

**SEMESTER -IV  
EXPERT SYSTEMS  
THEORY**

**1. Course Description**

**Programme:** MSc. Computer Science AI & ML

**Course Code:** P24/CAI/DSE/402

**Course Type:** DISCIPLINE SPECIFIC ELECTIVE

**No. of credits:** 3

**Max. Hours:** 45

**Hours per week:** 3

**Max. Marks:** 100

**2. Course Objectives**

- Understand the basic techniques of artificial intelligence & expert systems.
- Understand the non-monotonic reasoning and statistical reasoning.
- To study different applications like Game Playing Expert Systems.

**3. Course Outcomes**

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

**CO1:** Discuss the concepts of an expert system and its tools. (Cognitive levels – 3)

**CO2:** Understand the importance of building an expert system. (Cognitive levels – 2)

**CO3:** Implement various problems solutions with an expert system. (Cognitive levels – 6)



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#### 4. Course Content

##### MODULE I: INTRODUCTION TO EXPERT SYSTEMS

(15Hrs.)

Introduction to Expert Systems, Architecture of expert systems, Representation and organization of knowledge, Basics characteristics, and types of problems handled by expert systems.

##### MODULE II: EXPERT SYSTEM TOOLS

(15Hrs.)

Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.

##### MODULE III BUILDING AN EXPERT SYSTEM

(15Hrs.)

Expert system development, Selection of the tool, Acquiring Knowledge, Building process. Problems with Expert Systems: Difficulties, common pitfalls in planning, dealing with domain experts, difficulties during development.

#### 5. References

1. Waterman D.A., "A Guide to Expert Systems", Addison Wesley Longman. 1986.
2. Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley.
3. Weiss S.M. and Kulikowski C.A., "A Practical Guide to Designing Expert Systems", Rowman & Allanheld, New Jersey. R
4. Patterson, Artificial Intelligence & Expert System, Prentice Hall India, 1999.

#### 6.Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global Development	Expert System solves a problem accurately, faster. Interactive & easy to solve complicated issues.



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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	Ability to design and develop Hybrid expert systems for solving real world problems.
EMP	Modules 3	Highly valued by employers where critical thinking and problem-solving skills are required.

**7. Pedagogy**

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz, Group Discussion
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

## EXPERT SYSTEMS

MODEL QUESTION PAPER  
THEORY

Course Code: P24/CAI/DSE/402  
Credits: 3

Max Marks: 60  
Time: 2 ½ Hrs.

## I: Answer the following

3 x 12 = 36

1. What is an expert system? Explain the architecture of expert systems.

OR

2. Explain the types of problems handled by expert systems.

3. Explain system-building aids.

OR

4. Explain the stages in the development of expert systems.

5. Explain Building process of expert systems.

OR

6. Outline some of the main technical problems one must overcome when attempting to build a successful Expert System for a new domain.

## II. Answer any Four:

4 x 6 = 24

7. Write a short note on expert systems.

8. Explain the basic characteristics of an expert system.

9. Write a short note on support facilities.

10. Write a short note on knowledge engineering.

11. Explain the difficulties & common pitfalls in planning.

12. In the context of Expert Systems, describe what the term "knowledge acquisition" covers.



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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

*Sfe*

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**SEMESTER IV**

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

## SEMESTER -IV

## EXPERT SYSTEMS

## PRACTICAL

**1.Course Description****Programme: M.Sc. Computer Science (AI & ML)****Course Code: P24/CAI/DSE/402/P****Course Type: DSE****No. of credits: 2****Max. Hours: 60****Hours per week: 4****Max. Marks: 50****2.Course Objective**

- To understand the concepts of expert systems.
- To apply the logic for making decisions using computers to address challenging issues.

