**SEMESTER II**

# ALGORITHMS
# THEORY

## 1. Course Description

**Programme: M.Sc. Dat Science**
**Course Code: P24/CDS/DSC/204**
**Course Type: DSC**
**No. of credits: 3**

**Max. Hours: 45**
**Hours per week: 3**
**Max. Marks: 100**

## 2. Course Objectives:

- To understand the functionality of divide-and-conquer, dynamic programming and greedy algorithms.
- To apply analysis of algorithms to model problems.

## 3. Course Outcomes

On completion of the course the student will be able to:
CO1: ***Illustrate*** and ***explain***: Analyze and compare different algorithm (Cognitive level-1,2,3)
CO2: ***Apply*** the concepts of dynamic programming and greedy approach. (Cognitive level-3)
CO3***: Choose*** and ***Design*** performance of different graph algorithms. (Cognitive level-5,6)

## 4. Course Content

### MODULE 1: REVIEW OF FUNDAMENTAL ALGORITHMS & DATA STRUCTURES (15 Hrs)

Introduction – Definition of an Algorithm, Algorithm Specification, Growth of Functions and Dictionaries.
Elementary Data Structures – Stacks and Queues, Priority Queues.
Divide-and-Conquer –The master method for solving recurrences, Stassen's algorithm for Matrix Multiplication, Merge Sort, Quick Sort – Description and performance of Quick Sort and Hash Tables.Greedy Algorithms – Elements of greedy strategy, Activity-selection problem and Huffman codes as primary examples.

### MODULE 2: DYNAMIC PROGRAMMING AND GREEDY ALGORITHMS (15 Hrs)

Dynamic Programming – Elements of Dynamic Programming and Optimal Binary Search Trees as primary examples. Binary Search Trees – Building, Querying, Inserting and Deleting in a Binary Search Tree. Red-Black Trees, B-Trees and Heap sort

### MODULE 3: GRAPHS (15 Hrs)

Review of Fundamental Graph Algorithms, Minimum Spanning Trees – Kruskal and Prim, Single-Source Shortest Paths – Bellman-Ford and Dijkstra's algorithm. All-Pairs Shortest Paths – Floyd-Warshall algorithm. A brief Introduction to P and NP problems.

**5. References:**


1. Cormen, T. (2009). Introduction to algorithms. Cambridge, Mass: MIT Press
2. Horowitz, E., Sahni, S. & Rajasekaran, S. (2005). Computer algorithms. Norwood Mass: Books24x7.com
3. Sedgewick, R. & Wayne, K. (2011). Algorithms. Upper Saddle River, NJ: Addison-Wesley.
4. Cormen, T. (2009). Introduction to algorithms. Cambridge, Mass: MIT Press


**6.Syllabus Focus**

**a)** Relevance to Local, Regional, National and Global Development Needs

| **Local /Regional/National /Global Development Needs** | **Relevance** |
|---|---|
| Global Development | Overall, the analysis of algorithms is essential for driving innovation, improving efficiency, ensuring accessibility, and addressing global challenges in various domains, making it a fundamental aspect of global development efforts. |

**b) Components on Skill Development/Entrepreneurship Development/Employability**

| **SD/ED/EMP** | **Syllabus Content** | **Description of Activity** |
|---|---|---|
| **SD** | Modules 1 and 2 | Developing proficiency in algorithm analysis requires a combination of theoretical knowledge, practical problem-solving skills, programming proficiency, and a willingness to learn and adapt to new challenges. |
| **EMP** | Modules 3 | By analyzing these trends depicted in the employability graph for analysis of algorithms, individuals can make informed decisions about their career paths, identify areas for skill development, and tailor their job search strategies to align with the demands of the job market |

**7. Pedagogy**

| S. No | Student Centric Methods Adopted | Type / Description of Activity |
|---|---|---|
| 1. | Seminar Presentation | Participative Learning |
| 2. | Quiz | Experiential Learning |
| 3. | Group Discussion | Participative Learning |

**8.Course Assessment Plan**

**a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination**

| COs | Continuous Internal Assessments - CIA (40%) | End Semester Examination - (60%) |
|---|---|---|
| CO 1 | CIA-1 | End Semester examination |
| CO 2 | CIA-1 | |
| C03 | CIA-2 Presentation | |

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**b) Model Question Paper- End Semester Exam**

**ALGORITHMS**

**MODEL QUESTION PAPER**
**THEORY**

**Course Code: P24/CDS/DSC/204** **Max Marks: 60**
**Credits: 3** **Time: 2 ½ Hrs.**

**SECTION – A**

**I. Answer the following:** **3 x 12= 36**

1. Explain Strassen's algorithm for matrix multiplication.
   OR
2. Describe Quick Sort algorithm illustrating with an example.

