

## **Program Scheme**

# Master of Computer Applications Degree Program

Program Code: OMC

**Directorate of Distance and Online Education** 

Batch 2022-2024

## University's Vision, Mission, and Core Values

- Vision: We visualize Graphic Era (Deemed to be University) as an internationally recognized, equitydriven, ethically engaged, diverse community whose members work collaboratively for positive transformation in the world, through leadership in teaching, research, and social action.
- **Mission:** The mission of the university is to promote learning in true spirit and offering knowledge and skills in order to succeed as professionals. The university aims to distinguish itself as a diverse, socially responsible learning community with a high-quality scholarship and academic rigor

#### **Core Values:**

- Continuous learning and improvement
- Simplicity
- Integrity and trust
- Ethics

### **Program Scheme: Master of Computer Applications**

- 1. Title of the Degree: Master of Computer Applications (MCA)
- 2. Mode of Study: Fully Online
- 3. Program Curriculum Effective from: The academic Year 2022-2023
- 4. Date of Approval by the Board of Studies:
- 5. Date of Approval by the Academic Council:
- 6. Rationale for the Programme:

Computers, computer networks, and mobile communication have ushered in the digital revolution in the recent past. The fast-growing information and communication technology (ICT) is critical to strategic planning in most business houses, government organizations, and educational institutes all over the world. Organizations that strive to leverage the latest ICT tools require expert professionals who can apply the principles of computer science and information technology to address the issues effectively. To meet the shortage of qualified professionals in the IT industry, the Graphic Era Deemed to be University has designed, this Master of Computer Applications (MCA) degree programme. The broad objective of this postgraduate programme is to prepare graduates for productive careers in the software industry and academia. To accomplish these objectives, the university provides an outstanding environment for teaching and research in the core and emerging areas of this discipline.

The programme lays immense emphasis on giving the students a thorough and sound background in theoretical and application-oriented courses relevant to the latest ICT paradigm. The programme also focuses on the application of software technology to solve mathematical, computing, communications, networking, and commercial problems.

Professionals with an MCA degree are sought after in numerous corporate sectors, such as IT, Medical Sciences, and Engineering. These sectors need personnel having advanced knowledge in the application of computers to solve real-life problems. Several technology conglomerates in India have

job openings for such candidates. With the right amount of experience and skillset, MCA candidates can find several challenging and rewarding career opportunities.

#### 7. Program Educational Objectives (PEOs)

The educational objectives of the MCA program are to:

- **PEO 1.** Empower students with employability towards building successful careers based on a sound understanding of theoretical and applied aspects and methodology to solve multidisciplinary real-life problems.
- **PEO 2.** Develop professional graduates ready to work with a sense of responsibility and ethics.
- **PEO 3.** Instil competency to pursue higher studies and research in areas of computer applications and other professionally related fields.
- **PEO 4.** Inculcate the ability to adapt to changing technology through continuous learning.

Coriol		The Complete PO Statement
Number	Graduate Attribute Theme	After the successful completion of the MCA program, the
Number		graduates will be able to:
PO-1.	Knowledge Application	Apply the knowledge of mathematics, management, and
		computer applications to the solution of complex real-
		world problems.
PO-2.	Problem Analysis	Identify, formulate, review, and analyze complex
		problems reaching substantiated conclusions using
		principles of mathematics, management sciences, and
<b>DO 3</b>	Design / Development of	computer applications.
PO-3.	Solutions	design system components or processes that most the
	5010110115	specified needs with appropriate consideration for health
		and safety and cultural societal and environmental
		considerations.
PO-4.	Investigations of Complex	Use research-based knowledge and research methods
	Computing Problems	including design of experiments, analysis and
		interpretation of data, and synthesis of the information to
		provide valid conclusions.
PO-5.	Modern Tool Usage	Create, select, and apply appropriate techniques,
		resources, and modern computer software and IT tools
		including prediction and modeling to complex software
		engineering activities with an understanding of the
	Environment and	limitations.
PU-0.	Sustainability	onderstand the impact of professional software
	Sustainability	contexts and demonstrate the knowledge of and need
		for sustainable development.
PO-7.	Fthics	Apply ethical principles and commit to professional
	20000	ethics and responsibilities and norms of the
		development practice.

