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Sharad Institute of Technology College of Engineering

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Department: Computer Science Engineering **Rev:** Course Structure/01/NEP/2023-24

Class: T.Y. B. Tech. **Semester:** V

Sr No	Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
1	23CS3501	PCC	Advanced Java Programming	3		-	3	10	10	30	50	100	3
2	23CS3502	PCC	Design Analysis and Algorithms	3	-	-	3	10	10	30	50	100	3
3	23CS3503	PCC	Advanced Database Engineering	3	-	-	3	10	10	30	50	100	3
4	23CS3504	PCC	Advanced Java Programming Laboratory	-	-	2	2	15	15	-	20	50	1
5	23CS3505	PCC	Design Analysis and Algorithms Laboratory	-	-	2	2	15	15	-	20	50	1
6	23CS3506	PCC	Advanced Database Engineering Laboratory	-	-	2	2	15	15	-	20	50	1
7	23CS3507	PEC	Elective-I	3	-	-	3	10	10	30	50	100	3
8	23CS3508	CEP	Mini Project – III	-	-	2	2	25	25	-	-	50	1
9	23CSMDXX	MDM	Multidisciplinary Minor	3	-	-	3	10	10	30	50	100	3
10	23OECS33	OE	Open Elective III	3	-	-	3	10	10	30	50	100	3
11	23HSSM05	VEC	Aptitude Skills-III	1	-	-	1	25	25	-	-	50	Audit
12	23HSSM06	VEC	Language Skills-III	-	-	2	2	25	25	-	-	50	Audit
Total				19	-	10	29	180	180	180	360	900	22

***Open Elective III:** Object Oriented Modeling and Design

Note- Open Elective course will be offered to students of other programs and will not be offered to students of the same program.

Multidisciplinary Minor-

Basket	Agriculture	Management	Healthcare
Course Code, Name	Data Science for Agriculture (23CSMDA3)	Innovation, Business Models and Entrepreneurship (23CSMDB3)	Telemedicine and Remote Patient Monitoring (23CSMDC3)

Elective I- 23CS3507A) Text and Speech Analysis
23CS3507B) Cloud Computing
23CS3507C) Cryptography
23CS3507D) Introduction to AI

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23CS3501	PCC	Advanced Java Programming	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Java Programming

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

CO1	Develop a GUI application using swing components.
CO2	Explain event-driven programming concepts by using appropriate event classes, listener interfaces.
CO3	Construct applications that interact with relational databases using JDBC for data connectivity, manipulation, and retrieval.
CO4	Take part in Servlets with HTML forms and databases for dynamic content generation.
CO5	Make use of Java Server pages to implement dynamic web pages.
CO6	Design database-driven applications using Hibernate ORM framework by applying concepts of object-relational mapping, annotations.

Course Contents:

Unit 1: Swings Introduction toJFC and Swing, Difference between AWT and Swing, Features of the Java Foundation Classes, Swing Components: Swing Classes Hierarchy, Commonly used Methods of Component class (add(), setSize(), setLayout(), and setVisible()), JApplet, JFrame, JLabel, JTextField, JTextArea, JButton, JCheckBox, JRadioButton, JComboBox, JMenu, Advanced Swing Components(JTabbedPane, IScrollPane, JTree,JTable, JProgressBar,JSlider, JDiolog) Layout Management: Flow Layout,Border Layout, Card Layout, Box Layout, Grid Layout, Gridbag Layout.	[6]
Unit 2: Event Handling Event Handling: Introduction, Action Events, Key Events, Focus Events, Window Event, Mouse Event, Item Events, TextEvent, EventListnerInterface: ActionListener, KeyListener, FocusListener, WindowListener, MouseListener, MouseMotionListener, ItemListener, Event Handling using Adapter Classes.	[6]

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Unit 3: JDBC Programming Two-Tier Database Design, Three-Tier Database Design, JDBC- advantages and disadvantages, JDBC drivers, The JDBC API: The API components, Steps to Establish JDBC Connection (DriverManager, Connection, Statement), database operations like, CRUD (Create, Read, Update, Delete) operations using SQL Queries using Statement and PreparedStatement, Retrieving Data using ResultSet, develop java program using JDBC.	[6]
Unit 4: Servlet API and Overview Introduction to servlet, The life cycle of a servlet, Developing and deploying servlets, ServletRequest, ServletResponse Interfaces, Handling HTTP methods (GET, POST), Servlet config and Servlet context, Session Management using Cookies and HttpSession.	[6]
Unit 5: Java Server Pages Introduction to JSP: problem with Servlet, lifecycle of JSP, JSP Scripting elements (Scriptlets, Expressions, Declarations), JSP Directives (page, include, taglib), JSP Actions (Standard Actions), Implicit objects in JSP, Custom tags, Integrating JSP with Servlets.	[6]
Unit 6: Hibernate Introduction to hibernate, Exploring the architecture of hibernate, hibernate O/R mapping (ORM), Hibernate Annotation, CURD operation using Hibernate API.	[6]

