(COURSE CODE: 23BSPM11)

Programme: B.Sc. Honorus in Physics (Major) -2023-2024
SEMESTER-I   COURSE 1:

ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Theory   Credits: 4   5 hrs/week

JUSTIFICATION *of NON-ALTERATIONS* in COURSE-1

DEPARTMENT OF PHYSICS/ELECTRONICS

This is a common paper for all B.Sc. honour programmes of mathes stream (PHYSICS, ELECTRONICS, and CHEMISTRY all programs, MATHES & COMPUTERS). This paper contains heterogeneous combinational syllabus of all subjects (physics, chemistry, mathes and computers). In the view of the above complexity, for the benefit of student, it is decided in department of Physics/Electronics not to alter any part of syllabus i.e. physics part of syllabus.

NO ALTERATION HAS BEEN DONE IN PHYSICS PART OF SYLLUBUS IN THIS PAPER (semester-1 & course-1)

Title *of* course:
ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Dr. VS KRISHNA GOVT. DEGREE COLLEGE (A), VISHAKAPATNAM

BLUE PRINT

Programme: B.Sc. Honors in Physics (Major) -2023-2024
SEMESTER-I

COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES
(COURSE CODE: 23BSPM11)

MAX MARKS – 60   TIME – 3 HOURS   (CREDITS- 4)

S.NO	UNIT	TOPIC	ESSAY TYPE QUESTIONS (SECTION-B) Each one 8 marks	SHORT ANSWER QUESTIONS (SECTION-A) Each one 4 marks
1	I	ESSENTIALS OF MATHEMATICS	1	2
2	II	ESSENTIALS OF PHYSICS	1	2
3	III	ESSENTIALS OF CHEMISTRY	1	2
4	IV	APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY	1	2
5	V	ESSENTIALS OF COMPUTER SCIENCE	1	2
			5 (internal choice)	10 (five to be answered out of TEN questions)
		marks	5×8=40 (With choice)	5×4=20 (With choice)
			10×8=80 Total	~~5×8=40~~ 10×4=40 Total

$$\text{Percentage of choice} = \frac{120 - 60}{120} \times 100 = 50\%$$

Note: one numerical problem should be given in section-A

(COURSE CODE: 23BSPM11)

Programme: B.Sc. Honorus in Physics (Major) -2023-2024
SEMESTER-I

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

Theory   Credits: 4   5 hrs/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 countermeasures.

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SYLLUBUS

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.

UNIT- II

ESSENTIALS OF PHYSICS

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

UNIT -III

ESSENTIALS OF CHEMISTRY

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.

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(COURSE CODE: 23BSPM11)

UNIT IV:

APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

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

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

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

UNIT-V

ESSENTIALS OF COMPUTER SCIENCE

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, IP, Domain Name Services, applications.
Ethical and social implications: - Network and security. Information Assurance
Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques- Privacy and Data Protection.

(COURSE CODE: 23BSPM11)

Recommended books:

1. Functions of one complex variable by John.B.Conway, Springer-Verlag.

2. Elementary Trigonometry by H.S.Hall and S.R.Knight

3. Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media(P)Ltd.

4. Basic Statistics by B.L.Agarwal, New age international Publishers

5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman

6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker

7. Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway and   John W. Jewett Jr.

8. Physics for Technology and Engineering" by John Bird

9. Chemistry in daily life by Kirpal Singh

10. Chemistry of bio molecules by S. P. Bhutan

11. Fundamentals of Computers by V. Raja Raman

12. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

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(COURSE CODE: 23BSPM11)

STUDENT ACTIVITIES

UNIT I: 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 dataset 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 analyse 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 labels to represent connections and interdependencies between concepts.

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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 analyse the results.

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

UNIT III: 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, household products, medicine, or environmental issues.

Students will research and create a presentation (e.g., PowerPoint, poster, or video) that showcases 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 analyse 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.

(COURSE CODE: 23BSPM11)

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

1: Interdisciplinary Case Studies

Divide students into small groups and provide them with interdisciplinary case studies that involve the interdisciplinary 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, analysing the behaviour of electrical circuits, or measuring the properties of materials.

