

Academic Session March-2023

Syllabus- MCA (4th Semester)

Course Code	Course Title	Credits	Th/ Th-P/P/Pro
OMC401	Data Warehouse and Data Mining	3	Theory
OMC402	Design and Analysis of Algorithm	3	Theory
OMC403	Mobile Application Design and Development	3	Theory
OMC404	Cryptography and Network Security	3	Theory
OMC405	Project Work	6	Project

Data Warehouse and Data Mining

Course Code: OMC 401	Course Title: Data Warehouse and Data Mining (3 Credits)
<p>Course Objective: - The students will be able to:</p> <ul style="list-style-type: none"> ➤ Understand the concepts and role of data warehousing and enterprise intelligence in IT industry. ➤ Summarize the dominant data Warehousing Architectures and their support for quality attributes. ➤ Recognize and describe at least three computational approaches to data clustering, taking cognizance of the contribution of paradigms from the fields of Artificial Intelligence and Machine learning. ➤ Compare and contrast the dominant data mining algorithm. Understand the advanced features of data mining algorithms. 	

Course Contents

Sr. No.	Unit No./ Unit description	Unit Objectives
1	Unit 1- Introduction to Data Mining: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining.	Students will be able to understand and evaluate the basic concepts of data mining and can apply concepts of data mining in information technology applications within organizations.
2	Unit 2- Introduction to Data Warehouse: Definition, Data Warehousing Components, building a Data Warehouse, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse.	Students will be able to understand the concept of data Warehouse and differentiate it with database.
3	Unit 3- Multi-dimensional data Model: Data Cubes, Stars, Snowflakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data warehouse Measures, their categorization and computation, Operations in OLAP, Advantages of OLAP over OLTP.	Students will be able to implement the concepts of multidimensional data Model in real life applications.
4	Unit 4- Data Pre-processing: Need for pre-processing Descriptive data summarization	Students will be able to understand need of data pre-processing before it can be used for analysis.
5	Unit 5- Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation	Students will be able to implement various data cleaning and data integration techniques.
6	UNIT 6- Data Mining Primitives: Task-relevant data, mining objective, measures and identification of	Students will be able to understand the objective of doing data mining.

	patterns, KDD versus data mining, data mining tools and applications.	
7	Unit 7- Data Mining Query Language: Data specification, specifying kind of knowledge, hierarchy specification, pattern presentation & visualization specification, data mining languages and standardization of data mining, Architectures of Data Mining Systems.	Students will be able to write queries to implement the concepts of data mining.
8	Unit 8- Data Mining Techniques (Association Rules): Association rules from transaction database & relational database, Apriori algorithm and correlation analysis.	Students will be able to understand and implement the association rules on real life applications.
9	Unit 9- Data Mining Techniques (Classification and predication): Issues related to classification & prediction, decision tree induction, Bayesian classification. Classification methods K-nearest neighbour classifiers	Students will be able to understand and implement the classification and prediction rules on real life applications
10	Unit 10- Data Mining Techniques (Clustering techniques): Data types in cluster analysis, categories of clustering techniques: partition method, and Hierarchical method.	Students will be able to understand and implement the clustering techniques on real life applications
11	Unit 11- Overview of Advanced Features of Data Mining: Mining complex data objects, Spatial databases, Multimedia databases	Students will be able to understand the different and advanced concepts of data mining.
12	Unit 12- Overview of Advanced Features of Data Mining: Time series and Sequence data; mining Text Databases and mining Word Wide Web.	Students will be able to understand the different and advanced concepts of data mining.

References: -

- Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, TataMcGraw – Hill Edition, 2007.
- Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.

Design and Analysis of Algorithm

Course Code: OMC 402	Course Title: Design and Analysis of Algorithm (3 Credits)
<p>Course Objective: - The students will be able to:</p> <ul style="list-style-type: none"> ➤ Analyse and compare complexity for different types of algorithms for different types of problems. ➤ Apply mathematical preliminaries to the analyses and design stages of different types of algorithms. ➤ Choose among different types of data structures the best one for different types of problems ➤ Recognize the general principles and good algorithm design techniques for developing efficient computer algorithms ➤ Familiarize with specific algorithms for a number of important computational problems like sorting, searching, and graphs, etc. ➤ Decide the suitability of a specific algorithm design technique for a given problem. 	

