



S.R.R. & C.V.R. GOVT. DEGREE COLLEGE

(A) VIJAYAWADA, N.T.R. DT.

NAAC Accredited with 'A' Grade

AFFILIATED TO KRISHNA UNIVERSITY, MACHILIPATNAM

Department of PHYSICS & ELECTRONICS

ACADEMIC YEAR 2023-24

Composition of the Board Of Studies (BoS) of PHYSICS as Per UGC Guidelines

Members of Board of studies

Members of the Board of Studies of Department of Physics met on 30 -08-2023 at 3.00 PM in the Department of Physics & Electronics staff room.

S.No	Name of the faculty	Designation
1	Smt. P .Sailaja, Assoc. Prof .of Electronics SRR & CVR GDC (A), Vijayawada	Board of studies chairperson
2	Prof. M.Rami Reddy, Registrar, Krishna University, Machilipatnam	University Nominee
3	K.Ajay Kumar, Asst. Prof. of Physics GDC, Eluru, W.G.Dt. Mob:9493474612	Subject Expert
4	Dr. P.Gopi Krishna, Asst. Professor, Dept of ECM K.L. Education Foundation, Vaddeswaram, Guntur	Subject Expert
5	N. Vara Prasad, CEO, ARETE IT Services Pvt. Ltd Mob:8885591199	Industrialist
6	T.Pujitha, M.Sc Mob:7799467493	Alumni
7	1. Smt..B.Nagamani, Asst. Prof. of Physics 2. Smt. T.V.Vakula Priya, Ast. Prof.o f Physics 3. Dr.J. Nageswara Rao, Asst.Prof.of Physics 4. Dr. Asirvadam, Asst.Prof.of Physics 5. Sri.T. Devender Reddy, Asst. Prof. of Physics 6. Sri G.V.Gangadhara Rao, Asst. Prof.of Physics 7. Smt. Sk. Jubeda, Cont. Lec in Physics	Members of the Department
8	1. Pasumarthy Pallavisri III MPCs 2. Prathipati Suvarna III MPC	Students



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Department of PHYSICS & ELECTRONICS

ACADEMIC YEAR 2023-24

Members of the Board of Studies of Department of Physics met on 30 -08-2023 at 3.00 PM in the Department of Physics & Electronics staff room Under chairmanship of Smt P. Sailaja, In-charge of the Department, with the following agenda.

AGENDA:

1. Review of minutes of BOS .
2. To apprise and approve Departmental Vision and mission.
3. To discuss and approve curriculum structure suggested by APSCHE and from feedback of students and different stakeholders with modifications not exceeding 20% on demand of local needs and to be implemented from the year 2023-24.
4. To approve blue print and Model Question paper for theory and practical examinations.
5. Review of evaluation of Internal and External Examinations.
6. To Suggest Methodologies and innovative teaching practices.
7. To discuss and approve panel of Examiners.
8. To suggest and approve student study projects, Extension activities curricular, co-curricular activities and to discuss about certificate course.
9. Any other with the permission of the chairperson.

Programme: B.Sc. Honours in Physics (Major)

w.e.f.AY2023-24

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs/Week	No. of Credits
I	I	1	Essentials and Applications of Mathematical, Physical and Chemical Sciences	3+2	4
		2	Advances in Mathematical, Physical and Chemical Sciences	3+2	4
	II		Mechanics and Properties of Matter	3	3
		3	Mechanics and Properties of Matter Practical Course	2	1
		4	Waves and Oscillations	3	3
			Waves and Oscillations Practical Course	2	1

Year	Semester	Course	Title of the Course	No. of Hrs/Week	No. of Credits
II	III	5	Optics	3	3
			Optics Practical Course	2	1
		6	Heat and Thermodynamics	3	3
			Heat and Thermodynamics Practical Course	2	1
		7	Electronic Devices and Circuits	3	3
			Electronic Devices and Circuits Practical Course	2	1
	IV	8	Analog and Digital Electronics	3	3
			Analog and Digital Electronics Practical course	2	1
		9	Electricity and Magnetism	3	3
			Electricity and Magnetism Practical Course	2	1
		10	Modern Physics	3	3
			Modern Physics Practical Course	2	1
		11	Introduction to Nuclear and Particle Physics	3	3
			Introduction to Nuclear and Particle Physics Practical Course	2	1

Year	Semester	Course	Title of the Course	No. of Hrs/Week	No. of Credits
III	V	12	Applications of Electricity & Electronics	3	3
			Applications of Electricity & Electronics Practical Course	2	1
		13	Electronic Instrumentation	3	3
			Electronic Instrumentation Practical Course	2	1
		14 A	Optical Instruments and Optometry	3	3
			Optical Instruments and Optometry Practical Course	2	1
		OR			
		14 B	Optical Imaging and Photography	3	3
			Optical Imaging and Photography Practical Course	2	1
		15 A	Low Temperature Physics & Refrigeration	3	3
			Low Temperature Physics & Refrigeration Practical Course	2	1
		OR			
		15 B	Solar Energy and Applications	3	3
			Solar Energy and Applications Practical Course	2	1
	VI	Internship			
IV	VII		Courses will be available in due course of time		
	VIII		Courses will be available in due course of time		

SEMESTER-I

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

Theory

Credits:4

5hrs/week

Course Objective:

The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences. The course aims to develop students' critical thinking, problem-solving, and analytical skills in these areas, enabling them to apply scientific principles to real-world situations.

Learning outcomes:

1. Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.
2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations
3. To Explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.
4. Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
5. To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and counter measures.

UNIT I: ESSENTIALS OF MATHEMATICS:

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

UNITII: ESSENTIALS OF PHYSICS:

Definition and Scope of Physics- Measurements and Units: Fundamental and derived quantities - Motion of objects: Newtonian Mechanics and Relative velocity and postulates of special theory of relativity-Laws of Thermodynamics and Significance- Acoustic waves: definition and properties, Characteristics of electromagnetic waves: - Electric and Magnetic fields and their interactions: Maxwell equations differential and integral forms.-Wave-particle duality: De Broglie Hypothesis & wavelength, the uncertainty principle-Theories and understanding of universe: Big bang Theory and steady state theory.