Text Books: -

1. Herbert Schildt, JAVA: The Complete Reference", Ninth Edition, Oracle Press.

Reference Books: -

1. Ivor Horton, Beginning JAVA, WileyIndia.

2. "Java: The Complete Reference" by Herbert Schildt

3. JAVA Programming, Black Book, DreamtechPress

4. Core Java Volume I & II, Author: Cay S. Horstmann, Publisher: Pearson

5. Beginning Hibernate Author: Joseph B. Ottinger, Jeff Linwood, Dave Minter Publisher: Apress

6. Spring Boot in Action- Author: Craig Walls, Publisher: Manning

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23CS3502	PCC	Design Analysis and Algorithm	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basics of data structure

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

CO1	Illustrate basics and analyze performance of algorithms in terms of time complexity and space complexity.
CO2	Apply greedy Approach and Analyze the performance by taking different examples
CO3	Apply dynamic algorithms and analyze the performance by taking different examples.
CO4	Illustrate and apply algorithms using the backtracking technique to solve constraint satisfaction.
CO5	Illustrate tree and graph traversal techniques and outline the concepts of NP-Hard and NP-Complete problems.
CO6	Make use of branch and bound concepts, compare performance with backtracking.

Course Contents:

Unit 1: Introduction What is algorithm, Algorithm Specification, Performance Analysis, and Randomized Algorithm. Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Mathematical analysis of non-recursive and recursive Algorithms with Examples, Fundamental Data Structures: Stacks, Queues, Graphs and Sets.	[6]
Unit 2: Divide and Conquer General method, Binary search, Recurrence equation for divide and conquer, finding the maximum and minimum, Merge sort, Quick sort, Selection sort and analysis of these algorithms. Advantages and Disadvantages of divide and conquer	[6]
Unit 3: Greedy Method The general method, Activity Selection Problem, Huffman Coding, Knapsack problem, Job sequencing with deadlines Minimum-cost spanning trees–Prim'sandKruskal'sAlgorithmsOptimalstorageontapesOptimalmergepatterns nalysis Single source shortest paths notations.	[6]

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Unit 4: Dynamic Programming Introduction, Characteristics of Dynamic Programming, Shortest paths: Bellman Ford, Floyd, Warshall, Multistage graphs, all pair shortest paths, Optimal binary search trees, 0/1 knapsack, Reliability design, Traveling Sales person problem.	[6]
Unit 5: Traversal, NP Hard and Complete Problems Techniques for Binary Trees, Techniques for Graphs – Breadth First Search & Traversal, Depth First Search &Traversal, AND/OR graphs; NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes	[6]
Unit 6: Backtracking General method, N-Queens problem, Sum of subsets problem Graph coloring Hamiltonian cycles. Branch and Bound: Travelling Sales Person problem, 0/1 Knapsack problem (T LC Branch and Bound solution, FIFO Branch and Bound solution.	[6]

Text books: -

1. Fundamentals of Computer Algorithms-Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaran, Universities Press, Second Edition
2. Fundamentals of Algorithmics –Gilles Brassard, PaulBratley (Pearson Education).
3. Mastering Algorithms with C–Kyle Loudon (SPDO'Reilly).

Reference books: -

1. Computer Algorithms-Introduction to Design and Analysis–SaraBaase, Allen VanGelder (Pearson Education).
2. Michel Goodrich, Roberto Tamassia, Algorithm Design–Foundation, Analysis & Internet Examples, Wiley Publication, 2nd Edition, 2006
3. Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.
4. SaraBase, Computer algorithms: Introduction to Design and Analysis, Addison-Wesley Publication, 2nd Edition

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23CS3503	PCC	Advanced Database Engineering	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: DBMS

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

CO1	Explain the different types of database architectures.
CO2	Explain languages of Object based database.
CO3	Outline/solve FLOWER Expressions, joins, Nested Queries by using XQueries.
CO4	Compare SQL and NoSQL database system.
CO5	Examine Deductive and Active database Events, Conditions, Actions.
CO6	Choose the operations of multidimensional data model: OLAP.

Course Contents:

Unit 1: Introduction to database Architecture Introduction to client-server Database Model: Two-Tier Client server model, Three-Tier Client server model. Parallel databases: Parallel database system architecture, Types of parallelism, Parallel Database Implementation. Distributed databases: Distributed database system architecture, Benefits of distributed database system, Issues with distributed database systems.	[6]
Unit 2: Object Based Database Object based database: Object Identity, Object structure, Type Constructors, Encapsulation of Operations, Methods, Persistence, Type and Class Hierarchies, Inheritance, table inheritance, Complex Objects, Languages and Design: ODMG Model, Object Definition Languages (ODL), Object Query Languages (OQL).	[6]
Unit 3: XML Introduction to XML, Structure of XML data, XML Document schema, Querying and Transformation, Xpath, XQueriy: FLOWER Expressions, joins, Nested Queries, Functions and Types. Storage of XML Data.	[6]

