ADITYA DEGREE & P.G. COLLEGE (A), KAKINADA
Autonomous and NAAC Accredited with A++ Grade (3.66/4 CGPA)
KAKINADA
Department of Data Science
B.Sc., Data Science

Course Structure

I SEMESTER				
S.No.		**Name of the Course**	**Hr**	**Credits**
1	**Major**	Essentials and Applications of Mathematical, Physical and Chemical Sciences	5	4
2		Advances in Mathematical, Physical and Chemical Sciences	5	4
4	**Language**	English	4	3
5		Telugu/Hindi	4	3
	Multi.Dis	Introduction to Social Work	2	2
6	**Skill Enhancement courses**	Analytical Skills	2	2
7		Communication Skills	2	2
		Total	**24**	**20**
II Semester				
1	**Major**	Introduction to Data Science and R Programming - (T)	3	3
		Introduction to Data Science and R Programming Practical Course	2	1
2		Descriptive Statistics - (T)	3	3
		Descriptive Statistics Practical Course	2	1
3	**Minor**	Problem Solving using C - (T)	3	3
		Problem Solving using C- (P)	2	1
4	**Language**	English	4	3
5		Telugu/Hindi	4	3
6	**Skill Enhancement courses**	Digital Literacy	2	2
7		Business Writing	2	2
		Total	**27**	**22**

Community service Project of 180 Hrs with 4 credits

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ADITYA DEGREE & P.G. COLLEGE (A),KAKINADA
Department of Data Science
B.Sc., Data Science
I SEMESTER
COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Theory **Hours/Week: 5** **Credits: 4**

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 fundamentalareas 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 fundamentalareas 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.

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 andproblems **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.

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 concepts- Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques- Privacy and Data Protection

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

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 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 labels to represent connections and interdependencies 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.

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 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.

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, 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.

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

Hours/Week: 5 **Credits: 4**

Course – I & II Model Paper Time:3Hrs (70 Marks)

SECTION A (Multiple Choice Questions) ***30 x 1 = 30 M***

30 Multiple Choice Questions (Each Unit 6 Questions)

SECTION B (Fill in the blanks) ***10 x 1 = 10 M***

10 Fill in the Blanks (Each Unit 2 Questions)

SECTION C (Very short answer questions) ***10 x 1 = 10 M***

10 Very short answer questions (Each Unit 2 Questions)

SECTION D (Matching) (From 5 Units) ***2 x 5 = 10 M***

1
A
B
C
D
E

2
A
B
C

D
E

SECTION E (True or False) ***10 x 1 = 10 M***

10 True or False (Each Unit 2 Questions)

ADITYA DEGREE & P.G. COLLEGE (A), KAKINADA

Single Major (w.e.f. AY 2023-24)SEMESTER-I

COURSE – 1 ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL & CHEMICAL SCIENCES

Time:3hrs ***MAX MARKS: 70 M***

I Multiple Choice Questions **3x10=30M**

1. If Arg(Z) < 0 the Arg (-Z) – arg (Z) = [ ]
a) π b) $\frac{\pi}{4}$ c) $-\pi$ d) $\frac{\pi}{2}$

2. If $\left|\frac{Z_1}{Z_2}\right| = 1$ and Arg $(Z_1 Z_2) = 0$ then [ ]
a) $Z_1 = Z_2$ b) $|Z_1|^2 = Z_1 Z_2$ c) $Z_1 Z_2 = 1$ d) None of these

3. The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is equal to [ ]
a) 1 b) 0 c) ½ d) 2

4. If $a + mb + 3c, -2a + 3b - 5c$ and $a - 3b - 5c$ are coplanar m=_____[ ]
a) 2 b) -1 c) 1 d) -9/7

5. If the vectors $2i + \lambda j - k$ and $4i - 2j + 2k$ are perpendicular to each other, then
λ = _____ [ ]
a) 2 b) 5 c) 3 d) 1

6. Find the mode for the following data 0,0,1,1,2,2,2,4,5. [ ]
a) 1 b) 0 c) 4 d) 2

7. Newton – Second is the unit of [ ]
a) Velocity b) Angular Momentum c) Momentum d) Energy

8. If the force applied to a body is doubled and the mass is cut in half. What would be the acceleration ratio? [ ]
a) 1:2 b) 2:1 c) 1:4 d) 4:1

9. Which unit is used to measure angle the S.I system? [ ]
a) Radian b) Steradian c) Degree d) Minute

10. The mass – Energy relation is given by [ ]
a) $E = mc^2$ b) F = ma c) P = mv d) W = Fd

11. How many types of Robots are there [ ]
a) 7 b) 10 c) 6 d) 8

12. Light energy emitted by stars is due to [ ]
a)Breaking of nuclei b) Joining of nucles
c) Burning of nuclei d) Reflection of Solar Light

13. Organic chemistry is the study of_____. [ ]
a) Nitrogen based compoundsb) Carbon based compounds
c) Copper based compounds d) Chromium based compounds