#### 8. Programme Outcomes (POs)

PO-8.	Individual and Teamwork	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.				
PO-9.	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.				
PO-10.	Project Management and Finance	Demonstrate knowledge and understanding of the software engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.				
PO-11.	Life-Long Learning	Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.				
PO-12.	Innovation and Entrepreneurship	Identify a timely opportunity and use innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.				

#### 9. Programme Specific Outcomes (PSOs)

At the end of the MCA program, the graduate will be able to:

- **PSO 1.** Apply fundamental principles and methods of Computer Science to a wide range of applications.
- **PSO 2.** Design, implement, and document solutions to significant computational problems.
- **PSO 3.** Demonstrate an understanding of the basics of computer applications.
- **PSO 4.** Engage in continued professional development in a career in computer applications.

### 10. Program Structure:

SI. No.	Course Code	Course Title		Course
Semester 1			19	Туре#
1.1	OMC101	Object-Oriented Programming Using C++	3	Th
1.2	OMC102	Data Structures	3	Th
1.3	OMC103	Discrete Mathematics	3	Th
1.4	OMC104	Operating Systems	3	Th
1.5	OMC105	Digital Logic and Computer Organization	3	Th
1.6	OMC121	C++ Laboratory	2	Р
1.7	OMC122	Data Structures Laboratory	2	Р
Semest	ter 2		19	
2.1	OMC201	Design And Analysis of Algorithms	3	Th
2.2	OMC202	Database Management Systems	3	Th
2.3	OMC203	Data Communication and Computer Networks	3	Th
2.4	OMC204	Software Engineering	3	Th
2.5	OMC205	Introduction to Artificial Intelligence	3	Th
2.6	OMC221	Design and Analysis of Algorithms Laboratory	2	Р
2.7	OMC222	Database Management Systems Laboratory	2	Р
Semest	ter 3		19	
3.1	OMC301	Java Programming	3	Th
3.2	OMC302	Web Application Development	3	Th
3.3	OMC303	Cloud Computing and the Internet of Things	3	Th
3.4	OMC304	Skills for Career Success	3	Th
3.5	OMC305	Elective - 1 *	3	Th
3.6	OMC321	Java Programming Laboratory	2	Р
3.7	OMC322	Web Application Development Laboratory	2	Р
* Electi	ive 1 Courses	(Any one course must be chosen)	1	
3.5.1	OMC305(1)	Human-Computer Interaction	3	Th
3.5.2	OMC305(2)	Research Methodology	3	Th
3.5.3	OMC305(3)	Information Security	3	Th
3.5.4	OMC305(4)	Full Stack Web Development	3	Th
Semest	ter 4		17	
4.1	OMC401	Machine Learning using Python	3	Th
4.2	OMC402	Mobile Application Development	3	Th
4. <b>3</b>	OMC403	Elective – 2**	3	Th
4.4	OMC421	Machine Learning Laboratory	2	Р
4.5	OMC422	Project Work	6	Р
** Elec	tive 1 Courses	(Any one course must be chosen)		
4.3(1)	OMC403(1)	Data Warehousing and Data Mining	3	Th
4.3(2)	OMC403(2)	Advanced Java Programming	3	Th
4.3(3)	OMC403(3)	Entrepreneurship	3	Th
4.3(4)		Computational Intelligence	3	Ih
n: Ir	leory course,	r: Practical Course, Pro: Project Total Credite for the Programme	-	7.4
		rotal credits for the Programme	l <b>/</b>	4

