వాయువులలో అణువులు ఏ విధంగా వితరణ చెంది ఉంటాయో తెలిపే మేక్స్ వెల్ అణువేగ వితరణ సమీకరణాన్ని ఉత్పాదించుము.
10. State and prove Carnot's theorem.
కార్నో సిద్ధాంతమును నిర్వచించి నిరూపించుము.
11. Derive Maxwell's Thermodynamic equations from thermodynamic potentials.
ఉష్ణగతిక శక్త్యాలనుండి మేక్స్ వెల్ ఉష్ణగతిక సమీకరణాలను రాబట్టుము.
12. Derive an expression for Joule Thomson Cooling.
జౌల్ థామ్సన్ శీతలీకరణానికి సమీకరణమును ఉత్పాదించుము.
13. Derive Wein's displacement law.
వీన్ స్థాన భ్రంశ నియమమును ఉత్పాదించుము.

SECTION – C

14. Derive an expression for the Viscosity of a gas on the basis of kinetic theory of gases.
వాయు అణుచలన సిద్ధాంతము ఆధారముగా వాయువు యొక్క స్నిగ్ధతకు సమీకరణము రాబట్టుము.
15. Describe T-S diagram for Carnot's cycle. Derive an expression for the efficiency of Carnot's engine from the T-S diagram
కార్నోచక్రానికి T-S పరమును వర్ణించుము. దాని నుండి కార్నో యంత్రము యొక్క దక్షతకు సమీకరణమును ఉత్పాదించుము.
16. Derive the equations for (1) the difference and (2) ratio of the two specific heats of a perfect gas using Maxwell's thermodynamic equations.
మేక్స్ వెల్ ఉష్ణగతిక సమీకరణాలనుపయోగించి ఆదర్శ వాయువు యొక్క రెండు విశిష్టోష్ణాల మధ్య (1) భేదము మరియు (2) నిష్పత్తిలకు సూత్రాలను రాబట్టుము.
17. Explain Kapitza's method for liquefaction of helium gas with a neat diagram.
హీలియం వాయువును ద్రవీకరించడానికి కాపిట్జా పద్ధతిని చక్కటి పఠ సహాయమున వివరించుము.
18. Describe the construction and working of Disappearing filament Optical pyrometer.
అదృశ్యమయ్యే తీగ గల దృశా పైరోమీటరు నిర్మాణము మరియు పనిచేయు విధానము వర్ణించుము.

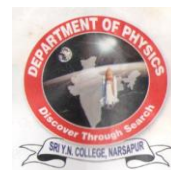


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SEMESTER – IV PAPER – IV

II B.Sc.: PHYSICS SYLLABUS UNDER CBCS
ELECTRICITY, MAGNETISM AND ELECTRONICS



UNIT-I

1. Electrostatics: (6hrs)

Gauss's law-Statement and its proof, Electric field intensity due to (i) uniformly charged solid sphere and (ii) an infinite conducting sheet of charge, Deduction of Coulomb's law from Gauss law, Electrical potential–Equipotential surfaces, Potential due to a (i) dipole (ii) uniformly charged sphere

2. Dielectrics: (6 hrs)

Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics, Dielectric strength, Capacitance of a parallel plate condenser with dielectric slab between the plates, Electric displacement D, electric polarization P, Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT-II

3. Magnetostatics: (6 hrs)

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

4. Electromagnetic Induction: (6 hrs)

Faraday's laws of electromagnetic induction, Lenz's law, Self induction and Mutual induction, Self inductance of a long solenoid, Mutual inductance of two coils, Energy stored in magnetic field, **Eddy currents and Electromagnetic damping**

UNIT-III

5. Alternating currents: (6 hrs)

Alternating current - 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.

6. Electromagnetic waves-Maxwell's equations: (6 hrs)

Idea of displacement current, Maxwell's equations-Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, **Poynting theorem** (Statement only)

UNIT-IV

7. Basic Electronic devices: (12 hrs)

PN junction diode, **Zener diode and Light Emitting Diode (LED)** and their I-V characteristics, Zener diode as a regulator- Transistors and its operation, CB, CE and CC configurations, Input and output characteristics of a transistor in CE mode, Relation between alpha, beta and gamma;

Hybrid parameters, Determination of hybrid parameters from transistor characteristics;

Transistor as an amplifier.

UNIT-V:

8. Digital Electronics: (12 hrs)

Number systems, Conversion of binary to decimal system and vice versa, Binary addition & Binary subtraction (1's and 2's complement methods), Laws of Boolean algebra, DeMorgan's laws-Statements and Proofs, Basic logic gates, **NAND and NOR as universal gates, Exclusive-OR gate, Half adder and Full adder circuits..**

(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.3, Telugu Akademy, Hyderabad.
- ❖ Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
- ❖ Electricity and Magnetism, B.D.Duggal and C.L.Chhabra. Shobanlal & Co.
- ❖ Electricity, Magnetism with Electronics, K.K.Tewari, R.Chand & Co.,
- ❖ Electricity and Magnetism, R.Murugesan, S. Chand & Co.
- ❖ Principles of Electronics, V.K. Mehta, S.Chand & Co.,
- ❖ Digital Principles and Applications, A.P. Malvino and D.P.Leach, McGrawHill Edition.

BLUE PRINT

SEMESTER – 1V PAPER IV

ELECTRICITY, MAGNETISM AND ELECTRONICS

Chapter / Unit	Section A (5 marks)	Section – B (10 marks)	Section – C (10 marks)
UNIT-I: 1. Electrostatics: 2.Dielectrics:	1	1	1
Unit-II: 3.Magnetostatics: 4.Electromagnetic Induction:	1 (Problem) 1	1	1
UNIT-III: 5.Alternating currents: 6.Electromagnetic waves-Maxwell's equations:	1	1	1
Unit-IV: 7. Basic Electronic devices:	1+1 (Problem)	1	1
Unit-V: 8. Digital Electronics:	1+1 (Problem)	1	1



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II B.Sc DEGREE EXAMINATIONS

PHYSICS MODEL QUESTION PAPER

For 2023-2024 Batch (w.e.f. 2020-21)

SEMESTER IV PAPER – IV

ELECTRICITY, MAGNETISM AND ELECTRONICS



TIME: 3Hrs

Max. Marks: 75

SECTION-A

Answer any FIVE questions

5x5=25M

1. Derive an expression for the potential due to a point charge.
ఒక బిందు ఆవేశము వలన ఏర్పడిన పొటెన్షియల్ కు సమీకరణం రాబట్టుము.
2. Explain Hall Effect.
హాల్ ప్రభావము వివరించుము.
3. 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.
4 సెం.మీ. వ్యాసార్థము, 0.50 మీటర్ల పొడవు గల సోలినాయిడ్ పై 5000 టర్న్స్ /మీ చుట్టు చుట్టబడి ఉంటే సోలినాయిడ్ యొక్క స్వయం ప్రేరణ గుణకం కనుగొనుము.
4. Show that electromagnetic waves are transverse in nature.
ప్రకృతి లో విద్యుత్తయస్కంత తరంగాలు, తిర్యక్ తరంగాలని చూపుము.
5. Write a short note on Zener diode.
జేనర్ డయోడ్ పై లఘు టీక వ్రాయండి.
6. In a transistor base current and emitter current are 0.08 m A and 9.6 m A calculate collector current α and β .
ట్రాన్సిస్టర్ ఆధార, ఉద్గార ప్రవాహములు వరుసగా 0.08 m A and 9.6 m A అయితే సేకరణ ప్రవాహమునకు α మరియు β కనుగొనుము.
7. State and explain De Morgan's theorem.
డిమోర్గాన్ సిద్ధాంతమును వివరించుము
8. Using 2's complimentary subtract $(100111)_2$ from $(110011)_2$
రెండో పూరక పద్ధతిని ఉపయోగించి $(110011)_2$ నుండి $(100111)_2$ తీసివేయుము

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 10 marks.

