ADUSUMILLI GOPALA KRISHNAIAH & SUGAR CANE GROWERS SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE, VUYYURU

An Autonomous College in the Jurisdiction of Krishna University, Machilipatnam

NAAC reaccredited at 'A 'level

ISO 9001-2015

DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING

2023-2024

EVEN SEMESTERS (2,4,6)

Dt : 12-03-2024

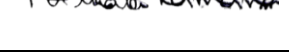
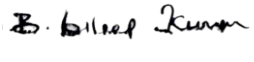
ADUSUMILLI GOPALA KRISHNAIAH & SUGAR CANE GROWERS SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE, VUYYURU-521165, KRISHNA Dt., A.P. (AUTONOMOUS).

DEPARTMENT OF PHYSICS

BOARD OF STUDIES MEETING :- 12th March 2024

The Board of studies meeting of Department of **PHYSICS** was convened at 11:30 AM on 12/03/2024 in **on-line mode** under the chairmanship of Sri J. Hareesh Chandra, Head of the Department.The members present have discussed various aspects such as changes to be made in the syllabi, scheme of Evaluation and Blue print both for theory and practical papers for II, IV,VI semesters for the academic year 2023-2024.

The following members were present.

S.No	Name	Designation	signature
1.	**Sri J. Hareesh Chandra** Head, Department of Physics A.G & S.G.S Degree College Vuyyuru .	**Chairman**	
2	**Prof. M. Rami Reddy** Department of Physics ACHARYA NAGARJUNA UNIVERSITY	**University Nominee**	
3.	**Dr. P.Venkata Ramana** H.O.D, Dept. of Physics Sri DNR Govt Degree college for women, Palakol,West Godavari .	**Subject Expert**	
4.	**Dr. T. Srinivasa Krishna,** Associate Professor , Head, Department of Physics, P.B. Siddhartha College, Vijayawada	**Subject Expert**	
5.	**Sri I. Chitti Babu** Representative from Industry, Sub Divisional Engineer, BSNL,Vijayawada .	**Industrialist**	
6.	**Sri B. Dileep Kumar** Lecturer in Physics, IIIT, NUZIVID.	Alumini	
7.	**Sri M. Sateesh** Lecturer in Physics , A.G&S.G.S Degree College, Vuyyuru	Member	
8.	**Smt. M.P.D. Parimala** Lecturer in Physics, A.G & S.G.S Degree College, Vuyyuru	Member	

Agenda of B.O.S Meeting

1. To discuss and recommend the Syllabi, Model Question Papers to be followed by question paper setters in Physics for the 2nd Semester as per the guidelines and instruction under CBCS prescribed by APSCHE and Krishna University from the Academic Year 2023-2024.
2. To discuss and recommend the Syllabi, Model Question Papers to be followed by question paper setters in Physics for the 4th Semester as per the guidelines and instruction under CBCS prescribed by APSCHE and Krishna University from the Academic Year 2023-2024.
3. To discuss and recommend the Syllabi, Model Question Papers to be followed by question paper setters in Physics for the 6th Semester as per the guidelines and instruction under CBCS prescribed by APSCHE and Krishna University from the Academic Year 2023-2024.
4. To implement semester end internship for III B.Sc, MPC in VI semester .
5. Any other suggestions regarding value added courses, Certificate Courses, Seminars, Workshops, Guest Lectures to be organized.
6. Any other matter.

Chairman
(J. Hareesh Chandra)

RESOLUTIONS

The following Resolutions are made in Board of studies in Physics for UG Programs of even semesters to recommend to the Academic Council for its approval .

- It is resolved and recommended to introduce "**Mechanics and Properties of Matter**" with course code **23PHMAL121** in II semester of **B.Sc (H) Physics** for the the students admitted in academic year 2023-24 and onwards.
- It is resolved and recommended to introduce "**Mechanics and Properties of Matter LAB"** with course code **23PHMAP121** in II semester of **B.Sc (H) Physics** for the students admitted in academic year 2023-24 and onwards.
- It is resolved and recommended to introduce "**WAVES AND OSCILLATIONS"** with course code **23PHMAL122** in II semester of **B.Sc (H) Physics** for the students admitted in 2023-24 and onwards.
- It is resolved and recommended to introduce "**WAVES AND OSCILLATIONS LAB**" with course code **23PHMAP122** in II semester of **B.Sc (H) Physics** for the students admitted in academic year 2023-24 and onwards.
- It is resolved and recommended to introduce "**Mechanics, waves and Oscillations"** as **Minor subject** with course code **23PHMIL121** in II semester of **B.Sc (H) Computer science** for the students admitted in academic year 2023-24 and onwards.
- It is resolved and recommended to introduce **"Mechanics, waves and Oscillations LAB**" as **Minor** with course code **23PHMIP121** in II semester of **B.Sc (H) of Computer science** for the students admitted in academic year 2023-24 and onwards.
- A few changes have been made in the paper "Mechanics and Properties of Matter", The Multistage Rocket concept, Hooke's law, stress and strain topics have been added**,** while discussions on collisions in three dimensions, Gyroscope, Types of bendig has been omitted . Similarly in the paper " WAVES AND OSCILLATIONS" revisions have been made.The velocity of a transverse wave along a stretched string concept has been included ,while concepts regarding Velocity resonance and transport impedence have been removed .
- In the Minor paper **"**Mechanics,Waves and Oscillations", few changes have been made. Fourier analysis, Undamped, Damped and Forced oscillations and Vibrating strings concepts are added. Vector analysis concept has been removed.
- It is resolved to continue the same syllabus (Theory & Practical), Model question paper, Blue Print and Guidelines for Question paper setters for IV Semester of II B.Sc. (MPCS) for the academic year 2023-2024.
- It is resolved to continue the same syllabus (Theory & Practical), Model question paper, Blue Print and Guidelines for Question paper setters for VI Semester of III B.Sc. (MPCS) for the academic year 2023-2024.
- It is resolved to implement semester end internship for III B.Sc (M.P.C) in VI Semester.
- Discussed and recommended the value added courses online/offline, seminars, Guest lectures, Online Examinations and Workshops to upgrade the knowledge of students for Competitive Examinations for the approval of the Academic Council.
- It is resolved to implement the following Teaching and Evaluation methods to be followed under Autonomous status.

Evaluation procedure:

Internal Assessment Examination:

- Out of maximum 100 marks in each paper for I B.Sc. PHYSICS Majors of B.Sc. Honours, 30 marks is allocated for internal assessment.
- Out of these 30 marks, 20 marks are allocated for Announced tests (IA-1& IA-2). Two announced tests will be conducted and average of these two tests shall be deemed as the marks obtained by the student, 5 marks are allocated on the basis of candidate's percentage of attendance and remaining 5 marks are allocated for the assignment.

- Out of maximum 100 marks for I B.Sc. PHYSICS MINOR of B.Sc. Honours, 30 marks is allocated for internal assessment .

- Out of maximum 100 marks in each paper for IV Semester of II B.Sc,MPCS, 30 marks shall be allocated for internal assessment.

- Out of these 30 marks, 20 marks are allocated for announced tests (IA-1& IA-2). Two announced tests will be conducted and average of these two tests shall be deemed as the marks obtained by the student, 5 marks allocated on assignment and reaming 5 marks seminar for IV semester. There is no pass minimum for internal assessment for IV Semester.
- Out of maximum100 marks in each paper for VI Semester of III B.Sc,MPCS, 25 marks shall be allocated for internal assessment. Out of these 25 marks, 15 Marks are allocated for announced tests (i.e. IA-1 & IA-2). Two announced tests will be conducted and average of these two tests shall be deemed as the marks obtained by the student, 5 marks allocated on the basis of candidate's percentage of attendance and remaining 5 marks are allocated for the assignment. There is no minimum passing for IA.

Semester – End Examination :

- The maximum mark for Second semester End examination shall be 70 marks and duration of the examination shall be 3 hours.

- 70 marks are allocated for II Semester of First B.Sc. PHYSICS Major and Minor of B. Sc. Honours in Semester end Examination. Even through the candidate is absent for two IA exams /obtain zero marks the external marks are considered (if the candidate gets 40/70) and the result shall be declared as "PASS".