3. Explain Binary Search Tree in detail along with Tree traversals.
   OR
4. Describe B-Trees and discuss the procedure to delete a key from it.

5. Describe Floyd – Warshall algorithm for all pair shortest paths.
   OR
6. Explain Dijkstra's algorithm for solving Single-Source Shortest Path.

**SECTION – B**

**II Answer any Four:** **4 x 6 = 24**

7. Write a short note on Stacks and Queues.
8. Explain Hash tables and describe how collisions can be resolved.
9. Explain Huffman Codes.
10. Discuss about elements of dynamic programming in brief.
11. Explain Breadth First Search.
12. Describe Kruskal's algorithm to find the minimum cost spanning tree.

**c) Question Paper Blueprint**

| Modules | Hours Allotted in the Syllabus | COs Addressed | Section A (No. of Questions) | Total Marks | Section B (No. of Questions) | Total Marks |
|---|---|---|---|---|---|---|
| I | 15 | 1 | 2 | 12 | 2 | 12 |
| II | 15 | 2 | 2 | 12 | 2 | 6 |
| III | 15 | 3 | 2 | 12 | 2 | 6 |

NOTE: From
Section-A any 3 questions can be answered (INTERNAL CHOICE).
Section-B any 4 questions can be answered. (EXTERNAL CHOICE

**9. CO - PO Mapping:**

| CO | PO | Cognitive Level | Classroom sessions(Hrs.) |
|---|---|---|---|
| 1 | 1 | 2,3 | 15 |
| 2 | 2 | 5 | 15 |
| 3 | 2 | 6 | 15 |

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**SEMESTER - II**
**ALGORITHMS**

**PRACTICAL**

**1.Course Description**

**Programme: M.Sc. Dat Science**
**Course Code: P24/CDS/DSC/204/P**
**Course Type: DSC**
**No. of credit: 2**

**Max. Hours: 60**
**Hours per week:4**
**Max. Marks: 50**

**2. Course Objectives**

To understand complex algorithm concepts and to develop programs to illustrate the applicability to solve real time problems.

**3. Course Outcomes**

CO1: To analyze and compare different algorithms, graphs and trees.
CO2: To apply divide and conquer to solve complex problems.

**Practical Sessions**

1. Program to demonstrate Merge Sort.
2. Program to demonstrate Quick Sort.
3. Program to demonstrate Heap Sort.
4. Program to create a Binary Search Tree and perform in order traversal.
5. Program to create a Binary Search Tree and perform preorder traversal.
6. Program to create a Binary Search Tree and perform postorder traversal.
7. Program to construct and display a simple Graph.
8. Program to implement Breadth-first Search on a Graph.
9. Program to implement Depth-first Search on a Graph.
10. Program to implement Topological Sort on a Directed Graph.
11. Program to implement Dijkstra's algorithm to find a single source shortest path on a Directed Graph.
12. Program to implement Bellman-Ford algorithm to find a single source shortest path on a Directed Graph.
13. Program to implement a Hash Table.
14. Program to demonstrate Huffman codes.
15. Program to illustrate Activity Selection Problem.

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## MODEL QUESTION PAPER
## PRACTICAL

**Course code: P24/CDS/DSC/204/P** **Max. Time: 2 Hrs.**
**Max. Marks: 50**

**Answer any ONE from the following**

1.Program to implement Dijkstra's algorithm to find a single source shortest path on a Directed Graph.
2. Program to implement Bellman-Ford algorithm to find a single source shortest path on a Directed Graph
3. Program to implement a Hash Table.
4. Write a Program to implement Topological Sort on a Directed Graph.
5. Write a Program to illustrate Activity Selection Problem.

| Prepared by | Checked & verified by | Approved by |
|---|---|---|
| Ms.Shobana<br>Teaching Faculty | Ms. D. Sowjenya<br>Head of the Department | Dr.Uma Joseph<br>Principal |