14. Number of electrons present in outer shell of chlorine atom is____[ ]
a) 5 b) 6 c) 7 d) 8

15. Which of the following is a disacchanide_____ [ ]
a) Sucrose b) Glucose c) Fructose d) Ribose

16. The Monomers present in proteins are_____ [ ]
a) Alcohols b) Acids c) Amino acids d) Esters

17. Lipids composed mainly of_____ [ ]
a) C, H, N b) C, H, O c) O, N, S d) N, S, Cl

18. Vitamin by is also known as_____ [ ]
a) Vitamin – H b) Vitamin – O c) Vitamin – Bd) Vitamin – L
19. Who is introduced in Calculus_____. [ ]
a) Isaac Newton b) Goff fried Leibniz
c) Both of the mentioned d) None of the mentioned
20. How many systems does a robot have_____. [ ]
a) 2 b) 6 c) 4 d) 3
21. A place where power information (or) a result leaves a system. [ ]
a) Chassis b) Output c) Sensor d) Input
22. The main electronic component used in first generation computers was [ ]
a) Transistors b) Vacuum Tubes and Valves
c) Integrated Circuits d) None of above
23. Magnetic disk is an example of [ ]
a) Secondary memory b) Primary memory
c) Main memory d) Both 1 & 2
24. http stands for [ ]
a) hypertext transfer protocol b) hypertext transmission protocol
c) high transfer transport protocol d) hyper transfer text protocol
25. What is the full form of WWW? [ ]
a) World Wide Web b) World with Web
c) Work Wide Web d) World Wide Wet
26. Which one of the following is a type of antivirus program? [ ]
a) Quick heal b) Mcafee
c) Kaspersky d) All of the above
27. Hackers usually used the computer virus for_____purpose. [ ]
a) To log, monitor each and every user's stroke
b) To gain access the sensitive information like user's Id and Passwords
c) To corrupt the user's data stored in the computer system
d) All of the above
28. Which of the following is an example of f BDD screening technique [ ]
a) U V spectroscopy b) HPLC c) NMR spectroscopy d) None
29. Fertilizers mainly consists of_____ [ ]
a) N, P, K b) O, N, Cl c) C, O, K d) H, P, O
30. The substance that facilitate chemical reactions without being consumed is [ ]
a) Reactions b) Product c) Catalyst d) Inhibin

SECTION – B

II Fill in the Blanks 10x1=10M

1. Find the value of $\sqrt{3}\cos ec20^{\circ} - \sec 20^{\circ}$ is_____.
2. The area of the parallelogram whose diagonals are $3\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + 4\hat{k}$ is_____.
3. _____is the number of cycles made by a sounding body per unit time.
4. A light year is a unit of_____.
5. EXPAND SAR_____.
6. Peptide bond formula_____.
7. A robot is a_____.
8. Differential equations that_____the definition of linear are nonlinear.
9. A string of 8 bits is _____
10. ROM stands for _____

SECTION – C

III Answer the following Short Questions **10x1=10M**

1. If 3 tan A = 5 then Find Sin A and Cos A.
2. Find A.M from the following distribution.

Wages	**100**	**120**	**140**	**160**	**180**	**200**
No of workers	**4**	**8**	**12**	**7**	**6**	**3**

3. Write any two applications of Semi – Conductor?
4. Define Zeroth law of Thermodynamics? with example.
5. Expand FBDD.
6. What are fat soluble vitamins?
7. Define Newton's 1st Law.
8. Write any two application of Environmental monitoring?
9. What is E-mail?
10. What is a gateway?

SECTION – D

III Match the following **10x1=10M**

1. A. Unit Vector in the direction $\bar{a} = 3\bar{i} - 2\bar{j} + 6\bar{k}$ ( ) a) Angular Momentum

   B. Polar form $-1 + \sqrt{3}i$ ( ) b) Glucose

   C. Joule x Sec ( ) c) $\frac{1}{7}\left(3\bar{i} - 2\bar{j} + 6\bar{k}\right)$

   D. Mass of a proton ( ) d) $2\left[\cos\left(\frac{2\pi}{3}\right) + i\sin\left(\frac{2\pi}{3}\right)\right]$

   E. Reducing Sugar ( ) e) 1.676×10^{-24} grams

2. A. Vitamin – B12 ( ) a) Newton

   B. Force ( ) b) Newton second

   C. Impulse ( ) c) RBC formation

   D. Punch Card ( ) d) Computer games

   E. Joy Stick ( ) e) Hollerith code

SECTION – E

IV True (or) False **10x1=10M**

1. If Z is a complex number then ZZ is purely real.
2. If Z is a complex number such that $Z^2 = \left(Z\right)^2$ then purely real.
3. The Mass of a body is equivalent to the ratio of the force action on it to the acceleration it generates.
4. The region of the atmosphere above troposphere is known as Lithosphere.
5. Essential Amino acids can be synthesized by the human body
6. Electrons fill the lowest energy levels first
7. For every action is nature here is an unequal and opposite reaction.
8. The special theory of relativity is concerned with frames of reference that are not experiencing any acceleration.
9. A terabyte is equal to 1 million gigabytes
10. Remote browser access is used to avoid browser-based hacking.

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B.Sc., Data Science
I SEMESTER
COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Hours/Week: 5 **Credits: 4**

QUESTION PAPER TAXONOMY										
Level of Bloom's Taxonomy	Type of Question & m Assigned									
	MCQs		FIB		VSQ		MC		T/F	
	CIA	SEE	CIA	SEE	CIA	SEE	CIA	SEE	CIA	SEE
Remembering	3 m	10 m								
Understanding	3 m	10 m								
Applying	4 m	10 m								
Analyzing					5 m	10 m				
Evaluating							5 m	10 m	5 m	10 m
Creating			5 m	10 m						

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I SEMESTER
COURSE 2: ADVANCES IN MATHEMATICAL, PHYSICALAND CHEMICAL SCIENCES

Theory **Hours/Week: 5** **Credits: 4**

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 themto 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 areasof 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 nanosensors. 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: 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, 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

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. 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.

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, suchas slope-intercept form, point-slope form, or general form.