Course Contents

Sr. No.	Unit No./ Unit description	Unit Objectives
1	<p>Unit 1- Algorithms: Analysis of Algorithms, Design of Algorithms, and Space and time Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences relations, Masters Theorem, Divide and Conquer Relations.</p>	<p>Students will be able to understand the basic concepts of algorithms, growth of the functions and Recurrence relational and methods to solve the different types of relations.</p>
2	<p>Unit 2- Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort. Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort.</p>	<p>Students will be able to understand and evaluate the time and space complexities of various sorting algorithms also student will be able to know about the linear time algorithms.</p>
3	<p>Unit 3- Binary Search Tree, Red Black Trees Binomial Heap, B-Tree, Fibonacci Heap and Operations.</p>	<p>Students will be able to understand the concepts of BST, RB tree, B tree and Binomial Heap and different operations on these structures.</p>

4	<p>Unit 4- Advanced Design and Analysis Techniques: Dynamic programming approach and its application, Chain Matrix Multiplication Problem, Optimal Binary search tree ,TSP, 0/1 knapsack problem,</p>	<p>Students will be able to understand and implement dynamic programming approach and solution of optimization problems with DPA.</p>
5	<p>Unit 5- Greedy and Backtracking approach, N-queen’s problem Hamiltonian cycles, application of greedy approach, Comparison with dynamic programming approach.</p>	<p>Students will be able to understand and implement Greedy and Backtracking approach and their application to different NP complete problems.</p>
6	<p>UNIT 6- Branch-and-Bound Techniques, solution og assignment problem, 0/1 Knapsack problem with branch and bound method and Amortized Analysis.</p>	<p>Students will be able to understand and implement Branch and Bound techniques also will get knowledge about amortized analysis and its application.</p>
7	<p>Unit 7- Graph Algorithms: Elementary Graph Algorithms, Various types of graphs, graph Trversal methods Breadth First Search, Depth First Search, Minimum Spanning Tree,</p>	<p>Students will be able to understand and implement Graphs algorithms and their applications. Student will also get knowledge about MST.</p>
8	<p>Unit 8- Kruskal’s Algorithms, Prim’s Algorithms, Single Source Shortest Path problem, Dijkstra algorithms, Bellman Ford Algorithm, All pair Shortest Path problem, Floyds algorithms</p>	<p>Students will able to understand, evaluate different algorithms to find MST also they will know how to solve single source and all pair shortest path problems.</p>
9	<p>Unit 9- Flow Network, .Residue network, Maximum flow -Min cut theorem, Flow Maximization Problem, Ford Fulkerson algorithm.</p>	<p>Students will able to understand the basics of Flow network and flow Maximization algorithms.</p>

10	Unit 10- Randomized Algorithms, Nut Bolt problem, String Matching, Naïve String Matcher, Rabin-Karp algorithm,	Students will be able to understand the basics of Randomized algorithms and string matching algorithms.
11	Unit 11- Approximation Algorithms, Sorting Network, Matrix Operations, Polynomials & the Fast Fourier Transformation, Number Theoretic Algorithms	Students will be able to understand the approximation algorithms their applications and other theoretic algorithms.
12	Unit 12- Class P, NP NP-Hard and NP-Completeness, Clique decision problems, Hamiltonian Cycle problem, Satisfiability problem, Cook's theorem,	Students will be able to understand the Classification of problems, also know about P, NP, NP Hard and NP complete problems.

References: -

- Horowitz Sahani, "Fundamentals of Computer Algorithms", Goltgia, 2008.
- Cormen Leiserson et al., "Introduction to Algorithms", PHI, 2000.
- Brassard Bratley, "Fundamental of Algorithms", PHI, 2002.
- Dimri, Malik, Mange Ram, "Algorithms-Design and Analysis, DeGruyter-2021.