5 x 10 = 50 M

SECTION-B

9. State and prove Gauss law in electro statics
స్థిర విద్యుత్ లో గాస్ నియమాన్ని నిర్వచించి నిరూపించుము.

10. Explain Biot-Savart's law. Derive an expression for the magnetic induction due to a circular loop carrying current.

బయట్ – సవరాట్ సూత్రమును వివరింపుము. విద్యుత్ ప్రవాహము గల ఒక వృత్తాకార తీగ చుట్ట
లేదా లూప్ వలన అయస్కాంత ప్రేరణ సమీకరణమును రాబట్టుము.

11. Given the detailed theory of L-C-R series circuit carrying AC and explain resonance condition.

ఏకంతర విద్యుత్ ప్రవాహిస్తున్న L-C-R శ్రేణి వలయము యొక్క సిద్ధాంతాన్ని వ్రాయండి మరియు
అనునాద నిబంధనలను వివరించండి

12. What is a P-N junction diode? Explain forward and reverse bias.

P – N సంధి డయోడ్ అనగానేమి ? పురోశక్తము , తిరోశక్తము లను వివరించుము.

13. 24. Discuss the working of a half adder and a full adder with their circuits with truth tables.

అర్థ సంకలని మరియు పూర్ణ సంకలని వలయాలు , సత్య పట్టికలు వ్రాసి పని చేయు విధానమును
చర్చించుము.

SECTION-C

14. Define electric displacement (D), electric polarization (P) & electric intensity (E) and obtain the relation among them.

విద్యుత్ స్థానభ్రంశము (D), విద్యుత్ క్షేత్ర తీవ్రత (E) మరియు విద్యుత్ ద్రువములను నిర్వచించి, వాటి
మధ్య సంబంధము రాబట్టుము.

15. Define self induction. Obtain an expression for the self inductance of a long solenoid.

స్వయం ప్రేరణ నిర్వచించుము. ఒక పొడవయిన సోలినాయిడ్ స్వయం ప్రేరకత్వమునకు
సమాసము ఉత్పాదించుము.

16. Write Maxwell's equation in differential and integral form. Derive Maxwell's wave equation.

మాక్స్ వెల్ సమీకరణము యొక్క అవకలన రూపాలు మరియు సమకలన రూపాలు వ్రాయండి.

విద్యుదయస్కాంత తరంగాల మాక్స్ వెల్ తరంగ సమీకరణము రాబట్టుము.

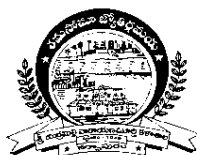
17. Explain briefly the three possible transistors CB, CE & CC transistor connections.

CB, CE మరియు CC ట్రాన్సిస్టర్ టర్లు మూడు అవకాశ సంధాలను క్లుప్తంగా వివరింపుము.

18. Write the operation of NAND and NOR gates. Give logic symbols and truth tables.

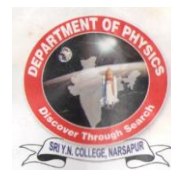
Realize AND, OR and NOT gates from NAND gates.

NAND, మరియు NOR ద్వారముల పనిచేయు విధానము వ్రాయుము. వాటి తర్క చిహ్నములను
యదార్థ పట్టికను ఇమ్ము. NAND తర్కము నుంచి AND , OR మరియు NOT ద్వారములను
రాబట్టుము.



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SEMESTER – IV PAPER – V

II B.Sc.: PHYSICS SYLLABUS UNDER CBCS
MODERN PHYSICS

UNIT-I :

1. Atomic and Molecular Physics : (12 hrs)

Vector atom model and Stern-Gerlach experiment, Quantum numbers associated with it, Angular momentum of the atom, Coupling schemes, **Spectral terms and spectral notations, Selection rules, Intensity rules, Fine structure** of Sodium D-lines, Zeeman effect, Experimental arrangement to study Zeeman effect; **Raman effect, Characteristics of Raman effect, Experimental arrangement to study Raman effect**, Quantum theory of Raman effect, Applications of Raman effect.

UNIT-II:

2. Matter waves & Uncertainty Principle: (12 hrs)

Matter waves, de Broglie's hypothesis, Wave length of matter waves, Properties of matter waves, Davisson and Germer's experiment, Phase and group velocities (Qualitative treatment), 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**), **Bohr's principle of complementarity.**

UNIT-III:

3. Quantum (Wave) Mechanics : (12 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 (i) one dimensional potential box of infinite height (Infinite Potential Well) and (ii) **one dimensional harmonic oscillator**

UNIT-IV:

4. Nuclear Physics : (12 hrs)

Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; **Nuclear forces: Characteristics of nuclear forces- Yukawa's meson theory;** **Nuclear Models:** Liquid drop model, The Shell model, Magic numbers; **Nuclear Radiation detectors: G.M. Counter, Cloud chamber, Solid State detector;** **Elementary Particles:** Elementary Particles and their classification.

UNIT-V:

5. Nano materials :(7hrs)

Nanomaterials – Introduction, Electron confinement, Size effect, Surface to volume ratio, **Classification of nano materials– (0D, 1D, 2D);** Quantum dots, Nano wires, Fullerene, CNT, Graphene (Mention of structures and properties), Distinct properties of nano materials (Mention-*mechanical, optical, electrical, and magnetic properties*); Mention of applications of nano

materials: (*Fuel cells, Phosphors for HD TV, Next Generation Computer chips, elimination of pollutants, sensors*)

6. Superconductivity: (5 hrs)

Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissner effect , Isotope effect, Type I and Type II superconductors, **BCS theory (elementary ideas only)**, 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. Murugesan 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 PAPER V MODERN PHYSICS

Chapter / Unit	Section A (5 marks)	Section – B (10 marks)	Section – C (10 marks)
UNIT-I:			
1. 1. Atomic and Molecular Physics:	1+1 (Problem)	1	1
Unit-II:			
2. Matter waves &Uncertainty Principle:	1+1 (Problem)	1	1
UNIT-III:			
3. Quantum (Wave) Mechanics	1	1	1
Unit-IV:			
4. Nuclear Physics	1+1 (Problem)	1	1
Unit-V:			
5. Nano materials	1	1	
6. Superconductivity			1



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SEMESTER – IV PAPER – V

II B.Sc.: PHYSICS SYLLABUS UNDER CBCS
MODERN PHYSICS



TIME: 3Hrs

Max. Marks: 75

SECTION-A

Answer any **FIVE** questions

5x5=25M

1. Explain L-S coupling and J-J coupling.

L-S సమ్మేళనము మరియు J-J సమ్మేళనములను గూర్చి వ్రాయుము.

2. Write about properties of matter waves?

ద్రవ్యతరంగాల ధర్మాలు వ్రాయుము

3. Explain the Eigen functions and Eigen values.

ఐగెన్ ఫ్రమేయము, ఐగెన్ విలువలను వివరించుము.

4. Explain elementary particles and their classification

ప్రాథమిక కణాలు, వాటి వర్గీకరణ ను వివరించండి

5. Explain Classification of Nano materials

నానో పదార్థములు, వాటి వర్గీకరణను వివరించుము.

6. A Sample is excited with a light of wavelength 4358 \AA . Raman lines are observed at 4447 \AA . Calculate the Raman shift in cm^{-1} .

