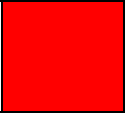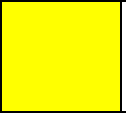|	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. Chemistry (H) I Semester			
Course Code Major-2 (General)	TITLE OF THE COURSE **Course – 2: Advances of Mathematics, Physics, chemistry & Computer Science**				
Teaching	Hours Allocated: 60 (**Theory and Activity**) (5 hrs. / wk.)	L	A	P	C
Pre-requisites	Basic knowledge about Mathematics, Physics, chemistry and Computer science	4	1	-	4

Course Objectives:

1. To provide students with an in-depth understanding of the recent advances and cutting- edge research in mathematical, physical, and chemical sciences.
2. 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.

Course Outcomes:

	On Completion of the course, the students will be able to	Cognitive Domain
CO1	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.	Application
CO2	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.	Application
CO3	Understand the different sources of renewable energy and their generation processes and advances in nanomaterial's and their properties.	Application
CO4	Understand and convert between different number systems, such as binary, cimal, and hexadecimal. Differentiate between analog and digital signals erstand their characteristics.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT I: ADVANCESIN BASICS MATHEMATICS   9 hrs.
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: 9 hrs.
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: 9 hrs.
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 9hrs.
Mathematical Modeling applications in physics and chemistry Application of Renewable energy: Grid Integration and Smart Grids, Application of nanotechnology: Nano medicine, Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics, Application of medical physics: Radiation Therapy, Nuclear medicine Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: Advanced Applications of computer Science   9 hrs.
Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check andCRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

Reference 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 PrakashanMedia(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
7. "Biophysics: An Introduction" by Rodney Cotterill
8. "Medical Physics: Imaging" by James G. Webster
9. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
10. Nano materials and applications by M.N.Borah
11. Environmental Chemistry by Anil.K.D.E.
12. Digital Logic Design by Morris Mano
13. Data Communication & Networking by BahrouzForouzan.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

Student Activities (15 hrs.)

UNIT I: ADVANCESIN BASIC MATHEMATICS   3 hrs.

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.

2: Limits and Differentiation Problem Solving Students will apply the concept of limits to solve various problems using standard limits.

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.

4: Matrices Manipulation Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose.

UNIT II: ADVANCES IN PHYSICS: 3 hrs.

1: Experimental Design Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics,

2: 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.

UNIT III: ADVANCES IN CHEMISTRY: 3 hrs.

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.

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.

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.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY   3 hrs.

1: Mathematical Modeling Experiment Provide students with a mathematical modeling experiment related to one of the topics. For example, in the context of renewable energy, studentscan develop a mathematical model to optimize the placement and configuration of solar panels ina solar farm..

2: Case Studies and Group Discussions Assign students to analyze case studies related to the applications of mathematical modeling in nanotechnology, biophysics, and medical physics,solid waste management, environmental remediation, or water treatment.

3. Group Project

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

UNIT V: Advanced Applications of computer Science   3 hrs.

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

2. Identify the networking media used for your college network

3. Identify all the networking devices used in your college premises