FACULTY OF ENGINEERING

Scheme of Instructions & Detailed Syllabus of III & IV Semester

For
Four Year Degree Programme of

Bachelor of Engineering (B.E)

in

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

(With effect from the academic year 2022-23)
(Approved by College Academic Council on -- -- ----)

Issued by

Dean, Academics,
Stanley College of Engineering and Technology for Women (Autonomous)

(Affiliated to Osmania University)
(Accredited by NAAC with "A" Grade)
Abids, Hyderabad – 500 001, Telangana.

AI&DS: SEMESTER – III

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/	CIE	SEE	SEE Duration in	
Theory Courses										
1	SBS301MT	Mathematics -III (Probability and Statistics)	3	-	-	3	40	60	3	3
2	SES301AD	Discrete Mathematics	3	-	-	3	40	60	3	3
3	SPC301AD	OOPs using Java	3	-	-	3	40	60	3	3
4	SPC302AD	Database Management System	3	-	-	3	40	60	3	3
5	SPC303AD	Concepts in Computer Organization & Microprocessor	3	-	-	3	40	60	3	3
6	SAC902EE	Electrical Technology	2	-	-	2	-	-	-	-
Practical/ Laboratory Courses										
7	SPC311AD	OOPs using Java Lab	-	-	4	4	40	60	3	2
8	SPC312AD	Database Management System Lab	-	-	4	4	40	60	3	2
9	SPC313AD	Concepts in Computer Organization & Microprocessor Lab	-	-	4	4	40	60	3	2
		Total	**17**	**-**	**12**	**29**	**320**	**480**		**21**

Course Code	Course Title						Core/Elective
SBS301MT	**MATHEMATICS-III (PROBABILITY & STATISTICS) (Common to AI&DS, CME, CSE)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
SBS101MT SBS 201MT	3	-	-	-	40	60	3

Course Objectives:

1. To provide knowledge of probability distribution, tests of significance, correlation and regression.

Course Outcomes: At the end of this course, the student will be able to

1. Apply probability theory to solve practical problems.
2. Apply various probability distributions to solve practical problems, to estimate unknown parameters and apply tests of hypothesis.
3. Apply continuous probability distributions like normal to solve the practical problems
4. Perform a regression analysis and to compute and interpret the coefficient of correlation.
5. Apply Chi-square test for goodness of fit and independent attributes

Unit I

Introduction of Probability: Conditional Probability, Theorem of total probability, Baye's heorem and its application, Random variables, types of random variables. Probability mass function and probability density function. Mathematical Expectations, moments, Skewness and Kurtosis.

Unit II

Discrete and Continuous probability distributions: Binomial, Poisson, Uniform, Normal and exponential. Mean, Variance, Moment geñerating function

Unit III

Curve fitting by the method of least squares: Straight line, second degree polynomial and more general curves. Correlation, regression and Rank correlation, Multiple regression, F-test,t-test and Chi-square tests.

Unit IV

Numerical Solutions of Differential Equations: Single step method, Taylor's, Euler's, R-K Method of 4" order, Predictor- Corrector method, Milne's Method, Adams - Bashforth Method.

Unit V

Linear Algebra: Vector spaces, subspaces, Linearly Independent, Linearly dependent vectors, Linear span, Basis, Dimensions, Rank, Impact, Singular value decomposition, connection between eigen values and eigen vectors, SVD with low rank, Relation between SVD and regularised least square methods.

TEXT BOOKS:

1. R.K. Jain and S.R. K. Iyengar, "Advanced Engineering Mathematics", Narosa Publications
2. Dr. B. S. Grewal "Higher Engineering Mathematics", Khanna Publication
3. P. Siva Rama Krishna Das & C. Vijaya Kumar, "Engineering Mathematics", Pearson India Education Services Pvt. Ltd.
4. N.P. Bali & M. Goyal, "A text Book of Engineering Mathematics", Laxmi Publications, 2010
5. S.C. Gupta & V.K. Kapoor, "Fundamentals of Mathematical Statistics", S. Chand Pub.

Course Code	Course Title						Core/Elective
SES301AD	**DISCRETE MATHEMATICS (Common to AI&DS, CME, CSE & IT)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	-	-	40	60	4

Course Objectives:- Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics.

1. To learn mathematically correct terminology and notation and to perform the operations associated with sets, functions, groups and relations.
2. To apply logical reasoning to solve a variety of problems.
3. To analyze the properties of graphs and trees.

Course Outcomes :- After completion of the course, the students should be able to

1. Understand sets, functions, groups and relations.
2. Apply permutation and combination to handle different types of problems.
3. Apply propositional logic and predicate logic to solve logical statements.
4. Evaluate Boolean functions and simplify expressions using the properties of Boolean Algebra.
5. Develop the given problem as graph networks and solve with techniques of graph theory.

UNIT – 1:

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem. Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

UNIT – 2:

Elementary Combinations:-Basics of counting, combinations and permutations, with repetitions constrained repetitions, Binomial coefficients. The principle of inclusion-exclusion, pigeon hole principle and its applications.

UNIT 3 :

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

UNIT 4:

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

UNIT -5:

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Coloring, Coloring maps and Planar Graphs, Coloring Vertices, Coloring Edges, List Coloring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

Text Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications,4th edition, Wadsworth Publishing Co. Inc
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill

References Books:

1. J.P.Trembly and R.Manohar ,Discrete Mathematical Structures with applications to Computer Science TMG Edition ,Tata MC Graw Hill.
2. JL Mott, A. Kandel, T.P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition PHI.
3. Narsing Deo, Graph Theory: with Application to Engineering and Computer Science. Prentice Hall of India 2003.