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**SEMESTER - II**
**ARTIFICIAL INTELLIGENCE**
**THEORY**

## 1. Course Description

| | | |
|---|---|---|
| **Programme:** | **M.Sc. Data Science** | **Max. Hours: 45** |
| **Course Code:** | **P24/CDS/DSC/201** | **Hours per week: 3** |
| **Course Type:** | **DISCIPLINE SPECIFIC CORE** | **Max. Marks: 100** |
| **No. of credits:** | **3** | |

## 2. Course Objectives

- To understand and apply both uninformed and informed AI search strategies
- To identify and explain various types of knowledge representation approaches
- To explore how learning and planning can be integrated

## 3. Course Outcomes

On completion of the course the student will be able to:

CO1: Identify and examine real-world issues that may be solved using search algorithms. (Cognitive levels – 4)

CO2: Apply methods of knowledge representation to solve simple problems across different domains. (Cognitive level – 3)

CO3: Outline how learned models can be used for decision-making in planning problems (Cognitive levels - 1)

**4. Course Content**

**MODULE I: AI SEARCH STRATEGIES** **(15 Hrs.)**

Overview of Artificial Intelligence - the Turing test, strong AI versus weak AI, heuristics, identifying problems suitable for AI, applications and methods, early history of AI, recent history of AI to the present, AI in the new millennium; uninformed search - search in intelligent systems, state-space graphs, generate-and-test paradigm, blind search algorithms, implementing and comparing blind search algorithms; informed search – heuristics, finding any solution, the best-first search, the beam search, additional metrics for search algorithms, finding an optimal solution, advanced search algorithms

**MODULE II: GAME THEORY, LOGIC, AND KNOWLEDGE REPRESENTATION** **(15 Hrs.)**

Search Using Games - game trees and minimax evaluation, minimax with alpha-beta pruning, variations and improvements to minimax, games of chance and the expect mini max algorithm, game theory; logic in artificial intelligence - logic and representation, propositional, logic, predicate logic; knowledge representation - search trees, representational choices, production systems, object orientation, frames, scripts and the conceptual dependency system, semantic networks, associations, more recent approaches, agents: intelligent or otherwise

**MODULE III: PLANNING AND LEARNING MODELS** **(15 Hrs.)**

Production Systems- basic examples, production systems and inference methods, production systems and cellular automata, stochastic processes and Markov chains; uncertainty in AI - fuzzy sets, fuzzy logic, fuzzy inferences, probability theory and uncertainty; expert systems: characteristics of expert systems, knowledge engineering, knowledge acquisition, case-based reasoning, more recent expert systems; automated planning- problem planning, frame the problem, planning methods: planning as search, partially ordered planning, hierarchical planning, case-based planning, a potpourri of planning methods, early planning systems, more modern planning systems.

**5. References**


1. Artificial Intelligence in the 21st Century - 2E by Stephen Lucci, Danny Kopec., Mercury Learning and Information, 2016
2. Artificial Intelligence: Building Intelligent Systems by Parag Kulkarni, Prachi Joshi, PHI Learning Yashwant Kanetkar, Let Us C 13E, BPS Publications.
3. Artificial Intelligence: A New Synthesis by Nils J Nilsson, Morgan Kaufmann Publishers Inc
4. Artificial Intelligence - 3E by Kevin Knight, Elaine Rich, B Nair, Tata McGraw Hill
5. Artificial Intelligence: A Modern Approach – 3E by Stuart Russell, Peter Norvig, Prentice Hall
6. Artificial Intelligence and Machine Learning by Vinod Chandra SS, Anand Hareendra S, Prentice Hall
7. Artificial Intelligence by Saroj Kaushik, Cengage Learning, 2011




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**6.Syllabus Focus**

**a)** Relevance to Local, Regional, National and Global Development Needs

| Local /Regional/National /Global Development Needs | Relevance |
|---|---|
| Global Development | The worldwide importance of AI information lies in its transformative effect on numerous sectors and components of society. |

**b) Components on Skill Development/Entrepreneurship Development/Employability**

| SD/ED/EMP | Syllabus Content | Description of Activity |
|---|---|---|
| **SD** | Modules 1 and 2 | Design search algorithms, and predicate logic solutions to given problems |
| **EMP** | Modules 3 and 4 | Apply basic supervised learning algorithms to real-world datasets |