Students will explore the properties and characteristics of straight lines, including theirslopes, 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 andapply 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 andchemistry
4: Matrices Manipulation

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

Students can apply their knowledge of matrices to real-world applications, such as solvingsystems 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 designan experiment accordingly.

Students will collect and analyze data, interpret the results, and draw conclusions basedon their findings.

They will discuss the implications of their experimental results in the context of recentadvances 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 studyenzyme-substrate interactions or molecular interactions in biological systems.
Students will perform their experiments or simulations, collect data, analyze the results,anddraw conclusions based on their findings.

2. Case Studies and Discussion

Provide students with real-world case studies related to the impact of chemical pollutants oneco systems 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 dealingwith chemical pollutants.
For the dye removal using the catalysis method, students can explore case studieswhere catalytic processes are used to degrade or remove dyes from wastewater.

Students will discuss the principles of catalysis, the advantages and limitations ofthe 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 anano 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 analyze 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 casestudies, analyze the outcomes, and evaluate the effectiveness of the modelling approach.

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

Students will present their findings and engage in critical discussions on the advantages andlimitations 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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I SEMESTER
COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Hours/Week: 5 **Credits: 4**

Course – I & II Model Paper Time:3Hrs (70 Marks)

SECTION A (Multiple Choice Questions) ***30 x 1 = 30 M***

30 Multiple Choice Questions (Each Unit 6 Questions)

SECTION B (Fill in the blanks) ***10 x 1 = 10 M***

10 Fill in the Blanks (Each Unit 2 Questions)

SECTION C (Very short answer questions) ***10 x 1 = 10 M***

10 Very short answer questions (Each Unit 2 Questions)

SECTION D (Matching) (From 5 Units) ***2 x 5 = 10 M***

1
A
B
C
D
E

2
A
B
C
D
E

SECTION E (True or False) ***10 x 1 = 10 M***

True or False (Each Unit 2 Questions)

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA

Single Major (w.e.f. AY 2023-24)SEMESTER-I

Model Paper

COURSE -2 ADVANCES OF MATHEMATICAL, PHYSICAL & CHEMICAL SCIENCES

Time: 3Hrs ***MAX MARKS: 70 M***

SECTION – A

1. The equation of the line passing through the point (1, 2) and perpendicular to the line x+y+1=0 is [ ]

a) y-x+1=0 b) y-x-1=0 c) y-x+2=0 d) y-x-2=0

2. 2 1 cos2 0 x x x → –Lt is equal to [ ]

a) 0 b) 1 c) 2 d) 4

3. The derivative of)2 1(cos 1 2 – – x w.r.to)x(1 –cos is [ ]

a) 2 b) 2 2 1 1 x– – c) x 2 d) 1- x 2

4. ∫ e x tan x 2 sec dx = [ ]

a) x e tan b) x e sin c) tan x d) sin x

5. Which phase of Shape memory alloy occurs at higher temperature & has a needle – like structure [ ]

a) Martensite b) Austenite c) Hysterisis d) None

6 . If mxn] [aij=A such that aij = 0 for j≠i then A is [ ]

a) a row matrix b) a column matrix c) a diagonal matrix d) a scalar matrix

7. Which of the following is an renewable energy source [ ]

a. Coal b) Natural gas c) Solar d) Nuclear

8. What is the main purpose of Photovoltaic cells in solar panels [ ]

a. Heat generation b) Electricity generation c) Water purification d) Carbon captune

9. Which renewable energy source is harnessed from the earth's Internal heat? [ ]

a. Solar b) Wind c) Geothermal d) Hydro

10. What is the fundamental principle behind quantum mechanics [ ]

a. Classical Mechanics b) Quantum Superposition c) Newton law of motion d) Maxwell's equation

11. What is the primary application of proton therapy in medical physics? [ ]

a. Diagnostic Imaging b) Radiation therapy c) Magnetic resonance Imaging d) Computed Tomography (C.T)

12. What is the primary advantage of using quantum dob in solar cells? [ ]

a. Low cost b) High efficiency c) Fast charging d) Large size

13. The Binding capacity between the drug and target is known as [ ]

a. Virtual Screening b) Docking Score c) ADMET d) None

14. The Increased sensitivity of Nanosensors is due to [ ]

a. High Surface-to-volume ratio b) Low surface-to-volume ratio

15. The green pigment chlorophyll is affected by [ ]

a. Co2 b) No2 c) So2 d) CH4

16. What is the Photo catalyst used in the dye renoval catalysis method [ ]
a. Oxygen b) Hydrogen c) Titanium Oxide d) Zinc
17. Which phase of Shape memory alloy occurs at higher temperature & has a needle – like structure [ ]
a. Martensite b) Austenite c) Hysterisis d) None
18. The Pollutant causing Global warming [ ]
a. Co2 b) So2 c) No2 d) O3
19. In Quantum mechanics, the Schrodinger Equation is a fundamental Equation, used to model the behavior of particles. What does the Schrodinger Equation describe [ ]
b. Stability b) Wave-Particle duality
c) Degidity d) Massive
19. What is the term used to describe the process of using nano particles to enhance imaging techniques for medical diagnostics [ ]
a. Nano Scopy b) Nano Therapy c) Nano Diagnose d) None of these
20. How can nano medicine contribute to personalized medicine? [ ]
a. By increasing the cost of medical treatment.
b. By using a one-size –fits all approach.
c. By tailoring based on an individual's genetic make-up.
d. By avoiding the use of advanced technologies.
21. In radiation therapy, What does the term "brancy therapy" refer to [ ]
a. External beam radiation therapy
b. Radiation therapy using photons
c. Internal radiation therapy involving the placement of radio active sources directly within orclose to the tumor.
d. Radiation therapy without the use of imaging.
22. What is the purpose of coagulation in the water treatment process? [ ]
a. Removing dissolved minerals
b. Disinteching water
c. Settling suspended particals
d. Adjusting PH levels
23. What is the purpose of green building design and construction? [ ]
a. maximizing energy consumption
b. minimizing the use of sustainable materials
c. Reducing the environmental impact of buildings
d. Ignoring energy – efficient technologies
24. Hybrid system combine which two types of signals? [ ]
a) Analog and Analog b) Digital and Digital c) Analog and Digital d) Continuous and Finite
25. Which error detection technique can detect a wide range of errors including burst errors and most multiple bits.
a) Hamming code b) Read- Solomon code c) Parity check d) CRC
26. Which layer of the OSI model does a router operate at [ ]
a. Transport layer b) Network layer c) Transport layer d) Data link layer
27. What technology allows DSL modems to separate voice and data signals.
b. Dail-up modem b) DSL modem c) Wireless modem d) Cable modem
Ans b) DSL modem