Course Code	Course Title						Core/Elective
SPC301AD	**OOPS USING JAVA (Common to AI&DS, CSE & IT , CME IV Sem)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ES302CS	3	-	-	-	40	60	3

Course Objectives:

1. To understand fundamentals of object-oriented programming in Java which includes defining classes, invoking methods, difference between applet and application programs, using class libraries
2. To create Java application programs using sound OOP practices such as interfaces, exception handling, multithreading.
3. Use Collection framework, AWT and event handling to solve real world problems.

Course Outcomes:

At the end of this course, the student will be able to

1. Identify classes, objects, members of a class and the relationships needed to solve a problem.
2. Use interfaces and creating user-defined packages.
3. Utilize exception handling and Multithreading concepts to develop Java programs.
4. Compose programs using the Java Collection API.
5. Design a GUI using GUI components with the integration of event handling.

UNIT-I

Introduction: OOP concepts, benefits of OOP, history of Java, Java buzzwords, data types, variables, scope andlife time of variables, operators, expressions, control statements, type conversion and casting.

Classes and Objects: Concept of classes, objects, constructors, methods, this keyword, super keyword, garbage collection, overloading methods and constructors, parameter passing, Arrays String handling: String, StringBuffer, StringBuilder

UNIT -II

Inheritance: Base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes.

Interfaces: Defining and implementing an interface, differences between classes and interfaces and extending interfaces Polymorphism.

Packages: Defining, creating and accessing a package, importing packages, exploring packages

UNIT -III

Exception handling: Concepts and benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of-try, catch, throw, throws and finally, built in exceptions, creating User defined exceptions.

Multithreading: Difference between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

UNIT -IV

Basic I/O Streams: Java I/O classes and interfaces, Files, Stream and Byte classes, Character streams, Serialization Exploring java.lang: Object class, Wrapper classes Exploring java.util: Scanner, StringTokenizer, BitSet, Date, Calendar, Timer

Collections: Overview of Java Collection frame work, commonly used Collection classes – Array List, Linked List, Hash Set, Tree Set, Collection Interfaces – Collection, List, Set. Accessing Collection via iterator, working with Map.

UNIT -V

GUI Programming with java: The AWT class hierarchy, MVC architecture.

Exploring Swing: JLabel, ImageIcon, JTextField, the Swing buttons, JTabbedpane, JScrollPane, JList, JComboBox.

Layout manager: Border, Grid, Flow, Card and Grid Bag layouts.

Event Handling: Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces.Handling mouse and keyboard events, Adapter classes.

New Features in Java: Major enhancement made in Java5, Java6, Java7 and Java8 like auto-boxing, generics, var-args, java annotations, enum, premain method , lambda expressions, functional interface, method references.

Text Books:

1. Schildt and Herbert, Java The complete reference, McGraw, 8th edition, TMH, 2017.
2. R Nageswara Rao, Core JAVA: An Integrated Approach, Black Book, DreamTech, 2016.
3. Cay S. Horstmann, Core JAVA Volume I—Fundamentals, Kindle Edition, 2020.

References Books:

1. Core Java: An Integrated Approach, Dr R. Nageswara Rao, dreamtech.
2. Java How to Program, H.M. Dietel and P.J. Dietel, Sixth Edition, Pearson Education/PHI.
3. An Introduction to Object Oriented programming with Java,C Thomas Wu, Tata McGraw Hill, 2005.

Course Code	Course Title						Core/Elective
SPC302AD	**DATABASE MANAGEMENT SYSTEMS (Common to AI&DS, CME, IT & CSE IV Sem)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ES302CS, PC301AD	3	-	-	-	40	60	3

Course Objectives:

1. To get familiar with fundamental concepts of database managements and with data base designing.
2. To master hands on SQL and PL/SQL concepts.
3. To impart knowledge in Indexing, hashing, transaction Management, concurrency control techniques and recovery techniques.

Course Outcomes: At the end of this course, the student will be able to :

1. Understand the role of database management system in an organization and learn the database concepts.
2. Construct database queries using relational algebra and SQL
3. Design databases using data modeling and Logical database design techniques.
4. Evaluating the indexing, hashing techniques and transaction management.
5. Understand the concept of a database transaction and related concurrent, recovery facilities.

UNIT – I

Introduction: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, E.F. Codd rules.

Relational Databases: Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators, History of Database Systems.

UNIT – II

Relational model: Structure of relational databases, fuundamental relational-algebra operations.

Introduction to SQL: Overview of the SQL, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database.

Advanced SQL: Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Indexes and types of indexes. Functions, Procedures, Triggers, Cursors, Exceptions, and Packages.

UNIT – III

Database Design and the E-R Model: Overview of the Design Process, E-R Diagrams, Reduction to Relational Schemas, E-R Design Issues, Extended E-R Features.

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, 2NF, 3NF, BCNF and 4NF.

UNIT – IV

Indexing and Hashing: Sparse index and dense index, static and dynamic hashing.

Transactions: Transaction Concept, A Simple Transaction Model, Storage Structure, Properties of a transaction, Serializability, Implementation of Isolation Levels, Transactions as SQL Statements.

UNIT – V

Concurrency Control: Lock-Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Weak Levels of Consistency in Practice.

Backup and Recovery System: Failure Classification, Storage structure, Recovery and Atomicity, log based recovery with concurrent transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, advanced recovery techniques, Remote Backup Systems.

Text Books:

1. Abraham Silberchatz, Henry F Korth and Sudarshan S, "Database System Concepts", Tata McGraw- Hill, 7th Edition.
2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Tata McGraw-Hill, 3rd Edition.
3. RamezElmasri and Shamkant B Navathe, "Fundamentals of Database Systems", Addison Wesley, USA, 6th Edition

Reference Books:

1. C J Date , "AN introduction to database systems", 8th Edition, Pearson.
2. Gupta G K, "Database Management System", Tata McGraw-Hill, New Delhi, 2011.

