

Syllabus of
UNDERGRADUATE DEGREE COURSE

Artificial Intelligence and Data Science



Rajasthan Technical University, Kota

Effective from session: 2021 – 2022



RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID2-01: Discrete Mathematics Structure

Credit: 3
3L+0T+0P

Max. Marks: 100(IA:30, ETE:70)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Set Theory: Definition of sets, countable and uncountable sets, Set operations, Partition of set, Cardinality (Inclusion-Exclusion & Addition Principles) Venn Diagrams, proofs of some general identities on sets. Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem. Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction. Composition of Functions. The Pigeonhole and Generalized Pigeonhole Principles.	7
3	Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. 2 way predicate logic. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers.	8
4	Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Combinatorics: Introduction, Permutation and combination, Binomial Theorem, Multimodal Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms, linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating functions.	8
5	Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.	8
6	Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs, matching, vertex/edge covering.	8
Total		40

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID1-03/3AID1-03: Managerial Economics and Financial Accounting

Credit-2
2L+0T+0P

Max. Marks : 100(IA:30, ETE:70)
End Term Exam: 2 Hours

SN	CONTENTS	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Basic economic concepts- Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	Demand and Supply analysis- Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	Production and Cost analysis- Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	Market structure and pricing theory- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	Financial statement analysis- Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
TOTAL		26

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID1-02/3AID1-02: Technical Communication

Credit-2
2L+0T+0P

Max. Marks : 100(IA:30, ETE:70)
End Term Exam: 2 Hours

SN	CONTENTS	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Technical Communication- Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	3
3	Comprehension of Technical Materials/Texts and Information Design & development- Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
4	Technical Writing, Grammar and Editing- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
5	Advanced Technical Writing- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
TOTAL		26



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Syllabus

II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID3-04: Microprocessor & Interfaces

Credit: 3
3L+0T+0P

Max. Marks: 100(IA:30, ETE:70)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Microprocessors, microcontroller; 8085 Microprocessor Architecture, pin description, Bus concept and organization; concept of multiplexing and de-multiplexing of buses; concept of static and dynamic RAM, type of ROM, memory map.	7
3	Software architecture registers and signals, Classification of instruction, Instruction set, addressing modes, Assembly Language Programming and Debugging, Programming Technique, instruction Format and timing.	8
4	Advance Assembly Language Programming, Counter and time delay; types of Interrupt and their uses, RST instructions and their uses, 8259 programmable interrupt controller; Macros, subroutine; Stack-implementation and uses with examples; Memory interfacing.	8
5	8085 Microprocessor interfacing:, 8255 Programmable Peripheral Interface, 8254 programmable interval timer, interfacing of Input/output device, 8279 Key board/Display interface.	8
6	Microprocessor Application: Interfacing scanned multiplexed display and liquid crystal display, Interfacing and Matrix Keyboard, MPU Design; USART 8251, RS232C and RS422A, Parallel interface-Centronics and IEEE 488.	8
Total		40



RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID4-05: Database Management System

Credit: 3
3L+0T+0P

Max. Marks: 100(IA:30, ETE:70)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to database systems: Overview and History of DBMS. File System v/s DBMS. Advantage of DBMS Describing and Storing Data in a DBMS. Queries in DBMS. Structure of a DBMS. Entity Relationship model: Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model- Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, and Design with ER Model- Entity v/s Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation v/s ternary Relationship Conceptual Design for a Large Enterprise.	7
3	Relationship Algebra and Calculus: Relationship Algebra Selection and Projection, Set Operations, Renaming, Joins, Division, Relation Calculus, Expressive Power of Algebra and Calculus. SQL queries programming and Triggers: The Forms of a Basic SQL Query, Union, and Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.	8
4	Schema refinement and Normal forms: Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF.	8
5	Transaction Processing: Introduction-Transaction State, Transaction properties, Concurrent Executions. Need of Serializability, Conflict vs. View Serializability, Testing for Serializability, Recoverable Schedules, Cascadeless Schedules.	8
6	Concurrency Control: Implementation of Concurrency: Lock-based protocols, Timestamp-based protocols, Validation-based protocols, Deadlock handling, Database Failure and Recovery: Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery, Recovery with Concurrent transactions.	8
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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID4-06: Theory Of Computation