**3.Course Outcomes****CO1:** Apply the good programming skills to formulate the solutions for computational problems.**CO2:** Design and develop an Expert System that operates in a realistic problem domain and communicates effectively in a team or individual and to prepare reports.**4. Practical Sessions**

1. Developing a mini project to solve the problem.



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## MODEL QUESTION PAPER

EXPERT SYSTEMS  
PRACTICAL

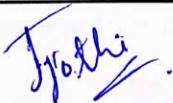

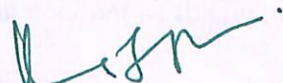
COURSE CODE: P24/CAI/DSE/402/P

Max.Marks: 50

Exam Duration: 2 hrs

Answer the following.

1. Demonstrating the Mini project.

Prepared by	Checked & Verified by	Approved by
 Ms. B. Jyothi P.G. Coordinator Dept. of Computer Science	 Ms. D. Sowjanya Head of the Department, Dept. of Computer Science	 Dr. Uma Joseph Principal, St. Francis College for Women



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## SEMESTER - IV

INFORMATION RETRIEVAL SYSTEM  
THEORY

## 1. Course Description

Programme: M.Sc. Computer Science (AI &amp; ML)

Course Code: P24/CAI/DSC/401

Course Type: DISCIPLINE SPECIFIC CORE

No. of credits: 3

Max. Hours: 45

Hours per week: 3

Max. Marks: 100

## 2. Course Objectives

- To understand indexing and querying in information retrieval systems
- To study text classification and clustering
- To learn about web searching

## 3. Course Outcomes

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

CO1: Apply the algorithms and techniques for information retrieval (Cognitive Level – 3)

CO2: Classify and cluster documents (Cognitive Level – 4)

CO3: Evaluate information retrieval systems (Cognitive Level - 5)



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#### 4. Course Content

##### MODULE I: BOOLEAN RETRIEVAL AND INDEXING

(15 Hrs.)

Boolean Retrieval - example information, building an inverted index, processing Boolean queries; the term vocabulary and postings lists - document delineation and character sequence decoding, determining the vocabulary of terms, faster postings list intersection via skip pointers, positional postings, and phrase queries; dictionaries and tolerant retrieval - search structures for dictionaries, wildcard queries, spelling correction; index construction - hardware basics, blocked sort-based indexing, single-pass in-memory indexing, distributed indexing, dynamic indexing

##### MODULE II: EVALUATION AND RELEVANCE FEEDBACK

(15 Hrs.)

Scoring, term weighting and the vector space model - parametric and zone indexes, term frequency and weighting, the vector space model for scoring, and variant TF-IDF functions; computing scores in a complete search system - efficient scoring and ranking, components of an information retrieval system, vector space scoring and query operator interaction; evaluation in information retrieval - information retrieval system evaluation, standard test collections, evaluation of unranked retrieval sets, evaluation of ranked retrieval results, assessing relevance; relevance feedback and query expansion - relevance feedback and pseudo relevance feedback, global methods for query reformulation

##### MODULE III: RANKING AND WEB CRAWLING

(15 Hrs.)

Probabilistic information retrieval - basic probability theory, the probability ranking principle, the binary independence model; matrix decompositions and latent semantic indexing - linear algebra review, term document matrices and singular value decompositions, low-rank approximations, latent semantic indexing; web search basics - background and history, web characteristics, advertising as the economic model, the search user experience, index size and estimation, near-duplicates and shingling; web crawling and indexes - overview, crawling, distributing indexes, connectivity servers; link analysis -the web as a graph, page rank, hubs and authorities

#### 5. References

1. An Introduction to Information Retrieval by Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, Cambridge University Press, Cambridge, England, 2008.
2. Information Retrieval – Algorithms and Heuristics -2E by David A. Grossman, Ophir Frieder, Springer, 2004.
3. Information Storage and Retrieval Systems by Gerald J Kowalski, Mark T Maybury., Springer, 2000.
4. Mining the Web: Discovering Knowledge from Hypertext Data by Soumen Chakrabarti, Morgan-Kaufmann Publishers, 2002.



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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	Information Retrieval systems are designed to retrieve relevant information from vast amounts of data, which can be distributed globally.