ఒక నమూనా 4358 \AA తరంగ దైర్ఘ్యం కల కాంతితో ఉత్తేజపరచబడమైనది. రామన్ రేఖను 4447 \AA వద్ద గమనించడమైనది. అయితే రామన్ అంతరాన్ని సం.మీ^{-1} . లలో కనుగొనుము.

7. An electron is confined to a box of length 10^{-9} m . Calculate the minimum uncertainty in its velocity.

10^{-9} మీ . పొడవుగల పెట్టెలో ఎలక్ట్రాన్ సంచరిస్తే దాని వేగంలో కనిష్ఠ అనిశ్చితత్వాన్ని లెక్కించండి.

8. A neutron breaks into a proton and an electron. Calculate the mass defect in the reaction. ($m_p = 1.6725 \times 10^{-27} \text{ Kg}$, $m_e = 9 \times 10^{-31} \text{ kg}$, $m_n = 1.6747 \times 10^{-27} \text{ Kg}$)

ఒక కేంద్రక చర్యలో ఒక న్యూట్రాన్, ప్రోటాన్ మరియు ఎలక్ట్రానుగా విడిపోయింది. ఈ చర్యలో

ద్రవ్యరాశి లోపం లెక్కించుము ($m_p = 1.6725 \times 10^{-27} \text{ Kg}$, $m_e = 9 \times 10^{-31} \text{ kg}$, $m_n = 1.6747 \times 10^{-27} \text{ Kg}$)

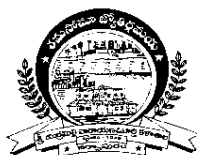
Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section. Each question carries 10 marks. 5 x 10 = 50 M

SECTION-B

9. Describe stern and Gerlach experiment. What is its importance?
స్టర్న్-గెర్లాక్ ప్రయోగమును వివరింపుము. ఆ ప్రయోగ ప్రాముఖ్యత ఏమిటి
10. Explain Devisson and Germer experiment for detection of matter waves.
ద్రవ్య తరంగాలను శోధించుటకు డేవిసన్ మరియు గెర్మర్ ప్రయోగాన్ని వివరించుము.
11. Derive Schrödinger's time independent wave equation.
కాలంపై ఆధారపడని ప్రోడింగర్ తరంగ సమీకరణమును ఉత్పాదించుము.
12. Explain the basic properties of nucleus.
కేంద్రకము యొక్క ముఖ్య లక్షణాలను వివరింపుము
13. What is Nano dot? Explain the construction of Quantum Nano structures.
క్వాంటం నానో బిందువు అంటే ఏమిటి? క్వాంటం నానో నిర్మాణాలను రూపొందించుటకు వివరించండి

SECTION – C

14. What is Raman Effect? Explain it experimentally.
రామన్ ఫలితము అనగానేమి. దానిని ప్రయోగ పూర్వకంగా వివరించండి
15. 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.
హైసన్ బర్గ్ అనిశ్చితత్వ నియమాన్ని వ్రాసి వివరించుము. అనిశ్చితత్వ నియమము యొక్క పర్యవసానాలను ఏక చీలిక వద్ద వివర్తనము మరియు గామా కిరణ సూక్ష్మదర్శిని విషయములలో వివరించుము.
16. Obtain an expression for the energy of a particle in one dimensional potential well.
ఏకమితీయ శక్తి కూపములోని కణము యొక్క శక్తికి సమీకరణాన్ని రాబట్టుము.
17. Describe the construction and working of G M counter?
G M గణకం ను వర్ణించి, పనిచేయు విధానమును తెలుపుము
18. What is super conductivity? Explain Meissner effect. Mention the properties of super Conductivity.
అతి వాహకత్వం అనగానేమి మైస్నర్ ఫలితంను వివరింపుము . అతివాహకాల ధర్మాలను తెలుపుము



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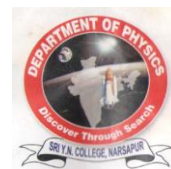
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SEMESTER – V PAPER – VI B (6B)

III B.Sc.: PHYSICS SYLLABUS UNDER CBCS

LOW TEMPERATURE PHYSICS & REFRIGERATION



UNIT-I PRODUCTION OF LOW TEMPERATURE (10 hrs)

Production of low temperatures-Introduction, Joule-Thomson effect, Regenerative cooling, Different methods of liquefaction of gases, liquefaction of air-Claude's method, Production of liquid hydrogen and Helium-Kapitza's method, Adiabatic demagnetization, Properties of materials at low temperatures, Superconductivity (qualitative treatment only).

UNIT-II MEASUREMENT OF LOW TEMPERATURE (10 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 (10 hrs)

Introduction to Refrigeration- Natural and artificial 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 Introductory ideas on air-conditioning (qualitative treatment only).

Refrigerants-Introduction, Ideal refrigerant, Properties of refrigerant, Requirement of refrigerants, Selection of refrigerants, Classification of refrigerants, commonly used refrigerants, Eco-friendly refrigerants.

UNIT-IV COMPONENTS OF REFRIGERATOR (10 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 (10 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, Water coolers, Cold storages, Ice plants, Food preservation methods, Chemical and Process industries, 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 Zemansky, 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 REFRIGERATOR	2	1	1
UNIT-V APPLICATIONS OF LOW TEMPERATURE & REFRIGERATION	2	1	1



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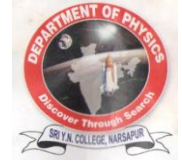
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SEMESTER – V PAPER – VI B (6B)

III B.Sc.: PHYSICS SYLLABUS UNDER CBCS

LOW TEMPERATURE PHYSICS & REFRIGERATION

MODEL QUESTION PAPER



Time: 3 Hrs.

Max. Marks: 75M

SECTION – A

Answer any **FIVE** questions.

5 x 5 = 25 M

1. Discuss properties of materials at low temperature.
అల్పఉష్ణోగ్రతల వద్ద పదార్థాల లక్షణాలను చర్చించండి.
2. Write a short note on secondary thermometer.
సెకండరీ థర్మోమీటర్ గూర్చి లఘుటీకను వ్రాయండి.
3. Explain the stages of Refrigeration.
శీతలికరణ జరుగుటలో వివిధ దశలను వివరించండి.
4. Write a short note on Eco-friendly refrigerants.
పర్యావరణ అనుకూల శీతలికరణి గూర్చి లఘుటీకను వ్రాయండి.
5. Write different types of compressors.
వివిధ రకాల సంపీడకాల గూర్చి వ్రాయండి.
6. Write the differences between Heat engine and refrigerator.
ఉష్ణ యంత్రానికి మరియు శీతలికరణ యంత్రానికి మధ్య భేదములను తెల్పుము.
7. How to preserve the Bio-logical materials.
జీవపదార్థాలను ఏ విధంగా నిల్వ ఉంచుతారు.
8. Write about uses of liquid hydrogen in medical field.
ద్రవహైడ్రోజను వైద్య రంగంలో ఉపయోగించే విధానమును తెల్పుము.

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.
జౌల్ థామ్సన్ శీతలీకరణానికి సమీకరణమును ఉత్పాదించుము.
10. Describe the working of Gas thermometer and write its advantages and disadvantages.
గ్యాస్ థర్మోమీటర్ పనిచేయు విధానమును వివరింపుము .దాని ప్రయోజనాలు మరియు అప్రయోజనాలను వ్రాయుము.
11. What is refrigeration? Explain the principle and working of a vapour compression Refrigeration system?
రిఫ్రిజరేషన్ అనగానేమి?సంపీడన ఆవిరి యంత్రం యొక్క పనితీరును వివరించుము?
12. Explain refrigeration cycle with block diagram.
బ్లాక్ రేఖాచిత్రం సహాయమున రిఫ్రిజరేషన్ వలయంను వివరించుము?
13. Explain the importance of liquid hydrogen and liquid nitrogen in medical field.
వైద్య రంగంలో ద్రవ హైడ్రోజన్ మరియు ద్రవ నైట్రోజన్ పాత్రను వివరించండి.