UNITIII: ESSENTIALS OF CHEMISTRY:

Definition and Scope of Chemistry- Importance of Chemistry in daily life -Branches of chemistry and significance- Periodic Table- Electronic Configuration, chemical changes, classification of matter, Biomolecules-carbohydrates, proteins, fats and vitamins.

UNITIV: APPLICATIONS OF MATHEMATICS, PHYSICS &CHEMISTRY:

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

Application of Physics in Industry and Technology: Applications of Electronics and Semiconductor Industry, Robotics and Automation: Collision avoidance robot, Newtons laws, physics-based algorithms, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring: Waste management and recycling, Sustainable Technologies: Applications of Renewable energies.

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

UNITV: ESSENTIALS OF COMPUTER SCIENCE:

Milestones of Computer Evolution: Computer- Block diagram, generations of computer

2Hrs

Internet Basics: Internet, history of Internet, Internet Service Providers, Types of Networks-LAN, MAN, WAN, IP- IPv4 & IPv6 (without packet formats), Ethernet address, Domain Name Services, applications

4Hrs

Ethical and Social Implications: Network and security concepts- Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques

3Hrs

Additional Input: Network topologies, features of IP

Recommended books:

1. Functions of one complex variable by John. B. Conway, Springer-Verlag.
2. Elementary Trigonometry by H.S.Halland S.R.Knight
- 3.Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media (P) Ltd.
- 4..Basic Statistics by B.L.Agarwal, Newage 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. JewettJr.
8. Physics for Technology and Engineering "by John Bird
9. Chemistry in daily life by Kirpal Singh
10. Chemistry of biomolecules by S.P.Bhutan
11. Fundamentals of Computers by V.Raja Raman
12. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

STUDENT ACTIVITIES

UNITI: ESSENTIALS OF MATHEMATICS:

1: Complex Number Exploration

Provide students with a set of complex numbers in both rectangular and polar forms. They will plot the complex numbers on the complex plane and identify their properties

2: Trigonometric Ratios Problem Solving

Give students a set of problems that require the calculation of trigonometric ratios and their relations.

Students will solve the problems using the appropriate trigonometric functions (sine, cosine, tangent, etc.) and trigonometric identities.

3: Vector Operations and Applications

Provide students with a set of vectors in Cartesian form.

Students will perform vector addition and subtraction operations to find the resultant vectors. They will also calculate the scalar and vector products of given vectors.

4: Statistical Measures and Data Analysis

Give students a data set containing numerical values.

Students will calculate the mean, median, and mode of the data, as well as other statistical measures if appropriate (e.g., range, standard deviation).

They will interpret the results and analyze the central tendencies and distribution of the data.

UNIT II: ESSENTIALS OF PHYSICS:

1. Concept Mapping

Divide students into groups and assign each group one of the topics.

Students will create a concept map illustrating the key concepts, relationships, and applications related to their assigned topic.

Encourage students to use visual elements, arrows, and label store present connections and inter dependencies between concepts.

2. Laboratory Experiment

Select a laboratory experiment related to one of the topics, such as motion of objects or electric and magnetic fields.

Provide the necessary materials, instructions, and safety guidelines for conducting the experiment.

Students will work in small groups to carry out the experiment, collect data, and analyze the results.

After the experiment, students will write a lab report summarizing their findings, observations, and conclusions.

UNITIII: ESSENTIALS OF CHEMISTRY

1: Chemistry in Daily Life Presentation

Divide students into groups and assign each group a specific aspect of daily life where chemistry plays a significant role, such as food and nutrition, house hold products, medicine, or environmental issues.

Students will research and create a presentation (e.g.,Power Point, poster ,or video) that show cases the importance of chemistry in their assigned aspect.

2: Periodic Table Exploration

Provide students with a copy of the periodic table.

Students will explore the periodic table and its significance in organizing elements based on their properties.

They will identify and analyze trends in atomic structure, such as electronic configuration,

atomic size, and ionization energy.

3: Chemical Changes and Classification of Matter

Provide students with various substances and chemical reactions, such as mixing acids and bases or observing a combustion reaction.

Students will observe and describe the chemical changes that occur, including changes in color, temperature, or the formation of new substances.

4: Biomolecules Investigation

Assign each student or group a specific biomolecule category, such as carbohydrates, proteins, fats, or vitamins.

Students will research and gather information about their assigned biomolecule category, including its structure, functions, sources, and importance in the human body.

They can create informative posters or presentations to present their findings to the class.

UNITIV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

1: Inter disciplinary Case Studies

Divide students into small groups and provide them with inter disciplinary case studies that involve the inter disciplinary application of mathematics, physics, and chemistry.

Each case study should present a real-world problem or scenario that requires the integration of concepts from all three disciplines.

2: Design and Innovation Project

Challenge students to design and develop a practical solution or innovation that integrates mathematics, physics, and chemistry principles.

Students can choose a specific problem or area of interest, such as renewable energy, environmental conservation, or materials science.

3: Laboratory Experiments

Assign students laboratory experiments that demonstrate the practical applications of mathematics, physics, and chemistry.

Examples include investigating the relationship between concentration and reaction rate, analyzing the behavior of electrical circuits, or measuring the properties of materials.

4: Mathematical Modeling

Present students with real-world problems that require mathematical modeling and analysis.

UNITV: ESSENTIALS OF COMPUTERS SCIENCE:

1. Identifying the attributes of network (Topology, service provider, IP address and bandwidth of your college network) and prepare a report covering network architecture.

2. Identify the types of malwares and required firewalls to provide security.

3. Latest Fraud techniques used by hackers.

SEMESTER-I

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

Theory

Credits:4

5hrs/week

COURSE 1: BLUE PRINT

Unit	Essay answer questions	Short answer questions	Numerical problem
Unit I	2 (with internal choice)	2	0
Unit II	2 (with internal choice)	2	0
Unit III	2 (with internal choice)	2	0
Unit IV	2 (with internal choice)	2	0
Unit V	2 (with internal choice)	2	0

(PHY M 1301)
S.R.R & C.V.R. GOVERNMENT DEGREE COLLEGE (A) VIJAYAWADA
B.Sc (PHYSICS)
SEMESTER-1
MODEL QUESTION PAPER

**ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND
CHEMICAL SCIENCES**

Time: 3 hours

Max marks: 60M

Section-A

Answer any Five of the following Questions

5X4=20 Marks

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

SECTION-B

Answer all questions

5X8=40 Marks

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.