28. What protocol do bridges use to prevent network loops? [ ]
a) Internet Protocol b) Transmission Control Protocol (TCP)
c) Simple Network Management Protocol (SNMP) d) Spanning Tree Protocol (STP)

29. The……. between two words is the number of difference between corresponding bits
c. Hamming code b) Hamming distance [ ]
c) Hamming rule d) Hamming data

30. Which phase of Shape memory alloy occurs at higher temperature & has a needle – like structure [ ]

a) Martensite b) Austenite c) Hysterisis d) None

SECTION – B

IIIFill in the Blanks **10x1=10M**

1. Tidal energy is an Example for_____energy.
2. ____are the particles used in quantum dots.
3. Expand CADD _____
4. First step in the purification of water _____
5. ____is an application for Medical Physics.
6. MRI stands for _____
7. $\int e^x \sin x \cos x dx$ =_____.
8. Equation of the lines through the point (3, 2) and making an angle of 45° with the line x-2y = 3 are _____.
9. A computer understands only.....code
10. ..... converts audio and video into digital information

SECTION – C

III Answer the following Questions **10x1=10M**

1. Give some Examples for renewable sources?
2. Information stored in quantum computer in the form of?
3. What is the difference between MRI and C.T. Scan?
4. Name two applications of Nanotechnology?
5. Solid waste Management? (SWM)
6. Expand ADMET
7. Evaluate $\int x \log x^2 dx$
8. What are the key design issues of the computer networks?
9. What is multiplexing?

SECTION – D

III Match the following **10x1=10M**

1. A. Wind energy ( ) a) Orthodontic applications
   B. Solar energy ( ) b) Non invasile imaging
   C. Minamata ( ) c) Harness the kinetic energy of wind to produce electricity
   D. Ni-Ti wire ( ) d) Convert sunlight into electricity
   E. Magnetic Resonance Imaging ( ) e) Mercury

2. A. Fluoroscene microscopy ( ) a) 3
B. 1111000l ( ) d) Guided media
C. Ethernet cable ( ) c) (secx)
D. x([dx d tan+log sec ( ) c) ( ) d)Moniterity cellular
E. Ni-Ti wire ( ) e) Guided media

SECTION – E

IV True (or) False **10x1=10M**

1. Quantum dots are the nano particles, are primarily used for structural Reintor cement in medical implants?
2. Quantum mechanics is a branch of physics Extensively used mathematical Models, to describe the behavior of particles at atomic and subatomic level.
3. The Mass of a body is equivalent to the ratio of the force action on it to the acceleration it generates.
4. The region of the atmosphere above troposphere is known as Lithosphere.
5. Essential Amino acids can be synthesized by the human body
6. Electrons fill the lowest energy levels first
7. The equation of a line with slope m and making an intercept c on y axis is y=mx
8. Intercept form of a line which cuts a and b respectively on the x and y axis

   Then $\frac{x}{a} [\frac{y}{b} [1$

9. A university would use a CAN to converts its composes in two cities.
10. Gateway device is operate at transport layer.

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science
I SEMESTER
COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Hours/Week: 5 **Credits: 4**

QUESTION PAPER TAXONOMY										
Level of Bloom's Taxonomy	Type of Question & m Assigned									
	MCQs		FIB		VSQ		MC		T/F	
	CIA	SEE	CIA	SEE	CIA	SEE	CIA	SEE	CIA	SEE
Remembering	3 m	10 m								
Understanding	3 m	10 m								
Applying	4 m	10 m								
Analyzing					5 m	10 m				
Evaluating							5 m	10 m	5 m	10 m
Creating			5 m	10 m						

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science
Course Structure

II Semester				
			Hr	**Credits**
1	**Major**	Introduction to Data Science and R Programming - (T)	3	3
		Introduction to Data Science and R Programming Practical Course	2	1
2		Descriptive Statistics - (T)	3	3
		Descriptive Statistics Practical Course	2	1
3	**Minor**	Problem Solving using C - (T)	3	3
		Problem Solving using C- (P)	2	1
4	**Language**	English	4	3
5		Telugu/Hindi	4	3
6	**Skill Enhancement courses**	Digital Literacy	2	2
7		Business Writing	2	2
		Total	**27**	**22**

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science
ADDITIONAL INPUTS/MODIFICATIONS IN THE SYLLABUS
For Semester II
2024-2025