- 70 marks are allocated for IV Semester of second B.Sc. MPCS in Semester End Examination. Even through the candidate is absent for two IA exams /obtain zero marks the external marks are considered (if the candidate gets 40/70) and the result shall be declared as "PASS".

- The maximum marks for VI semester End examination shall be 100.(Internal 25 + External 75) for III.B.Sc MPCs Students.

Chairman

(J. Hareesh Chandra)

DEPARTMENT OF PHYSICS

COURSE STRUCTURE

SEMESTER – II

Course Code	Title of the Course	Instruction Hours per week	Credits	Evaluation		
				CIA MARKS	SEE	
					MARKS	**Core**/LSC/ SDC/MDC Elective/ Cluster
23PHMAL121	Mechanics and properties of matter	3	3	30	70	CORE
23PHMAP121	Mechanics and properties of matter LAB	2	1	15	35	LAB
23PHMAL122	Waves and oscillations	3	3	30	70	CORE
23PHMAP122	Waves and oscillations LAB	2	1	15	35	LAB
23PHMIL121	Mechanics, Waves and oscillations (MINOR)	3	3	30	70	CORE
23PHMIP121	Mechanics, Waves and oscillations LAB (MINOR)	2	1	15	35	LAB

SEMESTER – IV

Course Code	Title of the Course	Instruction Hours per week	Credits	Evaluation		
				CIA MARKS	SEE	
					MARKS	Core/LSC/ SDC/MDC Elective/Cluster
22PHYT41	Electricity , Magnetism and Electronics	3	3	30	70	CORE
22PHYL41	Electricity , Magnetism and Electronics Lab	2	2	15	35	LAB
22PHYTO1	Modern Physics	3	3	30	70	CORE
22PHYPO1	Modern Physics Lab	2	2	15	35	LAB

SEMESTER - VI

Course Code	Title of the Course	Instruction Hours per week	Credits	Evaluation		
				CIA MARKS	SEE	
					MARKS	Core/LSC/ SDC/MDC Elective/ Cluster
PHYSET01	Applications of Electricity and Electronics	3	3	25	75	CORE
PHYSEP01	Applications of Electricity and Electronics - Lab	2	2	10	40	LAB
PHYSET02	Electronic Instrumentation	3	3	25	75	CORE
PHYSEP02	Electronic Instrumentation - Lab	2	2	10	40	LAB

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Title of the Paper: Mechanics and Properties of matter

Semester : II

Course Code	23PHMAL121	**Course Delivery Method**	Class Room / Blended Mode
Credits	3	CIA Marks	30
No. of Lecture Hours / Week	3	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2023 - 24	Year of Offering: 2023 - 24	Year of Revision :-----	Percentage of Revision: 5 %

Course objectives

1. The primary objective of the Mechanics and Properties of Matter course is to furnish students with a comprehensive comprehension of the dynamics exhibited by physical systems.
2. This encompasses a thorough exploration of mechanical motion as well as an in-depth examination of the diverse properties inherent in different forms of matter.
3. The course seeks to establish a solid foundational knowledge that enables students to grasp the intricate interplay between the behavior of physical systems and the intrinsic characteristics defining the nature of matter.

Course outcomes:

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

CO1 Distinguish between scalar and vector quantities.

CO2 Gain the knowledge of planetary motion

CO3 Understand laws of motion, reference frames, and their applications

CO4 Understand the basics of material properties like elasticity, elastic constants, and their relation

CO5 Develop an understanding of the special theory of relativity and its applications

Unit	Learning Units	Lecture Hours
I Vectors	**A**) Scalar and vector fields, Gradient of a scalar field and its physical significance. Divergence and curl of avector field with derivations and physical interpretation. **B**) Vector integration (line, surface, and volume),Statement and proof of Gauss and Stokes theorems.	12
II Mechanics of particles	**A**)Review of Newton's Laws of Motion,Motion of variable mass system, Multistage rocket, Conservation of energy and momentum, Elastic collisions in one dimension, Elastic & Oblique collisions in two dimensions. **B**) Concept of Impact parameter, Cross section , Rutherford scattering-derivation.	12
III Mechanics of rigid bodies and continuous media	**A**)Rigid body, rotational kinematic relations, equation of motion for a rotating body,Angular momentum and Inertial Tensor, Euler equations, Precessionof a top, Precession of the equinoxes. **B**) Elasticity, Stress and strain, Hooke's law, Elastic constants of isotropic solids and their relations,Poisson's ratio, and expression for Poisson's ratio.	12
IV Central forces	**A**)Central forces - definition and examples, characteristics of central forces, conservative nature of centralforces, conservative force as a negative gradient of potential energy. **B**) Equations of motion under a central force, Derivation of Kepler's I, II, & III laws,Motion of satellites – escape velocity and orbital velocity.	12

v Special Theory of Relativity	**A**)Galilean relativity, Absolute frames. Michelson-Morley experiment -the negative result. Postulates of the special theory of relativity. **B**) Lorentz transformation and its applications (i) time dilation (ii) length contraction (iii) mass-energy relation.	12

TEXTBOOKS

1. B. Sc. Physics, Vol.1, Telugu Academy, Hyderabad

Model Question Paper

Mechanics and Properties of matter

SECTION-A

Answer the following: 5 x 10 = 50 M

1. A) Define the divergence of a vector field. Derive an expression for the divergence of a vector field (L3. CO1)

   (OR)

   B) State and prove Gauss divergence theorem (L3, CO1)

2. A) Define a system of variable mass. Explain the motion of the rocket, Derive an expression for the velocity of the rocket at any time. (L3, CO3)

   (OR)

   B) Discuss the Rutherford scattering and derive an expression for the scattering angle. (L3, CO2)

3 A) What is processional motion? Find the angular velocity of the precession of a spinning top. (L3, CO3).

   (OR)

   B)Define the three elastic constants y, η, and k. Derive the relation between them. (L3, CO3)

4. A) What is conservative force? Show that central forces are conservative. (L2, CO4).

   (OR)

   B) State Kepler's third law of motion. And prove that the square of the period of revolution of a planet moving in a circular orbit around the sun is proportional to the cube of its distance from the sun. (L2, CO4)

5 A) Describe the Michelson-Morley experiment and explain the physical significance of negative results. (L2, CO5)

   (OR)

   B) State the fundamental postulates of the special theory of relativity and deduce the Lorentz transformations. (L2, CO5)

SECTION-B

Answer any **THREE** of the following questions: 3x4=12M

6. Explain the gradient scalar field and give its physical significance (L2, CO1)

7. State Newton's laws of motion and give two examples each. (L1, CO2)

8. Write a short note of precession of the equinoxes (L2, CO3)

9. Explain central forces with examples. (L1, CO4)

10. Explain time dilation. (L1, CO5)

Section – C 2X4=8M

Answer any **TWO** of the following:

11. If $\vec{A} = xy\hat{i} - 2x^2y\hat{j} + 2yz\hat{k}$ then find curl $\vec{A}$ at (1,1,0) (L4, CO1)

12. A rocket burns 0.1 kg of fuel per seconds. If force exerted by ejecting gases on rocket is 200N, find the exhaust velocity of gases. (L4, CO3)

13. If the Earth is one-half of its present distance from the sun, what will be the number of days in a year (L3,CO4)

14. If the total energy of a particle in motion is exactly thrice its rest energy, what is the velocity of the particle? (L3,CO5)

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Title of the Paper: Mechanics and Properties of Matter (LAB)

Semester: II Offered to : I B.Sc. (H)

Course Code	23PHMAP121	**Course Delivery Method**	Class Room / Blended Mode
Credits	1	CIA Marks	15
No. of Lecture Hours / Week	2	Semester End Exam Marks	35
Total Number of Lecture Hours	30	Total Marks	50
Year of Introduction : 2023 - 24	Year of Offering: 2023-24	Year of Revision: NIL	Percentage of Revision: NIL

COURSE OBJECTIVE:

To develop practical skills in the use of laboratory equipment and experimental techniques for measuring properties of matter and analyzing mechanical systems

Course outcomes : On successful completion of this course, the students will be able to:

CO 1 Understand the use of vernier calipers, screw gauge, and traveling microscopes.
CO 2 Learn the concept of Moment of Inertia.
CO 3 Understand the usage of basic laws and theories to determine various properties of the materials given.
CO 4 Analyze the application side of the experiments
CO 5 Interpret the difference between theoretical and experimental values.