Course Code	Course Title						Core/Elective
SPC303AD	**CONCEPTS IN COMPUTER ORGANIZATION AND MICROPROCESSOR (Common to AI&DS& CME, IT Sem IV)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

1. To understand the Instruction Set Architecture and the basic components of CPU.
2. To learn the interfacing of I/O Organization, Interrupt-driven I/O, and DMA
3. To understand the 8085 and 8051 architectures.

Course Outcomes: Students will be able to

1. Understand the Instruction Set Architecture: Instruction format, types, various addressing modes
2. Understand the basic components of the CPU
3. Understand the parallelism both in terms of a single processor and multiple processors
4. Understand the 8085 and 8051 architectures
5. Apply interfacing with I/O Organization, Interrupt-driven I/O, DMA

UNIT-I

Data Representation: Fixed and Floating Point representations. Overview of Computer Function and Interconnections: Computer components, Interconnection structures, Bus interconnection, Bus structure, and Data transfer.

Register Transfer Microoperations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic and Shift microperations, Arithmetic Logic Shift Unit.

UNIT-II

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory reference instruction, Input-Output and Interrupt. Microprogrammed Control: Control memory, Address Sequencing, Microprogram example, Design of Control Unit.

UNIT-III

Central Processing Unit: General Register Organization, Stack Organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, and Program control. Floating Point Arithmetic Operations.

Pipeline Processing: Arithmetic, Instruction and RISC Pipelines.

Memory Organization: Cache memory, Virtual memory, Memory Management hardware

UNIT-IV

8085 Architecture: Introduction to microprocessors and microcontrollers, 8085 Processor

Architecture, Internal operations, Instructions and timings. Programming the 8085 - Introduction to 8085 instructions, Addressing modes and Programming techniques with Additional instructions.

Input-Output Organization: Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), I/O Processor. Basic Interfacing concepts with 8085, Programmable Interrupt Controller(8259A). Direct Memory Access(DMA) - DMA Controller (Intel 8257)

UNIT-V

Introduction to Microcontrollers, 8051 – Architecture, Instruction set, Addressing modes and Programming techniques. Comparison of various families of 8-bit micro controllers. System Design Techniques - Interfacing of LCD, ADC, Sensors, Stepper motor, Keyboard and DAC using microcontrollers. Communication Standards - Serial RS 232 and USB. Features of Multi-Core Processors architectures and Graphics Processing Units.

Text Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, McGraw Hill, 2002.
2. Ramesh S Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, 5/E PrenticeHall,2002.
3. Pal Chouduri, Computer Organization and Design, Prentice Hall ofIndia,1994.

Reference Books:

1. M. M. Mano, Computer System Architecture, 3rd Edition,PrenticeHall.
2. Ramesh S. Gaonkar “Microprocessor Architecture, Programming, and Applications with the 8085”, 5/E, Prentice Hall, 2002.
3. Myke Predko “Programming and Customizing the 8051 Microcontroller”, Tata McGraw Hill, 1994

Course Code	Course Title						Core / Elective
SAC902EE	**Electrical Technology**						**Core**
Prerequisite	Contact Hours per Week				CIE T	Prerequisite	Contact Hours per Week L
	L	T	D	L			
–	2	-	–	2	-	–	2

Course Objectives: The students will be able to:

1. To introduce Generation of energy through conventional sources such as: Thermal, Hydro and Nuclear and renewable energy sources.
2. To familiarize present practices in working of static and dynamic machines and devices.
3. To familiarize mechanical design of Electrical vehicle and hybrid vehicle.

Course Outcomes: After completing this course, the student will be able to:

1. Gain knowledge of construction and operation of conventional and non-conventional sources of energy
2. Understand the working principle of single phase and three phase transformers
3. Understand the Working principle of generator and motor
4. Know the working of inverter and rectifier operation
5. Understand the concept of Electrical vehicles

UNIT I – Generation of Electrical Energy

Importance of Electrical Energy, Conventional Energy sources for generation of electrical energy, schematic diagram of steam power station, Hydro Electric power plants, Fissile materials, working principle of nuclear power plants and reactor control, Importance of Non-Conventional energy sources, Generation of electrical energy by using Solar and wind, Hybrid power generation.

UNIT II – Transformers

Electromagnetic induction, Faradays laws, statically induced Emf, Lenz law, BH characteristics, Construction and working of transformer, ideal and practical transformer, losses and efficiency.

UNIT III – DC Machines

Working principle of DC generator, dynamically induced Emf, Fleming's Right hand and Left-hand rules, Construction and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications, principle of operation of DC Motor, Types of DC motors, applications.

UNIT IV – Induction Motors

Generation of rotating magnetic fields, Construction and working of a three phase induction motor, squirrel cage IM, slip-ring IM, applications, Construction and principle of operation of 1-phase IM, Capacitor start & capacitor run motor, applications.

UNIT V – Batteries and Electric Vehicles

Introduction to Electrical vehicles, EV system, Components of Electrical Vehicle, Electrical vehicle advantages. Batteries: LED acid, Ni-Cd, Li-Ion batteries and battery characteristics and parameters. Hybrid Electrical Vehicle-Types of hybrid vehicles, advantages and disadvantages, comparison between Electrical vehicle and Hybrid Vehicle.

Text Books:

1. J.B. Gupta "Fundamentals of Electrical Engineering and Electronics" S.K. Kataria & Sons Publications, 2010.
2. P. S. Bimbhra, Electrical Machinery, Khanna Publishers, 2011.
3. Sunil R. Pawar "Electrical vehicle technology" Notion press, First edition 2021.