### 11. Programme Articulation Matrix (Course-PO-PSO Map)

Sem	Course Title	0-1	0-2	<u>-</u> 3	0-4	<b>)-5</b>	9-6		8-0	6-0	-10	-11	-12	0-1	0-2	0-3	0-4
Jenn.		PC	Ы	Ъ	Ъ	Ъ	Ъ	Ъ	PC	Ы	РО	РО	РО	PS	PS	PS	PS
1	Object-Oriented Programming Using C++	3	3	3	3	3	3	1	3	2	3	1	2	3	3	3	2
1	Data Structures	3	3	3	3							2		3	3	3	2
1	Discrete Mathematics	3	3	3	3							3		3	3	1	
1	Operating Systems	3	3	3	3		1	3	2			3	2	3	3	3	3
1	Digital Logic and Computer Organization	3	3	3	3					1		3		3	3	2	2
1	C++ Laboratory	3	3	3	3	3	2	3	2	1	1	1	2	3	3	2	1
1	Data Structures Laboratory	3	3	3	3	2						2		3	3	3	3
2	Design And Analysis of Algorithms	3	3	3	3							2		2	1	1	
2	Database Management Systems	3	3	3	3	2	1	2	3	3	3	2	3	3	3	3	3
2	Data Communication and Computer Networks	3	3	1	3	1	3	2	3	3		3	2	3			3
2	Software Engineering	3	3	3	3	3	2	1	3	2	3	1	2	3	2	2	1
2	Introduction to Artificial Intelligence	3	3	3	2	3			1	1			1	3	3	3	
2	Design and Analysis of Algorithms Laboratory	3	3	3	3	2						2		3	3	3	3
2	Database Management Systems Laboratory	3	3	3	3	2		2	2	3	2	2	3	3	3	2	3
3	Java Programming																
3	Web Application Development																
3	Cloud Computing and the Internet of Things																
3	Skills for Career Success																
3	Java Programming Laboratory																
3	Web Application Development Lab																
3	Human-Computer Interaction																
3	Research Methodology																
3	Information Security																
3	Full Stack Web Development																
4	Machine Learning using Python																
4	Mobile Application Development																
4	Machine Learning Laboratory																
4	Project Work																
4	Data Warehousing and Data Mining																
4	Advanced Java Programming																
4	Entrepreneurship																
4	Computational Intelligence																

## **12. Programme Regulations:** The regulations guiding this programme are available in the Program Guide.

## **OMC201** - Design and Analysis of Algorithms

Programme	Master of Computer Applications
Semester	2
Course Title	Design and Analysis of Algorithms
Course Code	OMC201
Course Credits	3
Course Type	Core Theory Course

#### 1. Course Summary

Design and Analysis of Algorithms is an important course in Computer Applications. The students are trained to specify algorithms using pseudocode conventions. In this course, the importance of algorithms and their analysis is discussed. The students are trained to perform the theoretical estimation of the time and space required for the algorithms. Different algorithm design methods like Divide and Conquer, Greedy Method, Dynamic Programming, Backtracking, and Branch and Bound are taught. They are trained to estimate and compare the time and space complexity of different algorithms.

#### 2. Course Outcomes (COs)

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

- **CO-1.** Illustrate the basic notations for analyzing the performance of the algorithms [L-1]
- **CO-2.** Apply the algorithm design methods to develop algorithms [L-3]
- CO-3. Analyze the algorithms and estimate the time and space complexities [L-4]
- **CO-4.** Compare the time and space complexities of various algorithms [L-4]

Sr.	Units	Unit Outcomes
No		After the successful completion of the
		unit, the learner should be able to:
1	Unit 1 - Introduction	Express algorithms using pseudocode
	What is an algorithm?	conventions.
	<ul> <li>Algorithm specification</li> </ul>	
	<ul> <li>Pseudocode conventions</li> </ul>	
2	Unit 2 - Recursive algorithms	Express algorithms using recursion.
	<ul> <li>Introduction</li> </ul>	
	<ul> <li>Greatest Common Divisor</li> </ul>	
	<ul> <li>Binary Search</li> </ul>	
	<ul> <li>Towers of Hanoi</li> </ul>	
	<ul> <li>Permutation Generator</li> </ul>	
3	Unit 3 - Performance analysis	Apply knowledge of computing and
	<ul> <li>Space complexity</li> </ul>	mathematics in estimating the time and
	<ul> <li>Time complexity</li> </ul>	space efficiency of the algorithms.
	<ul> <li>Asymptotic notation ( O, Ω, Θ)</li> </ul>	
	<ul> <li>Practical complexities</li> </ul>	