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Unit 4: Advanced Database Techniques. Structured versus Unstructured data. NoSQL database concepts: Types of NoSQL databases, comparision between SQL and NoSQL database system. NoSQL using MongoDB: Introduction to MongoDB Shell, MongoDB client, Basic operations with MongoDB shell, Basic Data Types, Embedded Documents. Querying with MongoDB: find() function, specifying which keys to return, query criteria, Types specific querying.	[6]
Unit 5: Deductive, Active, Multimedia database: Introduction to Multimedia Databases, Mobile Databases and digital databases, Deductive Database: Introduction to recursive queries, Datalog Notation, Clause Form and Horn Clauses, Active Database: Languages for rule specification: Events, Conditions, Actions, temporal database, spatial database.	[6]
Unit 6. Data Warehouse and OLAP Introduction to Decision support, Data Warehousing, Creating and maintaining a warehouse, OLAP: Multidimensional data model, OLAP Queries, Database design for OLAP, Implementation techniques for OLAP: Bitmap Indexes, Join Indexes, Views and decision support, Top N queries, Online aggregation, View Materialization: Issues.	[6]

Text books: -

1. "Database System Concepts", Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 6thedition, McGraw- Hill.
2. "Database Systems - A Practical Approach to Design, Implementation and Management", Thomas Connolly, Carolyn Begg, 4th Edition,Addison Wesley.
3. "MySQL Cookbook", PaulDuBois, 3rd edition, O'REILLY.

Reference books: -

1. "Principles of Database Systems", J. D. Ullman, 2nd Edition, Galgotia Publication, ISBN10: 0716780690, ISBN-13: 978-0716780694.
2. "Fundamentals of Database System", R. Elmasri and S. Navathe, . Pearson, 7th Edition, ISBN-10: 933258270X, ISBN-13: 978-9332582705 .

23CS3504	PCC	Advanced Java Programming Laboratory	0-0-2	1 Credit

Teaching Scheme	Evaluation Scheme
Practical: 2 hrs/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Java Programming

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

CO1	Develop a GUI application using swing components.
CO2	Explain event-driven programming concepts by using appropriate event classes, listener interfaces.
CO3	Construct applications that interact with relational databases using JDBC for data connectivity, manipulation, and retrieval.
CO4	Take part in Servlets with HTML forms and databases for dynamic content generation.
CO5	Make use of Java Server pages to implement dynamic web pages.
CO6	Design database-driven applications using Hibernate ORM framework by applying concepts of object-relational mapping, annotations.

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Course Contents:

List of Experiment:

1. Develop a program to create login form using Swing Component.
2. Develop a program to demonstrate a progressbar showing progress value in percentage by using set values.
3. Develop a program to Implement Traffic signal(Red, Green and Yellow) by using Swing components (Using JFrame, JRadioButton, ItemListener etc.).
4. Develop a program to mouse motion adapter class to implement only one method mouyse dragged.
5. Develop a program using JDBC to display student's record (Enroll No, Name, Address, Mobile No,and Email-ID) into table 'StuRec'.
6. Develop a program using JDBC to edit (insert, update, delete) Student's profile stored in the database.
7. Develop a program simple servlet to display "Welcome to Servlet Programming".
8. Develop a program servlet that handles GET and POST methods differently.
9. Develop a servlet for demonstrating the concept of session and cookies.
10. Create a form that accepts the user's name and age. Display the submitted data on the next JSP page.
11. Write a JSP page that demonstrates the use of declaration, scriptlet, and expression.
12. Develop an application to store, update, fetch and delete data of Employee (NAME, AGE, SALARY and DEPARTMENT) using Hibernate CRUD operations.

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23CS3505	PCC	Design Analysis and Algorithms Laboratory	0-0-2	1 Credit

Teaching Scheme	Evaluation Scheme
Practical: 2 hrs/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: C Programming

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

CO1	Design and implement algorithm by taking simple problems.
CO2	Design algorithm on greedy Approach and Analyze the performance.
CO3	Develop an algorithm on dynamic approach and analyze the performance.
CO4	Design algorithm by applying backtracking technique.
CO5	Design and Implement algorithm on Traversal technique.
CO6	Develop algorithm on branch and bound technique.

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Course Contents:

List of Experiments:

1. Sort a given set of n integer elements using Quick Sort method and compute its time complexity
2. Sort a given set of n integer elements using Merge Sort method and compute its time complexity
3. Sort a given set of n integer elements using selection Sort method and compute its time complexity
4. Search a given searching element using binary search algorithm.
5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program in Java.
6. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.
7. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
8. Write Java programs to

   1) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.

   2) Implement Travelling Sales Person problem using Dynamic programming.
9. Design and implement DFS And BFS algorithms.
10. Implement N Queen's problem using BackTracking.