.4: Mathematical Modelling

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

UNIT V: ESSENTIALS OF COMPUTER SCIENCE

1. Identifying the attributes of network (Topology, service provider, IP address and bandwidth of

2. Your college network) and prepare a report covering network architecture.

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

4. Latest Fraud techniques used by hackers.

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(COURSE CODE: 23BSPM11)

LEARNING OUT COMES

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

Learning outcomes: On Completion of the course, the students will be able to		Knowledge level (Bloom's Taxonomy)
CO 1	Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.	Level 2 (Understanding) Level 3 (applying)
CO 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.	Level 2 (Understanding) Level 3 (applying)
CO 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.	Level 2 (Understanding) Level 3 (applying) Level 4 (Analysing)
CO 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.	Level 1 (Understanding)
CO 5	To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.	Level 2 (Understanding) Level 3 (applying)

Course with focus on Employability/ Entrepreneurship /Skill development modules		
Skill development	Employability	Entrepreneurship

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(COURSE CODE: 23BSPM11)

Learning level wise Weightage				
Bloom's Taxonomy level	Weightage	Marks	Essay type	Short answer type
Knowledge/ Remember	33%	20	2(two out of four)	I (one out of two)
Understanding/ Comprehension	27%	16	2(two out of four)	
Application	20%	12	I (one out of two)	I (one out of two)
Analysis	13%	8		2(two out of four)
Synthesis/ Evaluate	7%	4		I (one out of two)
Total	IOO	60	5(each question has internal choice)	5 out of 10 questions

SEMESTER END EXAMINATIONS
MODEL PAPER
SEMESTER- I

Programme: B.Sc. PHYSICS
Course title:
Essentials and applications of Mathematical, Physical and Chemical Sciences.
Course code: 23BSPM11

Time: 3 hours   Maximum Marks: 60

PART- A

Answer any **five** of the following questions. Each question carries **four** marks. 5 X 4 = 20 Marks

1. Find the square root of -5 + 12 i
2. Find the Mean, Mode and Median of the following data
   1, 5, 10, -8, 6, 11, 10
3. What is F.P.S system and explain about it
4. Write a short note on Electric field
5. What are sources of Carbohydrates
6. What is the role of fat in the human body
7. Write the differential equation that describe the motion of the Pendulum
8. What is that formula that describe the radioactive decay
9. Write a short note on URL
10. What is anti-virus? Give some examples it.

PART- B

Answer **all the following** questions. Each carries **Eight** marks   5 X 8 = 40 Marks

11. (a) Prove that (1) $Sin\ 18 = \frac{\sqrt{5}-1}{4}$ (2) $Cos\ 36 = \frac{\sqrt{5}+1}{4}$

(Or)

(b) Find the locus of P satisfying the equation $|z + 4i| + |z-4i| = 10$

12. (a) What are applications of acoustic waves

(Or)

(b) What is the first law of thermodynamics? Explain its significance

13. (a). What are proteins and explain their role in the human body

(Or)

(b) Write a note on Vitamins

14. (a). Write a note on applications of calculus in Physics

(Or)

(b) Write a note on applications of differential equations in Chemistry

15. (a) Discuss about the evolution of computers

(Or)

(b) What are various types of networks and explain about them

SEMESTER END EXAMINATIONS
MODEL PAPER
SEMESTER- I

B.Sc Hons   PHYSICS/ELECTRONICS

COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICALAND CHEMICAL SCIENCES
(w.e.f. 2023-24)

Course Code : 23BSPM11

Time: 3 hours

Maximum Marks: 60

PART- A

Answer any **five** of the following questions. Each question carries **Four** marks. 5 X 4 = 20 Marks