List of Experiments

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 - the 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 the material of a wire-dynamic method (torsional pendulum)

Note :

- 8 (Eight) Experiments are to be done and recorded in the lab. These experiments will be evaluated by the CIA.
- For certification minimum of 6 (Six) experiments must be done and recorded by students who had put in 75 % of attendance in the lab.
- The best 6 experiments are to be considered for the CIA.
- 10 + 5 (RECORD) = 15 marks for CIA
- 35 marks for the practical exam.

The marks distribution for the Semester End practical examination is as follows:

Formula/ Principle / Statement with an explanation of symbols	05
Diagram/Circuit Diagram / Tabular Columns	05
Setting up of the experiment and taking readings/Observations	10
Calculations (explicitly shown) + Graph + Result with Units	05
Procedure and Precautions	04
Result	01
Viva-voce	05
Total Marks:	**35**

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Title of the Paper: WAVES AND OSCILLATIONS

Semester: II Offered to : I B.Sc. (H)

Course Code	23PHMAL122	**Course Delivery Method**	Class Room / Blended Mode
Credits	3	CIA Marks	30
No. of Lecture Hours / Week	3	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2023 - 24	Year of Offering: 2023-24	Year of Revision: NIL	Percentage of Revision: 5 %

Course objectives

CO1 Define and explain the basic concepts of waves and oscillations, including terms such as amplitude, frequency, wavelength, and phase.

CO2 Gain the knowledge ofwave propagation and oscillatory motion

CO3 Demonstrate an understanding of wave propagation by solving real-world problems.

CO4 Relate the principles of waves and oscillations to practical applications in fields such as physics, engineering, and communication

CO5 Critically assess the applications of wave and oscillation principles in various scientific and technological contexts

Unit	**Learning Units**	**Lecture Hours**
I Simple Harmonic oscillations	**A**) Simple harmonic oscillator and solution of the differential equation- Physical characteristics of SHM, Torsion pendulum-measurements of rigidity modulus, Compound pendulum- measurement of 'g' **B**) Principleof superposition, the combination of two mutually perpendicular simple harmonic vibrations of the samefrequency and different frequencies, applicationsof Lissajous figures	12

IIDamped and forced oscillations	**A**)Simple harmonic oscillator, damped harmonic oscillator - differential equations and its solutionsLogarithmic decrement, Relaxation time, and Quality factor. **B**) forced harmonic oscillator - differential equations and its solutions,amplitude resonance.	12
III Complex vibrations	**A**)Fourier theorem (Statement & limitations), evaluation of the Fourier coefficients using Fourier's theorem **B**) Analysis of periodic wave functions - square wave, saw tooth wave.	12
IV Vibrating Strings and Bars	**A**)Transverse wave propagation along a stretched string, Velocity of a transverse wave along a stretched string, modes of vibration of stretched string clamped at ends, overtones and harmonics. **B**) General solution of the Longitudinal wave equation. Special cases (i) bar fixed at both ends (ii) bar fixed at the midpoint (iii) bar fixed at one end.	12
V Ultrasonics	Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezo-electric and magnetostriction methods, detection of ultrasonics, Applicationsand uses of ultrasonic waves.	12

TEXTBOOKS

1. B. Sc. Physics, Vol.1, Telugu Academy, Hyderabad

Model Question Paper

Waves and Oscillations

SECTION-A

Answer the following : **5 x 10 = 50 M**

1. A) Define simple harmonic motion. Derive the equation of a simple harmonic oscillator and obtain its solution (L3. CO1)

(OR)

B) Discuss the combination of two mutually perpendicular simple harmonic vibrations (L3, CO1)

2. A) What are damped oscillations? Derive the equation of motion of a forced oscillator and find its solution (L3, CO3)

(OR)

B) What are forced oscillations? Derive the equation of motion of a forced oscillator and obtain its solution (L3, CO2)

3 A) State Fourier's theorem and evaluate the Fourier coefficients. (L3, CO3).

(OR)

B)Analyse a square wave using the Fourier theorem. (L3, CO3)

4. A) Derive an expression for the velocity of a transverse wave along a stretched string. (L3, CO4).

(OR)

B) Deduce the modes of vibration of a rod clamped at one end and free at the other end (L2, CO4)

5 A) Describe the Magnetostriction method of producing ultrasonic waves. (L2, CO5)

(OR)

B) Describe the Piezo-electric method of producing ultrasonic waves(L2, CO5)

SECTION-B

Answer any **THREE** of the following questions: **3x4=12M**

6. Explain briefly the physical characteristics of simple harmonic motion (L1, CO1)

7. Define relaxation time and drive an expression for it. (L2, CO2)

8. Mention the limitations of Fourier's theorem (L1, CO3)

9. Explain overtones and harmonics. (L1, CO4)

10. Write any five applications of ultrasonics. (L1, CO5)

Section – C

2X4=8M

Answer any **TWO** of the following:

11.A spring of force constant $20NM^{-1}$ is loaded with a mass of 0.1 kg and allowed to oscillate. Calculate the time period and frequency of oscillation of the string(L4, CO1)

12. The amplitude of an oscillator of frequency 200Hz falls to $1/10^{th}$ of its initial value after a time of 10s. Calculate its relaxation time and Q-factor. (L4, CO2)

13. A steel wire of length 50cm has a mass of 5gm. It is stretched with a tension of 400N. Calculate the frequency of the wire in the fundamental mode of vibration (L3,CO4)

14. Calculate the fundamental frequency of a quartz crystal of thickness 0.003m given Y-$8X10^{10}$Pa and density is $2500kgm^{-3}$ for quartz (L3,CO5)

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Title of the Paper: WAVES AND OSCILLATIONS (LAB)

Semester: II Offered to : I B.Sc. (H)

Course Code	23PHMAP122	**Course Delivery Method**	Class Room / Blended Mode
Credits	1	CIA Marks	15
No. of Lecture Hours / Week	2	Semester End Exam Marks	35
Total Number of Lecture Hours	30	Total Marks	50
Year of Introduction : 2023 - 24	Year of Offering: 2023-24	Year of Revision: NIL	Percentage of Revision: ---

COURSE OBJECTIVE:

To develop practical skills in the use of laboratory equipment and experimental techniques for measuring properties of matter and analyzing mechanical systems

Course outcomes:

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

CO 1 Gain hands-on experience in setting up and conducting experiments related to waves and oscillations.

CO 2 Investigate and analyze the behavior of different types of waves, such as mechanical waves, sound waves, and electromagnetic waves.

CO 3 Examine resonance phenomena in various systems and understand the conditions that lead to resonance.

CO 4 Enhance skills in presenting findings through graphical representations and written reports.

CO 5 Develop critical thinking skills by solving problems related to wave mechanics and oscillatory systems.

List of Experiments

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 methods.
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.

Note :

- 8 (Eight) Experiments are to be done and recorded in the lab. These experiments will be evaluated bythe CIA.
- For certification minimum of 6 (Six) experiments must be done and recorded by students who had put in 75 % of attendance in the lab.
- The best 6 experiments are to be considered for the CIA.
- 10 + 5 (RECORD) = 15 marks for CIA
- 35 marks for the practical exam.