SECTION – C

14. Explain Kapitza's method for liquefaction of helium gas with a neat diagram.
హీలియం వాయువును ద్రవీకరించడానికి కాపిట్జా పద్ధతిని చక్కటి పర సహాయమున వివరించుము
15. Describe the working of Magnetic thermometer and write its advantages and disadvantages.
మాగ్నెటిక్ థర్మోమీటర్ పనిచేయు విధానమును వివరింపుము .దాని ప్రయోజనాలు మరియు అప్రయోజనాలను వ్రాయుము.
16. What is refrigeration? Explain the principle and working of a vapour absorption Refrigeration system?
రిఫ్రిజరేషన్ అనగానేమి?శోషణ ఆవిరి యంత్రం యొక్క పనితీరును వివరించుము?
17. Discuss refrigerator components of a) Evaporator b) Condenser c) Compressor.
రిఫ్రిజరేటర్ లోని మూలకాలైన a)ఆవిరి కారకం b)కండెన్సర్ c)కంప్రెస్సర్
18. Explain the importance of superconducting magnet in MRI.
MRI లో అతివాహక అయస్కాంతాల ప్రాముఖ్యతను వివరించండి.

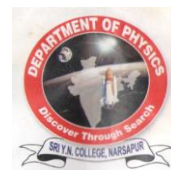


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SEMESTER – V PAPER – VII B (7B)

III B.Sc.: PHYSICS SYLLABUS UNDER CBCS
SOLAR ENERGY AND APPLICATIONS



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

Spectral distribution of solar radiation, Solar constant, zenith angle and Air-Mass, standard time, local apparent time, equation of time, direct, diffuse and total radiations. **Prediction of available solar radiation, Solar energy-importance and global warming, Storage of solar energy, 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, **Solar Thermal Power Plant** Evacuated tube collector, Definitions of collector efficiency, Testing of flat-plate collector, solar water heating system, natural and forced circulation types. 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, Photovoltaic cell, equivalent circuit, output parameters, conversion efficiency, **Photovoltaic applications, Solar photovoltaic cell and its working principle,** Measurement of I-V characteristics, series and shunt resistance of a solar cell, their effect on efficiency,

Unit -IV: TYPES OF SOLAR CELLS AND MODULES (10 hrs)

Types of solar cells, Crystalline silicon solar cells, poly-Si cells, **Thin film solar cells-CdTe/CdS and CuInGaSe₂/CdS cell configurations,** structures, advantages and limitations, Multi junction cells – Double and triple junction cells. Module fabrication steps, Modules in series and parallel, Bypass and blocking diodes. **Solar PV system and its components.**

Unit – V: SOLAR PHOTOVOLTAIC SYSTEMS (10hrs)

Energy storage in PV systems: Need of energy storage, Energy storage modes, electrochemical storage, Batteries: Primary and secondary, **Solid-state battery, Molten solvent battery, lead acid**

battery and dry batteries-Nickel Cadmium Batteries, Electrical storage –Differences between Capacitor and Battery, 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:

III. References:

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](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 MODERN PHYSICS

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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SEMESTER – V PAPER – VII B (7B)

III B.Sc.: PHYSICS SYLLABUS UNDER CBCS

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.
వికీరణము యొక్క వర్ణ పట వితరణను వివరించుము.
2. Define Solar constant, Air mass?
సౌర స్థిరాంకం, గాలి ద్రవ్యరాశి లను నిర్వచించుము?
3. Explain different types of solar cells.
సౌరఘటము లలోని వివిధ రకాలను వివరించుము.
4. Explain solar desalinators and drier?
సౌర డిసాలినేటర్ మరియు డ్రయర్ గూర్చి వివరించుము ?
5. Explain photo voltaic effect?
ఫోటో వోల్టాయిక్ ప్రభావాన్ని వివరించుము ?
6. Explain solar hot water system?
సౌర వేడి జల వ్యవస్థ గూర్చి వ్రాయుము ?
7. Discuss different modes of energy storage
శక్తిని నిల్వ చేయడంలో గల వివిధ రీతులను చర్చించుము.
8. Discuss need of energy storage.
శక్తిని నిల్వ చేయవలసిన అవశ్యకతను తెలుపుము.

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?
ఫైరహెలియోమీటర్ ఉపయోగించి సౌర స్థిరాంకాన్ని ఏ విధంగా కొలుస్తారో వర్ణించుము?
10. Explain energy balance equation?
శక్తి సమతుల్యత సమీకరణం గూర్చి వివరించుము ?
11. Draw solar cell output parameters? Explain series and shunt resistance of a solar cell?

సౌర ఘటము యొక్క ఔట్ పుట్ పారామితులు గీయుము ? సౌర ఘటము యొక్క శ్రేణి మరియు సమాంతర నిరోధాలను గురించి వివరించుము ?

12. Explain Thin film Solar cells?

సౌర ఘటములోని పలుచని పొరలు గూర్చి వివరింపుము.

13. Discuss about Solid – State and molten solvent batteries.

ఘనస్థితి మరియు మోల్టెన్ ద్రావణ బ్యాటరీలను గూర్చి చర్చించుము

SECTION – C

14. Write about the Importance of Solar Energy?

సౌర శక్తి యొక్క ప్రాముఖ్యతను తెలుపుము

15. What is flat plate collector? Describe liquid heating type FPC?

సమతల ఫలక గ్రాహకాలు అనగానేమి ? ద్రవాన్ని వేడిచేసే రకం FPC గూర్చి వర్ణించుము ?

16. Explain homo, hetero and schotty interfaces?

హోమో, హెటేరో మరియు స్కాట్టి అంతర తలాలు గూర్చి వివరించుము ?

17. Explain solar cell modular assembly? What type of steps involved in it?

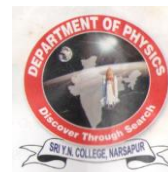
సౌర ఘటం మడులర్ అసెంబ్లీని వివరించుము ? దానిలో ఇమిడియున్న అంచెలు ఎమిటి?

18. Explain role of carbon nano tubes in electrodes.

ఎలక్ట్రోడుల యందు కార్బన్ నానో గొట్టాల పాత్రను తెలుపుము □



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SEMESTER –II (Group A)
UG- SKILL DEVELOPMENT COURSE-SYLLABUS
SOLAR ENERGY



No. of Hours per week: 02

Total Lectures: 30

UNIT-I – Solar Radiation: (6 hrs):

Sun as a source of energy, Solar radiation, Solar radiation at the Earth's surface, Measurement of Solar radiation-Pyroheliometer, Pyranometer, Sunshine recorder, Prediction of available solar radiation, Solar energy-Importance, Storage of solar energy, Solar pond

UNIT-II – Solar Thermal Systems: (10 hrs):

Principle of conversion of solar radiation into heat, Collectors used for solar thermal conversion: Flat plate collectors and Concentrating collectors, Solar Thermal Power Plant, Solar cookers, Solar hot water systems, Solar dryers, Solar Distillation, Solar greenhouses.