Reference Books:

1. Dr. P.S. Bhimbra, Power Electronics, Khanna Publishers, 2009.
2. Wadhwa C.L., Electrical Power Systems, New Age International (P) Ltd., 4th Edition, 2007.
3. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc., 1995.

Course Code	Course Title						Core/Elective
SPC311AD	**OOPS USING JAVA LAB (Common to AI&DS, CSE, IT & CME SemIV)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	-	-	-	3	40	60	1.5

Course Objectives:

1. To introduce fundamentals of object-oriented concepts using java programming such as classes, inheritance, packages and interfaces.
2. To understand and apply concepts of exception handling, multithreading, collection framework.
3. To learn and use concepts of I/O streams, serialization, GUI programming using Swings, database connectivity.

Course Outcomes: At the end of this course, the student will be able to

1. Understand object-oriented programming fundamental and java programming fundamentals such as classes, inheritance, abstract classes, interfaces, packages.
2. Apply exception handling, multithreading, input output basics and string handling.
3. Design and apply collection framework.
4. Design AWT and Swings concept.
5. Apply input-output operations through IO package.

List of Experiments: Write Programs using Java Language

1. To implement the concept of class with method overloading
2. To apply the concept of Single level and Multi level Inheritance.
3. To understand the concept of Interfaces.
4. To implement Abstract Classes concept.
5. To implement
    a) Checked Exception (IOException).
    b) Unchecked Exceptions. (Arithmetic Exception, Null Pointer Exception, Array Index Out Of Bounds Exception).
    c) User defined exception handling when user enters marks for a subject beyond the minimum and maximum range.
6. To implement
    a) The concept of threading using Thread Class and Runnable Interface.
    b) The concept of Thread synchronization.
7. To implement collection classes like Array List, Linked List, Tree map and Hash map.
8. To execute iteration over Collection using Iterator interface and List Iterator Interface.
9. To read a file name from the user, and display information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes. To copy contents of one file into another file.

10. To implement serialization concept
11. To implement event handlers: mouse and key board events
12. To design a basic calculator application using swings.
13. To develop an applet that displays a simple message in center of a screen.

Text Books:

1. Java The complete reference, 8th edition, Herbert Schildt, TMH.
2. Core and Advanced Java, Black Book, Recommended by CDAC, Revised and Upgraded Dream tech Press.

References Books:

1. Core Java: An Integrated Approach, Dr R. Nageswara Rao, dreamtech.
2. Java How to Program, H.M. Dietel and P.J. Dietel, Sixth Edition, Pearson Education/PHI.
3. An Introduction to Object Oriented programming with Java,C Thomas Wu, Tata McGraw Hill, 2005.

Software Required: Java 8

Course Code	Course Title						Core/Elective
SPC312AD	**DATABASE MANAGEMENT SYSTEMS LAB (Common to AI&DS, CME, IT & CSE Sem IV)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
--	-	-	-	3	40	60	1.5

Course Objectives:

1. To practice various commands of SQL.
2. To write simple and Complex queries in SQL.
3. To familiarize with the PL/SQL programs.

Course Outcomes: At the end of this course, the student will be able to

1. Implement the basic knowledge of SQL queries and relational databases.
2. Design and implement a database schema for a given problem.
3. Implement different constraints for refining of the databases.
4. Implement various triggers, procedures and cursors using PL/SQL.
5. Generate forms and reports.

List of Experiments:

1. Creation of database and writing SQL queries to retrieve information from the database.
2. Performing insertion, deletion, modifying, altering, updating and viewing records based on the conditions.
3. Creation of views, synonyms and save points.
4. To set various constraints.
5. Implementation of SQL inbuilt functions.
6. Implementation of Nested queries and Complex queries in SQL database.
7. Implementation of PL/SQL procedures and Functions?
8. Implementation of PL/SQL Cursors?
8. Implementation of different types of Exceptions in PL/SQL?
9. Implementation of Triggers in PL/SQL?
10. Implementation of PL/SQL Packages using various database objects?
11. Creation of Forms for Student information, Library information.
12. Report generation using SQL reports.
13. Creation of small full- fledged database application.

Text Books:

1. SQL, PL/SQL- The programming language of oracle, 4 th Edition, Ivan Bayross, BPB Publications.
2. Oracle PL/SQL Training guide, SAMS, , BPB Publications.
3. The Complete Reference, SQL, 3 rd Edition, James R. Groff, Paul N.Weinberg, Andrew J. Oppel

Software Required: MySql

Course Code	Course Title						Core/Elective
SPC313AD	**CONCEPTS IN COMPUTER ORGANIZATION AND MICROPROCESSOR LAB (Common to AI&DS, CME & IT Sem IV)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**40**	**60**	**1**

Course Objectives

The objectives of the course are to impart knowledge of the:

1. To become familiar with the architecture and Instruction set of Intel8085microprocessor.
2. To provide practical hands on experience with Assembly Language Programming.
3. To familiarize the students with interfacing of various peripheral devices with 8085 microprocessors

Course Outcomes

After the completion of the course, the student will be able to:

1. Interpret the principles of Assembly Language Programming, instruction set in developing microprocessor based applications.
2. Develop Applications such as: 8-bit Addition, Multiplication, Division, array operations, swapping, negative and positive numbers.
3. Analyse the interfaces like serial ports, digital-to-analog Converters and analog-to-digital converters etc.
4. Build interfaces of Input-output and other units like stepper motor.
5. Analyse the function of traffic light controller.