**7. Pedagogy**

| S. No | Student Centric Methods Adopted | Type / Description of Activity |
|---|---|---|
| 1. | Participative | Seminars |
| 2. | Experimental | Quiz |
| 3. | Problem solving | Programs |

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**8. Course Assessment Plan**

**a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination**

| CO | Continuous Internal Assessments CIA -40% | End Semester Examination-60% |
|---|---|---|
| CO1 | CIA 1 – Assignment | Written Exam |
| CO2 | CIA 2 – Written | |
| CO3 | CIA 3 – Lab Exercise | |

**b) Model Question Paper- End Semester Exam**

## ARTIFICIAL INTELLIGENCE

## MODEL QUESTION PAPER

## THEORY

**Course Code: P24/CDS/DSC/201** **Max Marks: 60**
**Credits: 3** **Time: 2 ½ Hrs.**

### SECTION – A

**I: Answer the following:** **3 x 12 = 36**

1. Explain A* search algorithm with an appropriate example

OR

2. What is depth first search? How is it different from breadth first search and uniform cost search?

3. Explain in detail about refutation regulations in propositional logic.

OR

4. Explain the minimax algorithm. What is the need for alpha beta pruning?

5. Define planning. Explain the different planning methods.

OR

6. Define uncertainty measure. Explain in detail about Bayesian belief networks.

**II. Answer any Four:** **4 x 6 = 24**

7. Write a short note on AI applications.
8. Write a short note on the problem types and characteristics.
9. Explain breadth first search.
10. Write a short note on predicate logic.
11. Discuss case-based reasoning in expert systems.
12. Explain about stochastic processes and Markov chains

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**c) Question Paper Blueprint**

| Modules | Hours Allotted in the Syllabus | COs Addressed | Section A (No. of Questions) | Total Marks | Section B (No. of Questions) | Total Marks |
|---|---|---|---|---|---|---|
| I | 15 | 1 | 2 | 10 | 2 | 10 |
| II | 15 | 2 | 2 | 10 | 2 | 10 |
| III | 15 | 3 | 2 | 10 | 2 | 10 |

**9. CO-PO Mapping**

| CO | PO | Cognitive Level | Classroom sessions(hrs) |
|---|---|---|---|
| 1 | 1,2 | 4 | 15 |
| 2 | 2 | 3 | 15 |
| 3 | 2 | 1 | 15 |

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**SEMESTER - II**
**ARTIFICIAL INTELLIGENCE**
**PRACTICAL**

**2. Course Description**

**Programme:** M.Sc. Data Science
**Course Code:** P24/CDS/DSC/201/P
**Course Type:** DISCIPLINE SPECIFIC CORE
**No. of credits:** 2

**Max. Hours: 60**
**Hours per week: 4**
**Max. Marks: 50**

**2. Course Objectives**

- Develop knowledge of basic AI techniques using python programming language

**3. Course Outcomes**

On completion of the course the student will be able to:

CO1: Identify and Apply Artificial Intelligence concepts to solve real world problems.
CO2: Use relevant Python libraries to generate accurate solutions for AI domain problems.

**4.Practical Sessions**

1. Uninformed Search
    a. BFS
    b. Uniform cost search
    c. DFS
    d. IDS
    e. Bi-directional Search
2. Informed Search
    a. Best First Search
    b. A* Search
    c. AO* Search
    d. Simple Hill Climbing
    e. Steepest Ascent Hill Climbing
    f. Simulated Annealing
3. Game Playing
    a. Constraint Satisfaction
    b. Minimax
    c. Alpha-beta pruning
4. Reasoning
    a. Resolution in proposition logic
    b. Resolution in predicate logic
5. Uncertainty
    Sample Bayesian network problem solution
6. Planning
    Blocks world
7. Mini project

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**MODEL QUESTION PAPER**
**ARTIFICIAL INTELLIGENCE**

**PRACTICAL**

**COURSE CODE: P24/CDS/DSC/201/P**

**Max.Marks: 50**
**Exam Duration: 2 hrs**

**Answer any one of the following.**

1. Write a program to implement iterative depth first search.
2. Write a program to implement A* algorithm.
4. Write a program to implement resolution in predicate logic.
5. Write a program to implement a minimax algorithm.
6. Write a program to implement Bayesian network solutions to sample problems.