The marks distribution for the Semester End practical examination is as follows:

Formula/ Principle / Statement with an explanation of symbols	05
Diagram/Circuit Diagram / Tabular Columns	05
Setting up of the experiment and taking readings/Observations	10
Calculations (explicitly shown) + Graph + Result with Units	05
Procedure and Precautions	04
Result	01
Viva-voce	05
Total Marks:	**35**

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Title of the Paper: MECHANICS, WAVES AND OSCILLATIONS (Minor)

Semester: II Offered to : I B.Sc. (H)

Course Code	23PHMIL121	**Course Delivery Method**	Class Room / Blended Mode
Credits	3	CIA Marks	30
No. of Lecture Hours / Week	3	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2023 - 24	Year of Offering: 2023-24	Year of Revision: NIL	Percentage of Revision: 20%

Course Objectives:

1. provide an in-depth understanding of the principles of Newtonian mechanics and apply them to solve problems involving the dynamic motion of classical mechanical systems
2. explain the limitations of Newtonian mechanics for motion at very high velocities, and thus introduce the special theory of relativity
3. provide hands-on experience to perform experiments to study some properties of matter and oscillations
4. By Learning Fourier analysis, students can analyze different mechanical, optical, and electromagnetic waves
5. To attain knowledge of Ultrasonic waves and apply it to different fields

Course outcomes:

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

CO1: Application of Newton's laws of motion to solve various problems related to day-to-daylife

CO2: Understand the application of central force to the stability of circular orbits, Kepler's lawsof planetary motion, Orbital Precession, and Rutherford scattering

CO3: Develop an understanding of the special theory of relativity and its applications

CO4: Ability to recognize and use a mathematical oscillator equation and wave equation, andderive these equations for certain systems

CO5: Gain knowledge on Ultrasonic waves, their production and detection, and their applications in different fields.

Unit	Learning Units	Lecture Hours
I	A.**Mechanics of Particles** (5 hrs) Review of Newton's Laws of Motion, Motion of variable mass system, Multistage rocket, Concept of impact parameter, scattering cross-section, Rutherford Scattering-Derivation. B. **Mechanics of Rigid bodies** (7 hrs) Rigid body, rotational kinematic relations, Equation of motion for a rotating body, Angular momentum, Euler equations, Precession of a spinning top, Precession of the equinoxes.	12
II	A. **Celestial mechanics** Central force - definition and examples, characteristics of central forces, conservative nature of central forces, Equation of motion under a central force B.**Orbital mechanics** Kepler's laws of planetary motion- Proofs, Motion of satellites – escape velocity, orbital velocity	12
III	A. **Frames of reference and transformation** (5hrs) Galilean transformations, Michelson-Morley experiment & negative result. Postulates of Special theory of relativity, B.**Consequences of relativistic transformations** (7 hrs) Lorentz transformation, time dilation, length contraction, Einstein's mass-energy relation	12
IV	A. **Undamped, Damped, and Forced oscillations**: (07 hrs) Simple harmonic oscillator, damped harmonic oscillator, forced harmonic oscillator - differential equations and its solutions, Resonance, Logarithmic decrement, Relaxation time and Quality factor. B. **Fourier analysis (05 hrs)** Fourier theorem (Statement & limitations), evaluation of the Fourier coefficients using Fourier's theorem, analysis of periodic wave functions - square wave	12
V	A. **Vibrating Strings**: (07 hrs) Transverse wave propagation along a stretched string, General solution of the wave equation and its significance, Modes of vibration of stretched string clamped at ends, Overtones, and Harmonics. B. **Ultrasonics**: (05 hrs) Ultrasonics, General Properties of ultrasonic waves, Production of ultrasonics by piezoelectric and magnetostriction methods, Applications of ultrasonic waves	12

TEXT BOOKS

1. B. Sc. Physics, Vol.1, Telugu Academy, Hyderabad

REFERENCE BOOKS:

1. Fundamentals of Physics Vol. I - Resnick, Halliday, Krane, Wiley
2. Waves and Oscillations. N. Subramanyam and Brijlal, VikasPulications.
3. Science and Technology of Ultrasonics- Baldevraj, Narosa, New Delhi,2004

Model Question Paper

Mechanics, Waves and Oscillations

SECTION-A

Answer the following: 5 x 10 = 50 M

1 A) What is Rutherford scattering? Obtain an expression for the number of particles scattered per unit area. (L1, CO1).

(OR)

B) What is precessional motion? Find the angular velocity of the precession of a spinning top. Show that the rate of precession is independent of mass but depends on the distribution of mass. (L1, CO2).

2. A) What is conservative force? Show that central forces are conservative. (L2, CO2).

(OR)

B) State Kepler's third law of motion. And prove that the square of period of revolution of a planet moving in a circular orbit round the sun is proportional to the cube of its distance from the sun. (L2, CO2)

3 A) State the fundamental postulates of special theory of relativity and deduce the Lorentz transformations. (L2, CO3)

(OR)

B) Describe the Michelson-Morley experiment and explain the physical significance of negative results. (L2, CO3)

4 A) What are damped oscillations? Derive the differential equation of the damped Harmonic oscillator and discuss the case of under-damping. (L2, CO3).

(OR)

B) Statethe Fourier Theorem and evaluate Fourier coefficients. (L2, CO4).

5 A) What are transverse waves? Obtain the equation of velocity of a transverse wave in a wire kept under tension. (L3. CO5).

(OR)

B) What are ultrasonics? Describe the Magnetostriction method of producing ultrasonics (L3, CO5).

SECTION-B

Answer any **THREE** of the following questions: 3x5=15M

6. State Newton's laws of motion and give two examples each. (CO1, L1)
7. Explain central forces with examples. (CO2, L1)
8. Explain time dilation. (CO3, L1)
9. What is logarithmic decrement and relaxation time? (CO4, L1)
10. Explain overtones and harmonics. (CO5, L1)

Section – C 2X5=10M

Answer any **TWO** of the following:

11. The kinetic energy of metal disc rotating at a constant speed of 5 revolutions per second is joules. Find the angular momentum of the disc. (CO2, L3)

12. If the Earth be one-half of its present distance from the sun, what will be the number of days in a year (CO2, L3)

13. If the energy note of frequency 100Hz decreases to one half of tis original value in one second, calculate the Q-factor, (CO4, L3)

14. A piezoelectric crystal has a thickness of 0.002m. If the velocity of sound wave in crystal is 5750m/s, calculate the fundamental frequency of crystal. (CO5, L3)

A.G & S.G. SIDDHARTHA DEGREE COLLEGE OFARTS & SCIENCE, Vuyyuru-521165

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

Title of the Paper: Mechanics, Waves and Oscillations (LAB)

Semester: II Offered to : I B.Sc. (H)

Course Code	23PHMIP121	**Course Delivery Method**	Class Room / Blended Mode
Credits	1	CIA Marks	15
No. of Lecture Hours / Week	2	Semester End Exam Marks	35
Total Number of Lecture Hours	30	Total Marks	50
Year of Introduction : 2023 - 24	Year of Offering: 2023-24	Year of Revision: NIL	Percentage of Revision: ---

COURSE OBJECTIVE:

To develop practical skills in the use of laboratory equipment and experimental techniques for measuring properties of matter and analyzing mechanical systems

Course outcomes : On successful completion of this course, the students will be able to:

CO 1 Understand the use of vernier calipers, screw gauge, and traveling microscopes.
CO 2 Learn the concept of Moment of Inertia.
CO 3 Understand the usage of basic laws and theories to determine various properties of the materials given.
CO 4 Verify the laws of transverse vibrations in a stretched string using sonometer
CO 5 Interpret the difference between theoretical and experimental values.

List of Experiments

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

Note :

- 8 (Eight) Experiments are to be done and recorded in the lab. These experiments will be evaluated bythe CIA.
- For certification minimum of 6 (Six) experiments must be done and recorded by students who had put in 75 % of attendance in the lab.
- The best 6 experiments are to be considered for the CIA.
- 10 + 5 (RECORD) = 15 marks for CIA
- 35 marks for the practical exam.