1. Find the square root of -5 + 12 I **[Synthesis/ Evaluate]**
2. Find the Mean, Mode and Median of the following data
   1, 5, 10, -8, 6, 11, 10 **[Synthesis/ Evaluate]**
3. What is F.P.S system and explain about it **[Analysis]**
4. Write a short note on Electric field **[Knowledge/Remember]**
5. What are sources of Carbohydrates **[Knowledge/Remember]**
6. What is the role of fat in the human body **[Analysis]**
7. Write the differential equation that describe the motion of the Pendulum **[Application]**
8. What is that formula that describe the radioactive decay **[Application]**
9. Write a short note on URL **[Analysis]**
10. What is anti-virus. Give some examples it. **[Analysis]**

PART- B

Answer **all the following** questions. Each carries **Eight** marks   5 X 8 = 40 Marks

11. (a) Prove that (1) $\sin 18 = \dfrac{\sqrt{5}-1}{4}$ (2) $\cos 36 = \dfrac{\sqrt{5}+1}{4}$ [**Knowledge/Remember**]

(Or)

(b) Find the locus of P satisfying the equation | z + 4i | + |z-4i| = 10 [**Knowledge/Remember**]

12. (a) What are applications of acoustic waves [**Understanding/ Comprehension**]

(Or)

(b) What is the first law of thermodynamics. Explain its significance [**Understanding/ Comprehension**]

13. (a). What are proteins and explain their role in the human body [**Knowledge/Remember**]

(Or)

(b) Write a note on Vitamins [**Knowledge/Remember**]

14. (a). Write a note on applications of calculus in Physics [**Application**]

(Or)

(b) Write a note on applications of differential equations in Chemistry [**Application**]

15. (a) Discuss about the evolution of computers [**Understanding/ Comprehension**]

(Or)

(b) What are various types of networks and explain about them [**Understanding/ Comprehension**]

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Programme: B.Sc. Honours in Physics (Major)
w.e.f. AY 2023-24 **COURSE CODE 23BSPM12**
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:

On Completion of the course, the students will be able to		Knowledge level (Bloom's Taxonomy)
CO 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.	Level 2 (Understanding) Level 3 (applying)
CO 2	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.	Level 2 (Understanding) Level 3 (applying)
CO 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	Level 2 (Understanding) Level 3 (applying) Level 4 (Analysing)
CO 4	Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working	Level 1 (Understanding)

	principles of nano sensors. Explore the effects of chemical pollutants on ecosystems and human health.	
CO 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, fibre optics) and wireless (e.g., radio waves, microwave, satellite).	Level 2 (Understanding) Level 3 (applying)

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: Generation, energy storage, and energy-efficient materials and devices.

Recent advances in the field of nanotechnology: Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics- Shape Memory Materials.

UNIT III: ADVANCES IN CHEMISTRY:

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: Grid Integration and Smart Grids,

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.

UNIT V: 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.

Course with focus on Employability/ Entrepreneurship /Skill development modules					
Skill development		Employability		Entrepreneurship	

Recommended books:

1. Coordinate Geometry by S.L.Lony, Arihant Publications

2. Calculus by Thomas and Finny, Pearson Publications

3. Matrices by A.R.Vasishtha and A.K.Vasishtha, Krishna Prakashan Media(P)Ltd.

4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle

5. "Energy Storage: A Nontechnical Guide" by Richard Baxter

6. "Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A. Bohara

7. "Biophysics: An Introduction" by Rodney Cotterill

8. "Medical Physics: Imaging" by James G. Webster

9. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas

10. Nano materials and applications by M.N.Borah
11. Environmental Chemistry by Anil.K.D.E.

12. Digital Logic Design by Morris Mano

13. Data Communication & Networking by Bahrouz Forouzan.

CO-PO Mapping								
1- Low, 2- Moderate, 3- High, '-' No Correlation								

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1									
CO 2									
CO 3									
CO 4									
CO 5									

CO-PSO Mapping
1- Low, 2- Moderate, 3- High, '-' No Correlation

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1					
CO 2					
CO 3					
CO 4					
CO 5					

STUDENT ACTIVITIES

UNIT I: ADVANCES IN BASIC MATHEMATICS

1: Straight Lines Exploration

Provide students with a set of equations representing straight lines in 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 analysing 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.