| Prepared by | Checked & Verified by | Approved by |
|---|---|---|
| **Ms. Padmashree Josyula**<br>**Teaching Faculty** | **Ms. D.Sowjenya**<br>**(HoD, Dept of Computer Science)** | **Dr. Uma Joseph**<br>**(Principal,St.Francis College for Women)** |

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## SEMESTER - II

## NETWORKING AND CLOUD COMPUTING

## THEORY

### 1. Course Description

| | | |
|---|---|---|
| **Programme:** | **M.Sc. Data Science** | **Max. Hours: 45** |
| **Course Code** | **P24/CDS/DSC/203** | **Hours per week: 3** |
| **Course Type:** | **DISCIPLINE SPECIFIC CORE** | **Max. Marks: 100** |
| **No. of credits:** | **3** | |

### 2. Course Objectives.

- Ability to design and deploy Cloud Infrastructure
- Understand cloud security issues and solutions
- Ability to understand role of Virtualization Technologies

### 3. Course Outcomes

On completion of the course the student will be able to:

CO1: ***Explain and*** **Compute** To explore the basic taxonomy and terminology of computer networks. (Cognitive levels – 2)

CO2: ***Apply*** Learn cloud implementation and administration. (Cognitive level – 3,4)

CO3***: Choose*** and ***Design*** Evaluate the use of cloud for business operations and choose the right framework for cloud. (Cognitive levels – 5,6).

### 4.Course Content

**MODULE I: AN INTRODUCTION TO NETWORKS** **(15 Hrs.)**

Network Communication, types of Networks, Network Protocols, Ethernet, The internet. Transmission Control Protocol/Internet Protocol, Domain Name System-DNS Infrastructure, Protocol, Performance.

Case study: Building Local Area network and TCP/IP.

**MODULE II: CLOUD COMPUTING** **(15 Hrs.)**

Cloud Computing Overview: Characteristics –challenges, benefits, limitations, Evolution of CloudComputing, Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption.Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds -Advantages of Cloud computing.

Case Study: SaaS: Salesforce.com, CRM, Online Collaboration Services, IaaS: AWS, OpenStack PaaS: IBM Bluemix, GAE

**MODULE III: INTRODUCTION TO VIRTUALIZATION (15 Hrs.)**

Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations. Compute Virtualization, Storage Virtualization Network Virtualization, Web Services

Case study*: Virtual* box-based Web Server creation, Images/Snapshots access webpage from 2nd VM on another subnet work 3. EC2 AWS – S3 bucket based static webpages. Use this page as a start page via EC2 web server 4. AWS – Local balancing and auto scaling

**4. References**:

1.Internet Infrastructure Networking, Web services and Cloud Computing by Richard Fox, Wei Hao

2.David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach

3.Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.

References

4.Cloud computing: principles and paradigms by Buyya, Raj kumar | Broberg, James Goscinski, Andrzej

5.Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill, New Delhi – 2010

**6.Syllabus Focus**

**a)** Relevance to Local, Regional, National and Global Development Needs

| **Local /Regional/National /Global Development Needs** | **Relevance** |
|---|---|
| Global Development | The global development for computer networks and cloud computing is driving innovation, economic growth, and societal transformation on a global scale, shaping the way we communicate, collaborate, and interact with information in the digital age. |

**b) Components on Skill Development/Entrepreneurship Development/Employability**

| SD/ED/EMP | Syllabus Content | Description of Activity |
|---|---|---|
| **SD** | Modules 1 and 2 | By focusing on developing these skills, individuals can position themselves for success in careers related to computer networks and cloud computing, whether as network engineers, cloud architects, DevOps engineers, cybersecurity specialists, or cloud consultants. |
| **EMP** | Modules 3 | Overall, the employability need for computer networking and cloud computing professionals is driven by the increasing reliance on cloud services, the need for robust network infrastructure, growing cybersecurity concerns, and the opportunities presented by digital transformation and innovation. Skilled professionals who possess expertise in these areas are well-positioned to succeed in the rapidly evolving technology landscape |

**7. Pedagogy**

| S. No | Student Centric Methods Adopted | Type / Description of Activity |
|---|---|---|
| 1. | Participative | Seminars |
| 2. | Experimental | Quiz |
| 3. | Compute | Hand on cloud Service providers |

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**8. Course Assessment Plan**