Credit: 3
3L+0T+0P

Max. Marks: 100(IA:30, ETE:70)
End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Finite Automata & Regular Expression: Basic machine, Finite state machine, Transition graph, Transition matrix, Deterministic and non-deterministic finite automation, Equivalence of DFA and N DFA, Decision properties, minimization of finite automata, Mealy & Moore machines. Alphabet, words, Operations, Regular sets, relationship and conversion between Finite automata and regular expression and vice versa, designing regular expressions, closure properties of regular sets, Pumping lemma and regular sets, Myhill- Nerode theorem , Application of pumping lemma, Power of the languages.	7
3	Context Free Grammars (CFG), Derivations and Languages, Relationship between derivation and derivation trees, leftmost and rightmost derivation, sentential forms, parsing and ambiguity, simplification of CFG, normal forms, Greibach and Chomsky Normal form , Problems related to CNF and GNF including membership problem.	8
4	Nondeterministic PDA, Definitions, PDA and CFL, CFG for PDA, Deterministic PDA, and Deterministic PDA and Deterministic CFL , The pumping lemma for CFL's, Closure Properties and Decision properties for CFL, Deciding properties of CFL.	8
5	Turing Machines: Introduction, Definition of Turing Machine, TM as language Acceptors and Transducers, Computable Languages and functions, Universal TM & Other modification, multiple tracks Turing Machine. Hierarchy of Formal languages: Recursive & recursively enumerable languages, Properties of RL and REL, Introduction of Context sensitive grammars and languages, The Chomsky Hierarchy.	8
6	Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, Un-decidability, examples of these problems like vertex cover problem, Hamiltonian path problem, traveling sales man problem.	8
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II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID4-07: Data Communication and Computer Networks

Credit: 3

Max. Marks: 100(IA:30, ETE:70)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introductory Concepts: Network hardware, Network software, topologies, Protocols and standards, OSI model, TCP model, TCP/IP model, Physical Layer: Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System	7
3	Data Link Layer: Error Detection and Correction, Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction, Protocols: Stop and wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding window, Piggy backing, Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA	9
4	Network Layer: Design issues, Routing algorithms: IPV4, IPV6, Address mapping: ARQ, RARQ, Congestion control, Unicast, Multicast, Broadcast routing protocols, Quality of Service, Internetworking	8
5	Transport Layer: Transport service, Elements of transport protocols, User Datagram Protocol, Transmission Control Protocol, Quality of service, Leaky Bucket and Token Bucket algorithm	8
6	Application Layer: WWW, DNS, Multimedia, Electronic mail, FTP, HTTP, SMTP, Introduction to network security	7
Total		40



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II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID4-21: Microprocessor & Interfaces Lab

Credit: 1
OL+OT+2P

Max. Marks: 100(IA:60, ETE:40)

List of Experiments:

1. Add the contents of memory locations XX00 &XX01 & place the result in memory location XX02.
2. Add the 16 bit numbers stored in memory location & store the result in another memory location.
3. Transfer a block of data from memory location XX00 to another memory location XX00 in forward & reverse order.
4. Write a program to swap two blocks of data stored in memory.
5. Write a program to find the square of a number.
6. Write a main program and a conversion subroutine to convert Binary to its equivalent BCD.
7. Write a program to find largest & smallest number from a given array.
8. Write a program to Sort an array in ascending & descending order.
9. Write a program to multiply two 8 bit numbers whose result is 16 bit.
10. Write a program of division of two 8 bit numbers.
11. Generate square wave from SOD pin of 8085 & observe on CRO.
12. Write a program to perform traffic light control operation.
13. Write a program to control the speed of a motor.



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II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID4-22: Database Management System Lab

Credit: 1.5
OL+OT+3P

Max. Marks: 100(IA:60, ETE:40)

List of Experiments:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER, UPDATE and DELETE.
4. Write the queries to implement the joins.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG () and COUNT ().
6. Write the query to implement the concept of Integrity constraints.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Perform the following operation for demonstrating the insertion , updation and deletion
10. Using the referential integrity constraints.
11. Write the query for creating the users and their role.

Data Base Designing Project:

For better understanding students (group of 3-4 students) should design data base for any data base project, understand the requirement and design methodology of project by its own.

Some example of data base design project like:

College management system, Inventory management system and Hospital management system.