Mobile Application Design and Development

Course Code: OMC 403	Course Title: Mobile Application Design and Development (3 Credits)
Course Objective: - The students will be able to: <ul style="list-style-type: none"> ➤ Students will be able to Use the development tools in the Android development environment. ➤ Make UI-rich apps using all the major UI components and describe the life cycles of Activities, Fragments and Intent. ➤ Make UI-rich apps using all the widgets and multimedia components that will show the power of Android Programming like Graphics, Sensors etc. ➤ Store and manipulate data internally and externally in the Files and also in SQLite Database. ➤ Understand the concept of web services, Telephony, and instant messaging and utilize the Google map to add location to their apps. ➤ Prepare their apps for distribution on the Google Play Store. 	

Course Contents

Sr. No.	Unit No./ Unit description	Unit Objectives
1	Unit 1- Introduction to Android: Introduction of Android, OHA, Features of Android, History, versions, Android Architecture, Android core building blocks, Android Emulator, Configuring Android Development Environment by downloading and installing JDK and Net beans, Downloading and installing Android Studio.	Students will be able to understand and evaluate the basic concepts of Android and also be able to configure Android Studio.
2	Unit 2- Application and Tools: Creating new Android Project, Android Manifest.xml, MainActivity.java, R.java, activity_main.xml, DVM, AVD Manager, Android SDK Manager, Android Emulator, DDMS, resource folder.	Students will be able to understand the importance of Android programming.
3	Unit 3- App Components: Activity, Service, Broadcast Receiver, and Content Provider. Introduction, needs of fragment and Lifecycle of Fragment. What is Intent, Why Intent? And types of Intent.	Students will be able to describe and design Android Lifecycle.
4	Unit 4- Layouts and Views: Linear, Relative, Tabular, Frame, and Absolute. Button, Text View, Edit Text, Radio Button, Image View, Toast, Adapter, Spinner, List View, Grid View, Adaptor and Adaptor View.	Students will be able to create and design applications to make better system.
5	Unit 5- Android Menu and Event Handling: Option menu, context menu, and popup menu. Event Handling and Listeners.	Students will be able to implement multiple events with the help of different listeners.
6	UNIT 6- Bluetooth and Google Map: Bluetooth Adapter class, Paired devices, Enable/Disable devices. What is Google map, Types of Google map, Methods of Google map, Need of Callback methods, and Geocoder class?	Students will be able to implement that how connection will work and how to explore and navigate the world.
7	Unit 7- Multimedia: Playing audio, video file and Camera. Android Graphics and Animation.	Students will be able to evaluate and apply the

		multimedia properties in different applications area.
8	Unit 8- Storage: How Content Provider works, steps to create content provider, URI. Internal and External storage. Shared Preference.	Students will be able to understand, evaluate and apply temporary storage design to store data in the Smartphone.
9	Unit 9- SQLite: Introduction to SQLite Database, SQLiteOpenHelper class, and Cursor, CRUD.	Students will be able to understand, evaluate and apply Permanent Storage to store data in the Smartphone.
10	Unit 10- Web Services: What is web service, Soap and Restful web service? Introduction of Instant Messaging.	Students will be able to understand and evaluate the components for the web services solution.
11	Unit 11- How sensors work, category of sensors, sensor framework, and classes and interfaces used to access sensor.	Students will be able to understand and evaluate that how sensors are integrated.
12	Unit 12- Versioning the app: Setting the version publishing the app on Google play, Monetizing the Android app.	Students will be able to analyse, and implement their apps on Google play store.

References: -

- Reto Meier, “Android 4 Application Development”, Wrox, 2012.
- Pradeep Kothari, Kogent Learning solutions Inc, “Android Application development (with Kitkat support), Black Book”, Dreamtech press, 2014.
- Michael Burton, “Android App Development for dummies”, Dummies, 2015.
- Sujit Kumar Mishra, “Fundamentals of Android App Development”, BPB publications, 2020.
- J. Paul Cardle, “Android App Development in Android Studio”, Createspace Independent Pub, 2017.