**a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination.**

| CO | Continuous Internal Assessments CIA -40% | End Semester Examination-60% |
|---|---|---|
| CO1 | CIA 1 – Written | Written Exam |
| CO2 | CIA 2 – Assignment | |
| CO3 | CIA 2 – Lab | |

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**b) Model Question Paper- End Semester Exam**

## NETWORKING AND CLOUD COMPUTING

## MODEL QUESTION PAPER
## THEORY

**Course Code: P24/CDS/DSC/203** **Max Marks: 60**
**Credits: 3** **Time: 2 ½ Hrs.**

### SECTION – A

**I. Answer the following:** **3 x 12= 36**

1. Define CC to Explain in detail Layers in cloud architecture.

OR

2. Explain in detail Transmission Control Protocol/Internet Protocol.

3. Explain in detail about eucalyptus & open stack cloud architecture.

OR

4. Explain in detail about implementation levels of virtualizations.

5. Explain the Cloud deployment model.

OR

6. Explain various Web services provided in cloud computing.

### SECTION- B

**II. Answer Any Four:** **5 x 4 = 20**

7. Differentiate B/w full virtualization & para virtualization.
8. Explain in detail about different types of clouds.
9. Discuss about Domain Name System.
10. Write a short note on cloud service providers.
11. Write short notes on Cloud storage for AWS S3 Bucket with private and public access levels
12. Write a short note on SaaS usage and their advantages.

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**c)Question Paper Blueprint**

| Modules | Hours Allotted in the Syllabus | COs Addressed | Section A (No. of Questions) | Total Marks | Section B (No. of Questions) | Total Marks |
|---|---|---|---|---|---|---|
| I | 15 | 1 | 2 | 12 | 2 | 12 |
| II | 15 | 2 | 2 | 12 | 2 | 6 |
| III | 15 | 3 | 2 | 12 | 2 | 6 |

NOTE: From

Section-A any 3 questions can be answered (INTERNAL CHOICE).
Section-B any 4 questions can be answered. (EXTERNAL CHOICE)

**9. CO-PO Mapping**

| CO | PO | Cognitive Level | Classroom sessions(Hrs.) |
|---|---|---|---|
| 1 | 1 | 2 | 15 |
| 2 | 2 | 3,4 | 15 |
| 3 | 2 | 5,6 | 15 |

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## SEMESTER - II

## NETWORKING AND CLOUD COMPUTING PRACTICAL

### 1.Course Description

**Programme: M.Sc. Data Science**
**Course Code: P24/CDS/DSC/203/P**
**Course Type: DSC**
**No. of credit: 2**

**Max. Hours: 60**
**Hours per week:4**
**Max. Marks: 50**

### 2. Course Objectives

- To introduce the terminology, technology and its applications
- To introduce the Raspberry PI platform, that is widely used in IoT applications

### 3. Course Outcomes

CO1: The completion of the course, the students will be able design some IOT based prototypes.
CO2. Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model.

### Practical Sessions

1. Simulators using Packet Tracer – VLAN design, Routing, Subnetting, Gateway configuration.
2. AWS Essentials Introduction to Amazon Web Services, EC2: Compute services, Networking, infrastructure and reliability, Storage and database services.
3. Amazon Elastic Block Store (Amazon EBS).
4. Amazon Simple Storage Service (Amazon S3).
5. Amazon Elastic File System (Amazon EFS).
6. Relational Database Service (Amazon RDS).
7. virtual private cloud (VPC), Identity and Access.
8. Management (IAM) and Security on AWS.

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# NETWORKING AND CLOUD COMPUTING

## MODEL QUESTION PAPER
## PRACTICAL

**Course code: P24/CDS/DSC/203/P** **Max. Time:2 Hrs.**
**Max. Marks: 50**

**Answer any ONE from the following**

1. Send a message to communicate in the given network for the given topology.
2. Create Instance for the Public DNS and use S3 bucket to share the data in public.

| Prepared by | Checked & Verified by | Approved by |
|---|---|---|
| **Ms.Shobana**<br>**Teaching Faculty** | **Ms. D. Sowjenya**<br>**Head of the Department** | **Dr.Uma Joseph**<br>**Principal** |

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## SEMESTER II

## PYTHON TOOLS FOR DATA SCIENCE

## PRACTICAL

### 1.Course Description

**Programme: M.Sc. Data Science** **Max. Hours: 60**

**Course Code: P24/CDS/DSC/202/P** **Hours per week: 4**

**Course Type: DSC** **Max. Marks: 50**

**No. of credits: 2**

### 2.Course Objective

To explore various libraries and packages like NumPy, Pandas and Matplotlib required for data analysis and data visualization.