The marks distribution for the Semester End practical examination is as follows:

Formula/ Principle / Statement with an explanation of symbols	05
Diagram/Circuit Diagram / Tabular Columns	05
Setting up of the experiment and taking readings/Observations	10
Calculations (explicitly shown) + Graph + Result with Units	05
Procedure and Precautions	04
Result	01
Viva-voce	05
Total	**35**

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NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

Title of the Paper: ELECTRICITY, MAGNETISM & ELECTRONICS

Semester: IV Offered to : II B.Sc. (MPCS)

Course Code	22PHYT41	**Course Delivery Method**	Class Room / Blended Mode
Credits	3	CIA Marks	30
No. of Lecture Hours / Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2021 - 22	Year of Offering: 2021-22	Year of Revision: NIL	Percentage of Revision: ---

Course Objective:

1. Understand the magnetic effects of electric current.
2. Study the unification of electric and magnetic phenomena.
3. To gain knowledge about Maxwell's equations and EM waves
4. develop competence in using laboratory instruments to carry out experiments to study different electromagnetic phenomena, that will enhance student'sclassroom learning

Course outcomes:

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

CO1 Remember and recollect basic electrodynamic definitions and apply them in daily life.

CO2 Ability to define and derive expressions for the energy both for the electrostatic andmagnetostatic fields

CO3 Analyze Maxwell's equation in different forms (differential and integral) and derive Poynting's theorem from Maxwell's equations and physical interpretation.

CO4 Knowledge about semiconductors since it is a basic material used in many electronic components like diodes, transistors

CO5 An introduction to digital electronics which is useful in digital computers. Also logic gates and their applications.

Syllabus

Unit	Learning Units	Lecture Hours
I	**A) 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)point charge (ii)uniformly charged sphere **B) Dielectrics: (6 hrs)** Polar and Non-polar dielectrics- Electric displacement D, electric polarization P,Relation between D, E and P, Dielectric constant and electric susceptibility.	12
II	**A) Magnetostatics: (6 hrs)** Biot-Savart's law and its applications: (i) calculation of B due to (i) long straight wire and (ii) solenoid, Ampere's Circuital Law and its application to Solenoid,Hall effect, determination of Hall coefficient and applications. **B) 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 a magnetic field, Eddy currents and Electromagnetic damping	12
III	**A) 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. **B) 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 and proof)	12
IV	**Basic Electronic devices:** **A) Diodes**: PN junction diode, Zener diode andLight Emitting Diode (LED) and their I-V characteristics, Zener diode as a regulator **B) Transistors**: Transistors and their operation, CB, CE and CC configurations, Input and output characteristicsofa transistor in CE	12

	mode, Relation between alpha, beta, and gamma; Hybrid parameters, Determination of hybrid parameters from transistor characteristics; Transistor as a amplifier.	
V	**Digital Electronics:** Number systems, Conversion of binary to decimal system and vice versa, Binary addition and binary subtraction (1's and 2's complement methods), Laws of Boolean algebra, Basic logic gates, DeMorgan's Laws-Statements and Proofs, NAND and NOR as universal gates, Exclusive-OR gate, Half adder, and Full adder circuits.	12

TEXT BOOKS

1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.

REFERENCE BOOKS

1. Electricity, Magnetism with Electronics, K. K. Tewari, R. Chand& Co.,
2. Principles of Electronics, V.K. Mehta, S. Chand& Co.,
3. Digital Principles and Applications, A. P. Malvino and D. P. Leach, Mc Graw Hill Edition.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

MEASURABLE

- ❖ Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
- ❖ Student seminars (on topics of the syllabus and related aspects (individual activity))
- ❖ Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams)
- ❖ Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity)
- ❖ Study projects (by very small groups of students on selected local real-time problems onthe syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

GENERAL

- ❖ Group Discussion
- ❖ Visit Research Stations/laboratories and related industries
- ❖ Others

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adoptee

- The oral and written examinations (Scheduled and surprise tests),
- Practical assignments and laboratory reports,
- Observation of practical skills,
- Efficient delivery using seminar presentations,
- Viva voce interviews.

MODEL QUESTION PAPER

Title of the Paper: ELECTRICITY, MAGNETISM & ELECTRONICS

Section-A

Answer the following: 5X10=50M

1 a) State Gauss law in electrostatics. Obtain an expression for potential due to point charge. (CO1, L1)

OR

b) Define D, E and P. Derive the relation between them. Hence deduce the relation between dielectric constant and susceptibility (CO3, L1)

2. a) Explain Biot-Savert Law. Derive an expression for the magnetic induction for infinite long straight wire. (CO2, L2)

OR

b) State Faraday's and Lenz's Law. Derive an expression for a long solenoid.(CO2, L2)

3 a) Derive an expression for the current flowing in an LCR series circuit. Explain resonance condition (CO3, L3)

OR

b) Write Maxwell's equations in differential form. Derive the equation of electromagnetic wave and hence evaluate the velocity of light in free space. (CO1, L3)

4 a) Explain the working and V-I characteristic of PN junction diode. (CO4, L2)

OR

b) Explain the working of PNP and NPN transistors. (CO3, L2)

5 a) State and prove De Morgan laws. (CO4, L2)

OR

b) Discuss the construction and working of Half Adder and Full Adder and give their truth tables. (CO3, L2)

SECTION- B

Answer any THREE of the following 3X4=12M

6. Define electric potential. Write a note on equipotential surfaces. (CO1, L1)
7. What is Halll effect? Write its applications.(CO2, L1)
8. Explain about Q-factor (CO2, L2)
9. Derive the relation between α and β (CO3, L2)
10. Explain how NAND gate can act as universal gate. (CO4, L1)

SECTION - C

Answer any TWO of the following. 2X4=8M

11. Find the resonant frequency of LCR series with L = 2mH, C=0.8μf and R = 100KΩ (CO4, L3)
12. In a transistor base current and emitter current are 0.09mA and 9.09mA respectively. Calculate current gains α and β (CO4, L3)
12. Find the binary equivalent of 625. (CO4, L3)
13. Add binary numbers 110, 111 and 101 (CO4, L3)

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NAAC reaccredited at "A" level

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Title of the Paper: ELECTRICITY, MAGNETISM & ELECTRONICS (LAB)

Semester: IV Offered to : II B.Sc. (MPCS)

Course Code	22PHYL41	**Course Delivery Method**	Class Room / Blended Mode
Credits	1	CIA Marks	15
No. of Lecture Hours / Week	2	Semester End Exam Marks	35
Total Number of Lecture Hours	30	Total Marks	50
Year of Introduction : 2021 - 22	Year of Offering: 2021-22	Year of Revision: NIL	Percentage of Revision: ---

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

CO1 Learn how a sonometer can be used to determine the frequency of AC supply.

CO2	Observe the variation of the magnetic field along the axis of a circular coil carrying current using Stewart and Gee's apparatus.
CO3	Understand the operation of the PN junction diode, Zener diode, and a transistor and their V-I characteristics.
CO4	Construct the basic logic gates, half adder and full adder, and verify their truth tables. Further, the student will understand how NAND and NOR gates can be used as universal building blocks.
CO5	Observe the resonance condition in the LCR series and parallel circuit

Minimum of 6 experiments to be done and recorded

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

Note :

1. 10 (TEN) experiments are to be done and recorded in the lab. These experiments will be evaluated by the CIA.
2. For certification minimum of 8 (Eight) experiments must be done and recorded by students who had put in 75 % of attendance in the lab.
3. The best8 experiments are to be considered for the CIA.
4. 10 + 5 (RECORD) = 15 marks for CIA
5. 35 marks for the practical exam.

The marks distribution for the Semester End practical examination is as follows:

Formula/ Principle / Statement with an explanation of symbols	05
Diagram/Circuit Diagram / Tabular Columns	05
Setting up of the experiment and taking readings/Observations	10
Calculations (explicitly shown) + Graph + Result with Units	05
Procedure and Precautions	04
Result	01
Viva-voce	05
Total	**35**

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NAAC reaccredited at "A" level

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MODERN PHYSICS

Semester: IV Offered to : II B.Sc. (MPCS)

Course Code	22PHYTO1	**Course Delivery Method**	Class Room / Blended Mode
Credits	3	CIA Marks	30
No. of Lecture Hours / Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2021 - 22	Year of Offering: 2021-22	Year of Revision: 2022-23	Percentage of Revision: ---

Course Objectives:

1. To learn the concepts in Atomic Physics.
2. Review the experiments that led the development of quantum theory
3. Understand the underlying foundations and basic principles of quantum mechanics
4. Impart knowledge of the nuclear processes that yield nuclear energy
5. Acquire the knowledge of crystal structures and superconductivity.