Course-3

Sno	Subject Title	Additional Input/Modification	Justification	Percentage of Modification
1	Introduction to Data Science and R Programming	Unit2 and Unit5 have been swapped	To induce foundations at an earlier stage	0%
2	Introduction to Data Science and R Programming	Plots & Data Visualisation added in Unit3	To have an understanding on plots& graphs.	10%
3	Introduction to Data Science and R Programming	Case studies added at the end of Unit2 , Unit3	For insights on real-time problems	5%
4	Introduction to Data Science and R Programming Practical Course	NIL	NIL	0%
Total Percentage of Modification in Paper				**15%**

Course-4

Sno	Subject Title	Additional Input/Modification	Justification	Percentage of Modification
1	Descriptive Statistics	NIL	NIL	0%
2	Descriptive Statistics Practical Course	NIL	NIL	0%
Total Percentage of Modification in Paper				**0%**

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science
SEMESTER-II
COURSE 3: INTRODUCTION TO DATA SCIENCE AND R PROGRAMMING

Theory **Credits: 3** **3 hrs/week**

Aim and objectives of Course :

Data Science is a fast-growing inter disciplinary field, focusing on the analysis of data to extract knowledge and insight. This course will introduce students to the collection. Preparation, analysis, modeling and visualization of data, covering both conceptual and practical issues. Examples and case studies from diverse fields will be presented, and hands- on use of statistical and data manipulation software will be included.

Learning outcomes of Course:

- Recognize the various disciplines that contribute to a successful data science effort.
- Learn the processes of data science, identifying the problem to be solved, datacollection, preparation, modeling, evaluation and visualization.
- Be aware of the challenges that arise in Data Sciences.
- Be able to identify the application of the type of algorithm based on the type of the problem.
- Be comfortable using commercial and open source tools such as the R/Python language andits associated libraries for data analytics and Visualization.

UNIT I:

Defining Data Science and Big data, Benefits and Uses, facets of Data, Overview of the Data Science Process-Setting the research goal, Retrieving Data, Data Preparation, Exploration, Modeling, data Presentation and Automation.

Classification of Data: Structured, Semi-Structured, Unstructured,Characteristics of Data,History and Overview of R, Getting Started with R- R Environment.

UNIT II:

R Nuts and Bolts: Datatypes , Data structures in R- lists, Array, Matrix, Vectors, Factors, data frames, Sub setting R objects, Vectorised Operations, Rpackages: Dplyr,ggraph,tidyverse, Managing Data Frames with the dplyr, Control structures, Functions: built-in and user-defined,Loop Functions, Scoping rules of R, Debugging, Simulation.

Case study: Analyzing and Cleaning a Real-World Dataset

Case study: Data preparation using functions and dplyr on "loan.csv"

UNIT III:

Getting Data in and out of R, Using reader package, Interfaces to the outside world. Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms, Boxplots, Bar Charts, Line Graphs, Scatter plots, Pie Charts.

ggplot2: Violin Plot,Density Plot,Time Series Plot,Heatmap

Case Study: Data visualization using basic graphs and libraries on "loan.csv"

UNIT IV:

Handling large Data on a Single Computer: The problems we face when handling large data, General Techniques for handling large volumes of data, Generating programming tips for dealingwith large datasets. Sampling techniques: Random sampling,Stratified sampling

Case Study: applying sampling techniques on a data set

UNIT V:

Machine Learning: Understanding why data scientists use machine learning-What is machine learning and why we should care about, Applications of machine learning in data science, Where itis used in data science, The modeling process, Types of Machine Learning-Supervised and Unsupervised.

TEXT BOOKS:

1. DavyCielen, Arno. D.B.Maysman, Mohamed Ali, "Introducing Data Science" Manning Publications, 2016.
2. Roger D. Peng, "R Programming for Data Science" Lean Publishing, 2015.

Web References:

https://onlinecourses.nptel.ac.in/noc19_ma33/preview
https://onlinecourses.nptel.ac.in/noc24_mg113/preview
https://infyspringboard.onwingspan.com/web/

REFERENCE BOOKS:

1. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.
2. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, AbhijitDasgupta, "PracticalDataScience Cookbook", Packt Publishing Ltd., 2014.

WebReferences for case studies:

1. https://www.kaggle.com/datasets
2. https://github.com/

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science
SEMESTER-II

COURSE 3: INTRODUCTION TO DATA SCIENCE AND R PROGRAMMING PRACTICAL

Practical | Credits: 1 | 2 hrs/week

Lab/Practical/Experiments/Tutorials syllabus:

1. Installing R and R studio, with proper notes on version management, cosmetic settings anddifferent libraries.
2. Basic operations in R. (Data types, Variables, Operators etc.)
3. Getting data into R, Basic data manipulation, Loading Data into R
4. Basic plotting
5. Implement R-Control Structures and functions
6. Implement operations on - Vectors, Lists, Arrays, Matrices, Data frames
7. Implement data frames in R. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
8. Implement different String Manipulation functions in R.
9. Implement Loop functions with lapply(), sapply(), tapply(), apply(), mapply().
10. Explore data using Single Variables: Unimodal, Bimodal, Histograms, Density Plots,Barcharts
11. Explore data using two Variables: Line plots, Scatter Plots, smoothing cures, Bar charts
12. Demonstrate the visualization and graphics using visualization packages like ggplot2.
13. Explore and implement commands using dplyr package
14. Download a dataset and work on basic data manipulation followed by inferential statistics.

RECOMMENDED TEXT BOOKS:

1. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley &Sons, Inc., 2012.
2. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013. Recommended Reference books:
3. The art of R Programming: A tour of Statistical Software design. Norman Matloff.KindleEdition
4. The book of R : The first course in Programming and Statistics by Tilman M. Davies.

