

**SEMESTER – I
ADVANCED JAVA PROGRAMMING
THEORY**

1. Course Description

Programme:	M.Sc Computer Science (AI & ML)	Max. Hours: 45
Course Code:	P24/CAI/DSC/104	Hours per week: 3
Course Type:	DISCIPLINE SPECIFIC CORE	Max. Marks: 100
No. of credits:	3	

2. Course Objectives

- To learn development of web applications using Java.
- To apply Java EE frameworks for model problems.

3. Course Outcomes

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

CO1: *Illustrate* and *explain* the relationship between servlets and JSP (Cognitive level – 2)

CO2: *Choose* and *Apply* advance concepts of java programming with database connectivity (Cognitive level – 3,5)

CO3: *Design* and deploy web applications on the internet (Cognitive level - 6)



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4. Course Content

MODULE I: JAVA DATABASE CONNECTIVITY

(15 Hrs.)

Java Database Connectivity (JDBC): Introduction, JDBC Drivers, JDBC Architecture, JDBC Classes and Interfaces, Loading a Driver, Making a Connection, Execute SQL Statement, SQL Statements, Retrieving Result, Getting Database Information, Scrollable and Updatable Result set, Result Set Metadata.

MODULE II: SERVLETS

(15 Hrs.)

Servlet: Server-Side Java, Servlet Alternatives, Servlet Strengths, Servlet Architecture, Servlet Life Cycle, Generic Servlet, Http Servlet, Servlet Example, Passing Parameters to Servlets, Retrieving Parameters, Cookies, Filters.

MODULE III: JSPs AND JAVA BEANS

(15 Hrs.)

Java Server Pages (JSP): Introduction, JSP Engines, How JSP Works, JSP and Servlet, Anatomy of a JSP Page, JSP Syntax, JSP Components, Beans, Session Tracking, Users Passing Control and Data between Pages, Sharing Session and Application Data, Introduction to JavaBeans, Advantages of JavaBeans, Properties of JavaBeans with examples, JavaBeans API, Enterprise JavaBeans (EJB), Applications using Session Beans and Entity Beans.

5. References

1. Uttam K. Roy, Advanced Java programming.
2. Herbert Schildt, Java Complete Reference
3. Sharanam Shah, Vaishali Shah, Java EE 7 for Beginners
4. Cay S. Horstmann, Gray Coronell, Core Java Vol. II – Advanced Features



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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	Advanced Java skills are essential for addressing the diverse and complex challenges of global Web development, enabling the creation of scalable, interoperable, secure, and innovative solutions that have a positive impact on communities around the world.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	Learn 3-tier architecture to develop web applications using servlet and JDBC.
EMP	Modules 3	Testing and deploying web applications on the internet.



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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Troubleshoot (debug) code

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 .**

**ADVANCED JAVA PROGRAMMING
MODEL QUESTION PAPER
THEORY**

**Course Code: P24/CAI/DSC/104
Credits: 3**

**Max Marks: 60
Time: 2 ½ Hrs.**

SECTION -A

I. Answer the following

3 x 12 = 36

1. Explain in detail about JDBC ARCHITECTURE

OR

2. Explain in detail the steps to establish connection to the database and perform operations.
3. Explain in detail about Java server pages.

OR

4. Explain in detail about servlet architecture and servlet life cycle.
5. Explain in detail about session tracking using JSPs.
6. Explain the advantages of JavaBeans.

SECTION - B

II. Answer any FOUR

4 x 6 = 24

7. Discuss in detail about Metadata.
8. Describe in detail about callable statements.
9. Explain briefly about Http servlet.
10. Discuss about cookies.
11. Explain briefly about JSP components.
12. Write a note on properties of javabeans and entity beans.



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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	15
3	2	5,6	15



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ADVANCED JAVA PROGRAMMING PRACTICAL

1.Course Description

Programme: M.Sc Computer Science (AI & ML)
Course Code: P24/CAI/DSC/104/P
Course Type: DISCIPLINE SPECIFIC CORE
No. of credits: 2

Max. Hours: 60
Hours per week: 4
Max. Marks: 100

2.Course Objectives

- To learn development of web applications using Java.
- To learn database connectivity for a web application using JSP & servlets.