UNIT II: ADVANCES IN PHYSICS:

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 analyse 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 points and 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-substrate 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 analyse 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 wastewater.

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 ecosystems. 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.

UNIT IV: 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 analyse case studies related to the applications of mathematical modelling 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, analyse 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 modelling in solving complex problems in these areas.

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.

UNIT V: 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
2. Identify all the networking devices used in your college premises.

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Programme: B.Sc. Honours in Physics (Major)
w.e.f. AY 2023-24 **COURSE CODE 23BSPM12**
SEMESTER-I COURSE 2: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Theory   Credits: 4   5 hrs/week

Blue Print for Semester End Theory Examinations

S.No	Type of question	No of questions given			No of questions to be answered		
		No of questions	Marks allotted to each question	Total marks	No of questions	Marks allotted to each question	Total marks
1	Section A Short answer questions	10 (Two questions from each unit)	4	40	5 (Any five out of 10 questions)	4	20
2	Section B Long answer questions	10 (Two questions from each unit with only internal choice)	8	80	5 (Answer one question from each unit)	8	40
Total				120			60

Percentage of choice given $= \dfrac{(120-60)}{120} \times 100 = 50\%$

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(An Autonomous Institution Affiliated to Andhra University
Reaccredited by NAAC with A Grade (3rd Cycle)
District Resource Centre and Centre for Research Studies
Maddilapalem, Visakhapatnam 530013, Andhra Pradesh

Programme: B.Sc. Honours in Physics (Major)
w.e.f. AY 2023-24 **COURSE CODE 23BSPM12**
SEMESTER-I COURSE 2: ADVANCES IN MATHEMATICAL, PHYSICAL AND
CHEMICAL SCIENCES

Learning level wise Weightage

Bloom's Taxonomy level	Weightage	Marks	Essay type	Short answer type
Knowledge/ Remember	33%	20	2(two out of four)	I (one out of two)
Understanding/ Comprehension	27%	16	2(two out of four)	
Application	20%	12	I (one out of two)	I (one out of two)
Analysis	13%	8		2(two out of four)
Synthesis/ Evaluate	7%	4		I (one out of two)
Total	IOO	60	5(each question has internal choice)	5 out of 10 questions

Chapter wise Weightage

Sl. No.	Module/ Chapter	Name of the chapter	8 Marks	4 Marks
1	I		2(one out of two)	2
2	II		2(one out of two)	2
3	III		2(one out of two)	2
4	IV		2(one out of two)	2
5	V		2(one out of two)	2
			5(each question has internal choice)	5 out of given 10

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Theory   Credits: 4   5 hrs/week

Model Question Paper

Duration: 3Hrs   **Max Marks: 60**

PART- A

Answer any **five** of the following questions. Each question carries **Four** marks. 5 X 4 = 20 Marks

1. Convert 2x+5y = 5 into intercept form. Find the points of intersection of this line with coordinate axes
2. Calculate the value of $\lim_{x\to\infty} \frac{\sin x}{x}$
3. What are the technologies that are used to obtain energy from tides
4. What are the advantages of renewable energy
5. What are applications of nano-sensors
6. What is computer aided drug design
7. What are sources of solid wastes
8. What is biomechanics
9. Explain Hexadecimal system with examples
10. Convert binary number 11101 into decimal system

PART- B

Answer **all the following** questions. Each carries **Eight** marks   5 X 8 = 40 Marks

11. (a) Find $\int e^{ax} \sin b\, x dx$

(Or)

(b) If A, B are invertible matrices then show that $(AB)^{-1} = B^{-1}A^{-1}$

12. (a) Explain different modes of energy storage

(Or)

(b) What are quantum dots and give applications

13. (a). Explain dye removal using catalysis methods

(Or)

(b) Explain impact of chemical pollutants on ecosystem

14. (a). What is green technology? How does it work and give types, adoption and examples of green technology

(Or)

(b) Write a note on nuclear medicine

15. (a) What is the difference between analogue and digital signal. Describe differences between them

(Or)

(b) Convert the following decimal numbers into binary form

(1) 243, (2) 45, (3) 77, (4) 89