Recommended Co-curricular activities: (Co-curricular Activities should not promotecopying from text book or from others' work and shall encourage self/independent and group learning)

Measurable:

1. Assignments
2. presentation of papers
3. Quiz Programs
4. Individual Field Studies/projects
5. Group/Team Projects

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science
SEMESTER-II
COURSE 3: INTRODUCTION TO DATA SCIENCE AND R PROGRAMMING

credits :3

Course Outcomes

CO	Outcome	Cognitive Domain
C01	To understand the importance of how different streams contribute to Data Science.	Understand
C02	To apply and remember the process of Data Science	Remembering and application
C03	Ability to evaluate the use of different types of algorithm based on requirement	Evaluate and understand
C04	Understand and Analyse different problems that arise in Data Science	Analysing
C05	Can create a basic program in R using different libraries	Application

CO-PO Mapping

CO	PROGRAM OUTCOMES														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C01		3				2									3
C02			2		3	2					3				
C03				3			3			3					2
C04					2			3			2				2
C05						3	3				2			3	

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science
SEMESTER-II
COURSE 3: INTRODUCTION TO DATA SCIENCE AND R PROGRAMMING

credits :3

BLUE PRINT

Unit	Essays	Shorts
Unit 1	2	2
Unit 2	2	2
Unit 3	2	1
Unit 4	2	1
Unit 5	2	2
Total	**10** **Out of 10, 5 questions should be answered** **5x10=50 Marks**	**8** **Out of 8, 5 questions should be answered** **5x4=20 Marks**

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA

Department of Data Science

B.Sc., Data Science; Single Major Model Question Paper

SEMESTER-II

Introduction to Data Science and R Programming

Time:3hrs ***MAX MARKS: 70 M***

SECTION – A

Answer any 5 questions. Each question carries 4 marks (5 X 4 = 20M)

1. What are the uses of data science and big data in r programming?
2. What is meant by data presentation and automation?
3. Write few applications of machine learning in data science?
4. What are the Generating programming tips for dealing with large datasets?
5. Write a short note on loop functions?
6. Write about Control structures, functions, Scoping rules of R?
7. What are the problems we face when handling large data?
8. What is meant reader package? write it uses?

SECTION – B

Answer all the questions. Each question carries 10 marks. (5 X 10 = 50M)

9.a) Explain briefly about Data Science Process?

(OR)

d. Write about history and Overview of R?

10 a) Explain about Data Science Process?

(OR)

b) Write an essay on getting Data in and out of R, Using reader package?

7.a) What is machine learning? Explain it's types?

(OR)

b) What are the uses of machine learning in data science and write it's applications?

8.a) What are the techniques used to handle the large amount of data on a single computer?

(OR)

b) Generating programming tips for dealing with large datasets.?

9.a) Write about coding Standards in R, Loop Functions, Debugging, Simulation?

(OR)

e. Explain briefly about Vectorised Operations?

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ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science;SEMESTER-II
Course No.: 3 Introduction to Data Science and R Programming
Semester End Examination - Practical
credits :1

Time: 3 Hrs **Max.Marks: 50**

1. Documentation/Practical Writing : 10 Marks
2. Practical Execution : 20 Marks
3. Observation & Record : 10 Marks
4. Viva : 10 Marks

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ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA

Department of Data Science

B.Sc., Data Science; II SEMESTER

COURSE 4: DESCRIPTIVE STATISTICS

Theory **Credits: 3** **3 hrs/week**

Course Learning Outcomes: Students will acquire:

- ✓ Knowledge of statistics and its implementation through practical understanding for various domains related to data science.
- ✓ Knowledge of various types of data, their organization and evaluation of summary measures such as measures of central tendency and dispersion etc.
- ✓ Knowledge of other types of data reflecting quality characteristics including concepts of independence and association between two attributes,
- ✓ Insights into preliminary exploration of different types of data.
- ✓ Knowledge of correlation, regression analysis, regression diagnostics, partial and multiple correlations.

UNIT I:

Introduction to Statistics: Importance of Statistics. Scope of Statistics in different fields. Concepts of primary and secondary data. Diagrammatic and graphical representation of data: Histogram, frequency polygon, Pie. Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean. Median and Mode through graph.

UNIT II:

Measures of Dispersion: Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Central and Non-Central moments and their interrelationship. Skewness and kurtosis.

UNIT III:

Curve fitting: Bi- variate data, Principle of least squares, fitting of degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, Fitting of power curve and exponential curves.

Correlation: Meaning, Types of Correlation, Measures of Correlation: Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties), Bi-variate frequency distribution, correlation coefficient for bi-variate data and simple problems. Concept of multiple and partial correlation coefficients (three variables only) and properties

UNIT IV:

Regression: Concept of Regression, Linear Regression: Regression lines, Regressioncoefficientsand it's properties, Regressions lines for bi-variate data and simple problems. Correlation vs regression, sigmoid curve, derivation from linear regression to logistic regression.

UNIT-V

Attributes : Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistency of data,Conditions for consistency of data for 2 and 3 attributes only , Independence of attributes , Association of attributes and its measures, Relationship between association and colligation of attributes, Contingency table: Square contingency**,** Mean square contingency, Coefficient of mean square contingency.