Course outcomes:

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

CO1 Remember the different atomic models and basic knowledge of spectroscopy

CO2 Understand and explain the differences between classical and quantum mechanics

CO3 Apply non-relativistic Schrödinger wave mechanics to a variety of potentials in one and three dimensions.

CO4 Examine the basic properties of nuclei, characteristics of nuclear forces, and salient features of particle physics

CO5 Students can understand superconducting materials, their properties, and technological applications of superconductivity.

SYLLABUS

Unit	Learning Units	Lecture Hours
I	**1.Atomic Physics** (07 hrs) Vector atom model and Stern-Gerlach experiment, Quantum numbers associated with it, Angular momentum of the atom, Coupling schemes, Selection rules, Intensity rules, Spectral terms, and spectral notations. **2.Molecular Physics** (05 hrs) Raman effect, Characteristics of Raman effect, Experimental study of Raman effect, Quantum theory of Raman effect, Applications of Raman effect.	12
II	**3.Matter waves &de Broglie's hypothesis** (06 hrs) **Failures of Classical Mechanics**, Matter waves – de Broglie's hypothesis, Derivation for de-Brogliewavelength of matter waves, Properties of matter waves, Davisson and Germer's experiment, Phase and group velocities (**Qualitative**), **4.Uncertainty Principle and Quantization** (06 hrs) Heisenberg's uncertainty principle for position and momentum (x and p), & energy and time (E and t), Illustration of uncertainty principle using diffraction of a beam of electrons (Diffraction by a single slit) and photons (Gamma-ray microscope), Bohr's principle of complementarily.	12
III	**5. 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, Eigenvalues, Application of Schrodinger wave equation to one-dimensional potential box of infinite height (Infinite Potential Well)	12
IV	**6.Structure of Nuclei and Nuclear Models**: (06 hrs) Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces, Characteristics of Nuclear Forces, Nuclear Models: Liquid drop model, Shell model, Magic numbers. **7.Elementary Particle Physics** (06 hrs) Elementary Particles and their classification, Fundamental Interactions	12

	– gravitational, electromagnetic, strong &weak; Properties of Leptons, Mesons, and Baryons	
V	**8.Crystal Structure**(07 hrs) Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice, types of lattices, diffraction of X-rays by crystals, Bragg's law, Laue's method and powder diffraction method **9.Superconductivity**: (05 hrs) Introduction – Properties of superconductors - critical temperature (T_c), critical magnetic field (T_m), Meissner effect, Type I and Type II superconductors, BCS theory (Qualitative), Applications of superconductors.	12

TEXTBOOKS

1. BSc Physics, Vol.4, Telugu Akademy, Hyderabad

REFERENCE BOOKS:

1. Atomic Physics by J.B. Rajam; S. Chand& Co.,
2. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
3. Nuclear Physics, D.C. Tayal, Himalaya Publishing House.
4. S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publ.Co.)
5. K. K. Chattopadhyay & A.N. Banerjee, Introd.to Nanoscience and Technology (PHI Learning Priv. Limited).
6. Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj, BB Rath and J Murday-Universities Press-IIM

LIBRARY ACTIVITY

Student visit library to refer and gather information regarding seminar topics and assignments.

Course Delivery method : Face-to-face / Blended
Course has focus on : Foundation & Employability

Course has focus on: Employability

Co-curricular Activities:

1. Assignments 2. Student seminars 3. Quiz

Model Question Paper

Title of the Paper: MODERN PHYSICS

Section-A

Answer ALL questions **5X10=50M**

1. a) Explain briefly the salient features of the vector atom model. Explain the quantum numbersassociated with the vector atom model (CO1, L1)

OR

b) What is the Raman effect? Describe the experimental arrangement to study the Raman effect inliquids. Write any two applications of the Raman effect. (CO1, L1)

2. a) What are matter waves? Describe the Davisson and Germer experiment on electron diffraction (CO2, L2)

OR

b) State and explain Heisenberg's uncertainty principle. Describe an experiment for verificationof the uncertainty principle. (CO2, L2)

3. a) Derive Schrodinger'stime-dependent wave equation. (CO3, L1)

OR

b) Derive an expression for the energy of a free particle in a one-dimensional box of infinite height. (CO3, L2)

4. a) Write Liquid drop model (CO4, L2)

OR

b) Write a detailed note on elementary particles (CO4, L2)

5. a) Explainthe powder diffraction method. (CO5, L2)

OR

b) What is superconductivity? Give a qualitative description of the BCS theory. (CO5, L2)

Section-B

Answer any THREE of the following: **3X4=12M**

6. Explain the coupling schemes (CO1, L1)
7. Write the properties of matter waves. (CO2, L1)
8. State the basic postulates of Quantum mechanics. (CO3, L1)
9. Write any three properties of the nucleus (CO5, L2)
10. Explain the Meissner effect. (CO5, L1)

Section-C

Answer any TWO of the following: **2X4=8M**

11. If the uncertainty in the position of an electron is $4x10^{-10}$m. Calculate the uncertainty in its momentum.(CO1, L3)
12. Find the kinetic energy of an electron whose de-Broglie wavelength is 0.3A°. (Mass of electron = 9.1 X 10^{-31} kg, Planck's constant h = 6.6 X 10^{-34} J-s) (CO2, L3)
13. Find the least energy of an electron moving in the dimension in an infinitely high potential box of width 1 A° (given mass of electron = 9.1 X 10^{-31} kg, Planck's constant h = 6.6 X 10^{-34} J-s) (CO3, L3)
14. Compute the approximate nuclear radius of Al^{27}. (Given r_0 = 1.2 fermi) (CO4, L3)

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NAAC reaccredited at "A" level

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Title of the Paper: MODERN PHYSICS (LAB)

Semester: IV Offered to : II B.Sc. (MPCS)

Course Code	22PHYPO1	**Course Delivery Method**	Class Room / Blended Mode
Credits	2	CIA Marks	15
No. of Lecture Hours / Week	2	Semester End Exam Marks	35
Total Number of Lecture Hours	30	Total Marks	50
Year of Introduction : 2021 - 22	Year of Offering: 2021-22	Year of Revision: ----	Percentage of Revision: ---

Course Description

In this course students would be able to understand Basic experiments of modern physics such as: Determination of Plank's and Boltzmann's constants, Determination of Range of β-particles, energy gap of semiconductor, Photo electric effect and determination of e/m

Objectives:

* The primary objective of this course is to provide the fundamental knowledge and able to write down the band theory of Solids
* Describe the characteristics of semiconductors on the basis of band theory of solids
* Relate Cosmic activity and the environmental effect on the earth‟s surface

COURSE OUTCOMES

Upon successful completion of this course, students should have the knowledge and skills to:

CO1 Measure the charge of an electron and e/m value of an electron by Thomson method.

CO2 Understand how the Planck's constant can be determined using Photocell and LEDs.

CO3 Study the absorption of α-rays and β-rays, Range of β-particles and the characteristics of GM counter

CO4 knowledge of Energy gap of a semiconductor using thermistor and junction diode.

List of experiments

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

Note :

1. 9 (NINE) experiments are to be done and recorded in the lab. These experiments will be evaluated by the CIA.
2. For certification minimum of 7 (Seven) experiments must be done and recorded by students who had put in 75 % of attendance in the lab.
3. The best 6 experiments are to be considered for the CIA.
4. 10 + 5 (RECORD) = 15 marks for CIA
5. 35 marks for the practical exam.