List of Experiments

PART A:

Programs using VERILOG

1. Review of the different logic design ckts., a) Gates b) Flip/Flop(RS, JK, D, T)
2. Familiarity with state of art IC-chips, e.g. a) Multiplexer , b) Decoder, c) Encoder, d) Counter, e)Shift-Register, f)adder Truth Table verification and clarification from Data-book.
3. Design a BCD adder.
4. Design an Adder/Subtracter composite unit
5. Design a carry-look ahead Adder
6. Design a ripple counter and carry-look ahead counter.
7. Design ALU and 4-bit processor

PART B: 8085 Programming using Microprocessor Trainer Kit

8. Simple programming examples using 8085 instruction set. To understand the use of various

instructions and addressing modes.
9. Interfacing and programming of 8255 (Eg. Traffic Light Controller)
10. Interfacing and programming of 8254.
11. Interfacing and programming of 8279.

PART C: 8051 Programming
12. Simple programming examples using 8051 Microcontroller
13. A/D and D/A converter interface
14. Stepper motor interface
15. Display Interface

Software Required: MASM 8086 ASSEMBLER

AI&DS: SEMESTER – IV

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/ D	Contact Hrs/Wk	CIE	SEE	SEE Duration in	
Theory Courses										
1	SES401EC	Digital Electronics	2	-	-	2	40	60	3	2
2	SPC401AD	Artificial Intelligence and Robotics	3	-	-	3	40	60	3	3
3	SPC402AD	Operating Systems	3	-	-	3	40	60	3	3
4	SPC403AD	Computer Networks	3	-	-	4	40	60	3	3
5	SPC404AD	Data Science	3	1	-	4	40	60	3	4
Practical/ Laboratory Courses										
6	SHS902EG	Soft Skills Lab	-	-	4	4	40	60	3	2
7	SPC411AD	Operating Systems & CN Lab	-	-	4	4	40	60	3	2
8	SPC412AD	Data Science Using R	-	-	2	2	40	60	3	1
9	SPW411AD	Internship-1	The students have to undergo an Internship of 4 week duration after IV-Semester SEE				50	-	-	1
Total			**14**	**2**	**8**	**24**	**370**	**480**		**21**

Course Code	Course Title						Core/Elective
SES401EC	**DIGITAL ELECTRONICS (Common to AI&DS IVSem, CME & CSE III Sem)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-----	3	-	-	-	40	60	3

Course Objectives:

1. To learn the principles of digital hardware and support given by it to the software.
2. To explain the operation and design of combinational and arithmetic logic circuits.
3. To design hardware for real world problems.

Course Outcome: On successful completion of the course, the students would be able to

1. Understand the deign process of digital hardware, use Boolean algebra to minimize the logical expressions and optimize the implementation of logical functions.
2. Understand the number representation and design combinational circuits like adders, MUX etc.
3. Design Combinational circuits using PLDS and write Verilog HDL code for basic gates and combinational circuits.
4. Analyze sequential circuits using flip-flops and design registers, counters.
5. Design a sequential circuit using Finite State machine and apply state minimization techniques to design a FSM.

UNIT – I

Design Concepts: Digital Hardware, Design process, Design of digital hardware. Introduction to logic circuits – Variables and functions, Logic gates and networks. Boolean algebra, Synthesis using gates, Design examples. Optimized implementation of logic functions using K-Map upto 5 Variable maps and Quine-McCluskey Tabular method

UNIT – II

Number representation: Addition and Subtraction of signed and unsigned numbers.

Combinational circuit building blocks: Adders and Subtractors, Multiplexers. Demultiplexers, Parity Checkers and Generators, Decoders. Encoders. Codeconverters, BCD to 7-segment converter, Arithmetic comparator circuits.

UNIT – III

Design of combinational circuits using Programmable Logic Devices (PLDs): General structure of aProgrammable Array Logic (PAL), Programmable Logic Arrays (PLAs), Structure of CPLDs and FPGAs, 2-input and 3-input lookup tables (LUTs)

UNIT – IV

Sequential Circuits: Basic Latch, Gated SR Latch, gated D Latch, Master-Slave edge triggered flip-flops, TFlip-flop, JK Flip-flop, Excitation tables. Registers and Counters.

UNIT – V

Synchronous Sequential Circuits: Basic Design Steps, Finite State machine(FSM) representation usingMoore and Mealy state models, State minimization, Design of FSM for Sequence Generation and Detection, Algorithmic State Machine charts.

TEXT BOOKS:

1. Moris Mano and Michael D CIletti, Digital Design, Pearson, fourth edition,2008
2. Zvi Kohavi, Switching and Finite Automata Theory, 3rd ed., Cambridge University Press-New Delhi, 2011.
3. R. P Jain, Modern Digital Electronics,4th ed., McGraw Hill Education (India) Private Limited, 2003
4. Ronald J.Tocci, Neal S. Widmer &Gregory L.Moss, "Digital Systems: Principles and Applications,"
   PHI, 10/e, 2009.
5. Samir Palnitkar , Verilog HDL A guide to digital design and Synthesis‖, Pearson ,2nd edition, 2015.

Course Code	Course Title						Core/Elective
SPC401AD	**ARTIFICIAL INTELLIGENCE & ROBOTICS (Common to AI&DS IV, CME V)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives:

1. To understand the concept of Artificial Intelligence
2. To learn various peculiar search strategies for AI
3. To acquaint with the fundamentals of robotics and applications of Robotics.

Course Outcomes: At the end of this course, the student will be able to

1. Identify and apply suitable Intelligent agents for various AI applications
2. Design smart system using different informed search / uninformed search or heuristic approaches
3. Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem.
4. Understand the robot programming and applications of robots.

UNIT-I

Introduction : Definition of AI, Foundations of artificial intelligence, History of AI, Structure of Agents.

State Space Search Strategies: Formulating problems, problem types, states and operators, state space, uniformed search strategies- BFS, DFS, Depth first Iterative deepening search, Informed search strategies – A* algorithm, heuristic functions, iterative deepening A*.