TEXT BOOKS:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of MathematicalStatistics,Sultan Chand &Sons, NewDelhi.
2. BA/BSc I year statistics - descriptive statistics, probability distribution - Telugu Academy - DrM.Jaganmohan Rao,Dr N.Srinivasa Rao, Dr P.Tirupathi Rao, Smt.D.Vijayalakshmi.
3. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI

REFERENCE BOOKS:

1. Willam Feller: Introduction to Probability theoryand its applications. Volume –I,Wiley
2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd.,Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishinghouse.
4. M. JaganMohan Rao and Papa Rao: A Text book of StatisticsPaper-I.
5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , NewDelhi

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science; II SEMESTER
COURSE 4: DESCRIPTIVE STATISTICS

Practical **Credits: 1** **2 hrs/week**

List of the experiments:

1. Graphical presentation of data (Histogram, frequency polygon).
2. Diagrammatic presentation of data (Bar and Pie).
3. Computation of measures of central tendency (Mean, Median and Mode)
4. Computation of measures of dispersion (Q.D, M.D andS.D)
5. Computation of non-central, central moments,1 and2 for ungrouped data.
6. Computation of Karl Pearson's coefficients of Skewness and Bowley's coefficients of Skewness.
7. Fitting of straight line by the method of least squares
8. Fitting of parabola by the method of least squares
9. Fitting of power curve of the type by the method of least squares.
10. Fitting of exponential curve of the type and by the method of least squares.
11. Computation of correlation coefficient and regression lines for ungrouped dat.
12. Computation of correlation coefficient, forming regression lines for grouped data

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science
SEMESTER-II
COURSE 4: DESCRIPTIVE STATISTICS

credits :3

Course Outcomes

CO	Outcome	Cognitive Domain
C01	Student will able to define the word Statistics, knowledge of statistics, its scope and importance in various areas such as medical, engineering, agricultural and social sciences etc.	Understand intellectual skills
C02	They can interpret various types of data, their organization and evaluation of summary measures such as measures of central tendency and dispersion etc.	Analyzing
C03	Knowledge and computation of other types of data reflecting quality characteristics including concepts of independence and association of attributes.	Evaluate and understand
C04	They can differentiate between different statistical methodologies.	Analysing
C05	Learner can evaluate the concepts of correlation and regression analysis.	Evaluate and accept
C06	Will be able to formulate the statistical data from raw data.	Application

CO-PO Mapping

CO	PROGRAM OUTCOMES														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C01	3					2			2		3				2
C02	2		3	3		2		3	2		2				2
C03			3	3	2	2			2						
C04	2		3	3	2	2		2	2			2			
C05	2		2	3	3	2									
C06	2		2			2									2

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science; II SEMESTER

Course: 4 DESCRIPTIVE STATISTICS
Credits:3

BLUE PRINT

Unit	Essays	Shorts
Unit 1	2	2
Unit 2	2	2
Unit 3	2	1
Unit 4	2	1
Unit 5	2	2
Total	**10** **Out of 10, 5 questions should be answered** **5x10=50 Marks**	**8** **Out of 8, 5 questions should be answered** **5x4=20 Marks**

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science; II SEMESTER

Single Major Model Question Paper
Introduction to Data Science and R Programming

Time:3hrs **MAX MARKS: 70 M**

SECTION – A

Answer any 5 questions. Each question carries 4 marks **(5 X 4 = 20M)**

9. What are the uses of data science and big data in r programming?
10. What is meant by data presentation and automation?
11. Write few applications of machine learning in data science?
12. What are the Generating programming tips for dealing with large datasets?
13. Write a short note on loop functions?
14. Write about Control structures, functions, Scoping rules of R?
15. What are the problems we face when handling large data?
16. What is meant reader package? write it uses?

SECTION – B

Answer all the questions. Each question carries 10 marks. **(5 X 10 = 50M)**

9.a) Explain briefly about Data Science Process?

(OR)

f. Write about history and Overview of R?

10. a) Explain about Data Science Process?

(OR)

b) Write an essay on getting Data in and out of R, Using reader package?

11. a) What is machine learning? Explain it's types?

(OR)

b) What are the uses of machine learning in data science and write it's applications?

12.a) What are the techniques used to handle the large amount of data on a single computer?

(OR)

b) Generating programming tips for dealing with large datasets.?

13.a) Write about coding Standards in R, Loop Functions, Debugging, Simulation?

(OR)

b) Explain briefly about Vectorised Operations?

***

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science; II SEMESTER

Course No.: 4 - Introduction to Data Science and R Programming
Semester End Examination - Practical
Credits:1

Time: 3 Hrs **Max.Marks: 50**

1. Documentation/Practical Writing : 10 Marks
2. Practical Execution : 20 Marks
3. Observation & Record : 10 Marks
4. Viva : 10 Marks

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ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
B.Sc., Data Science; II SEMESTER

Course: 1 Problem Solving using C - (Minor)
Credits:3

Course Objectives

1. To explore basic knowledge on computers
2. Learn how to solve common types of computing problems.
3. Learn to map problems to programming features of C.
4. Learn to write good portable C programs.

Course Outcomes

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

1. Understand the working of a digital computer and Fundamental constructs of Programming
2. Analyze and develop a solution to a given problem with suitable control structures
3. Apply the derived data types in program solutions
4. Use the 'C' language constructs in the right way
5. Apply the Dynamic Memory Management for effective memory utilization

UNIT-I

Introduction to computer and programming: Introduction, Basic block diagram and functions of various components of computer, Concepts of Hardware and software, Types of software, Compiler and interpreter, Concepts of Machine level, Assembly level and high-levelprogramming, Flowcharts and Algorithms

Fundamentals of C: History of C, Features of C, C Tokens-variables and keywords and identifiers, constants and Data types, Rules for constructing variable names, Operators, Structure of C program, Input /output statements in C-Formatted and Unformatted I/O

UNIT-II

Control statements: Decision making statements: if, if else, else if ladder, switch statements. Loop control statements: while loop, for loop and do-while loop. Jump Control statements: break,continue and goto.