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23CS3506	PCC	Advanced Database Engineering Laboratory	0-0-2	1 Credit

Teaching Scheme	Evaluation Scheme
Practical: 2 hrs/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: DBMS

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

CO1	Demonstrate the different types of database architectures.
CO2	Explain languages of Object based database.
CO3	Outline FLOWER Expressions, joins, Nested Queries by using XQueries.
CO4	Compare SQL and NoSQL database system.
CO5	Examine Deductive and Active database Events, Conditions, Actions.
CO6	Choose the operations of multidimensional data model: OLAP.

Course Contents:

List of Experiments:

1. Create database using XML attributes and elements.
2. Implement Query based on FLOWER expression and joins using XQuery.
3. Implement Query based functions and types using XQuery.
4. Implement queries using structured types in SQL.
5. Implement the query using type inheritance and table inheritance in SQL.
6. Implement the query using array and multiset types in SQL.
7. Design and develop MongoDB queries using basic operations.
8. Implement aggregations queries using MongoDB.
9. Implement MongoDB queries using find () function.
10. Install and configure any data mining tool like (WEKA) and use installed data mining tool.

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Program Elective Course-I

23CS3507A	PEC	Text and Speech Analysis	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Data Science

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

CO1	Identify various techniques of natural language data.
CO2	Apply vector semantics and embedding techniques to classify text.
CO3	Develop question answering systems and dialogue systems by integrating information retrieval techniques.
CO4	Make use of various text-to-speech synthesis techniques
CO5	Apply the principles of acoustic modeling in automatic speech recognition systems
CO6	Analyze advanced Natural Language Processing (NLP) techniques

Course Contents:

Unit 1: Natural Language Basics Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stop-words – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model	[6]
Unit 2: Text Classification Vector Semantics and Embeddings, Word Embeddings – Word2Vec model – Glove model –Fast Text model. Overview of Deep Learning models, RNN, Transformers – Overview of Text summarization	[6]
Unit 3: Question Answering and Dialogue System Information retrieval – IR-based question answering – knowledge-based question answering –language models for QA – classic QA models – chatbots – Design of dialogue systems -evaluating dialogue systems	[6]

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Unit 4: Text-to-Speech Synthesis Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing –Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems	[6]
Unit5: Automatic Speech Recognition Speech recognition: Acoustic modelling – Feature Extraction – HMM, HMM-DNN systems	[6]
Unit 6: Advanced NLP Techniques Named Entity Recognition (NER), Part-of-speech tagging, Bias in NLP and speech models, Privacy concerns and data ethics.	[6]

Reference books: -

1. Tanveer Siddiqui, Tiwary U S, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2. Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, "Fundamentals of Speech Recognition" 1st Edition, Pearson, 2009
3. Dipanjan Sarkar, "Text Analytics with Python: A Practical Real-World approach to Gaining.
4. Steven Bird, Ewan Klein, and Edward Loper, "Natural language processing with Python", O'REILLY.

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Program Elective Course-I

23CS3507B	PEC	Cloud Computing	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Computer Network, Database Management Systems

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

CO1	Outline the different Cloud Computing environment.
CO2	Illustrate the architecture of Cloud Computing
CO3	Analyze virtualization technology and install virtualization software
CO4	Make use of appropriate data storage technique on Cloud based on Cloud application
CO5	Apply security in cloud applications
CO6	Develop and deploy applications on cloud

Course Contents:

Unit 1: Fundamentals of Cloud Computing Importance of Cloud Computing, Characteristics, Pros and Cons of Cloud Computing, Cloud Economics and Benefits, Migrating into the Cloud, Seven-step model of migration into a Cloud, Trends in Computing.	[6]
Unit 2: Cloud Architecture Cloud Deployment Models: public cloud, private cloud, hybrid cloud, cloud services models: SaaS, PaaS, IaaS, Architecture of cloud computing: Cloud System Architecture, Cloud Computing Logical Architecture, Layered cloud architecture design.	[6]

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Unit 3: Virtualization in Cloud Computing Definition of Virtualization, Adopting Virtualization, Types of Virtualizations, Virtualization Architecture and Software, Virtualization in Cloud, Virtual infrastructures, CPU Virtualization, Network and Storage Virtualization, Virtualization Application, Pitfalls of Virtualization.	[6]
Unit 4: Storage in Clouds Introduction to Enterprise Data Storage, Direct Attached Storage, Storage Area Network, Data Storage Management, File System, Cloud Data Stores , Data Management, Provisioning Cloud storage, Cloud Storage from LANs to WANs, Cloud Characteristics, Distributed Data Storage.	[6]
Unit 5: Security in Cloud Computing Cloud security Fundamentals, Risk Management, Types of Risks in Cloud Computing, Security Issues, Challenges, advantages, Disadvantages, Content Level Security. Cloud Security Services: Confidentiality, Integrity and Availability, Security Authorization Challenges in the Cloud, Secure Cloud Software Requirements, Secure Cloud Software Testing	[6]
Unit 6: Cloud Platforms and Cloud Applications Cloud Platforms: Amazon Web Services and Components, Amazon Simple DB, Elastic Cloud Computing (EC2), Amazon Storage System, Microsoft Cloud Services: Azure core concepts, SQL Azure. Cloud Computing Applications: Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Geosciences: Satellite Image Processing, Business and Consumer Applications: CRM and ERP, Social Networking, Google Cloud Application: Google App Engine.	[6]

Text Books:

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, ISBN-13:978-1-25-902995-0

Reference Books:

1. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", 2010, The McGraw-Hill.