UNIT-III – Solar Photovoltaic Systems: (10 hrs):

Conversion of Solar energy into Electricity - Photovoltaic Effect, Solar photovoltaic cell and its working principle, Different types of Solar cells, Series and parallel connections, Photovoltaic applications: Battery chargers, domestic lighting, street lighting and water pumping

Co-curricular Activities (Hands on Exercises): (04 hrs)

[Any four of the following may be taken up]

1. Plot sun chart and locate the sun at your location for a given time of the day.
2. Analyse shadow effect on incident solar radiation and find out contributors.
3. Connect solar panels in series & parallel and measure voltage and current.
4. Measure intensity of solar radiation using Pyranometer and radiometers.
5. Construct a solar lantern using Solar PV panel (15W)
6. Assemble solar cooker
7. Designing and constructing photovoltaic system for a domestic house requiring 5kVA power
8. Assignments/Model Exam.

Reference Books:

1. Solar Energy Utilization, G. D. Rai, Khanna Publishers
2. Solar Energy- Fundamentals, design, modeling& applications, G.N. Tiwari, Narosa Pub., 2005.
3. Solar Energy-Principles of thermal energy collection & storage, S.P. Sukhatme, Tata Mc-Graw Hill Publishers,1999.
4. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
5. Science and Technology of Photovoltaics, P. Jayarama Reddy, BS Publications, 2004.

Blue Print
SEMESTER -- II PAPER SD
SOLAR ENERGY

Module	5 marks		10 marks		Marks allotted
UNIT-I – Solar Radiation	Section A	3	Section B	2	35
UNIT-II – Solar Thermal Systems		3		2	35
UNIT-III – Solar Photovoltaic Systems		2		2	30
Total					100



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SEMESTER –II (Group A)
UG- SKILL DEVELOPMENT COURSE
SOLAR ENERGY



Learning Outcomes:

After successful completion of the course, students will be able to:

- Acquire knowledge on solar radiation principles with respect to solar energy estimation.
- Get familiarized with various collecting techniques of solar energy and its storage
- Learn the solar photovoltaic technology principles and different types of solar cells for energy conversion and different photovoltaic applications.
- Understand the working principles of several solar appliances like Solar cookers, Solar hot water systems, Solar dryers, Solar Distillation, Solar greenhouses



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UG- SKILL DEVELOPMENT COURSE



SEMESTER –II (Group A)
SOLAR ENERGY MODEL QUESTION PAPER

Time: 2 Hrs

SECTION-A

Max Marks: 50M

Answer any **FOUR** questions. Each question carries 5 marks.

4 x 5M = 20M

1. What is Photovoltaic Effect

ఫోటో వోల్టాయిక్ ప్రభావం అనగానేమి ?

2. Discuss about Solar greenhouses

సౌర గ్రీన్ హౌస్ గూర్చి చర్చించుము

3. Define Solar radiation and its uses

సౌర వికిరణము ను నిర్వచించుము మరియు వాటి అనువర్తనాలను వ్రాయుము

4. Write about domestic lighting

ఇంటికి ఉపయోగించే లైటింగ్ గూర్చి వ్రాయుము

5. Discuss about Sunshine recorder

సూర్యరశ్మి రికార్డర్ గూర్చి చర్చించుము

6. Explain about the solar hot water systems

సోలార్ వేడి జల వ్యవస్థను వివరించుము

7. Explain the Solar dryers

సౌర డ్రయర్ గూర్చి వివరించుము ?

8. How can we Store the solar energy

సౌర శక్తి ని ఏవిధంగా నిల్వ చేస్తారు

SECTION – B

Answer any **THREE** questions. Each question carries 10 marks.

3 x 10M = 30M

9. Discuss about the Solar radiation at the Earth's surface

భూమి ఉపరితలం మీద ఉన్న సౌర వికిరణము గూర్చి చర్చించుము

10. What is solar energy? Explain its importance

సౌర శక్తి అనగానేమి ? దాని ప్రాముఖ్యతను వివరించుము

11. Explain the principle of conversion of solar radiation into heat?

సౌర వికిరణము ఏవిధంగా ఉష్ణంగా మార్పిడి చెందుతుందో తెలిపే సూత్రమును వివరించుము

12. Discuss about the Solar Thermal Power Plant and its importance in daily life.

సౌర థర్మల్ పవర్ ప్లాంట్ గూర్చి వివరించుము మరియు నిత్య జీవితంలో దాని ప్రాముఖ్యతను చర్చించుము .

13. Describe solar photovoltaic cell and its working principle

సౌర ఫోటో వోల్టాయిక్ సెల్ యొక్క సూత్రమును మరియు పనిచేయు విధానమును వివరింపుము

14. Define a solar cell. Explain different types of Solar cells?

సౌరఘటమును నిర్వచించుము ? వాటిలో రకాలు గూర్చి వివరించుము.



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Certificate Course of Refrigeration and Air Conditioning

For 2023-2024 Batch (w.e.f. 2014-2015) - 2 Hours per Week



Unit – 1:- Fundamentals of Thermodynamics

Thermodynamic Systems – Classification of Systems, Definition of State, Path Process Cycle, properties, work, heat, thermal energy, specific heat, enthalpy, flow work – Point and path functions.

Unit – 2:- Laws of thermodynamics:-

Zeroth law, 1st law, 2nd law of thermodynamics. Laws of perfect gases – Boyle's law, Charles's law, Avogadro's law, Joule's law, C_p , C_v relations, Isothermal, Isobaric, Isochoric, Adiabatic Process, Polytropic – pre expansion throttling process.

Unit – 3:- Fundamentals of Refrigeration:-

Introduction - Definition of Refrigeration – Methods of refrigeration – Applications Of refrigeration, Unit of refrigeration – Coefficient of performance (C.O.P) power required per ton of refrigeration. Air refrigeration systems – Reversed Carnot Cycle, Bell Coleman Cycle – Problems – Open system versus closed system of air refrigeration.

Unit – 4:- Air Conditioning Systems:-

Room Air Conditioners – Installation – Split Units Fans – Classes of Fans, Types of Fans, Centrifugal Fans, Axial-Flow fans, Fan performance Air Distribution System – Air Filtration, Air Filters.



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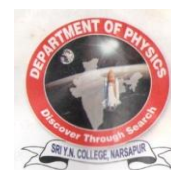
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Certificate Course of Refrigeration and Air Conditioning

For 2023-2024 Batch (w.e.f. 2014-2015)

MODEL QUESTION PAPER



Time 2 hrs

Max Marks: 50

Section – A

Answer any **two** of the following

2 X 10 = 20 M

1. Explain the terms “System”, “Surroundings”, “heat”, “work” and Thermal Energy.
2. Describe the working of Carnot’s Engine and derive an expression for its efficiency.
3. Draw P-V and T-O diagrams of a reversed Carnot Cycle applied to a Refrigerating machine and obtain an expression for its C.O.P.
4. Mention the types of Fans.

Section – B

Answer any **Five** of the following

5 X 4 = 20 M

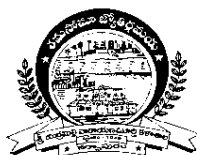
5. Explain “Plow Work-Point” and “path functions”.
6. Define Enthalpy and Specific heat.
7. Derive the relation between C_p and C_v .
8. State and explain second law of thermodynamics.
9. Distinguish between a heat pump and a refrigerator.
10. What are the applications of refrigeration?
11. Explain the important role of Air filters in air conditioning.
12. Explain Split Unit.

Section – C

Answer **all** the questions.

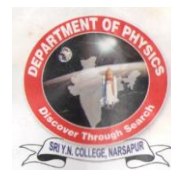
5 X 2 = 10

13. What is path process cycle?
14. Define Isobaric and Isothermal processes.
15. What is the unit of refrigeration?
16. Define First law of thermodynamics.
17. Define Air Filtration.