Or

Or

Or

Or

Or

SEMESTER-I

COURSE 2: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Theory

Credits:4

5 hrs/week

Course Objective:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences. The course aims to broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Learning outcomes:

1. Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.
2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations.
3. Understand the different sources of renewable energy and their generation processes and advances in nanomaterials and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials.
3. Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of nano sensors. Explore the effects of chemical pollutants on ecosystems and human health.
4. Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
- 5 Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics. Gain knowledge of different types of transmission media, such as wired (e.g., copper cables, fiber optics) and wireless (e.g., radio waves, microwave, satellite).

UNIT I: ADVANCES IN BASICS MATHEMATICS

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:

Renewable energy: Types of Renewable energy resources, Generation: Photo Voltaic effect, Solar cell, energy storage: Solar Pond, and energy-efficient materials: Mono crystalline and polycrystalline (Perovskite, CDTe, CIGS) and devices: LED.

Recent advances in the field of nanotechnology: Introduction to nano materials, Quantum dots, Quantum Communication: Qubits-recent advances in medical physics-Shape Memory Materials.

UNIT III: ADVANCES IN CHEMISTRY:

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

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

Mathematical Modelling applications in physics and chemistry

Application of Renewable energy: Smart Grids: Definition, Block diagram and operation

Application of nanotechnology: Nanomedicine,

Application of biophysics: Biophysical Imaging, Biomechanics, Neuro physics,

Application of medical physics: Radiation Therapy, Nuclear medicine Solid waste management, Environmental Remediation-Green Technology, Water treatment

UNITV: Advanced Applications of computer Science

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.

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. Nanomaterials 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 Bahrouz Forouzan.

STUDENT ACTIVITIES

UNITI:

ADVANCES IN BASIC MATHEMATICS

1: Straight Lines Exploration

Provide students with a set of equations representing straight-line different forms, such as slope- intercept form, point-slope form, or general form.

Students will explore the properties and characteristics of straight lines, including their slopes, intercepts, and point of intersection.

2: Limits and Differentiation Problem Solving

Students will apply the concept of limits to solve various problems using standard limits.

Encourage students to interpret the results and make connections to real-world applications, such as analyzing rates of change or optimizing functions.

3: Integration Exploration

Students will explore the concept of integration as a reverse process of differentiation and apply basic methods of integration, such as the product rule, substitution method, or Integration by parts.

Students can discuss the significance of integration in various fields, such as physics and chemistry

4: Matrices Manipulation

Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose.

Students can apply their knowledge of matrices to real- world applications, such as solving systems of equations or representing transformations in geometry.

UNITII: ADVANCES INPHYSICS:

1: Case Studies

Provide students with real-world case studies related to renewable energy, nanotechnology, biophysics , medical physics, or shape memory materials.

Students will analyze the case studies, identify the challenges or problems presented, and propose innovative solutions based on the recent advances in the respective field.

They will consider factors such as energy generation, energy storage, efficiency, sustainability, materials design, biomedical applications, or technological advancements.

2: Experimental Design

Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials.

They will identify a specific research question or problem to investigate and design an

experiment accordingly.

Students will collect and analyze data, interpret the results, and draw conclusions based on their findings. They will discuss the implications of their experimental results in the context of recent advances in the field.

3: Group Discussion and Debate

Organize a group discussion or debate session where students will discuss the ethical, social, and environmental implications of the recent advances in renewable energy, nanotechnology, biophysics, medical physics, and shape memory materials.

Assign students specific roles, such as proponent, opponent, or moderator, and provide them with key point sand arguments to support their positions.

UNIT III: ADVANCES IN CHEMISTRY:

1. Experimental Design and Simulation

In small groups, students will design experiments or simulations related to the assigned topic.

For example, in the context of computer-aided drug design, students could design a virtual screening experiment to identify potential drug candidates for a specific disease target.

For nano sensors, students could design an experiment to demonstrate the sensitivity and selectivity of nano sensors in detecting specific analytes. Chemical biology-related activities could involve designing experiments to study enzyme-sub Strat interactions or molecular interactions in biological systems. Students will perform their experiments or simulations, collect data, analyze the results, and draw conclusions based on their findings.

2. Case Studies and Discussion

Provide students with real-world case studies related to the impact of chemical pollutants on ecosystems and human health.

Students will analyze the case studies, identify the sources and effects of chemical pollutants, and propose mitigation strategies to minimize their impact.

Encourage discussions on the ethical and environmental considerations when dealing with chemical pollutants.

For the dye removal using the catalysis method, students can explore case studies where catalytic processes are used to degrade or remove dyes from waste water.

Students will discuss the principles of catalysis, the advantages and limitations of the catalysis method, and its applications in environmental remediation.

3: Group Project

Assign students to work in groups to develop a project related to one of the topics.

The project could involve designing a computer-aided drug delivery system, developing a nano sensor for a specific application, or proposing strategies to mitigate the impact of chemical pollutants on eco systems.

Students will develop a detailed project plan, conduct experiments or simulations, analyze

data, and present their findings and recommendations.

Encourage creativity, critical thinking, and collaboration throughout the project.

UNITIV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

1: Mathematical Modelling Experiment

Provide students with a mathematical modelling experiment related to one of the topics. For example, in the context of renewable energy, students can develop a mathematical model to optimize the placement and configuration of solar panels in a solar farm.

Students will work in teams to design and conduct the experiment, collect data, and analyze the results using mathematical models and statistical techniques.

They will discuss the accuracy and limitations of their model, propose improvements, and

Interpret the implications of their findings in the context of renewable energy or the specific application area.

2: Case Studies and Group Discussions

Assign students to analyze case studies related to the applications of mathematical modeling in nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.

Students will discuss the mathematical models and computational methods used in the case studies, analyze the outcomes, and evaluate the effectiveness of the modelling approach.

Encourage group discussions on the challenges, ethical considerations, and potential advancements in the field.

Students will present their findings and engage in critical discussions on the advantages and limitations of mathematical modeling solving complex problems in the seareas.

3. Group Project

Assign students to work in groups to develop a group project that integrates mathematical modelling with one of the application areas: renewable energy, nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.