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II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID4-23: Network Programming Lab

Credit: 1.5
OL+OT+3P

Max. Marks: 100(IA:60, ETE:40)

List of Experiments:

1. Study of Different Type of LAN& Network Equipments.
2. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.
3. LAN installations and Configurations.
4. Write a program to implement various types of error correcting techniques.
5. Write a program to implement various types of framing methods.
6. Write two programs in C: hello_client and hello_server
 - a. The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection
 - b. The client connects to the server, sends the string "Hello, world!", then closes the connection
7. Write an Echo_Client and Echo_server using TCP to estimate the round trip time from client to the server. The server should be such that it can accept multiple connections at any given time.
8. Repeat Exercises 6 & 7 for UDP.
9. Repeat Exercise 7 with multiplexed I/O operations.
10. Simulate Bellman-Ford Routing algorithm in NS2.



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4AID4-24: Linux Shell Programming Lab

Credit: 1

Max. Marks: 100(IA:60, ETE:40)

OL+OT+2P

List of Experiments:

1. Use of Basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.
2. Commands related to inode, I/O redirection and piping, process control commands, mails.
3. Shell Programming: Shell script based on control structure- **If-then-fi, if-then-else-if, nested if-else, to find:**
 - 3.1 Greatest among three numbers.
 - 3.2 To find a year is leap year or not.
 - 3.3 To input angles of a triangle and find out whether it is valid triangle or not.
 - 3.4 To check whether a character is alphabet, digit or special character.
 - 3.5 To calculate profit or loss.
4. Shell Programming - Looping- while, until, for loops
 - 4.1 Write a shell script to print all even and odd number from 1 to 10.
 - 4.2 Write a shell script to print table of a given number
 - 4.3 Write a shell script to calculate factorial of a given number.
 - 4.4 Write a shell script to print sum of all even numbers from 1 to 10.
 - 4.5 Write a shell script to print sum of digit of any number.
5. Shell Programming - case structure, use of break
 - 5.1 Write a shell script to make a basic calculator which performs addition, subtraction,
Multiplication, division
 - 5.2 Write a shell script to print days of a week.
 - 5.3 Write a shell script to print starting 4 months having 31 days.
6. Shell Programming - Functions
 - 6.1 Write a shell script to find a number is Armstrong or not.
 - 6.2 Write a shell script to find a number is palindrome or not.
 - 6.3 Write a shell script to print Fibonacci series.
 - 6.4 Write a shell script to find prime number.
 - 6.5 Write a shell script to convert binary to decimal and decimal to binary
7. Write a shell script to print different shapes- Diamond, triangle, square, rectangle, hollow square etc.
8. Shell Programming – Arrays
 - 8.1 Write a C program to read and print elements of array.
 - 8.2 Write a C program to find sum of all array elements.
 - 8.3 Write a C program to find reverse of an array.
 - 8.4 Write a C program to search an element in an array.
 - 8.5 Write a C program to sort array elements in ascending or descending order.



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II Year-IV Semester: B.Tech. Artificial Intelligence and Data Science

4AID4-25: Java Lab

Credit: 1
OL+OT+2P

Max. Marks: 100(IA:60, ETE:40)

List of Experiment:

1. Develop an in depth understanding of programming in Java: data types, variables, operators, operator precedence, Decision and control statements, arrays, switch statement, Iteration Statements, Jump Statements, Using break, Using continue, return.
2. Write Object Oriented programs in Java: Objects, Classes constructors, returning and passing objects as parameter, Inheritance, Access Control, Using super, final with inheritance Overloading and overriding methods, Abstract classes, Extended classes.
3. Develop understanding to developing packages & Interfaces in Java: Package, concept of CLASSPATH, access modifiers, importing package, Defining and implementing interfaces.
4. Develop understanding to developing Strings and exception handling: String constructors, special string operations, character extraction, searching and comparing strings, string Buffer class. Exception handling fundamentals, Exception types, uncaught exceptions, try, catch and multiple catch statements. Usage of throw, throws and finally.
5. Develop applications involving file handling: I/O streams, File I/O.
6. Develop applications involving concurrency: Processes and Threads, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Joins, and Synchronization.

Indicative List of exercises:

7. Programs to demonstrate basic concepts e.g. operators, classes, constructors, control & iteration statements, recursion etc. such as complex arithmetic, matrix arithmetic, tower of Hanoi problem etc.
8. Development of programs/projects to demonstrate concepts like inheritance, exception handling, packages, interfaces etc. such as application for electricity department, library management, ticket reservation system, payroll system etc.
9. Development of a project to demonstrate various file handling concepts.
10. Develop applications involving Applet: Applet Fundamentals, using paint method and drawing polygons. It is expected that each laboratory assignments to given to the students with an aim to In order to achieve the above objectives.

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