

**MADHYA PRADESH BHOJ (OPEN) UNIVERSITY,
Raja Bhoj Marg Kolar Road, BHOPAL (M.P.)**



**DIPLOMA IN
ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
(from Calendar Year 2023)**

**MADHYA PRADESH BHOJ (OPEN) UNIVERSITY,
Raja Bhoj Marg Kolar Road, BHOPAL (M.P.)**

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04/09/2023

Detailed Syllabi
1st Year

1 st Year	Course Code	Title of the Course	Credits
I	11	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	6

Course objectives

- The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches.
- Develop a basic understanding of the building blocks of AI as presented in terms problem, problem space: Search, Knowledge representation, inference, logic, and learning.

Course outcome

By the end of this course, you should be able to:

- Create AI solutions for various business problems.
- Build and deploy production grade AI applications.
- Apply methods, techniques and tools immediately.
- To gain experience of doing independent study and research.

Unit 1:

AI - Problems and Search: Introduction: The Artificial Intelligence (AI) Problem – What is an AI technique - Criteria for success. Problems, Problem Spaces, Search: Defining Problems, Problem Spaces, Search State space search - Production Systems – Problem characteristics - Production system characteristics – Application areas.

Unit 2 :

Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First search - Problem reduction – constraint satisfaction - Means-end analysis.

Unit 3:

AI - Knowledge Representation: Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.

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Unit 4 :

Using Predicate logic: Representing simple facts in logic – Representing Instance and ISA relationships - Computable functions and predicates -Resolution. Representing knowledge using rules: Procedural Vs Declarative knowledge –Logic programming - Forward Vs-Backward reasoning - Matching – Control knowledge.

Unit 5 :

AI –Learning : What is learning – Rote learning - Learning by taking advice – learning in problem solving.

Unit 6 :

Learning from examples: Induction - Explanation-based learning - discovery - analogy formal learning theory – Neural Net Learning and Genetic Learning.

Reference and text books:

1. Dan W. Patterson, "*Introduction to AI and ES*", Pearson Education.
2. Dheeraj Mehrotra(2019), *Basics of Artificial Intelligence & Machine Learning*. Notion Press.
3. Elaine Rich and Kevin Knight(1991)," *Artificial Intelligence*", Second Edition,Tata – McGraw Hill, Publishers company Pvt Ltd.
4. Kevin Night, Elaine Rich, Nair B.(2008), "*Artificial Intelligence (SIE)*", McGraw Hill.
5. Stuart Russel, Peter Norvig (2007), "*AI – A Modern Approach*", 2nd Edition, Pearson Education.
6. Venugopal C.K(2019), *Artificial Intelligence and Machine Learning*, Pacific Books International.

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1 st Year	Course Code	Title of the Course	Credits
2	12	RELATIONAL DATABASE MANAGEMENT SYSTEM (RDBMS)	6

Course Objectives:

- To understand the fundamentals of data models
- To make a study of SQL and relational database design.
- To know about data storage techniques and query processing.
- To impart knowledge in transaction processing, concurrency control techniques and External storage

Course Requirements:

- Knowledge about the basic concepts of the database.

Course Outcome:

By the end of this course, you should be able to:

- Design a database using ER diagrams and map ER into Relations and normalize the relations
- Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- Develop a simple database application using normalization.

Unit 1 :

Data base System Applications, data base System VS file System - View of Data - Data Abstraction - Instances and Schemas - data Models - the ER Model - Relational Model Other Models - Database Languages - DDL - DML - database Access for applications Programs - data base Users and Administrator - Transaction Management - data base System Structure - Storage Manager - the Query Processor.

Unit 2

History of Data base Systems - Data base design and ER diagrams - Beyond ER Design Entities, Attributes and Entity sets - Relationships and Relationship sets - Additional features of ER Model - Concept Design with the ER Model - Conceptual Design for Large enterprises.

Unit 3 :

Relational Model: Introduction- Integrity Constraint Over relations - Enforcing Integrity constraints - Querying relational data - Logical data base Design - Introduction to Views -

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Destroying / altering Tables and Views.

Unit 4 :

Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews - Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

Unit 5 :

Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – joins- Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases. Schema refinement.

Unit 6 :

Normal forms: Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms - BCNF.

Reference and text Books:

1. Colin Ritchie (2004), *Relational Database Principles*, 3rd Edition, Cengage Learning Business Press.
2. Elmasri Navrate, *Fundamentals of Database Systems*, Pearson Education.
3. Peter Rob & Carlos Coronel, *Data base Systems design, Implementation, and Management*, 7th Edition.
4. Raghurama Krishnan, Johannes Gehrke(2003), *Data base Management Systems*, 3rd Edition, TATA McGrawHill.
5. Silberschatz, Korth(2011), *Data Base System Concepts*, 6th Edition, Tata McGraw Hill.
6. Sharad Maheswari and RuchinJain(2006), *Database management systems Complete Practical Approach*, Firewall media.