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SEMESTER – III PAPER – III

II B.Sc.: PHYSICS SYLLABUS UNDER CBCS
HEAT AND THERMODYNAMICS

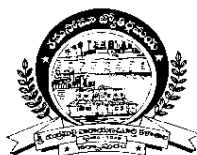
Practical Course-III: Heat and Thermodynamics

Work load: 30 hrs

2 hrs/week

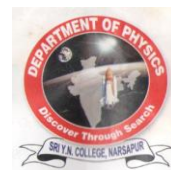
Minimum of 6 experiments to be done and recorded

- 1. Specific heat of a liquid –Joule’s calorimeter –Barton’s radiation correction**
- 2. Thermal conductivity of bad conductor-Lee’s method**
3. Thermal conductivity of rubber.
- 4. Measurement of Stefan’s constant.**
5. Specific heat of a liquid by applying Newton’s law of cooling correction.
- 6. Heating efficiency of electrical kettle with varying voltages.**
7. Thermoemf- thermo couple - Potentiometer
8. Thermal behavior of an electric bulb (filament/torch light bulb)
9. Measurement of Stefan’s constant- emissive method
- 10. Study of variation of resistance with temperature - Thermistor.**
- 11. Measurement of Plank’s constant.**



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SEMESTER – IV PAPER – IV
II B.Sc.: PHYSICS SYLLABUS UNDER CBCS
ELECTRICITY, MAGNETISM AND ELECTRONICS

Practical Course IV: Electricity, Magnetism and Electronics

Work load: 30 hrs

2 hrs/week

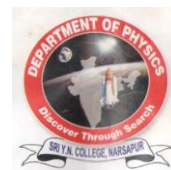
Minimum of 6 experiments to be done and recorded

- 1. Figure of merit of a moving coil galvanometer.**
- 2. LCR circuit series/parallel resonance, Q factor.**
- 3. Determination of ac-frequency –Sonometer.**
4. Verification of Kirchoff's laws and Maximum Power Transfer theorem.
- 5. Field along the axis of a circular coil carrying current-Stewart & Gee's apparatus.**
6. PN Junction Diode Characteristics
7. Zener Diode –V-I Characteristics
8. Zener Diode as a voltage regulator
9. Transistor CE Characteristics- Determination of hybrid parameters
- 10. Logic Gates- OR, AND, NOT and NAND gates. Verification of Truth Tables.**
11. Verification of De Morgan's Theorems.
- 12. Construction of Half adder and Full adders-Verification of truth tables**



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SEMESTER – IV PAPER – V
II B.Sc.: PHYSICS SYLLABUS UNDER CBCS
MODERN PHYSICS

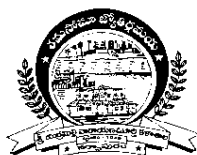
Practical Course V: Modern Physics

Work load: 30 hrs

2 hrs/week

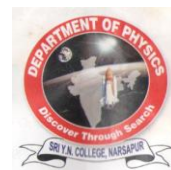
Minimum of 6 experiments to be done and recorded

- 1. e/m of an electron by Thomson method.**
- 2. Determination of Planck's Constant (photocell).**
- 3. Verification of inverse square law of light using photovoltaic cell.**
4. Determination of the Planck's constant using LEDs of at least 4 different colours.
5. Determination of work function of material of filament of directly heated vacuum diode.
6. Study of absorption of α -rays.
7. Study of absorption of β -rays.
8. Determination of Range of β -particles.
- 9. Determination of M & H.**
10. Analysis of powder X-ray diffraction pattern to determine properties of crystals.
- 11. Energy gap of a semiconductor using junction diode.**
12. Energy gap of a semiconductor using thermistor
13. GM counter characteristics
- 14. Verification of De Morgan's Theorems.**



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SEMESTER – V PAPER – VI B (6B)

III B.Sc.: PHYSICS SYLLABUS UNDER CBCS

COURSE: 6B LOW TEMPERATURE PHYSICS & REFRIGERATION

PRACTICAL SYLLABUS (30 Hrs. Max Marks: 50)

I. Learning Outcomes: On completion of practical course, student shall be able to

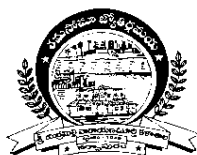
1. List out, identify and handle equipment used in refrigeration and low temperature lab.
2. Learn the procedures of preparation of Freezing Mixtures.
3. Demonstrate skills on developing various Freezing mixtures and materials and their applications in agriculture, medicine and day to day life.
4. Acquire skills in observing and measuring various methodologies of very low temperatures
5. Perform some techniques related to Refrigeration and Freezing in daily life.

II. Practical (Laboratory) Syllabus: (30 hrs. Max marks: 50))

1. Record the Principles and applications of Refrigerators and Freezers.
2. Measure the temperatures below Melting point of Ice using a thermometer available in the Lab.
3. Make a freezing mixture by adding different salts viz., Sodium chloride, Potassium Hydrate (KOH), Calcium chloride to ice in different proportions and observe the temperature changes.
4. Study the operation of a refrigerator and understand the working of different parts.
5. Study the properties of refrigerants like chlorofluorocarbons-hydrochlorofluoro- carbons and record the lowest temperatures obtained.
6. Consider a simple faulty refrigerator and try to troubleshoot the simple problems by understanding it's working.
7. Understand the practical problem of filling the Freon Gas into the Refrigerator.
8. Get the Liquid Nitrogen or Liquid Helium from nearby Veterinary Hospital and measure their temperatures using chromel-alumel thermocouple or mercury thermometer and observe their physical properties like colour, smell etc and precautions to be taken for their safe handling.
9. Preparation of freeze drying food with Dry ice and liquid nitrogen
10. Preparation of freeze drying food with liquid nitrogen

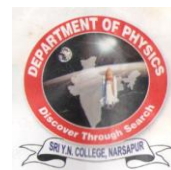
III. Lab References:

1. Experimental techniques in low temperature physics by Guy White, Philip Meeson.
2. Experimental low-temperature physics by A. Kent, Macmillan physical science series
3. Physics and Chemistry at Low Temperatures by Leonid Khriachtchev.
<https://www.routledge.com/Physics-and-Chemistry-at-Low-Temperatures/Khriachtchev/p/book/9789814267519>
4. Practical Cryogenics .<http://research.physics.illinois.edu/bezryadin/links/practical%20Cryogenics.pdf>
5. Freeze-Drying, 3rd Edition by Peter Haseley, Georg-Wilhelm Oetjen, Wiley (e-Book)
6. Web sources suggested by the teacher concerned.



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SEMESTER – V PAPER – VII B (7B)
III B.Sc.: PHYSICS SYLLABUS UNDER CBCS
COURSE: 7B SOLAR ENERGY AND APPLICATIONS
PRACTICAL (LAB) WORK (30 hrs, Max Marks: 50)

I. Learning Outcomes: On successful completion of this practical course, student shall be able to:

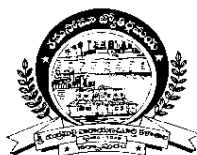
1. List out and identify various components of solar thermal collectors and systems, solar photovoltaic modules and systems.
2. Learn the procedures for measurement of direct, global and diffuse solar radiation, I - V characteristics and efficiency analysis of solar cells and modules.
3. Demonstrate skills acquired in evaluating the performance of solar cell / module in connecting them appropriately to get required power output.
4. Acquire skills in identification and elimination of the damaged panels without affecting the output power in a module / array.
5. Perform procedures and techniques related to general maintenance of solar thermal and photovoltaic modules.