UNIT-III

Derived data types in C: Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays -Declaration, Initialization and Memory representation. Strings: Declaring & Initializing string variables; String handling functions, Character handling functions

UNIT-IV

Functions: Function Prototype, definition and calling. Return statement. Nesting of functions. Categories of functions. Recursion, Parameter Passing by address & by value. Local and Global variables. Storage classes: automatic, external, static and register.

Pointers: Pointer data type, Pointer declaration, initialization, accessing values using pointers. Pointer arithmetic. Pointers and arrays, pointers and functions

UNIT-V

Dynamic Memory Management: Introduction, Functions-malloc, calloc, realloc, free Structures: Basics of structure, structure members, accessing structure members, nested structures, array of structures, structure and functions, structures and pointers. Unions - Union definition; difference between Structures and Unions.

Text Books:

1. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, 6 th Edn, ISBN-13: 978-1-25- 90046-2
2. Herbert Schildt, ―Complete Reference with C, Tata McGraw Hill, 4th Edn., ISBN- 13: 9780070411838, 2000
3. Computer fundamentals and programming in C, REEMA THAREJA, OXFORD UNIVERSITY PRESS

Reference Books

1. E Balagurusamy, COMPUTING FUNDAMENTALS & C PROGRAMMING – Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.
2. Ashok N Kamthane, Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.
3. Henry Mullish&Huubert L.Cooper: The Spirit of C An Introduction to modern Programming, Jaico Pub. House,1996.
4. Y kanithkar, let us C BPB, 13 th edition-2013, ISBN:978-8183331630,656 pages.

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Quiz on computer hardware and software concepts
Evaluation Method: Objective-based quiz assessing knowledge and understanding
Unit 2: Activity: Problem-solving using Decision-Making Statements
Evaluation Method: Correctness of decision-making logic
Unit 3: Activity: Array and String Program Debugging
Evaluation Method: Identification and correction of errors in code
Unit 4: Activity: Pair Programming Exercise on Functions
Evaluation Method: Collaboration and Code Quality
Unit 5: Activity: Structured Programming Assignment
Evaluation Method: Appropriate use of structures and nested structures

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
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Course: 1 – Problem Solving using C (Minor)
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PRACTICALS

List of Experiments

1. A. Write a program to calculate simple & compound interest
   B. Write a C program to interchange two numbers.
2. Find the biggest of three numbers using C.
3. Write a c program to find the sum of individual digits of a positive integer.
4. A Fibonacci sequence is defined as follows: the first and second terms in the sequenceare 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.
5. Write a c program to check whether a number is Armstrong or not.
6. Write a c program to generate all the prime numbers between 1 and n, where n is avalue supplied by the user.
7. Write a c program that implements searching of given item in given list
8. Write a c program that uses functions to perform the following: Addition of twomatrices. Multiplication of two matrices.
9. Write a program for concatenation of two strings.
10. Write a program for length of a string with and without String Handling functions
11. Write a program to demonstrate Call by Value and Call by Reference mechanism
12. Write a Program to find GCD of Two numbers using Recursion
13. Write a c program to perform various operations using pointers.
14. Write a c program to read data of 10 employees with a structure of 1.employee id2.aadar no, 3.title, 4.joined date, 5.salary, 6.date of birth, 7.gender, 8.department.
15. Write a Program to demonstrate dynamic arrays using Dynamic Memory Management functions

ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA
Department of Data Science
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Unit	Essays	Shorts
Unit 1	2	2
Unit 2	2	2
Unit 3	2	1
Unit 4	2	1
Unit 5	2	2
Total	**10** **Out of 10, 5 questions should be answered** **5x10=50 Marks**	**8** **Out of 8, 5 questions should be answered** **5x4=20 Marks**

ADITYA DEGREE & P.G. COLLEGE (A), KAKINADA
Department of Data Science
B.Sc., Data Science; II SEMESTER
SEMESTER END EXAMINATION MODEL QUESTION PAPER
Course: 1 – Problem Solving using C (Minor)
Credits:3

Time :3Hrs MaxMarks : 70

SECTION-A

Answer any 5 question **5X4 = 20M**

1. Explain Block diagram of Computer.
2. Define an Algorithm. What are the key features of an algorithm?
3. Write about go to statement with syntax and example.
4. Dynamic memory allocation.
5. Explain pointers in arrays.
6. How to write data from files with example?
7. Write about enumerated data types.
8. Briefly explain various types of recursions.

SECTION-B

Answer following question **5X10 = 50M**

9. a) Briefly explain about generations of computers.
(OR)
b) What is a Flowchart? Explain significance with an example.
10. a) Explain basic data types in C?
(OR)
b) Explain about iterative statements available in C.
11. a) What is an Array? Explain different types of arrays with examples.
(OR)
b) What is a string? Explain various string handling functions available in C.
12. a) Define a function. Explain the passing parameter mechanism.
(OR)
b) Explain about Structure with syntax and example in detail.
13. a) Define and use of a pointer and write a 'C' program on swapping of two numbersusing pointers.
(OR)
b) Explain file modes in detail

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ADITYA DEGREE & P.G. COLLEGE (A) KAKINADA

Department of Data Science

B.Sc., Data Science; II SEMESTER

Course No: 1 – Problem Solving using C (Minor) Semester End Examination - Practical

Credits:1

Time: 3 Hrs **Max. Marks: 50**

1. Documentation/Practical Writing : 10 Marks
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