2. Srinivasan, J. Suresh, "Cloud Computing: A Practical Approach for Learning and Implementation", Pearson.

3.Thomas Erl with Eric Barcelo Monroy"Cloud Computing:Concepts, Technology And Architecture",2024,Pearson.

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Program Elective Course-I

23CS3507C	**PEC**	**Cryptography**	**3-0-0**	**3 Credits**

Teaching Scheme	**Evaluation Scheme**
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites:

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

CO1	Outline cryptographic principles, security attacks, and classical encryption techniques.
CO2	Demonstrate symmetric key encryption algorithms
CO3	Demonstrate asymmetric encryption techniques
CO4	Apply authentication requirements, hash functions, key management, and PKI.
CO5	Make use of integrity verification, digital signatures, and authentication protocols
CO6	Identify Kerberos authentication, its components, and cyber laws related to security

Course Contents:

Unit 1: Introduction to Cryptography Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, stenography, key range and key size, possible types of attacks.	[6]
Unit 2: Symmetric key Ciphers Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.	[6]
Unit 3: Asymmetric key Ciphers Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, and Knapsack Algorithm.	[6]

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Unit 4: Authentication requirements and Key Management Cryptographic Hash Functions: Message Authentication, Secure hash algorithm(SHA 512) Message Authentication Codes: Authentication requirements, HMAC, CMAC Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, X.509 Authentication Service, Public – Key Infrastructures.	[6]
Unit 5: (Integrity checks and Authentication algorithms) MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - directory authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME.	[6]
Unit 6: Kerberos Working - AS, TGS, SS, Common Attacks - Pass-the-Ticket Attack, Golden Ticket Attack, Silver Ticket Attack -Cyber laws – Crime against individual, Government, Property	[6]

Textbooks:

1. Cryptography and Network Security: William Stallings, Pearson Education,4 Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill Edition

Reference Books:

1. Cryptography and Network Security: C K Shyamala, N Harin i, Dr T R Padmanabhan, Wiley India, 1" Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, MC Graw Hill, 2"" Edition
3. Information Security, Principles and Practice: Mark Stamp, Wiley India. Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH.
4. Introduction to Network Security: Neal Krawetz, CENGAGE Learning Paradigms", Wiley publication, ISBN: 9788126570966

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Program Elective Course-I

23CS3507D	PEC	Introduction to AI	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Database Management System, Design Analysis of Algorithm

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

CO1	Explain Fundamental Concepts & Challenges in AI.
CO2	Apply search methods that Agents can employ for problem solving.
CO3	Compare results of various Constraint Satisfaction Problems.
CO4	Model Adversarial Search, Games, Optimal Decisions in Games.
CO5	Illustrate Logical Agents with various example
CO6	Demonstrate Ethical Awareness in AI

Course Contents:

Unit 1: Introduction Introduction, What Is AI? The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art. Agents and Environments Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.	[6]
Unit 2: Problem-solving Solving Problems by Searching, Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.	[6]
Unit 3: Constraint Satisfaction Problems Defining Constraint Satisfaction Problems, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.	[6]
Unit 4: Game Playing Adversarial Search, Games, Optimal Decisions in Games, Alpha–Beta Pruning.	[6]

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Unit 5: Logical Agents Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic: A Very Simple Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic	[6]
Unit 6: AI Ethics and Future Trends Ethical Implications of AI: Bias in AI, AI and Privacy, AI in Warfare, Future of AI: Trends in AI research, AI in Autonomous Systems. AI Governance and Regulation: Ethical AI development frameworks.	[6]

Textbooks:

1. Rich, E. and Knight K.: Artificial Intelligence, Tata McGraw- Hill

Reference Books:

1. Peter Norvig, Artificial Intelligence: A Modern Approach, Third Edition.
2. Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley

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23CS3508	CEP	Mini Project III	0-0-2	01 Credit

Teaching Scheme	Evaluation Scheme
Practical: 2 hrs/week	Continuous Assessment-I: - 25 Marks Continuous Assessment-II: -25 Marks

Pre-Requisites: Mini Project, Mini Project II

About Hackathon

The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms where students will solve real world challenges. This Course focuses on the selection of methods/engineering tools/analytical techniques for problem solving.

Through this course, students will gain the understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills and responsibility

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

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the methods /tools used to develop the solution
CO4	Design / simulate the model/ project work
CO5	Describe the solution with help of a project report and presentation
CO6	Conclude the outcomes of project.