II. Practical (Laboratory) Syllabus: (30 hrs) (Max.50 Marks)

1. Measurement of direct radiation using pyr heliometer.
2. Measurement of global and diffuse radiation using pyranometer.
3. Evaluation of performance of a flat plate collector
4. Evaluation of solar cell / module efficiency by studying the I–V measurements.
5. Determination of series and shunt resistance of a solar cell / module.
6. Determination of efficiency of two solar cells / modules connected in series.
7. Determination of efficiency of two solar cells / modules connected in parallel.
8. Study the effect of input intensity on the performance of solar cell / module.
9. Study the influence of cell / module temperature on the efficiency.
10. Study the effect of cell / module inclination on the efficiency.

III. Lab References:

1. Solar Photo voltaic- Alab training manual, C.S. Solanki et al., Foundation Books Publishers, 2012.
2. Laboratory Manual on Solar thermal experiments, HP Garg, TC Kandpal, Narosa Publishing House 2000.
3. Web sources suggested by the teacher concerned.
<https://renewablelab.niu.edu/experiments/solarPanel>
Development of simple solar hot water collector:
<https://www.youtube.com/watch?v=WP8H5IOTwYU>
<https://www.instructables.com/Solar-Water-Heater-From-Scratch/>



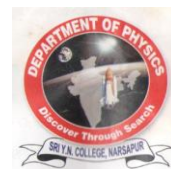
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B.Sc
PHYSICS

DETAILS OF COURSE TITLES & CREDITS

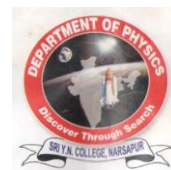
Sem	Course No.	Course Name	Course type (T/L/P)	Hrs./Week(Science: 4+2)	Credits (Science: 4+1)	Max. Marks Cont/ Internal/Mid Assessment	Max. Marks Sem-end Exam
III	5	Heat & Thermodynamic	T	4	4	25M	75M
	6	Practical Course – 3	L	3	1	0	50M
IV	7	Electricity, Magnetism & Electronics	T	4	4	25M	75M
	8	Practical Course -4	L	3	1	0	50M
	9	Modern Physics	T	4	4	25M	75M
	10	Practical Course -5	L	3	1	0	50M
V	11	Low Temperature Physics & Refrigeration 6B	T	3	3	25M	75M
	12	Practical Course-6B	L	3	2	0	50M
	13	Solar Energy and Applications 7B	T	3	3	25M	75M
	14	Practical Course-7B	L	3	2	0	50M
VI	15	Semester-Long Term Internship Program					200

Note: *Course type code: T: Theory, L: Lab, P: Problem solving



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SEMESTER – I PAPER – I
I B.Sc.: PHYSICS SYLLABUS UNDER CBCS
MECHANICS, WAVES AND OSCILLATIONS

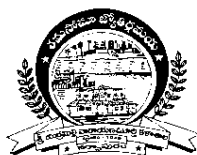
Practical Course 1: Mechanics, Waves and Oscillations

Work load: 30 hrs

2 hrs/week

Minimum of 6 experiments to be done and recorded:

1. Young's modulus of the material of a bar (scale) by uniform bending
- 2. Young's modulus of the material a bar (scale) by non- uniform bending**
3. Surface tension of a liquid by capillary rise method
4. Viscosity of liquid by the flow method (Poiseuille's method)
- 5. Bifilar suspension –Moment of inertia of a regular rectangular body.**
6. Fly-wheel -Determination of moment of inertia
- 7. Rigidity modulus of material of a wire-Dynamic method (Torsional pendulum)**
8. Volume resonator experiment
- 9. Determination of 'g' by compound/bar pendulum**
- 10. Simple pendulum- normal distribution of errors-estimation of time period and the error of the mean by statistical analysis**
11. Determination of the force constant of a spring by static and dynamic method.
12. Coupled oscillators
- 13. Verification of laws of vibrations of stretched string –Sonometer**
14. Determination of frequency of a bar –Melde's experiment.
15. Study of a damped oscillation using the torsional pendulum immersed in liquid-decay constant and damping correction of the amplitude.



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SEMESTER – II PAPER – II
I B.Sc.: PHYSICS SYLLABUS UNDER CBCS
WAVE OPTICS

Practical Course II: Wave Optics

Work load: 30 hrs

2 hrs/week

Minimum of 6 experiments to be done and recorded

- 1. Determination of radius of curvature of a given convex lens-Newton's rings.**
2. Resolving power of grating.
3. Study of optical rotation –polarimeter.
- 4. Dispersive power of a prism.**
- 5. Determination of wavelength of light using diffraction grating-minimum deviation method.**
6. Determination of wavelength of light using diffraction grating-normal incidence method.
- 7. Resolving power of a telescope.**
8. Refractive index of a liquid-hallow prism
9. Determination of thickness of a thin wire by wedge method
- 10. Determination of refractive index of liquid-Boy's method.**
- 11. Aberrations-determination of the focal length of the material of a given lens**



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SEMESTER – II PAPER – III
II B.Sc.: PHYSICS SYLLABUS UNDER CBCS
HEAT AND THERMODYNAMICS

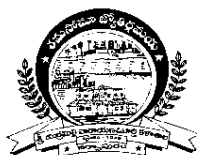
Practical Course-III: Heat and Thermodynamics

Work load: 30 hrs

2 hrs/week

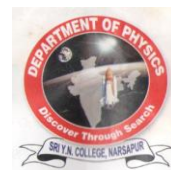
Minimum of 6 experiments to be done and recorded

- 1. Specific heat of a liquid –Joule's calorimeter –Barton's radiation correction**
- 2. Thermal conductivity of bad conductor-Lee's method**
3. Thermal conductivity of rubber.
- 4. Measurement of Stefan's constant.**
5. Specific heat of a liquid by applying Newton's law of cooling correction.
- 6. Heating efficiency of electrical kettle with varying voltages.**
7. Thermoemf- thermo couple - Potentiometer
8. Thermal behavior of an electric bulb (filament/torch light bulb)
9. Measurement of Stefan's constant- emissive method
- 10. Study of variation of resistance with temperature - Thermistor.**
- 11. Measurement of Plank's constant.**



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SEMESTER – II PAPER – IV
II B.Sc.: PHYSICS SYLLABUS UNDER CBCS
ELECTRICITY, MAGNETISM AND ELECTRONICS

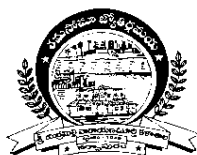
Practical Course IV: Electricity, Magnetism and Electronics

Work load: 30 hrs

2 hrs/week

Minimum of 6 experiments to be done and recorded

- 1. Figure of merit of a moving coil galvanometer.**
- 2. LCR circuit series/parallel resonance, Q factor.**
- 3. Determination of ac-frequency –Sonometer.**
4. Verification of Kirchoff's laws and Maximum Power Transfer theorem.
- 5. Field along the axis of a circular coil carrying current-Stewart & Gee's apparatus.**
6. PN Junction Diode Characteristics
7. Zener Diode –V-I Characteristics
8. Zener Diode as a voltage regulator
9. Transistor CE Characteristics- Determination of hybrid parameters
- 10. Logic Gates- OR, AND, NOT and NAND gates. Verification of Truth Tables.**
11. Verification of De Morgan's Theorems.
- 12. Construction of Half adder and Full adders-Verification of truth tables**



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SEMESTER – II PAPER – V
II B.Sc.: PHYSICS SYLLABUS UNDER CBCS
MODERN PHYSICS

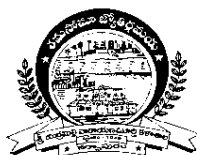
Practical Course V: Modern Physics

Work load: 30 hrs

2 hrs/week

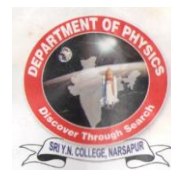
Minimum of 6 experiments to be done and recorded