Cryptography and Network Security

Course Code: OMC 404	Course Title: Cryptography and Network Security (3 Credits)
Course Objective: - The students will be able to: <ul style="list-style-type: none"> ➤ Understand the security issues of Computer Networks. ➤ Understand the goals of Security: Confidentiality, Authentication and Integrity. ➤ Understand the symmetric and asymmetric key encryptions and decryptions. ➤ Understand the use of message authentication and hash functions. ➤ Understand the web security applications. 	

Course Contents

Sr. No.	Unit No./ Unit description	Unit Objectives
1	Unit 1-Information Security: Introduction To Security: Attacks, Services & Mechanisms, Security Requirements.	<ul style="list-style-type: none"> • Understand the weakness of encryption methods • Understand the security services and mechanism.
2	Unit 2- Classical Encryptions Techniques: Substitution & Transposition techniques, Cryptanalyses, Steganography, Feistel structure.	<ul style="list-style-type: none"> • Be able to know the details of each round operation. • Be able to perform reduction and expansion of the bits in a block using permutation tables. • Encryption and decryption with Feistel structure
3	Unit 3- Data Encryption Standard: Simplified-DES, DES, Double DES, Meet-in-the-Middle attack, Triples DES, Cryptanalysis, Block Ciphers, Block Cipher Modes Of Operation, Stream Ciphers.	<ul style="list-style-type: none"> • Operating principles of a block cipher • An important block cipher method DES
4	Unit 4-Encryption Algorithms: Blowfish, International Data Encryption Algorithm, Key Distribution, Diffie-Hallman Algorithm.	<ul style="list-style-type: none"> • Misconceptions of public key system • Terminologies used in asymmetric encryption • Differences between symmetric and asymmetric encryption
5	Unit 5- Public Key Encryption: Principles of Public-Key Cryptosystems, RSA Algorithm, Key Management.	<ul style="list-style-type: none"> • Understand the concept of public key cryptography • Come to know of increasing efficiency of RSA
6	UNIT 6-Message Authentication & Hash Functions: Authentication Requirements, Message Authentication Codes, Hash Functions, Message Digest Algorithm, Secure	<ul style="list-style-type: none"> • Appreciate the simplicity and power of Hash functions in cryptography • Understand the ways messages can be authenticated

	Hash Algorithm, Digital Signatures, Authentication Protocol, Digital Signature Standard.	<ul style="list-style-type: none"> • Know digital signature methods
7	Unit 7- Network & System Security: Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / MIME, IPSec: Authentication Header..	<ul style="list-style-type: none"> • Learn about challenges in securing web • Understand the ways of securing e-mails and an important principle in email security called pretty good privacy • Various authentication protocols • Know applications and benefits of securing IP.
8	Unit 8- Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction.	<ul style="list-style-type: none"> • Learn about challenges in securing web • Come to know about potential threats • Learn about relationship between layers and kind of security
9	Unit 9- System Security: Intruders, Viruses, Firewalls, Trusted Systems.	<ul style="list-style-type: none"> • Understand the concept of viruses. • Working of firewall.
10	Unit 10-Access Control: Authentication Methods, Passwords, Biometrics; Authorization- Access Control Matrix, Multilevel Security Models, Multilateral Security, Inference Control, CAPTCHA.	<ul style="list-style-type: none"> • Implementation of the authentication methods. • Concept of access control. • Concept of multilevel security.
<p>References: -</p> <ul style="list-style-type: none"> ➤ William Stallings, “Cryptography and Network Security: Principles and Practice”, 4thEd., Prentice Hall, New Jersey. ➤ Johannes A. Buchmann, “Introduction to Cryptography”, Springer- Verlag. ➤ Atul Kahate, “Cryptography and Network Security”, 2nd Ed., TMH ➤ Bruce Schneier, “Practical Cryptography”, Wiley DreamTech India ➤ Eric Cole, “Network Security Bible,” Wiley DreamTech India Pvt. Ltd 		