Course Contents:

Week 1: Survey Design-1 • Ensure case study group students have made necessary communication and done a preparatory visit. • Watch the lecture on survey design and study the notes. • Prepare a questionnaire and try it out with your group members as mock.	[2]

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Week 2: Survey Design-2 • Review survey questionnaire prepared by case study groups. • Decide sampling strategy. • Prepare a detailed schedule for fieldwork	[2]
Week 3: Fieldwork • Data Collection: Collect quantitative data (e.g., statistics, usage metrics) and qualitative data (e.g., user stories, testimonials). • Use data collection tools like questionnaires, observation checklists, and digital analytics. • Ensure data accuracy and reliability through proper sampling and recording methods. • 25% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 4: Trails and Experimentation-1 • Initial Setup and Configuration • Concept Validation • Feasibility Testing	[2]
Week 5: Trails and Experimentation-2 • Prototyping • Functionality Testing	[2]
Week 6: Trails and Experimentation-3 • Bug Identification and Fixing • Integration Testing • Security Testing • 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 7: Results • Coordinator has to check and verify below points in term of result: • Functional Performance • Accuracy and Precision • Efficiency • Safety	[2]
Week 8: Validation • Coordinator has to check and verify below points in term of validation: • Testing and Verification • Compliance with Standards • 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]

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Week 9: Integration Testing • Validate that the hardware integrates seamlessly with other systems or components as intended • Perform compatibility tests with software, other hardware, and network systems.	[2]
Week 10: Documentation and Reporting • Maintain comprehensive documentation of design, development, testing, and validation processes • Provide detailed reports on test results, issues found, and corrective actions taken.	[2]
Week 11: Final Presentation • 100% Presentation has to be conducted by mentor/guide based on above activity. • Prototype/Final Software solution is mandatory at the time of final presentation along with report	[2]
Week 12: Exhibition • Mini project exhibition will be schedule with interdepartmental evaluation.	[2]

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Multidisciplinary Minor- III

23CSMDA3	**MDM**	**Data Science for Agriculture**	**3-0-0**	**3 Credits**

Teaching Scheme	**Evaluation Scheme**
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Python, Data Science and visualization

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

CO1	Relate the role of data science in agriculture.
CO2	Outline process of data collection for various agricultural practices.
CO3	Apply preprocessing techniques on agricultural data.
CO4	Identify use of remote sensing and GIS tools for smart farming.
CO5	Explain IoT-based farming for Precision Agriculture.
CO6	Select Time series techniques for Predictive Analysis.

Course Contents:

Unit 1: Introduction to Data Science in Agriculture Role of data science in agriculture, Basics of agricultural data (Soil, Weather, Crop Yield, Pests, Diseases), Big data in agriculture, Data-driven decision-making in agriculture, Challenges in agricultural data analysis.	[6]
Unit 2: Data Collection Sources of agricultural data (Satellite, IoT, Sensors, Drones), Types of Agricultural Data, Soil parameters (moisture, pH, nutrients), Weather data (temperature, humidity, rainfall), Crop health & growth monitoring, Disease & pest control data, Smart farming with IoT and Edge AI. Importance of AI & machine learning in farming.	[6]
Unit 3: Data Preprocessing Data cleaning, transformation, and visualization, Feature engineering for crop and soil data, Handling missing values, outliers, and noise, Feature selection & engineering for agricultural datasets, Data normalization.	[6]

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Unit 4: Remote Sensing and GIS in Agriculture Use of satellite imagery for crop monitoring, GIS-based mapping of soil and land fertility, NDVI (Normalized Difference Vegetation Index) for plant health analysis, NDVI (Normalized Difference Vegetation Index), SAVI, EVI for crop stress detection.	[6]
Unit 5: Precision Agriculture and IoT Sensors for soil moisture, pH, and temperature monitoring, IoT architecture for agriculture, Wireless sensor networks (WSN) for farm monitoring Drone-based data collection and analysis, Smart irrigation & automated fertilization systems.	[6]
Unit 6: Time-Series and Predictive Analytics ARIMA, LSTM, Prophet models for crop yield forecasting, predicting rainfall & temperature variations, Forecasting crop yields using time-series models, Weather prediction for agricultural planning, AI-based decision support systems for farmers.	[6]

Text Books:

1. "Data Science from Scratch (First Principles with Python)", Joel Grus, O'Reilly Publication.
2. "Textbook of Agricultural Meteorology" by H. S. Mavi, 2nd ed. (Oxford & IBH, 1994)
3. S.R. Reddy – "Principles of Agronomy"

Reference Books:

1. "Data Science in Agriculture and Natural Resource Management", G. P. Obi Reddy · Mehul S. Raval · J. Adinarayana · Sanjay Chaudhary
2. "Data-Driven Precision Agriculture Opportunities and Challenge", Wenxuan Guo, Song Cui, Jessica Torrion, and Nithya Rajan.
3. A.K. Dahama, "Organic Farming for Sustainable Agriculture" (Agrobios, Jodhpur, 2nd Edition, 2009)

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Multidisciplinary Minor- III

23CSMDB3	**MDM**	**Innovation, Business Models and Entrepreneurship**	**3-0-0**	**3 Credits**

Teaching Scheme	**Evaluation Scheme**
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites:

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

CO1	Summarize the fundamentals of innovation.
CO2	Demonstrate the marketing of innovation.
CO3	Illustrate the concept of business model.
CO4	Explain the role of entrepreneurship in business model.
CO5	Illustrate Competencies required to become an entrepreneur.
CO6	Outline of management of innovation.