The project could involve developing a mathematical model to optimize the delivery of radiation therapy in medical physics or designing a mathematical model to optimize waste management practices. Students will plan and execute their project, apply mathematical modelling techniques, analyze the results, and present their findings and recommendations.

Encourage creativity, critical thinking, and collaboration throughout the project.

UNITV: Advanced Applications of computer Science

Students must be able to convert numbers from other number system to binary number systems

1. Identify the networking media used for your college network

Identify all the networking devices used in your college premises.

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SEMESTER-1
MODEL QUESTION PAPER
ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Time: 3 hours

Max marks: 60M

COURSE 2: BLUE PRINT

Unit	Essay answer questions	Short answer questions	Numerical problems
Unit I	2 (with internal choice)	2	0
Unit II	2 (with internal choice)	2	0
Unit III	2 (with internal choice)	2	0
Unit IV	2 (with internal choice)	2	0
Unit V	2 (with internal choice)	2	0

(PHY 1301)
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B.Sc (PHYSICS)
SEMESTER-1
MODEL QUESTION PAPER
ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Time: 3 hours

Max marks: 60M

Section-A

Answer any Five of the following Questions

5X4=20 Marks

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

SECTION-B

Answer all questions

5X8=40 Marks

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.

Or

Or

Or

Or

Or

Multidisciplinary Courses Offered for B.A./B.Com./BBA/BCA Majors

w.e.f. AY 2023-24

**SEMESTER-I
PRINCIPLES OF PHYSICAL SCIENCES**

Credits:2

2hrs/week

Course Objective:

The course "Principles of Physical Sciences" is designed to introduce arts students to fundamental concepts and principles of physical sciences, fostering a deeper understanding of the physical world and its inter connections with various disciplines.

Learning outcomes:

Upon completion of the course "Principles of Physical Sciences for Arts Students," students from arts back grounds will be able to:

1. Understand the foundation a principle of physical sciences: Students will develop a comprehensive understanding of the core principles and concepts in physical sciences.
2. Analyze and interpret scientific information: Students will acquire the ability to critically analyse scientific information and data related to physical sciences.
3. Apply physical science principles to real-world scenarios: Students will develop the skills to apply physical science principles to solve real-world problems and scenarios.

Syllabus:

Unit1: Introduction to Physics

Definition of Physics, Scope of physics, and Applications of physics related to Commerce and humanities, Measurement and Units: Fundamental and derived quantities, SI units, Significant figures.

Unit2: 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 and work, different forms of energy and Work- Energy theorem.

Unit3: Waves and Optics for Arts Students

Waves: Definition of wave and characteristics of waves, wave types, stationary waves. Light and Optics: reflection, refraction, Myopia and hypermetropia.

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 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 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.

Student activities:

1. Conduct research on a famous physicist or a significant discovery in the field of physics. Write a short report highlighting the physicist's contributions or explaining the importance of the discovery. Include information about how the discovery impacted other scientific fields or technological advancements.
2. Watch videos or animations demonstrating circular motion, such as the motion of objects on a Ferris wheel or a car turning on a curved track. Identify the forces involved, including the centripetal force, and explain how they contribute to the object's circular motion. Discuss real-world examples where circular motion is significant, such as satellites orbiting the Earth.
3. Set up a wave demonstration using a rope or a slinky to visualize the properties of waves, such as wavelength, frequency, amplitude, and wave speed. Observe how these properties change when altering the parameters of the wave, such as tension or length.

(PHY 1301)
S.R.R & C.V.R. GOVERNMENT DEGREE COLLEGE (A) VIJAYAWADA
B.Sc (PHYSICS)
SEMESTER-1
MODEL QUESTION PAPER

PRINCIPLES OF PHYSICAL SCIENCES

Time: 2 hours

Max marks: 50M

COURSE 3: BLUE PRINT

Unit	Essay answer questions
Unit I	3
Unit II	4
Unit III	3

(PHY 1301)
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B.Sc (PHYSICS)
SEMESTER-1
MODEL QUESTION PAPER

PRINCIPLES OF PHYSICAL SCIENCES

Time: 2 hours

Max marks: 50M

Section-A

Answer any Five of the following questions

5X10=50 Marks

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

SEMESTER-II
COURSE3: MECHANICS AND PROPERTIES OF MATTER

Theory

Credits:3

3hrs/week

COURSE OBJECTIVE:

The course on Mechanics and Properties of Matter aims to provide students with a fundamental understanding of the behaviour of physical systems, both in terms of mechanical motion and in terms of the properties of matter

LEARNING OUTCOMES:

1. Students will be able to understand and apply the concepts of scalar and vector fields, calculate the gradient of a scalar field, determine the divergence and curl of a vector field.
2. Students will be able to apply the laws of motion, solve equations of motion for variable mass systems
3. Students will be able to define a rigid body and comprehend rotational kinematic relations, derive equations of motion for rotating bodies, analyze the precession of a top and gyroscope, understand the precession of the equinoxes
4. Students will be able to define central forces and provide examples, understand the characteristics and conservative nature of central forces, derive equations of motion under central forces.
5. Students will be able to differentiate between Galilean relativity and the concept of absolute frames, comprehend the postulates of the special theory of relativity, apply Lorentz transformations, understand and solve problems

UNIT-I VECTOR ANALYSIS

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

UNIT-II MECHANICS OF PARTICLES

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 (qualitative treatment only), Concept of impact parameter, scattering cross-section, Rutherford angle of scattering -derivation.

UNIT-III MECHANICS OF RIGID BODIES AND CONTINUOUS MEDIA

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, Precessional velocity 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. Relation between Y & η , Y & k and Y , η and k -derivation. Classification of beams, types of bending, point load, distributed load.

UNIT-IV CENTRAL FORCES

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 central force. Derivation of Kepler's laws. Motion of satellites: Orbital velocity.

UNIT-V SPECIAL THEORY OF RELATIVITY

Frame of reference and types, Galilean transformation equations, 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, space – time concept.