The marks distribution for the Semester End practical examination is as follows:

Formula/ Principle / Statement with an explanation of symbols	05
Diagram/Circuit Diagram / Tabular Columns	05
Setting up of the experiment and taking readings/Observations	10
Calculations (explicitly shown) + Graph + Result with Units	05
Procedure and Precautions	04
Result	01
Viva-voce	05
Total Marks:	**35**

A.G & S.G. SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE, Vuyyuru-521165

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

Title of the Paper : Applications of Electricity & Electronics

Semester : **VI** **YEAR : III B.Sc (MPCS)**

Course Code	PHYSET01	**Course Delivery Method**	Class Room / Blended Mode - Both
Credits	3	**CIA Marks**	25
No. of Lecture Hours / Week	3	**Semester End Exam Marks**	75
Total Number of Lecture Hours per semester	60	**Total Marks**	100
Year of Introduction: 2022-23	**Year of Offering: 2022 -23**	**Year of Revision: 2023-24**	**Percentage of Revision: --**

Course Objectives:

- To help students to understand the principles and laws of electricity which isessential to constantly emerging newest technologies
- To create interest among the students about the communication systems bystudying electricity and electronics
- Students will be able to understand applications of passive elements, AC, DCcircuits and power supplies

Course Outcomes:

At the end of this course, students should be able to:

CO1 Understand the types of resistors, Inductors and capacitors and itsapplications

CO2 Distinguish between AC and DC sources and understand about the batteriesand Network theorems for DC circuits

CO3 Explain the working principle and construction of Generators and transformers

CO4 Learn the applications of EM induction and power supplies

SYLLABUS

Unit	Learning Units	Lecture Hours
I	**UNIT-I: INTRODUCTION TO PASSIVE ELEMENTS** **a) Passive elements** Resistor - Types of Resistors, Color coding, Combination of Resistors – Series combination (Voltage division), Parallel combination (Current division), Ohms Law and its limitation. Inductor - Principle, Types of Inductors. Capacitor - Principle, Charging and discharging of a Capacitor, Types of Capacitors. **b) Applications of Passive elements:** Applications of a Resistor as a heating element in heaters and as a fuse element. Applications of Inductors, Application of choke in a fan and in a radio tuning circuit, Series resonance circuit as a Radio tuning circuit. Applications of Capacitor in power supplies, motors (Fans).	12
II	**UNIT-II: POWER SOURCES (BATTERIES)** **a) Power sources:** Types of power sources-DC & AC sources, Different types of batteries, Rechargeable batteries - Lead acid batteries, Li-ion batteries, Series, Parallel & Series-Parallel configuration of batteries **b) Network Theorems for DC circuits** Thevenin's theorem, Norton's theorem, Maximum Power transfer theorem, Constant Voltage source - Constant Current Source-Applications of Current sources & Voltage sources.	12
III	**UNIT-III: ALTERNATING & DIRECT CURRENTS** **a)** A.C Generator, Construction and its working principle, DC Generator, Construction and its working principle, advantages and disadvantages, Differences between DC and AC generators **b)** Transformers- Construction and its working principle, Open circuit and short circuit tests, Types of Transformers - Step-down and Step-up Transformers, Relation between primary and secondary turns of the transformer with emf, Use of Transformer in a regulated Power supply	12
IV	**UNIT-IV: MODULATION CIRCUITS** (Skill Based) **a) Amplitude modulation:** Amplitude modulation, modulation index, Waveforms, Power relations, AM transmitter, AM Receiver, Demodulation, Diode detector **b) Frequency modulation:** Frequency modulation, modulation index, Waveforms, FM Transmitter, FM Receiver	12

V	**Unit-V: Applications of EM Induction & Power Supplies (Skill Based)** **a)** DC motor – Construction and operating principle, Calculation of power, voltage and current in a DC motor, Design of a simple Motor (Fan) with suitable turns of coil **b)** Working of a DC regulated power supply, Construction of 5 volts regulated power supply, Design of a step-down (ex:220-12V) and step-up (ex:120-240V) transformers.	12

TEXT BOOKS

BSc Unified Physics: Applications of Electricity & Electronics, S.L Gupta & Sanjeev Gupta

References:

1. Grob's Basic Electronics by Mitchel Schultz , TMH or McGraw Hill
2. Electronic and Electrical Servicing by Ian Robertson Sinclair, John Dunton, Elsevier Publications
3. Troubleshooting Electronic Equipment by R.S.Khandapur ,TMH
4. Web sources suggested by the teacher concerned and the college librarian including reading material.

Model Question Paper
APPLICATIONS OF ELECTRICITY & ELECTRONICS
Section A

Answer ALL questions **5X10=50M**

1. A) Briefly explain the different types of resistors and capacitors. (CO1, L3)
(OR)
B) Write a note on applications of passive elements. (CO1, L2)

2 A) Describe Li ion batteries. (CO2, L2)
(OR)
B) Briefly explain the Thevenin's theorem with equivalent circuit. (CO2, L2)

3 A) Explain the construction and working principle of AC generator. (CO3, L2)
(OR)
B) Explain the construction and working principle of Transformers. (CO3, L2)

4 A) What is amplitude modulation? Explain. (CO4, L2)
(OR)
B) What is frequency modulation? Explain. (CO4, L2)

5 A) Explain the construction and operating principle of DC motor. (CO5, L2)

(OR)

B) Explain the working of DC regulated power supply. (CO5, L2)

Section B

Answer ANY FIVE of the following **5X5=25M**

6. What is Ohm's law? (CO1, L1)
7. Explain the Series resonance circuit as a Radio tuning circuit. (CO1, L2)
8. Explain series-parallel configuration of batteries. (CO2, L2)
9. Write the applications of current and voltage sources. (CO2, L1)
10. Distinguish between DC and AC generators. (CO3, L2)
11. Explain the use of a Transformer in a regulated Power supply. (CO3, L1)
12. Explain the concept of demodulation. (CO4, L2)
13. Write a note on transmitters and receivers. (CO4, L1)
14. Explain the measurement of power, current and voltage in DC motor. (CO5, L2)
15. Write a short note on step-down and step-up transformers. (CO5, L1)

Course : Applications of Electricity & Electronics

PRACTICAL (Laboratory) SYLLABUS *(Max Marks:50)*

Course Code	PHYSEP01	**Course Delivery Method**	Class Room / Blended Mode
Credits	2	CIA Marks	10
No. of Lecture Hours / Week	2	Semester End Exam Marks	40
Total Number of Lecture Hours	30	Total Marks	50
Year of Introduction : 2022 - 23	Year of Offering: 2022 - 23	Year of Revision: NIL	Percentage of Revision: NIL

EXPERIMENTS LIST

Minimum SIX experiments are to be done and recorded

1. Measurement of R using Color coding of Resistors and measurement of R using multimeter - Resistors of different values, Multimeters
2. Connect two or three resistors or capacitors or inductors and measure the Series, Parallel Combination values using a Multimeter and compare the values with the calculated values - Capacitors of different values
3. Use the Digital Multimeter and Analog Multimeter to measure the output voltage of an AC & DC power supply - Digital Multimeters, Analog Multimeters
4. Draw the characteristics of FET
5. Construct a series electric circuit with R, L and C having an AC source and study the frequency response of this circuit Using Function generator
6. Construct a Parallel electric circuit with R, L & C having an AC source and study the frequency response of this circuit using Function generator
7. Efficiency of Transformer.

8. Verification of Network Theorems – Thevenin's theorem, Norton's theorem
9. AM Generation Kit
10. FM generation Kit

Lab References:

1. Laboratory Manual for Introductory Electronics Experiments by Maheshwari, L.K. Anand, M.M.S., New Age International (P) Ltd.
2. Electricity-Electronics Fundamentals: A Text-lab Manual by Paul B. Zbar, Joseph Sloop, & Joseph G. Sloop , McGraw-Hill Education
3. Laboratory Manual Basic Electrical Engineering by Umesh Agarwal, Notion Press
4. Basic Electrical and Electronics Engineering by S.K. Bhattacharya , Pearson Publishers.
5. Web sources suggested by the teacher concerned.

Note :

1. Eight experiments are to be done and recorded in the lab. These experiments will be evaluated in CIA.
2. For certification minimum of 6 (Six) experiments must be done and recorded by student who had put in 75 % of attendance in the lab.
3. Best 6 experiments are to be considered for CIA.
4. 10 marks for CIA.
5. 40 marks for practical exam.