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

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	Design solutions to given problems using relevant programming modules
EMP	Modules 3	Build web-based information retrieval systems

## 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 – Written	Written Exam
CO2	CIA 2 – Assignment	
CO3	CIA 3 – Lab Exercise	



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## b) Model Question Paper- End Semester Exam

## INFORMATION RETRIEVAL SYSTEM

MODEL QUESTION PAPER  
THEORYCourse Code: P24/CAI/DSC/401  
Credits: 3Max Marks: 60  
Time: 2 ½ Hrs.

## I: Answer the following:

3 x 12 = 36

1. Explain the steps involved in building an inverted index  
OR
2. Explain construction of single pass in memory index with an example
3. Write in detail about the components of an information retrieval system  
OR
4. What are the steps involved in evaluation of unranked retrieval sets
5. Explain link analysis with an appropriate example  
OR
6. Write in detail about low rank approximations.

## II. Answer any Four:

4 x 6 = 24

7. Write a short note on skip pointers.
8. Explain the processing of using wildcard queries.
9. What is the importance of vector space scoring?
10. Differentiate between relevance feedback and pseudo relevance feedback
11. Write a short note on latent semantic analysis.
12. What is shingling?



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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	2,3	3	15
2	3,4	4	15
3	5,6	5	15



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## SEMESTER - IV

INFORMATION RETRIEVAL SYSTEM  
PRACTICAL**3. Course Description**

**Programme:** M.Sc. Computer Science (AI & ML)  
**Course Code:** P24/CAI/DSC/401/P  
**Course Type:** DISCIPLINE SPECIFIC CORE  
**No. of credits:** 2

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

**2. Course Objectives**

Study the algorithms of an information retrieval system

**3. Course Outcomes**

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

CO1: Identify and apply IRS concepts to solve real world problems.

CO2: Use NLTK, scikit, PyTorch, TensorFlow, Flask, Django, Beautiful Soup and other relevant Python libraries to generate accurate solutions for IRS domain problems

**4. Practical Sessions**

1. Document selection and preprocessing
2. Indexing a document
3. Processing document queries
4. Implementing ranking models
5. Incorporating evaluative metrics
6. Designing UI for sample IRS
7. Experiment with relevance feedback
8. Implementing web crawler
9. Mini project



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## MODEL QUESTION PAPER

INFORMATION RETRIEVAL SYSTEM  
PRACTICAL

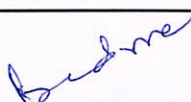

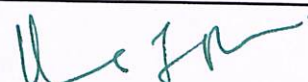
COURSE CODE: P24/CAI/DSC/401/P

Max.Marks: 50

Exam Duration: 2 hrs

Answer any one of the following.

1. Write a program to generate indexes on a document.
2. Write a program to incorporate evaluative metrics.
3. Write a program to implement a ranking model.
4. Write a program to implement web crawler.
5. Write a program to design UI for sample IRS

Prepared by	Checked & Verified by	Approved by
 Ms. Padmashree Josyula (Faculty, Department of Computer Science)	 Ms. D.Sowjanya (HoD, Dept of Computer Science)	 Dr. Uma Joseph (Principal, St.Francis College for Women)al



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**SEMESTER - IV****NATURAL LANGUAGE PROCESSING  
THEORY****1. Course Description**

<b>Programme:</b>	<b>M.Sc. Computer Science (AI &amp; ML)</b>	<b>Max. Hours: 45</b>
<b>Course Code:</b>	<b>P24/CAI/DSC/402</b>	<b>Hours per week: 3</b>
<b>Course Type:</b>	<b>DISCIPLINE SPECIFIC CORE</b>	<b>Max. Marks: 100</b>
<b>No. of credits:</b>	<b>3</b>	

**2. Course Objectives**

- To define and recognize the basic concepts and principles of natural language processing
- To demonstrate ability in text processing techniques
- To design a computational model of natural language

**3. Course Outcomes**

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

CO1: Apply Python and NLTK to access and process text (Cognitive Level – 3)

CO2: Extract meaningful information from text data using NLP processing (Cognitive Level – 4)

CO3: Evaluate text classification and apply NLTK to perform syntactic analysis and parsing on sentences (Cognitive Level - 5)



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#### 4. Course Content

##### MODULE I: NLP and NLTK OVERVIEW

(15 Hrs.)