REFERENCEBOOKS:

1. BSc Physics -Telugu Akademy, Hyderabad
2. Mechanics- D.S.Mathur, Sulthan Chand &Co,NewDelhi
3. Mechanics-J.C.Upadhyaya,Ramprasad&Co.,Agra
4. Properties of Matter-D.S. Mathur, S. Chand & Co,New Delhi,11thEdn.,2000
5. PhysicsVol.I-Resnick-Halliday-Krane,Wiley,2001
6. Properties of Matter–Brijlal & Subrmanyam, S.Chand&Co.1982
7. Dynamics of Particles and Rigid bodies–Anil Rao,Cambridge Univ Press,2006
8. Mechanics-EMPurcell, McGraw 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.

SEMESTER-II
COURSE3: MECHANICS AND PROPERTIES OF MATTER

Practical

Credits:1

2hrs/week

COURSE OBJECTIVE:

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

LEARNING OUTCOMES:

1. Mastery of experimental techniques: Students should become proficient in using laboratory equipment and experimental techniques to measure properties of matter and analyze mechanical systems.
2. Application of theory to practice: Students should be able to apply theoretical concepts learned in lectures to real-world situations, and understand the limitations of theoretical models.
3. Accurate recording and analysis of data: Students should be able to accurately record and analyze experimental data, including understanding the significance of error analysis and statistical methods.
4. Critical thinking and problem solving: Students should be able to identify sources of error, trouble shoot experimental problems, and develop critical thinking skills in experimental design and analysis.
5. Understanding of physical principles: Students should develop an understanding of the physical principles governing mechanical systems and the properties of matter, including elasticity, viscosity, and thermal expansion.

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 of 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 extant.
10. Rigidity modulus of material of a wire-dynamic method (torsional pendulum)

STUDENT ACTIVITIES

Unit I: Vector Analysis Activity: Field Mapping

Students can choose a physical field (e.g., temperature, magnetic field) and create a field map by taking measurements at different points. They can then calculate the gradient of the field and analyse the variations. This activity helps them understand the concept of gradient in a scalar field.

Unit II: Mechanics of Particles Activity: Collision Experiments

Students can set up simple collision experiments using marbles, carts, or other objects. They can measure the initial and final velocities, masses, and analyze the momentum conservation. By varying the conditions (e.g., masses, initial velocities), they can observe the effects on the collision outcomes.

Unit III: Mechanics of Rigid Bodies and Continuous Media Activity: Balancing Act

Students can experiment with balancing various objects (e.g., rulers, books) on different points to understand the concept of center of mass and stability. They can analyse the equilibrium conditions and explore how the position of the center of mass affects the stability.

Unit IV: Central Forces Activity: Pendulum Motion

Students can investigate the motion of a simple pendulum by varying its length and measuring the time period. They can analyze the relationship between the period and the length, and discuss the concept of centripetal force and its role in circular motion.

Unit V: Special Theory of Relativity Activity: Time Measurement

Students can perform a time measurement experiment using simple devices like water clocks or sand timers. They can compare the measured time between two events at different relative speeds and discuss the concept of time dilation.

(PHY M2301-1)
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B.Sc (PHYSICS)
SEMESTER-II
MODEL QUESTION PAPER
MECHANICS AND PROPERTIES OF MATTER

Time:3 hours

Max marks: 60M

COURSE III : BLUE PRINT

Unit	Essay answer questions	Short answer questions	Numerical problem
Unit I	2 (with internal choice)	1	1
Unit II	2 (with internal choice)	2	0
Unit III	2 (with internal choice)	1	1
Unit IV	2 (with internal choice)	2	0
Unit V	2 (with internal choice)	1	1

(PHY M2301-1)
S.R.R & C.V.R. GOVERNMENT DEGREE COLLEGE (A) VIJAYAWADA
B.Sc (PHYSICS)
SEMESTER-II
MODEL QUESTION PAPER
MECHANICS AND PROPERTIES OF MATTER

Time:3 hours

Max marks: 60M

Section-A

Answer any **FIVE** of the following Questions

5X4=20 Marks

- 1.If $A=2X\mathbf{i}+2Y\mathbf{j}+3Z\mathbf{k}$, find Curl A.
- 2.Explain the line, surface and volume integrals.
- 3.Distinguish between elastic and inelastic collisions.
4. What is impact parameter and Scattering Cross-section.
- 5.Explain the principle and working of gyroscope.
- 6.Calculate the Poisson's ratio of a material when it's Young's modulus $Y= 7.25 \times 10^{10} \text{ N/m}^2$ and bulk modulus $K= 11 \times 10^{10} \text{ N/m}^2$ are given.
- 7.Show that the central forces are conservative in nature.
- 8.Write a short note on motion of satellites.
- 9.If a rod travels with a speed of $V= 0.6C$ along its length, then calculate the percentage of contraction. (C is velocity of light)
- 10.Explain about time dilation.

SECTION-B

Answer **ALL** the questions

5X8=40 Marks

- 11 . State and prove Gauss divergence theorem.
OR
12. State and prove Stoke's theorem
13. Obtain an expression for the angle of Scattering of alpha particle in Rutherford scattering experiment.
OR
- 14.What is variable mass system? Derive an expression for the motion of a rocket.
15. What is symmetric top precession? Deduce an expression for its precessional velocity.
OR
- 16.Define the three elastic moduli. Derive the relation between them.
- 17.State and prove Kepler's first law.
OR
- 18.Define central force and derive the equation of motion of a particle under central force.
- 19.Describe the construction and working of Michelson-Morley experiment.
OR
- 20.State the postulates of special theory of relativity and derive Einstein's mass energy relation.

DEPARTMENT OF PHYSICS

Question Bank-2023-24

Semester II

Subject: Physics

Course III

Paper: Mechanics, and Properties of matter

UNIT-I

Vector Analysis

Essay Questions

1. Obtain the formula for the gradient of a scalar field. And write about its physical significance.
2. Derive an expression for the curl of a vector field. Give it's physical significance.
3. Derive an expression for the divergence of a vector field. Give it's physical significance.
4. Explain the divergence of a vector field. State and prove Gauss divergence theorem.
5. Explain the curl of a vector field. State and prove Stoke's theorem.

Short Answer Questions

1. Define scalar and Vector fields and give 2 examples.
2. Explain the terms gradient and divergence.
3. Define gradient of a scalar field and give it's physical significance with one example.
4. Define divergence and curl of a vector field.
5. Define curl of a vector field and explain its physical significance.
6. Define gradient, divergence and curl. Give examples.
7. Explain vector integration. Or Explain the line, surface and volume integrals.
8. State Gauss and Stokes Theorems.