The marks distribution for the Semester End practical examination is as follows:

Formula/ Principle / Statement with explanation of symbols	05
Diagram/Circuit Diagram / Tabular Columns	05
Setting up of the experiment and taking readings/Observations	10
Calculations (explicitly shown) + Graph + Result with Units	05
Procedure and precautions	05
Viva-voce	05
Record	05
Total Marks:	**40**

A. G & S.G. SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE VUYYURU-521165.

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Domain Subject: **PHYSICS**

Title of the Paper : ELECTRONIC INSTRUMENTATION **Semester: VI**

Offered to : III B.Sc (MPCs) **Course Type:** Core (TH)

Course Code	PHYSET02	**Course Delivery Method**	Class Room / Blended Mode
Credits	3	CIA Marks	25
No. of Lecture Hours / Week	3	Semester End Exam Marks	75
Total Number of Lecture Hours per semester	60	Total Marks	100
Year of Introduction : 2022-23	Year of Offering: 2022-23	Year of Revision: 2023-24	Percentage of Revision : ----

Course Objectives:

- Explain basic concepts and definitions in measurement.
- Describe the bridge configurations and their applications.
- Elaborate discussion about the importance of electronic instruments

COURSE OUTCOMES

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

CO1 Understand the basic measurements of Instruments (accuracy, precision, range, resolution, sensitivity and errors). Understand the theory, working principle, specifications and significance of Multimeter.

CO2 Describe the function of basic building blocks of Cathode Ray Oscilloscope. Measure the appropriate parameters (Voltage, Time Period, Frequency and Phase angle)

CO3 Understand the A/D & D/A converters and display instruments

CO4 Gain knowledge about amplifiers, oscillators and biomedical instruments

CO5 Understand the fundamental theory of Transducers and bridges

SYLLABUS

Unit	Learning Units	Lecture Hours
I	**UNIT-I INTRODUCTION TO INSTRUMENTS** **a)** Basic of measurements: Instruments accuracy, precision, sensitivity, resolution, range, types of errors, Classification of Instruments, Analog instruments & Digital Instruments, Construction and working of an Analog Multimeter and Digital Multimeter (Block diagram approach) **b)** DC Voltmeter and AC Voltmeter, Sensitivity, Sources of errors in the Measurement of resistance, voltage and current, Specifications of multimeter and their significance, Basic ideas on Function generator (brief explanation).	12
II	**UNIT-II OSCILLOSCOPE** **a)** Cathode ray oscilloscope – Principle and block diagram of CRO - Cathode Ray Tube – functioning – various controls **b)** Applications CRO: Measurement of voltage (dc and ac), frequency& time period, Different types of oscilloscopes and their uses, Digital storage Oscilloscope	12
III	**UNIT-III TRANSDUCERS AND BRIDGES** **a)** Classification of Transducers, Resistive, Capacitive & Inductive transducers, Piezoelectric transducer, Photo transducer. b) DC bridge – Wheatstone's bridge, AC Bridges - Measurement of Inductance and Capacitance – Maxwell's bridge .	12
IV	**UNIT-IV ADC AND DAC & DISPLAY INSTRUMENTS** **a)** A/D & D/A converters - Binary ladder, A/D converters – continuous type, integrating type, successive approximation type. b)Introduction to Display devices, LED Displays, Seven Segment Displays, Construction and operation (Display of numbers).	12
V	**UNIT-V OPERATIONAL AMPLIFIERS** **A)** Differential amplifier, IC-741 identification, internal blocks of OP-AMP. Characteristics of ideal and practical op-amp, inverting and non-inverting configuration. B) Applications of op-amp (IC-741): summing and difference amplifiers, differentiator and integrator	12

Reference Books:

1. Electronic Instrumentation by H.S.Kalsi ,TMH Publishers
2. Electronic Instrument Hand Book by Clyde F. Coombs ,McGraw Hill
3. Introduction to Biomedical Instrumentation byMandeep Singh, PHI Learning.
4. Electronic Instrumentation – WD Cooper
5. Electrical and Electronic Instrumentation – AK Sawhany
6. A text book in electrical technology by B.L.Thereja (S.Chand&Co)
7. *Biomedical Instrumentation* and Measurements by Leslie *Cromwell ,Prentice Hall India.*
8. Electronic Measurements and Instrumentation by Kishor, K Lal, Pearson, New Delhi
9. Electrical and Electronic Measurements by Sahan, A.K., Dhanpat Rai, New Delhi
10. Electronic Instruments and Measurement Techniques by Cooper, W.D. Halfrick, A.B., PHI Learning, New Delhi
11. Web sources suggested by the teacher concerned and the college librarian including reading material.

Course : Electronic Instrumentation

Practical (Laboratory) Syllabus: *(Max Marks:50)*

Course Code	PHYSEP02	**Course Delivery Method**	Class Room / Blended Mode
Credits	2	CIA Marks	10
No. of Lecture Hours / Week	2	Semester End Exam Marks	40
Total Number of Lecture Hours	30	Total Marks	50
Year of Introduction : 2022 - 23	Year of Offering: 2022 - 23	Year of Revision: NIL	Percentage of Revision: NIL

Minimum SIX experiments are to be done and recorded

1. Familiarization of digital multimeter and its usage in the measurements of (i) resistance (ii) current, (iii) AC & DC voltages
2. Measure the AC and DC voltages, frequency using a CRO and compare the values measured with other instruments like Digital multimeter.
3. Formation of Sine, Square wave signals on the CRO using Function Generator and measure their frequencies. Compare the measured values with actual values.
4. Display the numbers from 0 to 9 on a single Seven Segment Display module by applying voltages.
5. Summing amplifier
6. Difference amplifier
7. Integrator
8. Differentiator
9. Display the letters **a** to **h** on a single Seven Segment Display module by applying voltages.

VI. Lab References:

1. Electronic Measurement and Instrumentation by J.P. Navani. ,S Chand & Co Ltd
2. Principles of Electronic Instrumentation by A De Sa, Elsevier Science Publ.
3. Electronic Measurements and Instrumentation by S.P.Bihari, YogitaKumari, Dr. Vinay Kakka, Vayu Education of India .
4. Laboratory Manual For Introductory Electronics Experiments by Maheshwari, New Age International (P) Ltd., Publishers.
5. Electricity-Electronics Fundamentals: A Text-lab Manual by Paul B. Zbar ,Joseph
6. Sloop, & Joseph G. Sloop , McGraw-Hill Education.

Web sources suggested by the teacher concerned.

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(Accredited at "A" Grade by NAAC, Bangalore)

MODEL PAPER

III B.Sc , PHYSICS , SEMESTER – VI	PAPER CODE : PHYSEP02
PAPER TITLE : ELECTRONIC INSTRUMENTATION	

Time: 3Hours Maximum marks: 75 Minimum marks: 28

MODEL PAPER

Section -A

Answer ALL questions **(5x 10 = 50M)**

1. A) Define error. Mention different types of Errors. Explain any three types of errorsassociated with measurements. (CO1, L2)

(OR)

B) What is a multimeter? What are the advantages of analog multimeter? How do wemeasure voltage using analog multimeter? (CO1, L2)

2 A) Describe the principle and working of CRO. (CO2, L3)

(OR)

B) Write a brief note on different types of oscilloscopes and their uses. (CO2, L2)

3 A) Explain in brief Piezoelectric transducer. (CO3, L2)

(OR)

B) Discuss about Wheatstone's bridge. (CO3, L2)

4 A) Explain A/D and D/A converters. (CO4, L2)

(OR)

B) Discuss about various display devices. (CO4, L2)

5 A) What is an op-amp? Explain Inverting and Non-Inverting configuration. (CO5, L2)

(OR)

B) Explain Integrator and Differentiator using op-amp. (CO5, L2)

Section B

Answer any FIVE of the following **5X5=25M**

6. Distinguish between accuracy and precession of a measurement. (CO1, L1)
7. What are the uses of function generator? (CO1, L1)
8. Write a short note on photo transducer. (CO2, L1)
9. What are the various applications of CRO? (CO2, L1)
10. Explain any two specifications of CRO. (CO3, L2)
11. Distinguish between DC and AC bridges. (CO3, L2)
12. Explain A/D Converter using successive approximation type. (CO3, L2)
13. Explain LED display systems. (CO4, L2)
14. Explain summing and difference amplifier? (CO5, L2)
15. What are the ideal characteristics of op-amp? (CO5, L1)