3.Course Outcomes

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

CO1: *Explain* the strategies that include servlets and java server pages (Cognitive level – 2)
CO2: *Design, Apply* evaluate the different frameworks to develop web applications by connecting to databases. (Cognitive level – 5,6)

4.Practical Sessions

1. Develop Servlet Question-Answer Application using Http Servlet Request and Http Servlet Request interfaces.
2. Develop Servlet application to accept HTNO of a student from client and display the memorandum of marks from the server
3. JSP Programs
 - a. Create a JSP page that prints temperature conversion (from Celsius to Fahrenheit) chart
 - b. Create a JSP page to print current date and time
 - c. Create a JSP page to print the number of times the page is referred after the page is loaded.
4. Write a simple JSP application to demonstrate the use of implicit object (at least 5).
5. Develop a JSP Application to accept Registration Details from the user and store database table. Develop a JSP Application to Authenticate User Login as per the Registration Details.If Login Success then forward User to Index Page otherwise show Login failure Message.
6. Write EJB applications using stateless session beans and state-full session beans.
7. Develop a Room Reservation System Application using Entity Beans.
8. Create Three-tier application using Servlets, JSP, EJB.14.



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MODEL QUESTION PAPER

ADVANCED JAVA PROGRAMMING PRACTICAL

Course Code : P24/CAI/DSC/104/P

Time : 2Hrs
Max Marks:50

Answer any two:

1. Develop Servlet application to accept HTNO of a student from client and display the memorandum of marks from the server.
2. Create Three-tier applications using JSP.
3. Write EJB applications using stateless session beans and state-full session beans.

Prepared by	Checked & Verified by	Approved by
Ms.B.Kavitha Teaching Faculty	Ms. D. Sowjanya Head of the Department	Dr.Uma Joseph Principal



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SEMESTER – I

ARTIFICIAL INTELLIGENCE
THEORY

1. Course Description

Programme:	M.Sc. Computer Science (AI & ML)	Max. Hours: 45
Course Code:	P24/CAI/DSC/103	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)



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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 minimax 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.



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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

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.

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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

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	



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b) Model Question Paper- End Semester Exam**ARTIFICIAL INTELLIGENCE****MODEL QUESTION PAPER
THEORY**

Course Code: P24/CAI/DSC/103
Credits: 3

Max Marks: 60
Time: 2 ½ Hrs.

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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SEMESTER - I
ARTIFICIAL INTELLIGENCE
PRACTICAL

1. Course Description

Programme:	M.Sc. Computer Science (AI & ML)	Max. Hours: 60
Course Code:	P24/CAI/DSC/103/P	Hours per week: 4
Course Type:	DISCIPLINE SPECIFIC CORE	Max. Marks: 50
No. of credits:	2	

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

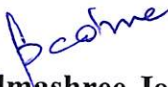


ARTIFICIAL INTELLIGENCE
PRACTICAL

COURSE CODE: P24/CAI/DSC/103/P

MAX.MARKS: 50
EXAM DURATION: 2Hrs.

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 (Faculty, Department of Computer Science)	 Ms. D.Sowjenya (HoD, Dept of Computer Science)	 Dr. Uma Joseph (Principal, St. Francis College for Women)



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SEMESTER – I
FUNDAMENTALS OF DATA SCIENCE
THEORY

1. Course Description

Programme:	M.Sc. Computer Science (AI & ML)	Max. Hours: 45
Course Code:	P24/CAI/DSC/101	Hours per week: 3
Course Type:	DISCIPLINE SPECIFIC CORE	Max. Marks: 100
No. of credits:	3	

2. Course Objectives

- Learn to explore and analyze mega data from various sources.
- To optimize business processes or for decision support.

3. Course Outcomes

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

CO1: *Illustrate* and *explain* the various stages of data science. (Cognitive level – 2)

CO2: *Analyze & Use* of NoSQL databases. (Cognitive level – 3,4)

CO3: *Apply* NoSQL development tools on different types of NoSQL Databases. (Cognitive level - 5)



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4. Course Content**MODULE I: INTRODUCTION TO DATA SCIENCE****(15 Hrs.)**

Benefits and uses, Facets of data, The data science process, Applications of data science. Overview of the data science process- Retrieving data, Cleansing, integrating, and transforming data, Exploratory data analysis, Build the models.

MODULE II: GRAPH AND XML DATABASES**(15 Hrs.)**

Graph Databases – Graphs and graph structures, graph data structures, the property graph model, storing property graphs in relational tables, advanced graph models. XML Databases – XML concepts, XML query languages, storing XML in relational databases, native XML storage. Key value storage – map reduce, Document databases – JSON, REST

MODULE III: OBJECT AND DISTRIBUTED DATABASES**(15 Hrs.)**

Column stores – column wise storage, column striping. Object Databases – Object orientation, object relational mapping, object mapping APIs, object databases Distributed Databases – scaling horizontally, distribution transparency, failure in distributed systems. Data fragmentation – properties, types of fragmentation, fragmentation approaches, data allocation.