Adversarial search- games, optimal decisions in games, alpha beta pruning

UNIT-II

Constraint Satisfaction problems: Constraint satisfaction problems

Knowledge Representation and Reasoning: Propositional calculus, the language, rules of inference, definition of proof, semantics, resolution in propositional calculus, predicate calculus, syntax, semantics, quantification, semantics of quantifiers, resolution in predicate calculus

Structured knowledge representation- Frames, semantics nets.

UNIT-III

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Applications.

Planning – STRIPS Palnning Systems, States and Goals, Forward Search Methods, Recursive STRIPS, Plans with Run-Time Conditionals, The Sussaman Anomaly, Backward Search

Methods, Plan Spaces and Partial-Order Planning, Hierarchical Planning.

Unit IV
Uncertainty: Basic probability, Bayes rule, belief networks, inference in Bayesian networks.

Fuzzy System: Fuzzy Logic Control, Sugeno style of Fuzzy inference processing, Fuzzy Hedges, α-cut threshold, Neuro Fuzzy systems.

UNIT-V
Robotics: Introduction, Robot Hardware, Basic components of robot, classification of robot, Robotic Software Architectures, Application domains.

Text Books:

1. Stuart Russell and Peter Norvig: Artificial Intelligence – A Modern Approach, 4th Edition, Pearson education Press, 2021

2. Saroj Kaushik, Artificial Intelligence, Cengage learning -2018.

3. John J. Craig, "Introduction to Robotics", Addison Wesley publication.

References Books:

1. Deepak Khemani, First Course in Artificial Intelligence, MC-Graw Hills Education India,2013

2. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, 3rd edition, McGraw Hill 2008

3. Tsuneo Yoshikawa, "Foundations of Robotics", PHI Publication

4. N.J. Nilsson, "Artificial Intelligence – A New Synthesis", Morgan Kaufmann Publisher, 2015.

Course Code	Course Title						Core/Elective
SPC402AD	**OPERATING SYSTEMS (Common to AI&DS, CME, CSE & IT)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
SPC303AD	3	-	-	-	40	60	3

Course Objectives:

1. To learn fundamentals of Operating Systems.
2. To understand the functions of Operating Systems.
3. To learn memory management.

Course Outcomes:

At the end of this course, the student will be able to

1. Understand System calls and evaluate process scheduling.
2. Apply procedures for process synchronization.
3. Understand the concepts of deadlock.
4. Implement the concepts of memory management.
5. Understand file system interface and I/O systems.

UNIT-1

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine.

UNIT-2

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.
Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.
Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling Criteria, Scheduling algorithms, multiprocessor scheduling.

UNIT-3

Process Synchronization: Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Peterson‘s Solution, classical problems of synchronization: The Bounded buffer problem, Producer\Consumer Problem, reader‘s writer problem, Dinning philosopher‘s problem. Semaphores, Event Counters, Monitors, Message Passing.
Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Methods for Handling: Deadlocks: Deadlock prevention, Deadlock Avoidance: Banker‘s algorithm, Deadlock detection and Recovery.

UNIT-4

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation, fragmentation, and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, structure of page table, Protection and sharing, Disadvantages of paging.
Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms, Trashing.

UNIT-5

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods, Free-space management, directory implementation, efficiency, and performance.
Secondary-Storage Structure: Disk structure, Disk scheduling algorithms, Disk Management, RAID structure.

Text Books:

1. AviSilberschatz,PeterGalvin,GregGagne,OperatingSystemConceptsEssentials,9 th Edition, Wiley Asia Student Edition, 2017.

2. William Stallings, Operating Systems: Internals and Design Principles, 5 th Edition, Prentice Hall of India, 2016.

3. Maurice Bach, Design of the Unix Operating Systems, 8 th Edition, Prentice-Hall of India, 2009

4. Daniel P. Bovet, Marco Cesati, Understanding the Linux Kernel, 3 rd Edition, O'Reilly and Associates.

5. Naresh Chauhan, Principles of Operating Systems, Oxford University Press,2014

Course Code	Course Title						Core/Elective
SPC403AD	**COMPUTER NETWORKS (Common to AI&DS IV, CME V, CSE V & IT V)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-----	3	-	-	-	40	60	3

Course Objectives:

1. To introduce internet routing architecture and protocols.
2. To learn the flow control and congestion control algorithms in Transport Layer
3. To learn basic and advanced socket system calls.

Course Outcomes: At the end of this course, the student will be able to

1. Identify various networking components.
2. Explain the function of each layer of OSI and trace the flow of information from one node to another node in the network.
3. Understand the principles of IP addressing and internet routing
4. Describe the working of various networked applications such as DNS, mail, file transfer and www
5. Implement client-server socket-based networked applications.

UNIT I

DATA COMMUNICATIONS: Components, analog and digital signals and Encoders, Modems, RS232 Interfacing Switching: Circuit Switching, Message Switching and Packet Switching. Topologies – Concept of layering.-Protocols and Standards – ISO / OSI model, TCP/IP

UNIT II

DATA LINK LAYER: Error Control: Error detection and correction (CRC and Hamming code for single bit correction) Flow Control: stop and wait – - sliding window protocols-go back-N ARQ – selective repeat ARQ MAC LAYER: Ethernet IEEE 802.3LAN, Manchester encoding, Binary exponential algorithm, Efficiency calculation, ARP and RARP.

UNIT III

NETWORK LAYER : Internetworks – virtual circuit and Datagram approach Routing – Distance Vector Routing ,Link State Routing , OSPF and BGP IPv4 , addressing, Subnetting, IPv6, CIDR, ICMP and IGMP protocols.