UNIT-II

Mechanics of particles

Essay Questions

1. What is a variable mass system ? Derive an expression for the motion of a rocket.
2. Define impact parameter and Scattering Cross-section. Explain Rutherford scattering.(concept only)
3. Obtain the equation for the angle of Scattering of alpha particle in Rutherford scattering.

Short Answer Questions

1. Define impact parameter and Scattering Cross-section.
2. Explain the principle and working of a rocket.
3. Derive the expression for thrust on the rocket.
4. Derive the equation for the motion of a variable mass system.
5. Distinguish between elastic and inelastic collisions. Give examples.

UNIT-III

Mechanics of Rigid bodies and Continuous Media

Essay Questions

1. What is meant by a rigid body? Derive the equation of motion for a rigid body that is rotating about the axis of symmetry?
2. Explain the rotational kinematic relations. Deduce the equations of motion for a rigid rotating body.
3. What is symmetric top precession? Deduce an expression for its precessional velocity.
4. Define the three elastic moduli. Derive the relation between them.

Short Answer Questions

1. Define a rigid body. A perfect rigid body is available in nature or not?
2. Explain the principle and working of gyroscope.
3. Derive the relation between torque and angular momentum
4. Explain the Precession of Equinoxes and its consequences.

5. Classify different types of beams.
6. what are different types of loads?
7. Discuss types of bending.
8. Explain briefly about elastic constants.
9. Define poisson ratio and obtain expression for it.
10. Write about point load and distributed load.

UNIT IV
Central forces
Essay Questions

1. Derive the equation of motion of a particle under the central force?
2. State Kepler's laws and hence deduce Kepler's first law?
3. What is Conservative Force? Prove conservative nature of central force?

Short Questions

1. What is a central force? Give two examples?
2. Show that central forces are conservative in nature?
3. Derive Kepler's second law of motion?
4. Write a note on motion of a satellite?
5. State Kepler's laws of planetary motion.
6. Derive Kepler's third law of motion.
7. write a short note on orbital velocity.
8. Show the conservative force as negative gradient of potential energy.

UNIT- V
Special theory of relativity
Essay Questions

1. State the postulates of special theory of relativity. Derive Lorentz transformation equations?
2. Describe the construction and working of Michelson-Morley experiment.
3. What are length contraction and time dilation? Explain.
4. State the postulates of special theory of relativity and explain the principle of mass-energy equivalence.

Short Answer Questions

1. What are inertial and non-inertial frames?
2. Explain length contraction?
3. Discuss time dilation?
4. Write a short note on space-time concept.
5. Explain the concept of Einstein's mass energy relation.
6. write a short note on absolute frames.

SEMESTER-II
COURSE 4: WAVES AND OSCILLATIONS
Theory

Credits:3

3hrs/week

COURSE OBJECTIVE:

This course provides students with a broad understanding of the physical principles of the oscillations, to help them develop critical thinking and quantitative reasoning skills, to empower them to think creatively and critically about scientific problems and experiments.

LEARNING OUTCOMES:

The student should be able

1. To describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed.
2. To utilize mathematical relationships related to wave characteristics.
3. To compare particle motion and wave motion in different types of waves.
4. To distinguish between Longitudinal and Transverse waves.
5. To get the knowledge about how to construct and analysis the square waves, saw tooth waves, etc. from Fourier analysis

UNIT-I Simple Harmonic oscillations

9hr

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

UNIT-II Damped and forced oscillations

9hr

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, saw tooth wave, simple problems on evolution of Fourier coefficients, Applications of Fourier theorem.

UNIT-IV Vibrating Strings and Bars

9hr

Transverse wave propagation along stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones and harmonics. Musical instruments-Veena

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:

9hr

Ultrasonics, properties of ultrasonic waves, Piezo electric effect, production of ultrasonics by piezoelectric and magneto strictive methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Applications and uses of ultrasonic waves.

REFERENCEBOOKS:

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

SEMESTER-II
COURSE4: WAVES AND OSCILLATIONS

Practical

Credits:1

2hrs/week

COURSEOBJECTIVE:

This course provides students with a broad understanding of the physical principles of the oscillations, to help them develop critical thinking and quantitative reasoning skills, to empower them to think creatively and critically about scientific problems and experiments.

LEARNINGOUTCOMES:

1. Students are made to determine the unknown frequency of tuning fork by volume resonator experiment
2. Students are made to determine 'g' by compound /bar pendulum
3. Students are made to determine the force constant of a spring by static and dynamic method.
4. Students are made to determine the elastic constants of the material of a flat spiral spring.
5. Students are made to verify the laws of vibrations of stretched string –sonometer
6. Students are made to determine the frequency of a bar–Melde's experiment.
7. Students are made to study the damped oscillation using the torsional pendulum immersed in liquid-decay constant and damping correction of the amplitude.
8. Students are made to form Lissajous figures using CRO.

Minimum of 6 experiments to be done and recorded 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 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.

STUDENTACTIVITIES

Unit-I Simple Harmonic oscillations:

Activity: Measuring the period of a simple pendulum and verifying the relationship between the period and the length of the pendulum. Students can use a stopwatch and a ruler to measure the time for a fixed number of oscillations and calculate the period.

Unit-II Damped and forced oscillations:

Activity: Measuring the damping coefficient of a mass-spring system and calculating the quality factor. Students can measure the amplitude of the system as it undergoes damped oscillations and use the logarithmic decrement formula to calculate the damping coefficient. They can then use the formula for the quality factor to evaluate the quality of the system.

Unit-III Complex vibrations:

Activity: Constructing a square wave using Fourier series and analyzing its Fourier coefficients. Students can use a software tool or a programming language to generate a square wave and then compute the Fourier coefficients. They can then plot the magnitude spectrum of the waveform and observe the harmonic components.

Unit-IV Vibrating Strings and Bars:

Activity: Measuring the speed of sound in a metal rod and comparing it with the theoretical value. Students can use a microphone and an oscilloscope to measure the time delay between two reflections of a sound pulse in the rod. They can then use the formula for the speed of sound in a solid to calculate the speed and compare it with the theoretical value.