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5. References

1. Davy Cielen, Arno D. B. Meysman and Mohamed Ali, Manning, 2016.
2. Advanced Data Management: For SQL, NoSQL, Cloud and Distributed.
3. Databases (De Gruyter Textbook) by Lena Wiese, 29 October 2015.
4. The Art of Data Science by Roger D Peng and Elizabeth Matsui.
5. NoSQL Distilled by Pramod J. Sadalage Martin Fowler, Addison-Wesley, 2013.
6. Next Generation Databases NoSQL, NewSQL, and Big Data by Guy Harrison, APress 2015.
7. NoSQL for Mere Mortals by Dan Sullivan, Addison-Wesley, 2015.

6. Syllabus Focus

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

Local/Regional/National /Global Development Needs	Relevance
Global Development	Fundamentals of data science are essential for advancing global development goals by enabling evidence-based decision-making, predictive modeling, resource optimization, monitoring and evaluation, equity promotion, and capacity building. Organizations can accelerate progress towards achieving sustainable development outcomes and improving the well-being of communities worldwide.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1	Learn benefits, different facets of data, and overview of data science process.
EMP	Modules 2 and 3	Represent data using NoSQL formats.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Troubleshoot (debug) code

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 2 – Assignment	
CO3	CIA 2 – Lab	



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

FUNDAMENTALS OF DATA SCIENCE
MODEL QUESTION PAPER
THEORY

Course Code: P24/CAI/DSC/101
Credits: 3

Max Marks: 60
Time: 2 ½ Hrs.

SECTION – A

I. Answer the following

3 x 12 = 36

1. Explain the main categories of data in data science in detail.

OR

2. Explain in detail the steps followed in the data science process with the help of a diagram.

3. Explain how data is represented in graph structures. Explain with an example the graph models.

OR

4. Explain the XML format of the database with key value storage in detail.

5. Explain the need for data fragmentation. Explain the properties for fragmentation and the various approaches of fragmentation.

OR

6. Explain the techniques of distributing the databases in detail.

SECTION – B

II. Answer any FOUR

4 x 6 = 24 M

7. Explain applications of data science in detail.

8. Explain in detail data cleaning, integrating and transforming of data with the help of diagrams.

9. Explain how to document databases using JSON

10. Explain advanced graph models in detail.

11. Explain how to store data column wise and need for striping it with an example.

12. Explain distribution transparency in detail.

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Semester –I
Mathematics for AI
THEORY

1.Course Description**Programme: M.Sc. Computer Science (AI & ML)****Max. Hours: 45****Course Code: P24/CAI/DSC/102****Hours per week: 3****Course Type: DSC****Max. Marks: 100****No. of credits: 3****2.Course Objectives:**

1. To provide a modern elementary introduction to linear algebra.
2. To aid in the objective of extracting valuable insights from datasets which is crucial across diverse fields.

3.Course Outcomes:

CO 1 : Apply elementary matrix operations, rank of a matrix and system of linear equations (**Apply**)

CO 2 : Discuss inner product and Gram-Schmidt's process of orthogonalization (**Discuss**)

CO 3 : Categorize the concept of probability and random variables (**Categorize**)



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4.Course Content**MODULE I:****(15 Hrs)**

Elementary matrix operations and elementary matrices, the rank of a matrix and matrix inverses. Systems of linear equations – Theoretical aspects, systems of linear equations, computational aspects.

Sections: 3.1, 3.2; Pg No's 147- 168

Sections: 3.3, 3.4; Pg No's 168-175,182-198

MODULE II:**(15 Hrs)**

Inner Product and Norms, Orthogonal and orthonormal vectors, the Gram-Schmidt orthogonalization process, orthogonal complements and orthogonal projections.

Sections: 6.1, 6.2; Pg No's. 329 to 355

MODULE III:**(15 Hrs)**

Probability – Basic terminology, mathematical definition of probability, some theorems of probability, boole's inequality, Conditional probability, Independent events, multiplication theorem of probability, Baye's theorem. (no proofs)

Random variables and problems related to discrete random variable and continuous random variable.