### 3.Course Outcomes

**CO 1:** Applying NumPy for various Array features and Structured data analysis.
**CO 2:** Working with data frames and data sets using Pandas and Exploring Matplotlib.

### 4.Practical Session

1. Exploring IPython Shell and Jupyter Notebook:
a. Working with Keyboard Shortcuts in IPython Shell.
b. Exploring Magic commands in IPython and Shell.
c. Working with IPython's In and Out Objects.
d. Exploring Shell commands and Passing values to and from the Shell.
2. Installing and exploring NumPy:
a. Exploring NumPy Arrays and Attributes of Arrays.
b. Indexing, slicing, splitting and joining of arrays.
c. Exploring Universal Functions.
d. Applying Aggregate Functions.
e. Computation on Arrays using Broadcasting.
f. Exploring Fancy Indexing.
g. Sorting Arrays and working on Fast Sorting.
h. Exploring Structured data and working with Structured Arrays.
3. Installing and working with Panda:
a. Installing Panda and working with Pandas objects.
b. Exploring data frames using Pandas.
c. Working on Datasets in Pandas.
d. Exploring Pivot Tables.
4. Installing and Working with MatplotLib:
a. Creating and working with Line Plots.
b. Creating and working with Scatter Plots.
c. Working with Histograms
d. Exploring Text and Annotations.
e. Creating a Three-Dimensional Plot.
f. Visualization of Geographic data with Basemap.
g. Visualization with Seaborn.

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# PYTHON TOOLS FOR DATA SCIENCE

## MODEL QUESTION PAPER

## PRACTICAL

**COURSE CODE: P24/CDS/DSC/202/P** **Max.Marks: 50**

**Exam Duration: 2 Hrs.**

**Answer any one of the following.**

1. Generate the pivot table for a data set with different attributes of the pivot table.
2. Show all the operations on strings.
3. Display the density and contour plot showing importance to all properties.
4. Show seaborn plots with different features.
5. Create histograms, binning and density with different examples.

| Prepared by | Checked & Verified by | Approved by |
|---|---|---|
| Ms.Khalida Tabassum<br>Teaching Faculty | Ms. D. Sowjenya<br>Head of the Department | Dr.Uma Joseph<br>Principal |

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**SEMESTER - II**
**STATISTICS FOR DATA SCIENCE - II**

## 1. Course Description

**Programme: M.Sc. Data Science**
**Course Code: P24/CDS/DSC/202**
**Course Type: DSC**
**No. of credits: 3**

**Max. Hours: 45**
**Hours per week:3 hrs.**
**Max. Marks:100**

## 2. Course Objectives:

The aim of the course is to make the student to:

1. Describe the important features of the time series pattern.
2. Understand the application of various regression models to real time data.

## 3. Course Outcomes:

On completion of the course the student will be able to:

**CO1**: Learn how to apply regression models in practice

**CO2**: Demonstrate understanding of the concepts of time series and their application.

**CO3**: Apply various techniques of time series models.

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**4. Course Content:**

**MODULE I: REGRESSION ANALYSIS** **(15 Hrs.)**

Concept of covariance, correlation. Simple Regression analysis, Multiple regression analysis, Step wise regression analysis, Logistic Regression (concept, assumptions and interpretation).

**MODULE- II: TIME SERIES ANALYSIS-I:** **(15 Hrs.)**

Introduction to Forecasting, Basic steps involved in Forecasting, Introduction to times series data, Definition and applications of time series, Components of a time series. Time series models – Decomposition and Smoothing methods

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**MODULE-III: TIME SERIES ANALYSIS-II** **(15 Hrs.)**

Stationary, White noise processes, Identification of Stationarity, Transformation of non-stationary time series into stationary time series, Stationary time series models -Autoregressive (AR), Moving Average (MA), Autoregressive and Moving Average (ARMA). Concept and definitions of Autoregressive Integrated Moving Average (ARIMA) processes, Box-Jenkins methodology for identifying the appropriate time seriesmodel.