Language Processing and Python - texts and words, texts as lists of words, simple statistics, making decisions and taking control, automatic natural language understanding; accessing text corpora and lexical resources - accessing text corpora, conditional frequency distributions, lexical resources, WordNet

##### MODULE II: NLP STAGES

(15 Hrs.)

Processing raw text: accessing text from the web and from disk, strings, text processing with Unicode, regular expressions for detecting word patterns, useful applications of regular expressions, normalizing text, regular expressions for tokenizing text, segmentation, formatting; categorizing and tagging words - using a tagger, tagged corpora, mapping words to properties using python dictionaries, automatic tagging, n-gram tagging, transformation-based tagging, determining the category of a word

##### MODULE III: TEXT CLASSIFICATION AND CFG

(15 Hrs.)

Learning to Classify Text - supervised classification, evaluation, Naive Bayes classifiers extracting information from text - information extraction, chunking, developing and evaluating chunkers, recursion in linguistic structure, named entity recognition, relation extraction. analyzing sentence structure – basic grammar, use of syntax, context-free grammar, parsing with context-free grammar

#### 5. References

1. Natural Language Processing using Python by Steven Bird, Ewan Klein, Edward Loper, 1st edition, O'Reilly Publications, 2009.
2. Natural Language Processing in Action: Understanding, Analyzing, and Generating Text with Python, Hobson Lane, Cole Howard, Hannes Hapke, Manning, 2019
3. Speech and Language Processing- Daniel Jurafsky, James H Martin, 2nd edition, PHI, 2008.
4. Natural Language Processing Recipes: Unlocking Text Data with Machine Learning and Deep Learning using Python, Akshay Kulkarni, Adarsha Shivananda, Apress, 2019



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

<b>Local /Regional/National /Global Development Needs</b>	<b>Relevance</b>
Global Development	Natural Language Processing (NLP) has significant implications on a global scale, influencing various aspects of communication, information processing, and cross-cultural understanding.

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

<b>SD/ED/EMP</b>	<b>Syllabus Content</b>	<b>Description of Activity</b>
<b>SD</b>	Modules 1 and 2	Design solutions to given problems using NLP algorithms
<b>EMP</b>	Modules 3	Identify document similarity using classification

**7. Pedagogy**

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

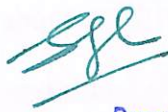


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**8. Course Assessment Plan****a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination**

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b) **Model Question Paper- End Semester Exam****NATURAL LANGUAGE PROCESSING****MODEL QUESTION PAPER  
THEORY**

**Course Code: P24/CAI/DSC/402**  
**Credits: 3**

**Max Marks: 60**  
**Time: 2 ½ Hrs.**

**I: Answer the following:**

**3 x 12 = 36**

1. Explain about the different language understanding techniques using appropriate examples  
OR
2. How is conditional frequency distribution useful for text processing? Explain with an example
3. Define the various stages of NLP and elaborate their significance.  
OR
4. Explain the use of regular expressions for tokenizing text. Use appropriate examples
5. What is meant by parts of speech tagging? Explain the process of entity name normalization.  
OR
6. Explain parsing with context-free grammar with an appropriate example.

**II. Answer any Four:**

**4 x 6 = 24**

7. Write a short note on text corpora.
8. What is WordNet?
9. Explain the process of normalizing text with an example
10. What are regular expressions?
11. Write a short note on latent semantic analysis.
12. Explain supervised classification.