Sections: 3.1, 3.3, 3.4, 3.9.3, 3.10, 3.12, 3.13, 4.2 ; Pg No's 3.2,3.4, 3.6, 3.30-3.36, 3.42-3.46, 4.4-4.11


Sections: 5.1-5.4 ; Pg No's. 5.2 - 5.10

Reference Books:

1. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence; Linear Algebra.
2. S.C. Gupta and V.K. Kapoor's, Fundamentals of Mathematical Statistics S. Chand & Co., New Delhi.
3. David C Lay, Linear Algebra and its Applications (4th edition).
4. Sheldon Axler; Linear Algebra Done Right.
5. Probability and Statistics T. K. V Iyengar, B Krishna Gandhi, S. Ranganatham, M.V.S.S.N Prasad, Chand Series.

6. Syllabus Focus**a) Relevance to Local, Regional, National and Global Development Needs**

Local /Regional/National /Global Development Needs	Relevance
Global	<p>Matrix multiplication is used in image processing to perform transformations such as rotations, scaling, and shearing.</p> <p>Applications of Continuous Random Variables in Real-World Scenarios · Stock prices: The prices of stocks are often</p>


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	modeled using continuous random variables.
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b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 1: Matrix Operations and System of linear equations	Using sage software
Employability	Module 2: Inner product Spaces	Using mathematica software and explore orthogonal components
Skill Development	Module 3: Probability	Using R-software

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative Learning	Skill Tests
2.	Experiential Learning	Seminars



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3.	Problem solving	Group Discussions, Assignments
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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-I(Written Exam)	End Semester Examination
CO2	CIA-I(Written Exam)	
CO3	CIA-II (Skill Tests)	



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THEORY
MODEL QUESTION PAPER
THEORY

Course code: P24/CAI/DSC/102

Max. Marks: 60

No. of credits: 3

Time: 2 Hrs

SECTION-A

I. Answer the following:

3 x 12 = 36 M

1. Let A be an $m \times n$ matrix. If P and Q are invertible $m \times m$ and $n \times n$ matrices respectively, then prove that (i) $\text{rank}(AQ) = \text{rank}(A)$.
(ii) $\text{rank}(PA) = \text{rank}(A)$.
(iii) $\text{rank}(PAQ) = \text{rank}(A)$.

OR

2. Solve the system by Gaussian Elimination method
 $2y + 4z = 2$, $2x + 4y + 2z = 3$, $3x + 3y + z = 1$.
3. Define norm of inner product space. Prove that $\|x+y\|^2 + \|x-y\|^2 = 2\|x\|^2 + 2\|y\|^2$ for all $x, y \in V$.

OR

4. State and prove Gram Schmidt process.
5. (i) State and prove Baye's theorem. (ii) In a bolt factory machine A, B and C manufacture respectively 25%, 35%, 40% of the total of their outputs 5%, 4%, 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B, C?

OR

6. A random variable X has the following probability distribution:

X	0	1	2	3	4	5	6	7
P(X)	0	K	2k	2k	3k	K ²	2k ²	7k ² +k

- (i). Find k
(ii) Evaluate $P(X < 6)$, $P(X \geq 6)$ and $P(0 < X < 5)$ (iii) if $P(X \leq c) > 12$, Find the minimum value of c, and (iv) Determine the distribution function of X.



PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

SECTION –B

II. Answer any **FOUR**

4 x 6 = 24 M

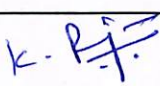
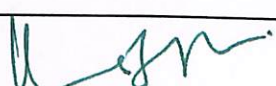
7. Find the rank of the matrix $A = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{pmatrix}$
8. Prove that for the system $Ax=0$ $K = N(L_A)$.
9. State and prove Triangle Inequality.
10. Check whether this set $S = \{(\frac{1}{\sqrt{5}}, \frac{2}{\sqrt{5}}), (\frac{2}{\sqrt{5}}, \frac{-1}{\sqrt{5}})\}$ orthonormal.
11. If A and B are independent events then A, B are also independent events.
12. In a single throw of three dice, find the probability of getting a sum of
(i) 5 (ii) at least 5.

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
1	15	CO-1	2	12	2	8
2	15	CO-2	2	12	2	8
3	15	CO-3	2	12	2	8

9. CO-PO Mapping

CO	PO	Cognitive Level	Class room sessions(hrs)
1	1,2	Applying	15
2	1,2	Understanding	15
3	1,2	Analysing	15

Prepared by Course Teacher	Checked & Verified by	Approved by Principal
 K.Ramanjana Teaching Faculty	Rekha R J Head, Dept. of Mathematics	 Dr. Uma Joseph Principal, St. Francis College for Women

 **PROFESSOR**
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

DEPARTMENT OF COMPUTER SCIENCE,
ST. FRANCIS COLLEGE FOR WOMEN, HYDERABAD - 16