UNIT IV

TRANSPORT LAYER : Services of transport layer, Multiplexing and crash recovery Transmission Control Protocol (TCP) – TCP window management Congestion Control, timer management and User Datagram Protocol (UDP)

UNIT V

APPLICATION LAYER : Domain Name Space (DNS) – SMTP – FTP – HTTP.
SOCKET PROGRAMMING : Primitive and advanced system calls, client/server iterative and concurrent programs IO multiplexing, Asynchronous IO and select system call.

Text Books:

1. Computer Networks (5th Edition), Authors: Andrew S. Tanenbaum , David J. Wetherall, Pearson
2. Computer Networks: A Systems Approach, Authors: Larry Peterson and Bruce Davie, Elsevier
3. Computer Networking: A Top-Down Approach (6th Edition), Authors: James F. Kurose , Keith W. Ross , Pearson

References Books:

1. Data Communications and Networking,4 th edition, Behrouz A Forouzan, Tata Mc Graw Hill,2007.
2. Data and Computer Communication, 8 th edition, William Stallings, Pearson PrenticeHall India.

Course Code	Course Title						Core/Elective
SPC404AD	**DATA SCIENCE (Only AI&DS IV Sem)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
----	3	-	-	-	40	60	3

Course Objectives:

1. Provide knowledge and expertise about data to become a proficient data scientist.
2. To learn basics of R programming environment.
3. To learn various statistical concepts and visualisation of data.

Course Outcomes: At the end of this course, the student will be able to

1. Collect the data from different sources..
2. Analyse and Extract Statistical Inferences from data.
3. Able to predict and visualise the data.
4. Prepare the data for training and testing.
5. Apply data science concepts in real world problems

Unit -1

Introduction to Data Science : Data Science Process, Data Science Tool kit, Applications of Data Science.

Introduction to R Programming: Installation of R software and using the interface, R Packages, Variables and data types, R Objects, Vectors, lists, Arrays, Matrices and Data Frames. Operations: Arithmetic and Logical, Functions, Strings and Factors, Control structures, Date and Time, Debugging and Simulation in R.

Unit -2

Introduction: Different kinds of data: Database data, Data warehouse, Transactional data
Getting to know your Data: Data objects, Types of Data: Attribute types,
Basic Statistical descriptions of Data, Measuring data Similarity and Dissimilarity.

Unit -3

Data Storage and Wrangling: Data Loading, Storage, File Formats: Reading Writing data in text format – binary data format – interacting with HTML and API – Interacting with databases, NoSQL Databases.
Data Wrangling: Clean, Transform, Merge and Reshape - Combining and Merging Data sets – Reshaping and Pivoting – Data Transformation – String Manipulation.

Unit 4

Data Exploration and Analysis: Exploring Data-Importing Data-Exploring Table Functions-Joining Numerous Datasets-Identifying Correlations-Identifying Outliers-Creating Groupings-Analyzing Data-Separating and Focusing the DataPresenting.
Data Visualization: Data-Visualizing the Data-Charts (Scatter plots, Line graphs, barcharts, Histograms, Boxplots) -Time-Related Data-Maps-Interactives-Words-Images, Video, and Illustrations-Presentation Tools-Publishing the Data-Open Source Platforms.

Unit 5

Web Scraping What to Scrape and How-Analyzing a Web Page-Network/Timeline-Interacting with JavaScript-In-Depth Analysis of a Page-Getting Pages-Reading a Web Page-Reading a Web Page with LXML-XPath-Advanced Web Scraping-Browser-Based Parsing-Screen Reading with Selenium-Screen Reading with Ghost.PySpidering the Web-Building a Spider with Scrapy-Crawling Whole Websites with Scrapy.

TEXTBOOKS:

1. Nina Zumel, John Mount "Practical Data Science with R··. Manning Publications. 2014
2. Sameer Madhavan , "Mastering Python for Data Science", Packt Publishing Limited, 2010
3. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly.

Reference Books:

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.
2. W. N. Venables. D. M. Smith and the R Core Team, "An Introduction to R",2010
3. Jain VK, "Data Science and Analytics", Khana Publishing House, Delhi.

MOOC Courses

1. https://nptel.ac.in/courses/106106179
2. https://nptel.ac.in/courses/111104146

Course Code	Course Title						Core/Elective
SHS912EG	**SOFTSKILLS LAB (Common to IT-III SEM &AI&DS –IV SEM)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-----	-	-	-	2	40	60	2

Course Objectives:

1. To enable the students to learn, understand by listening to different speakers in different contexts for various purposes.
2. To enable the students to develop the interactive skills to speak professionally in public and while emceeing.
3. To enable the students to acquire skills to face any interview.
4. To equip the students with the right attitude and coping techniques required to manage time and in decision making.
5. To develop leadership skills required among students to speak professionally in building a team.

Course Outcomes:

At the end of this course, the student will be able to

1. Listen to a variety of speakers and texts and will be able to comprehend and perform the required tasks.
2. Interact in a group professionally.
3. Face any interview confidently.
4. Manage time and make decision by speaking appropriately according to the context.
5. Demonstrate the right attitude and skills to cope with team and communicate professionally.

LIST OF EXPERIMENTS

UNIT DETAILS

I Listening Skills

- Listening for comprehensive/ critical/ analytical.
- Listening for job recruitment.
- Listening and watching to a variety of speakers in different contexts to dialogues from TV/Radio/Ted talks/Podcasts.

II Speaking Skills-I(Group Communication)

(Group Communication

- Presentation Skills.
- Public Speaking Skills(ceremonial, demonstrative, informative and persuasive)
- Emceeing.

III Speaking Skills- II(Interview Skills)

Interview Skills

- Initial Round(Group Discussion, Debate and JAM)
- Final Round(Telephonic, HR and Panel)

IV Specific Soft Skills- I(Activities Situations)

- Time Management.
- Decision Making.

V Specific Soft Skills-II (Activities & Situtaions)

- Team Building.
- Leaderships Skills.