Unit-V Ultrasonics:

Activity: Measuring the wavelength of ultrasonic waves using the diffraction of light. Students can use a laser and a diffraction grating to create a diffraction pattern of an ultrasonic wave. They can then measure the distance between the diffraction fringes and use the formula for the diffraction of light to calculate the wavelength of the ultrasonic wave.

(PHY M 2301-2)
S.R.R & C.V.R. GOVERNMENT DEGREE COLLEGE (A) VIJAYAWADA
B.Sc (PHYSICS)
SEMESTER-2
MODEL QUESTION PAPER
WAVES AND OSCILLATIONS

Time: 3 hours

Max marks: 60M

COURSE IV : BLUE PRINT

Unit	Essay answer questions	Short answer questions	Numerical problem
Unit I	2 (with internal choice)	1	1
Unit II	2 (with internal choice)	2	0
Unit III	2 (with internal choice)	2	0
Unit IV	2 (with internal choice)	1	1
Unit V	2 (with internal choice)	1	1

(PHY M 2301-2)
S.R.R & C.V.R. GOVERNMENT DEGREE COLLEGE (A) VIJAYAWADA
B.Sc (PHYSICS)
SEMESTER-2
MODEL QUESTION PAPER
WAVES AND OSCILLATIONS

Time: 3 hours

Max marks: 60M

SECTION-A

Answer Any Five of the following Questions.

5X4=20 Marks

1. What are Lissajous Figures? Mention the Applications.
2. A particle of mass 3 grams executes Simple Harmonic Motion with amplitude 8 cm. It makes 16 vibrations per second. Find the maximum Velocity and Energy at mean position.
3. Explain logarithmic decrement.
4. Write a short note on amplitude resonance.
5. What are applications of Fourier theorem?
6. What are limitations of Fourier theorem?
7. What are overtones and harmonics?
8. Velocity of Sound in Iron is 5130 m/s. The density of Iron is 7800 Kg/cubic metre. Find the Young's Modulus of Iron.
9. Write the applications of ultrasonic waves.
10. A Piezoelectric Quartz crystal has thickness of 0.002 m. If the velocity of sound wave in the crystal is 5750 m/s, calculate the fundamental frequency of the crystal?

SECTION-B

Answer All Questions.

5X8=40 Marks

11. What is simple harmonic oscillator? Derive the equation of motion of simple harmonic oscillator and find its solution.
OR
12. Discuss the method of measuring acceleration due to gravity (g) using compound pendulum?

13. What are damped harmonic oscillations? Derive the equation of motion of damped harmonic oscillator and find its general solution?

OR

14. What are forced oscillations? Discuss the differential equation of a forced oscillator and obtain its general solution?

15. State and explain Fourier theorem? Derive the expressions for Fourier coefficients?

OR

16. State Fourier theorem? Analyze a Saw Tooth Wave using Fourier theorem?

17. Derive the expression for differential equation of transverse wave along a stretched string and find its solution?

OR

18. Explain the Longitudinal vibrations of a bar in the cases (1) Bar fixed at both ends (2) Bar fixed at the mid point?

19. What are ultrasonic waves? Describe how ultrasonic waves are produced by the method of Piezoelectric method.

OR

20. Explain the method to determine the wavelength of Ultrasonic Waves?

SRR & CVR Govt. Degree College (A), Vijayawada

DEPARTMENT OF PHYSICS

Question Bank

Course IV: Waves & Oscillations

Course Code: PHY M 2301-2

Sem: II

UNIT-I : Simple Harmonic Oscillations

Long Answer Questions

1. What is simple harmonic oscillator? Derive the equation of motion of simple harmonic oscillator and find its solution.
2. Explain the measurement of Rigidity Modulus using Torsional Pendulum?
3. Discuss the method of measuring acceleration due to gravity (g) using compound pendulum?
4. Explain the combination of two mutually perpendicular simple harmonic vibrations of same frequency?

Short Answer Questions

1. What is Simple Harmonic Motion? Explain any two of its characteristics?
2. What are Beats? Explain the properties of Beats.
3. What are Lissajous Figures? Mention the Applications.
4. A particle of mass 3 grams executes Simple Harmonic Motion with amplitude 8 cm. It makes 16 vibrations per second. Find the maximum Velocity and Energy at mean position.

UNIT – 2: Damped and Forced Oscillations

Long Answer Questions

1. What is damped harmonic oscillator? Derive the equation of motion of damped harmonic oscillator and find its general solution?
2. What are forced oscillations? Discuss the differential equation of a forced oscillator and obtain its general solution?
3. Derive the equation for Energy in a Damped Harmonic Oscillator?
4. What is Resonance? Explain velocity resonance and amplitude resonance.

Short Answer Questions

1. Explain logarithmic decrement.
2. Write a short note on resonance?
3. Write a short note on velocity resonance?

4. Write a short note on amplitude resonance.
5. Explain relaxation time
6. Explain Q-factor.

UNIT- III: Complex Vibrations:

Long Answer Questions

1. State and explain Fourier theorem? Derive the expressions for Fourier coefficients?
2. State Fourier theorem? Analyze a Square Wave using Fourier theorem?
3. State Fourier theorem? Analyze a Saw Tooth Wave using Fourier theorem?

Short Answer Questions

1. State and explain Fourier theorem?
2. What are applications of Fourier theorem?
3. What are limitations of Fourier theorem?

UNIT –IV : Vibrating Strings and Bars

Long Answer Questions

1. Derive the expression for differential equation of transverse wave along a stretched string and find its solution?
2. Discuss the modes of vibration of stretched string clamped at ends?
3. Derive the wave equation of a Longitudinal vibration in a bar and find its general solution?
4. Explain the Longitudinal vibrations of a bar in the cases (1) Bar fixed at both ends (2) Bar fixed at the mid point?

Short Answer Questions

1. What is the significance of the transverse waves along the stretched string?
2. What are overtones and harmonics?
3. State the laws of transverse vibrations of strings?
4. Explain the working of musical instrument Veena?
5. Velocity of Sound in Iron is 5130 m/s. The density of Iron is 7800 Kg/cubic metre. Find the Young's Modulus of Iron.