  
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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
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II	15	2	2	12	2	6
III	15	3	2	12	2	6

## 9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions(hrs)
1	1	3	15
2	2	4	15
3	2	5	15



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**SEMESTER - IV****NATURAL LANGUAGE PROCESSING  
PRACTICAL****1. Course Description**

<b>Programme:</b>	<b>M.Sc. Computer Science (AI &amp; ML)</b>	<b>Max. Hours: 60</b>
<b>Course Code:</b>	<b>P24/CAI/DSC/402/P</b>	<b>Hours per week: 4</b>
<b>Course Type:</b>	<b>DISCIPLINE SPECIFIC CORE</b>	<b>Max. Marks: 50</b>
<b>No. of credits:</b>	<b>2</b>	

**2. Course Objectives**

- Develop NLP algorithms using NLTK, scikit

**3. Course Outcomes**

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

CO1: Identify and apply NLP concepts to solve real world problems.

CO2: Use NLTK, scikit, and other relevant Python libraries to generate accurate solutions for NLP domain problems

**4. Practical Sessions**

1. Working with Regular expressions
2. Performing text preprocessing – tokenization, validation, stemming
3. Performing morphological analysis
4. Implementing n-gram extraction
5. Implementing POS tagging
6. Implement chunking to extract noun phrases
7. Identify semantic relationships between the words from the given text using WordNet dictionary
8. Perform Named Entity Recognition (NER) on given text
9. Mini project (Retrieval based chatbot/Search based chatbot)



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## MODEL QUESTION PAPER

## NATURAL LANGUAGE PROCESSING

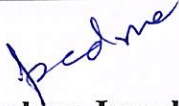


COURSE CODE: P24/CAI/DSC/402/P

Max. Marks: 50

Exam Duration: 2 Hrs.

Answer any one of the following.

1. Write a program to perform POS tagging.
2. Write a program to perform morphological analysis.
3. Write a program to implement bi-gram extraction.
4. Write a program to implement chunks on given text to extract noun phrases.
5. Write a program to perform NER on given text.

Prepared by	Checked & Verified by	Approved by
 Ms. Padmashree Josyula (Faculty, Department of Computer Science)	 Ms. D. Sowjanya (HoD, Dept of Computer Science)	 Dr. Uma Joseph (Principal, St. Francis College for Women)



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**SEMESTER - ~~IV~~**  
**REINFORCEMENT LEARNING**  
**THEORY**

**1. Course Description**

<b>Programme:</b>	<b>M.Sc. Computer Science (AI &amp; ML)</b>	<b>Max. Hours: 45</b>
<b>Course Code:</b>	<b>P24/CAI/DSE/401</b>	<b>Hours per week: 3</b>
<b>Course Type:</b>	<b>DISCIPLINE SPECIFIC ELECTIVE</b>	<b>Max. Marks: 100</b>
<b>No. of credits:</b>	<b>3</b>	

**2. Course Objectives**

- To introduce students, the essentials of Reinforcement Learning.
- To introduce students to the major ideas, methods, and techniques of Reinforcement Learning for dynamic learning of the environment.
- To develop an appreciation for various issues in the environment and learns from the consequences of its actions.

**3. Course Outcomes**

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

CO1: **Illustrate** and **explain** dynamic learning and decision process.  
(Cognitive levels – 2)

CO2: **Apply** Monte Carlo methods that rely on repeated random sampling to obtain numerical results.  
(Cognitive level – 3,4)

CO3: **Choose** and **Design** the Temporal Difference and Tabular Methods for learning environment.  
(Cognitive levels – 5,6)



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#### 4. Course Content

##### **MODULE 1: INTRODUCTION TO REINFORCEMENT LEARNING AND FINITE MARKOV DECISION PROCESSES**

**(15 Hrs.)**

Introduction: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and scope. Finite Markov Decision Processes: The Agent-Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notation for Episodic and Continuing Tasks, Policies and Value Functions, Optimal Policies and Optimal value functions, Optimality and approximation.

##### **MODULE 2: DYNAMIC PROGRAMMING, MONTE CARLO METHODS**

**(15 Hrs.)**

Dynamic programming: Introduction, Policy Evaluation, Policy improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic programming, Generalized policy iteration, Efficiency of Dynamic Programming. Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy Prediction via Importance Sampling.