- 1. e/m of an electron by Thomson method.**
- 2. Determination of Planck's Constant (photocell).**
- 3. Verification of inverse square law of light using photovoltaic cell.**
4. Determination of the Planck's constant using LEDs of at least 4 different colours.
5. Determination of work function of material of filament of directly heated vacuum diode.
6. Study of absorption of α -rays.
7. Study of absorption of β -rays.
8. Determination of Range of β -particles.
- 9. Determination of M & H.**
10. Analysis of powder X-ray diffraction pattern to determine properties of crystals.
- 11. Energy gap of a semiconductor using junction diode.**
12. Energy gap of a semiconductor using thermistor
13. GM counter characteristics
- 14. Verification of De Morgan's Theorems.**



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SEMESTER – IV PAPER – VI B (6B)

III B.Sc.: PHYSICS SYLLABUS UNDER CBCS

COURSE: 6B LOW TEMPERATURE PHYSICS & REFRIGERATION

PRACTICAL SYLLABUS (30 Hrs. Max Marks: 50)

I. Learning Outcomes: On completion of practical course, student shall be able to

1. List out, identify and handle equipment used in refrigeration and low temperature lab.
2. Learn the procedures of preparation of Freezing Mixtures.
3. Demonstrate skills on developing various Freezing mixtures and materials and their applications in agriculture, medicine and day to day life.
4. Acquire skills in observing and measuring various methodologies of very low temperatures
5. Perform some techniques related to Refrigeration and Freezing in daily life.

II. Practical (Laboratory) Syllabus: (30 hrs. Max marks: 50))

1. Record the Principles and applications of Refrigerators and Freezers.
2. Measure the temperatures below Melting point of Ice using a thermometer available in the Lab.
3. Make a freezing mixture by adding different salts viz., Sodium chloride, Potassium Hydrate (KOH), Calcium chloride to ice in different proportions and observe the temperature changes.
4. Study the operation of a refrigerator and understand the working of different parts.
5. Study the properties of refrigerants like chlorofluorocarbons-hydrochlorofluoro- carbons and record the lowest temperatures obtained.
6. Consider a simple faulty refrigerator and try to troubleshoot the simple problems by understanding it's working.
7. Understand the practical problem of filling the Freon Gas into the Refrigerator.
8. Get the Liquid Nitrogen or Liquid Helium from nearby Veterinary Hospital and measure their temperatures using chromel-alumel thermocouple or mercury thermometer and observe their physical properties like colour, smell etc and precautions to be taken for their safe handling.
9. Preparation of freeze drying food with Dry ice and liquid nitrogen
10. Preparation of freeze drying food with liquid nitrogen

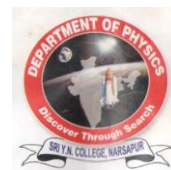
III. Lab References:

1. Experimental techniques in low temperature physics by Guy White, Philip Meeson.
2. Experimental low-temperature physics by A. Kent, Macmillan physical science series
3. Physics and Chemistry at Low Temperatures by Leonid Khriachtchev.
<https://www.routledge.com/Physics-and-Chemistry-at-Low-Temperatures/Khriachtchev/p/book/9789814267519>
4. Practical Cryogenics .<http://research.physics.illinois.edu/bezryadin/links/practical%20Cryogenics.pdf>
5. Freeze-Drying, 3rd Edition by Peter Haseley, Georg-Wilhelm Oetjen, Wiley (e-Book)
6. Web sources suggested by the teacher concerned.



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SEMESTER – IV PAPER – VII B (7B)

III B.Sc.: PHYSICS SYLLABUS UNDER CBCS

COURSE: 7B SOLAR ENERGY AND APPLICATIONS

PRACTICAL (LAB) WORK (30 hrs, Max Marks: 50)

I. Learning Outcomes : On successful completion of this practical course, student shall be able to:

1. List out and identify various components of solar thermal collectors and systems, solar photovoltaic modules and systems.
2. Learn the procedures for measurement of direct, global and diffuse solar radiation, I - V characteristics and efficiency analysis of solar cells and modules.
3. Demonstrate skills acquired in evaluating the performance of solar cell / module in connecting them appropriately to get required power output.
4. Acquire skills in identification and elimination of the damaged panels without affecting the output power in a module / array.
5. Perform procedures and techniques related to general maintenance of solar thermal and photovoltaic modules.

II. Practical (Laboratory) Syllabus: (30 hrs) (Max.50 Marks)

1. Measurement of direct radiation using pyr heliometer.
2. Measurement of global and diffuse radiation using pyranometer.
3. Evaluation of performance of a flat plate collector
4. Evaluation of solar cell / module efficiency by studying the I–V measurements.
5. Determination of series and shunt resistance of a solar cell / module.
6. Determination of efficiency of two solar cells / modules connected in series.
7. Determination of efficiency of two solar cells / modules connected in parallel.
8. Study the effect of input intensity on the performance of solar cell / module.
9. Study the influence of cell / module temperature on the efficiency.
10. Study the effect of cell / module inclination on the efficiency.

III. Lab References:

1. Solar Photo voltaic- Alab training manual, C.S. Solanki et al., Foundation Books Publishers, 2012.
2. Laboratory Manual on Solar thermal experiments, HP Garg, TC Kandpal, Narosa Publishing House 2000.
3. Web sources suggested by the teacher concerned.
<https://renewablelab.niu.edu/experiments/solarPanel>
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<https://www.instructables.com/Solar-Water-Heater-From-Scratch/>



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B.Sc. (HONOURS) PHYSICS SINGLE MAJOR

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

SEMESTER – II

I B.Sc.: PHYSICS SYLLABUS UNDER CBCS

PRACTICAL COURSE 3: MECHANICS AND PROPERTIES OF MATTER

Hours: 30

Credits: 1

2 hrs/week



Minimum of 6 experiments to be done and recorded

- 1. Viscosity of liquid by the flow method (Poiseuille's method)**
- 2. Young's modulus of the material of a bar (scale) by uniform bending**
- 3. Young's modulus of the material a bar (scale) by non- uniform bending**
- 4. Surface tension of a liquid by capillary rise method**
- 5. Determination of radius of capillary tube by Hg thread method**
- 6. Viscosity of liquid by Searle's viscometer method**
- 7. Bifilar suspension –moment of inertia of a regular rectangular body.**
- 8. Determination of moment of inertia using Fly-wheel**
- 9. Determination of the height of a building using a sextant.**
- 10. Rigidity modulus of material of a wire-dynamic method (torsional pendulum)**



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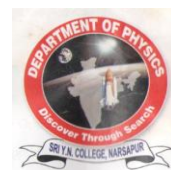
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For 2023-2024 Batch [w.e.f. 2023-2024 (Revised in May 2023)]

SEMESTER – II

I B.Sc.: PHYSICS SYLLABUS UNDER CBCS
PRACTICAL COURSE 4: WAVES AND OSCILLATIONS



Hours: 30

Credits: 1

2 hrs/week

- 1. Volume resonator experiment**
- 2. Determination of 'g' by compound/bar pendulum**
- 3. Simple pendulum normal distribution of errors-estimation of time period and the error of the mean by statistical analysis**
4. Determination of the force constant of a spring by static and dynamic method.
- 5. Determination of the elastic constants of the material of a flat spiral spring.**
6. Coupled oscillators
- 7. Verification of laws of vibrations of stretched string –sonometer**
8. Determination of frequency of a bar –Melde's experiment.
9. Study of a damped oscillation using the torsional pendulum immersed in liquid-decay constant and damping correction of the amplitude.
- 10. Formation of Lissajous figures using CRO.**