**5. References:**

1. Anderson, T. W., An Introduction to Multivariate Statistical Analysis, Wiley, 2003.

2. Brockwell, P. J., & Davis, R. A., Introduction to time series and forecasting, ThirdEd., Springer, 2016.

3. D.C Montgomery, E.A Peck and G.G Vining, Introduction to Linear Regression Analysis, John Wileyand Sons, Inc.NY, 2003.

4. S. Chatterjee and A.Hadi, Regression Analysis by Example, 4th Ed., John Wiley and Sons, Inc, 2006

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**6.Syllabus Focus**

a) Relevance to Local, Regional, National and Global Development Needs

| Local /Regional/National /Global Development Needs | Relevance |
|---|---|
| Global | The global approach involves employing statistical techniques to analyze historical data, identify patterns and relationships, and make informed predictions or decisions for the future. Collaboration across borders, sharing of data and expertise, and advancements in technology facilitate theapplication of these techniques on a global scale, contributing to improvements in various fields and sectors worldwide. |

b) **Components on Skill Development/Entrepreneurship Development/Employability**

| SD/ED/EMP | Syllabus Content | Description of Activity |
|---|---|---|
| Skill | Time series analysis I and II,Regression analysis. | Ability to construct regression models by selecting relevant independent variables, considering multicollinearity,and assessing model fit. Skill in interpreting regression coefficients, assessing the significance of predictors,and understanding measures of model performance such as R-squared and adjusted R-squared. Skill in applying differencing and transformation techniques to make time series stationary, including first differencing, seasonal differencing, and Box-jenkins transformations. |

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**7. Pedagogy**

| S. No | Student Centric Methods Adopted | Type / Description of Activity |
|---|---|---|
| 1. | MCQ test | Experiential learning |
| 2. | Assignment | Experiential learning |

**8. Course Assessment Plan**

**a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination**

| CO | Continuous Internal Assessments CIA -40% | End Semester Examination-60% |
|---|---|---|
| CO1 | CIA-1- Written Exam | Written Exam |
| CO2 | CIA-1- Written Exam | |
| CO3 | CIA-2 written test/Assignment | |
| CO4 | CIA-2 MCQ test | |

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**b) Model Question Paper- End Semester Exam**

## STATISTICS FOR DATA SCIENCE - II

**Course Code: P22/CDS/DSC/201** **Max. Marks: 60**
**Credits: 5** **Time: 2 1/2**
**Hrs.**

### SECTION –A

**Answer the following** **3X12=36**

1. Define Karl Pearson's Coefficient of Correlation, State and Prove its properties.

(OR)

2. Write in detail about Step wise Regression Analysis along with its properties.
3. Define Forecasting and Basic steps involved in Forecasting.

(OR)

4. Define Time series, Explain components of Time series with examples.
5. Write in detail about, i) Autoregressive model ii) Autoregressive and Moving Average model.(OR)
6. Define, i) Stationary ii) White noise process iii) Identification of Stationary

iv) Transformation of Non – Stationary Time Series into Stationary Time Series.

### SECTION –B

**II. Answer any FOUR.** **4x6=24**

7. Define Covariance and state its properties.
8. Define Logistic Regression.
9. Define smoothing. State the types of smoothing methods.
10. Define Decomposition and write applications of Time Series.
11. Explain Moving Average with order q.
12. Explain Box-Jenkins's methodology.

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**c) Question Paper Blueprint**

| Modules | Hours Allotted inthe Syllabus | COs Addressed | Section A (No. of Questions) | Total Marks | Section B (No. of Questions) | Total Marks |
|---|---|---|---|---|---|---|
| 1 | **15** | CO-1 | 2 | 12 | 2 | 3 |
| 2 | **15** | CO-2 | 2 | 12 | 2 | 3 |
| 3 | 15 | CO-3 | 2 | 12 | 2 | 3 |

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**9. CO-PO Mapping**

| CO | PO | Cognitive Level | Class room sessions(hrs) |
|---|---|---|---|
| 1 | 2 | Apply/Understand | 15 |
| 2 | 2 | Remember/Apply | **15** |
| 3 | 1 | Analyze/Apply | 15 |

| Prepared by | Checked & verified by | Approved by |
|---|---|---|
| **G. Priyanka**<br>**Teaching Faculty** | **Dr. Yugandhar**<br><br>**Head, Department of Statistics** | **Dr. Uma Joseph,**<br>**Principal** |

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