##### **MODULE 3: TEMPORAL DIFFERENCE LEARNING, PLANNING AND LEARNING WITH TABULAR METHODS**

**(15 Hrs.)**

Temporal Difference Learning: TD Prediction, Advantages of TD Prediction Methods, Optimality of TD(0), Sarsa: On-policy TD control, Q-learning: Off-policy TD control.

Planning and Learning with Tabular Methods: Models and Planning, Dyna: Integrating planning, acting and Learning, Prioritized Sweeping, Expected vs. Sample Updates, Trajectory Sampling, Real-Time Dynamic Programming, Planning at Decision Time, Heuristic Search, Rollout algorithms, Monte Carlo Tree Search.

#### 5. References

1. "Reinforcement Learning: An Introduction", Richard S. Sutton and Andrew G. Barto, 2 nd Edition, 2018.
2. "Reinforcement Learning Algorithms: Analysis and Applications," Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, and Jan Peters First Edition, Springer 2021.
3. Alexander Zai and Brandon Brown "Deep Reinforcement Learning in Action," First Edition, Manning Publications 2020.



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

<b>Local /Regional/National /Global Development Needs</b>	<b>Relevance</b>
Global Development	Reinforcement Learning is driven by the demand for intelligent systems that can learn, adapt, and make decisions in complex and uncertain environments across various domains and industries.

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

<b>SD/ED/EMP</b>	<b>Syllabus Content</b>	<b>Description of Activity</b>
SD	Modules 1 and 2	Applying Finite Markov Decision processes, Monte Carlo Methods.
EMP	Modules 3	Testing and evaluating Temporal Difference Learning, Tabular Methods



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**7. Pedagogy**

S. No	Student Centric Methods	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Designing algorithms and techniques to enable agents to learn optimal behaviour in sequential decision-making tasks.

**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****REINFORCEMENT LEARNING****MODEL QUESTION PAPER  
THEORY****Course Code:P24/CAI/DSE/401****Max Marks: 60****Credits: 3****Time: 2 ½ Hrs.****I: Answer any Three****3 x 12 = 36**

1. Define Reinforcement Learning. Explain in detail about elements of Reinforcement Learning and its limitations.

OR

2. Discuss Agent-Environment Interface. Explain in detail about Unified Notation for Episodic and Continuing Tasks.

3. Describe in detail about Asynchronous Dynamic programming and its efficiency.

OR

4. Explain in detail about Monte Carlo Prediction and Estimation.

5. Describe about Sarsa: On-policy TD control and Q-learning: Off-policy TD control.

OR

6. Define Planning and Learning with Tabular Methods. Explain in detail about Trajectory Sampling.

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

7. Discuss optimal policies and optimal value functions.

8. Define Finite Markov Decision Processes. Write a short note on Goals and Rewards.

9. Briefly describe policy evaluation and improvement of dynamic programming.

10. Write a short note on Monte Carlo Control.

11. Explain the advantages of TD Prediction Methods.

12. Write a short note on Rollout algorithms.



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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 IV**  
**REINFORCEMENT LEARNING**  
**PRACTICAL**

**1.Course Description****Programme: M.Sc. Computer Science (AI & ML)****Max. Hours: 60****Course Code: P24/CAI/DSE/401/P****Hours per week: 4****Course Type: DSE****Max. Marks: 50****No. of credits: 2****2.Course Objective**

To explore various techniques of Learning environment dynamically and computing the complex decision.

**3.Course Outcomes****CO1:** Exploring Reinforcement learning techniques.**CO2:** Applying Reinforcement learning techniques to show the decision making of a particular use case.**4. Practical Sessions**

An appropriate mini project on Applying the Reinforcement Learning Algorithms for the following use cases.

1. Autonomous vehicle management.
2. Health care.
3. Supply chain management.
4. Recommendation systems.
5. Intelligent assistant.



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## MODEL QUESTION PAPER

REINFORCEMENT LEARNING  
PRACTICAL

COURSE CODE: P24/CAI/DSE/401/P

Max.Marks: 50

Exam Duration: 2 hrs

1.Evaluation of Projects &amp; Viva.

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



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