Course Contents:

Unit 1: Innovation & Creativity Innovation Concept, Characteristics of Innovation, Importance of Innovation, Principles of Innovation, Process of Innovation. Scope of Innovation, Challenges of Innovation, Steps of Innovation Management, Idea Management System, Innovation in Current Environment, Types of Innovation.	[6]
Unit 2: Marketing of Innovation Idea Management System, Divergent Vs Convergent Thinking, Levers of Idea Management, Experimentation in Innovation Management, Participation for Innovation, Co-creation for Innovation, Technology Innovation Process, Technological Innovation Management Strategies, Technology Forecasting.	[6]
Unit 3: Business Model Search for a business idea- How to choose an idea- Product idea- selection of product, the adoption process- Product innovation- Production, planning and development strategy, Design of production system- Types of production system.	[6]

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Unit 4: Introduction to Entrepreneurship Meaning and concept of entrepreneurship- Difference between Entrepreneurship & wage employment - Functions of an Entrepreneur. - Entrepreneur vs Manager- role of entrepreneurship in economic development – Barriers to entrepreneurship.	[6]
Unit 5: The Entrepreneur Types of entrepreneurs- Competencies required to become an entrepreneur - Creative and Design Thinking, the entrepreneurial decision process- The process of Entrepreneurial development program (EDP)- Evaluation of EDP - Entrepreneur development training.	[6]
Unit 6: Management of Innovation Creation of IPR, Management of Innovation, creation of IPR, Types of IPR, Patents in India, Copyrights and other important IPR. Future markets and Innovation needs for India.	[6]

Text Books:

1. James A Christiansen, "Competitive Innovation Management", published by Macmillan Business, 2000.
2. Paul Trott, "Innovation Management & New Product Development", published by Pitman, 2000.
3. Kelley, Tom, Jonathn Littman, and Tom Peters. The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm. New York: Doubleday, 2001.

Reference Books:

1. Entrepreneurship Development- Sangeeta Sharma, Kindle edition 2. Production & operations Management- Kanishka Bedi.
2. Marketing Management- Philip Kotler.
3. The Business Model Book: Design, build and adapt business ideas that drive business growth: Adam Bock, Gerard George.

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Multidisciplinary Minor- III

23CSMDC3	MDM	Telemedicine and Remote Patient Monitoring	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week	CA I: 10 Marks CA II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Python, Data Science and Visualization

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

CO1	Outline basics of telemedicine.
CO2	Explain the key components of a telemedicine system.
CO3	Outline the key components of the hardware platform for telemedicine.
CO4	Develop strategies to integrate AI tools into healthcare.
CO5	Develop healthcare service coordination strategies that utilize wearable IoT devices.
CO6	Analyze future trends in telemedicine.

Course Contents:

Unit 1: Introduction to Telemedicine What is Telemedicine, Applications of Telemedicine, Modes of Communication available in Telemedicine, Benefits of Telemedicine to patients, Limitations of Telemedicine, Telemedicine in India, Types of telemedicine, Challenges, How Telehealth Services are Reshaping Healthcare.	[6]
Unit 2: Telemedicine Infrastructure and Delivery Modes Telemedicine System (Types of information in telemedicine, Process), Components of Telemedicine System (Telemedicine Platform: information technology infrastructure, Clinical/medical devices, Video Conferencing equipment, software requirement, connectivity and communication system), Delivery modes in telemedicine (store and forward telemedicine, real-time telemedicine, Hybrid System, Remote monitoring)	[6]
Unit 3: Information Systems and Cloud Computing in Telemedicine Information Sources in telemedicine system, Data Transmission (EMR, PHR, EHR), Hardware Platform for Telemedicine, Workstation for telemedicine, Client-server Computing and cloud computing in telemedicine.	[6]

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Unit 4: Health care with AI Introduction, positive effects if AI in healthcare, using AI to improve health in Ares such as illness, prevention, detection & treatment, Providing healthcare to patients - Technical perspectives –healthcare provider, end users, authorities biomedical sensors: ECG, EEG, blood pressure, temperature, and glucose monitoring.	[6]
Unit 5: Advancements in IoT-Based Healthcare Attributes of SHM & IOMT, Framework, data security, remote heart rate tracking sensor enabled iot based devices, superior medical technology, service coordination in healthcare, Wearable devices for remote monitoring: Smart watches, fitness bands, and medical-grade sensors.	[6]
Unit 6: Case Studies and Real-World Applications Telemedicine implementations in different regions and specialties, Case studies from healthcare providers, hospitals, and startups, challenges faced by telemedicine projects. Future trends: 5G, AI-powered telemedicine, and virtual health assistants.	[6]