TEXT BOOKS:

1. Andrea J. Rutherford. Basic Communication Skills for Technology. Person Education. Inc. New Delhi.
2. Anne Dannellon. Team Talk The Power of Language in Team Dynamics. Harvard Business School.
3. Antony Jay and Ros Jay. Effective Presentation. How to be a Top Class Presenter. Universities Press. (India) Limited. 1999.
4. Daniel Goldman. Emotional Intelligence. New York. Bantam Books. 1995.

REFERENCE BOOKS:

1. Fnedrike Klippel. Keep Talking. Cambridge University Press London. 1984.
2. Lewis, Hedwing Body Language: A Guide for Professionals. Response Book(a division of Saga Publications India. Pvt. Ltd.)New Delhi.1998.
3. Hari Mohan Prasad and Rajnish Mohan. How to prepare for Group Discussion and Ineview. 2nd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi. 2005.
4. Mitra, Barun. Personality Development and Soft Skills.
5. Good heart and Willcox. Soft Skills at Workplace.

Course Code	Course Title						Core/Elective
SPC411AD	**OPERATING SYSTEMS & COMPUTER NETWORKS LAB (Only AI&DS IV Sem)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
SPC303AD	-	-	-	4	40	60	2

Course Objectives:

1. Learn to communicate between two desktop computers.
2. Learn to implement the different protocols
3. Be familiar with socket programming.
4. Be familiar with the various routing algorithms
5. Be familiar with simulation tools.
6. To use simulation tools to analyze the performance of various network protocols
7. Learn different types of CPU scheduling algorithms
8. Demonstrate the usage of semaphores for solving synchronization problem.
9. Understand memory management techniques and different types of fragmentation that occur in them and various page replacement policies Learn various disk scheduling algorithms.

Course Outcomes: At the end of this course, the student will be able to

1. Implement various protocols using TCP and UDP.
2. Program using sockets.
3. Use simulation tools to analyze the performance of various network protocols.
4. Implement and Analyze various routing algorithms.
5. Evaluate the performance of different types of CPU scheduling algorithms.
6. Implement producer-consumer problem, reader-writers problem, Dining philosopher's problem.
7. Implement paging replacement and disk scheduling techniques. Use different system calls for writing application programs.

List of Experiments

Part -A

Operating Systems Lab:

1. Practice Unix Shell Commands.
2. Write C programs to Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF c)Round Robin d) Priority
3. Write C programs to Simulate IPC techniques
   a) Pipes b) Message Queues c) Shared Memory
4. Write C Programs to Simulate Classical Problems of Synchronization
   a) Readers-Writers b) Producers-Consumers C) Dining Philosophers
5. Write C Program to simulate Bankers Algorithm for Dead Lock Avoidance

6. Write C Programs to Simulate all page replacement algorithms
    a) FIFO b) LRU c) Optimal
7. Write C program to Simulate Disk Scheduling Algorithms
    a) FCFS b) SSTF etc.

Part – B

Computer Networks Lab

1. Configuration of router, hub, switch etc. (using real devices or simulators)
2. Running and using services/commands like ping, traceroute, nslookup, arp, telnet, ftp, etc.
3. Network packet analysis using tools like Wireshark, tcpdump, etc.
4. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS3, etc.
5. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)
6. Programming using raw sockets

Software Required: Putty

Course Code	Course Title						Core/Elective
SPC412AD	**DATA SCIENCE USING R (Only AI&DS IV Sem)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-----	-	-	-	2	40	60	1

Course Objectives:
1. Understand the R programming basics.
2. Exposure on solving data science problems and study descriptive statistics.
3. Learn correlation, covariance, and regression model.
4. Comprehend the multiple regression model and its use for prediction.

Course Outcomes:
At the end of this course, the student will be able to
1. Work with Data science using R programming environment.
2. Implement various statistics concepts for the real world problems.
3. Implement correlation, covariance, and regression model.
4. Execute the multiple regression model and its use for prediction.
5. Visualize the data science problems.

LIST OF EXPERIMENTS

1. BASICS OF R PROGRAMMING -1
Implementation of various Control Structures in R

2. BASICS OF R PROGRAMMING-2
Implementation of R objects : Vectors, Arrays.

3. BASICS OF R PROGRAMMING-3
Implementation of R objects : Matrices, Lists, Data Frames

4. R AS CALCULATOR APPLICATION
a. Using with and without R objects on console
b. Using mathematical functions on console
c. Write an R script, to create R objects for the calculator application and save in a specified location in disk.

5. READING AND WRITING DIFFERENT TYPES OF DATASETS
a. Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location.
b. Reading Excel data sheet in R.
c. Reading XML dataset in R.
d. Reading data from database.

6. DESCRIPTIVE STATISTICS IN R

a. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars dataset.

b. Write an R script to find subset of dataset by using
subset (), aggregate () functions on iris dataset.

7. INFERENTIAL STATISTICS IN R

a. Write an R script to find F Test, T Test, Z Test for the given dataset.

8. CORRELATION AND COVARIANCE

a. Find the correlation matrix.

b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.

c. Analysis of covariance.

9. VISUALIZATIONS

a. Find the data distributions using box and scatter plot.

b. Find the outliers using plot.

c. Plot the histogram, bar chart and pie chart on sample data.

10. WEB SCRAPING – 1

Scraping the twitter data using Twitter API.

11. WEB SCRAPING -2

Scraping the data from any website without using API.

LIST OF REFERENCE BOOKS:

1. Nina Zumel, John Mount " Practical Data Science with R. Manning Publications. 2014

WEB REFERENCES:

1. https://nptel.ac.in/courses/106106179
2. https://nptel.ac.in/courses/111104146

Software required: r tool, rstudio