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1 st Year	Course Code	Title of the Course	Credits
3	13	R PROGRAMMING	6

Course objectives

- This course aims to provide a knowledge about R programming language.
- Student will learn how to use R for effective data analysis.
- By the end of the day-long course, the user will be comfortable operating in the R environment, including importing external data, manipulating data for specific needs, and running summary statistics, machine learning algorithms and visualizations.
- This course helps participants to have a good understanding of the methods, methodologies and techniques from the basics of statistics to obtain supporting evidence through data

Course outcome

By the end of this course, you should be able to:

- Download and install R
- Navigate and optimise the R integrated development environment (IDE) R Studio
- Install and load add-in packages
- Import external data into R for data processing and statistical analysis
- Learn the main R data structures
- Compute basic summary statistics
- produce data visualizations

Unit 1

Introduction to R – History of R - Features of R - Essentials of the R language – R-Environment setup – Basic syntax: command prompt, script file, comments. Data types - Variables – assigning, finding, deleting variables- operators: operator types - arithmetic operator – logical operators -assignment operators – logical operators -expressions.

Unit 2

Control statements – Decision making- if – if-else – nested if - switch- loops – repeat- while – for – loop control statements - break – next statement. Functions: function definition - function components –built-in functions – user defined function - calling function - Recursion - Strings: Rules of strings - string manipulation.

Unit 3

Objects in R: Vectors – Vector creation – Vector Manipulation – Lists: Creating a list,

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naming, accessing, manipulating list elements- merge list -converting list to Vector – Arrays- Names columns and rows – Accessing array elements, manipulating array elements – operations of array elements.

Unit 4

Matrices – Accessing elements of Matrix – operations on matrix– Factors – Frames – Create data frames - getting the structure of data frame- Extract data from data frame. Packages – available R packages - install a new package – load package to library - Data reshaping – joining columns and rows in a data frame- merging dt frames – melting and casting

Unit 5

Working with files: CSV file – input CSV, read CSV, analyzing CSV, writing into CSV, Excel file: install, load, input, read excel files - Binary files: reading and writing – XML files: input and read XML files. mySQL package – connection R with mySQL – querying the table – table manipulation: create, insert, drop and update.

Unit 6

Visualizing: R charts and Graphs: R Pie charts: Pie chart title, color- slice percentages and chart legend – 3D Pie chart - Bar charts – Histograms – Line graphs – Scatter plots – creating scatterplot – scatterplot matrices.

Reference and text books:

1. Andrie de Vries, Joris Meys(2016), *R Programming for Dummies*, 2nd édition, Wiley.
2. Brett Lantz(2013), *Machine Learning with R*, Packt Publishing Ltd.
3. Mark Gardener(2013), *Beginning R The Statistical Programming Language*, Kindle edition.
4. Rajendra B. Patil, Hiren Dand & Rupali Dahake(2017), *A practical Approach to R*, ShroffTX-Team; First edition.
5. Scott Burger(2018), *Introduction to Machine Learning with R: Rigorous Mathematical Analysis*, Shroff/O'Reilly.
6. *UCI Machine Learning Repository* : <http://archive.ics.uci.edu/ml/index.php>



1 st Year	Course Code	Title of the Course	Credits
4	14	R Programming LAB	6

Course objectives

- This course aims to provide a knowledge about practical R programming language.
- Student will learn how to use R for effective data analysis.
- By the end of the day-long course, the user will be comfortable operating in the R environment, including importing external data, manipulating data for specific needs, and running summary statistics, machine learning algorithms and visualizations.

Course outcome

By the end of this course, you should be able to:

- Download and install R
- Navigate and optimize the R integrated development environment (IDE) R Studio
- Install and load add-in packages
- Import external data into R for data processing and statistical analysis
- Learn the main R data structures
- Compute basic summary statistics and machine learning
- produce data visualizations

Experiments based on R Programming

- Simple R Programs
- Programs using conditional control statements
- Programs using functions and recursion.
- Problems based on Vectors, List, Arrays, Matrices, Factors and Frames.
- Experiments using packages.
- Problems using files and database.
- Experiments using charts and graphs.
- Experiments to perform statistics(mean, mode, median, normal distribution, binomial distribution) in R.
- Experiments for forecasting numeric data: Regression Methods.
- Experiments for data Visualizations.

Reference books:

7. Andrie de Vries, Joris Meys(2016), *R Programming for Dummies*, 2nd edition, Wiley.
8. Brett Lantz(2013), *Machine Learning with R*, Packt Publishing Ltd.
9. Mark Gardener(2013), *Beginning R The Statistical Programming Language*, Kindle edition.

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10. Rajendra B. Patil, Hiren Dand & Rupali Dahake (2017), *A practical Approach to R*, Shroff/X-Team; First edition.
11. Scott Burger (2018), *Introduction to Machine Learning with R: Rigorous Mathematical Analysis*, Shroff/O'Reilly.
12. UCI Machine Learning Repository : <http://archive.ics.uci.edu/ml/index.php>

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Course of Study and Scheme of Examinations

1 st Year	Course Code	Title of the Course	Credits
1	11	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	6
2	12	RELATIONAL DATABASE MANAGEMENT SYSTEM (RDBMS)	6
3	13	R PROGRAMMING	6
4	14	R Programming LAB	6

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