Reference/Text books: -

1. Telemedicine: Technology and Applications (mHealth, TeleHealth and eHealth) by R. S. Khandpur
2. Remote Patient Monitoring: A Computational Perspective in Healthcare by Rishabha Malviya , Priyanshi Goyal .
3. Telemedicine: A Gateway To Health Care by Aryan Chaudhary
4. Remote Patient Monitoring: Technologies and Applications" by *Sanjay Sharma and Rajendra Prasad Yadav*
5. Health Informatics: A Systems Perspective" by *Eliot S. L. H. Rees*

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23HSSM05	VEC	Aptitude Skills- III	1-0-0	Audit

Teaching Scheme:	Evaluation Scheme:
Lecture: 1 Hrs/Week	CA I:25 Marks CA II: 25 Marks

Pre-Requisites: Aptitude Skills-I and II

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

CO1	Solve the problems on system of equation
CO2	Solve the problems on seating arrangement
CO3	Solve the logical reasoning problems
CO4	Solve the critical analysis problems
CO5	Solve the problems of Data interpretation
CO6	Solve the problems permutations and combinations

Course Contents:

Unit 1: System of equations Quadratic equations, Surds and indices, solution of equations, Ages,	[2]
Unit 2: Seating Arrangements Linear seating Arrangement, Circular seating arrangement, Complex seating arrangement	[2]
Unit 3: Logical Reasoning Numerical based on sense of direction, Blood relations, Odd man Out	[2]
Unit 4: Critical analysis Clocks and Calendar based problems, Cryptarithmetic, heights and distances	[2]
Unit 5: Data Interpretation Table form, Bar form, Line for Pi chart form	[2]

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Unit 6: Permutation and combination Permutation and combinations	[2]

Text Books:

1. RS Aggarwal, "Quantitative Aptitude for Competitive Examinations ", S. Chand Publisher; 2016 edition.
2. Quantitative Aptitude for CAT TMH Publications
3. Vedic Maths Made Easy By Dhaval Bhatiya Jaico Publication House.

Reference Books:

1. Rao N,D,V,Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press;Second edition
3. RS Aggarwal, Objective General English, S. Chand Publisher; 2016 edition

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23HSSM06	VEC	Language Skill- III	0-0-2	Audit

Teaching Scheme:	Evaluation Scheme:
Practical: 2 hrs/week	CA I: 25 Marks CA II: 25 Marks

Pre-Requisites: Language Skill I & II

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

CO1	Develop a program to read input and return output.
CO2	Develop a program using data types, Strings and variables
CO3	Develop a program using Unary, Binary and Ternary operator
CO4	Develop a program using Conditional and Logical statements.

Course Contents:

1. **Write a Python program to print "Hello, World!"** o Objective: Understand basic syntax, indentation, and output.	[2]
2. **Write a program to demonstrate the use of different types of comments in Python.** o Objective: Single-line and multi-line comments.	[2]
3. **Write a Python program that declares different types of variables and displays their data types using the type() function.** o Objective: Variables, data types, and type identification.	[2]
4. **Write a program to demonstrate type casting and type conversion between int, float, and string.** o Objective: Type conversion, casting functions.	[2]
5. **Write a Python script to perform string operations such as slicing, concatenation, upper(), lower(), and len().** o Objective: String manipulation and built-in functions.	[2]

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6. **Write a program to demonstrate the use of all arithmetic, logical, and bitwise operators.** o Objective: Operator functionality.	[2]
7. **Write a Python program to use membership and identity operators with examples.** o Objective: in, not in, is, is not.	[2]
8. **Write a Python program using a ternary operator to find the larger of two numbers.** o Objective: Conditional (inline) expressions.	[2]
9. **Write a program that takes user input for age and prints whether the person is a child, teenager, adult, or senior citizen using if-elif-else.** o Objective: Conditional statements and user input.	[2]
10. **Write a program to find the sum of the first 10 natural numbers using a while loop.** o Objective: Looping with while.	[2]
11. **Write a Python script to display the multiplication table of a number using a for loop.** o Objective: Looping with for and range().	[2]
12. **Write a program that uses break, continue, and pass statements in appropriate looping scenarios.** o Objective: Loop control statements.	[2]

Text Books:

1. Python Projects (Author: Laura Cassell, Alan Gauld) Wrox publication
2. murach's Python Programming. Aut.:Michael Urban, Joel Murach, murach's Publication.

Reference Books:

1. Fundamentals of Python (First Program) Cengage MINDTAP Publication 2nd Edition. Author: K.A. Kambert.

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