UNIT –V: Ultrasonics

Long Answer Questions

1. What are ultrasonic waves? Describe how ultrasonic waves are produced by the method of Piezo electric method.
2. What are ultrasonic waves? Describe how ultrasonic waves are produced by the method of Magnetostriction method.
3. Explain the method to determine the wavelength of Ultrasonic Waves?
4. Explain the method to detect the Ultrasonic Waves?

Short Answer Questions

1. Write the applications of ultrasonic waves.
2. Write the detecting methods of ultrasonic waves?
3. What are ultrasonics? Write the general properties of the ultrasonics?
4. What is piezoelectric effect? Explain it.
5. A Piezoelectric Quartz crystal has thickness of 0.002 m. If the velocity of sound wave in the crystal is 5750 m/s, calculate the fundamental frequency of the crystal?



S.R.R. & C.V.R. GOVT. DEGREE COLLEGE

(A) VIJAYAWADA, N.T.R. DT.

AFFILIATED TO KRISHNA UNIVERSITY, MACHILIPATNAM

Department of PHYSICS & ELECTRONICS

Academic Year-2023-24

ACADEMIC YEAR 2022-2023

DEPARTMENT OF PHYSICS & ELECTRONICS

Smt P. Sailaja, In charge of the Department of Physics & Electronics request the Academic Council to Consider and approve the changes in the syllabi recommended by the Board of Studies for the academic year 2023-24.

The BOS meeting held on 29-08-2023.

The resolutions were seconded by Prof. M.Rami Reddy, Member of the Board of studies.

The Academic council is also requested to accord permission to appoint Examiners for theory and Practical for the academic year 2023-24.

Chairman BOS

Members present

1. Smt.P. Sailaja , Assoc. Prof of Electronics (**Board of studies chairperson**) :
2. Prof. M.RamiReddy, (**University Nominee**) :
Registrar, Krishna University, Machilipatnam
3. SriK. Ajay Kumar, Asst. Prof. of Physics (**Subject Expert**) :
4. Dr.P.Gopi Krishna, Asst. Prof. of Dept of ECM (**Subject Expert**) :
5. Sri N.Vara Prasad (**Industrialist**) :
6. T.Pujitha, M.Sc (**Alumni**) :



S.R.R. & C.V.R. GOVT. DEGREE COLLEGE

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AFFILIATED TO KRISHNA UNIVERSITY, MACHILIPATNAM

Department of PHYSICS & ELECTRONICS

Academic Year-2023-24

List of Examiners and Paper Setters:

S.NO	Name of the Lecturer	Address
1	Sri.K. Ajay Kumar , Asst. Prof. of Physics Mob:9493474612	GDC,Eluru,W.G.Dt
2	Sri M. Aruna , Lecturer in physics, Mob.no-9490881096	GDC, Kanchikacherla, Krishna Dt
3	Smt. Ch.Komala Lakshmi, Lecturer in Physics, Mob.no-9440151266	GDC(A), Rajamahendravaram, E.G.Dt
4	Kum.G.Sirisha, Lecturer in Physics Mob.no-8121925246	GDC(W),Guntur, Guntur Dt.
5	Sri. Ch.VenkatswaraRao, Asst. Prof. of Physics	GDC(A), Rajamahendravaram, E.G.Dt
6	Dr.P. Gopi Krishna, Asst.Prof. of ECM	K.L. Education Foundation, Vaddeswaram, Guntur.
7	Dr. K.Jayadev, Asst. Prof. of Physics	PR GDC(A), Kakinada
8	Sri.SK.Basha, Lecturer in Physics Mob no.9705964213	GDC, Rajamahendravaram, E.G.Dt



S.R.R. & C.V.R. GOVT. DEGREE COLLEGE

(A) VIJAYAWADA, N.T.R. DT.

AFFILIATED TO KRISHNA UNIVERSITY, MACHILIPATNAM

Department of PHYSICS & ELECTRONICS

Academic Year-2023-24

After thorough Discussion the following Resolutions are made:

1. It is resolved to follow the same syllabus prescribed by the APSCHE, Andhra Pradesh for UG students of B.Sc (Physics) honors in all semesters from the Academic Year 2023-24 with some additional inputs and some deletions.
2. It Is resolved to Approve the syllabus of **Semester I and semester II.**
3. It is resolved and approved the **Multi-disciplinary Course** with 20% modifications in semester I for Commerce and Humanities programmes.
4. It is resolved and approved the Syllabus for Certificate Courses of
Certificate course on “Hardware and Networking”
Certificate course on “Textile Printing”
Certificate course on “Video editing”
5. Resolved and approved the model question paper pattern for all semester examinations.
6. It is resolved to take 40% marks are eligible to treat as pass both in internal and external examinations.
7. It is resolved to take 60% of marks for external examinations and 40% for internal examinations as same as the BOS of last academic year 2022-23.
8. It is approved blueprint for theory and practical examinations.
9. It is resolved to consider 50 Marks for External evaluation in Practical examination in all semesters from this admitted batch 2023-24.
10. It is resolved to suggested student study projects, Extension activities, and Field trips, curricular and co-curricular activities.

Signatures of the BOS members:

1.Smt. P.Sailaja , Assoc. Prof of Electronics **(Board of studies chairperson)** :

2. Prof.M. Rami Reddy, **(University Nominee)** :
Registrar, Krishna University, Machilipatnam

3. SriK. Ajay Kumar,Asst. Prof. of Physics **(Subject Expert)** :

4. Dr.P.Gopi Krishna, Asst. Professor, Dept. of ECM **(Subject Expert)** :

5. Sri N.Vara Prasad **(Industrialist)** :

6. T.Pujitha, M.Sc(**Alumni**) :

Members of the Department:

7.Smt..B.Nagamani,Asst.Prof.of Physics :

8. Smt. T.V.VakulaPriya, Ast. Prof. of Physics :

9. Dr.J.Nageswara Rao ,Asst. Prof. of Physics :

10. Dr. Asirvadam, Asst. Prof. of Physics :

11. Sri.T.Devender Reddy, Asst. Prof. of Physics :

12. Sri G.V.GangadharaRao, Asst. Prof. of Physics :

13. Smt. Sk. Jubeda, Cont. Lec. in Physics :

14. Pasumarthy Pallavisri III MPCs :

15. Prathipati Suvarna III MPC :