	<ul> <li>Performance measurement</li> </ul>	
4	Unit 4 - Divide-and-conquer	Apply divide and conquer method to
	<ul> <li>General method</li> </ul>	solve complex problems.
	<ul> <li>Binary search</li> </ul>	
	<ul> <li>Finding the maximum and minimum</li> </ul>	
	<ul> <li>Merge sort</li> </ul>	
	<ul> <li>Quicksort</li> </ul>	
5	Unit 5 - The greedy method	Design algorithms to solve optimization
	The general method	problems using greedy criterion.
	<ul> <li>Knapsack problem</li> </ul>	
	<ul> <li>Tree vertex splitting</li> </ul>	
	<ul> <li>Job sequencing with deadlines</li> </ul>	
	<ul> <li>Minimum-cost spanning trees</li> </ul>	
	<ul> <li>Prim's algorithm</li> </ul>	
	<ul> <li>Kruskal's algorithm</li> </ul>	
	<ul> <li>Single source shortest paths</li> </ul>	
6	Unit 6 - Dynamic programming	Represent the problem solutions
	<ul> <li>The general method</li> </ul>	using recurrence relations and
	<ul> <li>Multistage graphs</li> </ul>	develop algorithms to get the
	<ul> <li>All pairs shortest paths</li> </ul>	solutions.
	<ul> <li>Single-source shortest paths</li> </ul>	
	<ul> <li>Optimal Binary Search Trees</li> </ul>	
	<ul> <li>0/1 Knapsack</li> </ul>	
7	Unit 7 - Basic traversal and search techniques	Learn and develop programs to visit
	<ul> <li>Techniques for binary trees</li> </ul>	each node of the tree/graph and
	<ul> <li>Inorder traversal</li> </ul>	perform appropriate operations at the
	Preorder Traversal	node.
	<ul> <li>Postorder traversal</li> </ul>	
	<ul> <li>Techniques for graphs</li> </ul>	
	<ul> <li>Breadth-first search and traversal</li> </ul>	
	<ul> <li>Depth-first search and traversal</li> </ul>	
8	Unit 8 - Backtracking	Build a set of all the solutions
	<ul> <li>The general method</li> </ul>	incrementally and remove the solutions
	<ul> <li>The 8-queens problem</li> </ul>	that fail to satisfy the constraints.
	<ul> <li>Sum of subsets</li> </ul>	
	<ul> <li>Graph coloring</li> </ul>	
	<ul> <li>Hamiltonian cycles</li> </ul>	
	<ul> <li>Knapsack problem</li> </ul>	
9	Unit 9 - Branch-and-bound	Develop algorithms to systematically
	<ul> <li>The method</li> </ul>	enumerate the candidate solutions using
	<ul> <li>Least cost (LC) search</li> </ul>	the state space search method.
	<ul> <li>Control abstractions for LC-search</li> </ul>	
	<ul> <li>Bounding</li> </ul>	
	<ul> <li>FIFO branch-and-bound</li> </ul>	
	<ul> <li>LC branch-and-bound</li> </ul>	
	<ul> <li>0/1knapsack problem</li> </ul>	
	<ul> <li>Travelling sales person problem</li> </ul>	

	Programme Outcomes (POs)									Programme Specific Outcomes (PSOs)						
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO- 2	PSO-3	PSO-4
CO-1	2	2	3	2							1		1	2	1	1
CO-2	3	3	3	3							2		3	3	2	1
CO-3	3	3	3	3							1		1	2		
CO-4	2	3	2	2							1		2	1	1	
	3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

#### 5. Course Resources

#### a. Essential Reading

- 1. Ellis Horowitz, Sartraj Sahni, S Rajasekaran ., 1998, Fundamentals of Computer Algorithms, 2<sup>nd</sup>Ed., Galgotia Publication.
- 2. Anany Levitin., 2011, Introduction to The Design and analysis of algorithms, 3<sup>rd</sup> Ed., Pearson India Publishers.

#### b. Recommended Reading

- 1. Harsh Bhasin, 2015, Algorithms: Design and Analysis, 1<sup>st</sup> Ed., Oxford University Press India.
- 2. Richard E. Neapolitan, Kumarss Naimipour, 2009, Foundations of Algorithms, 4<sup>th</sup> Ed., Jones and Bartlett.

## **OMC202** - Database Management System

Programme	Master of Computer Applications
Semester	2
Course Title	Database Management System
Course Code	OMC202
<b>Course Credits</b>	3
Course Type	Core Theory Course

#### 1. Course Summary

This course aims to create a strong foundation of database management systems (DBMS). The students are taught the basic components of DBMS and its architecture. The students are also trained in performing structured query language (SQL) operations, relational algebra, and the implementation of different applications. This course also emphasizes different database recovery and security techniques. Students are trained to employ the principles of normalization to minimize redundancy in databases.

#### 2. Course Outcomes (COs)

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

- **CO-1.** Discuss the underlying concepts of basic database management structure and operations of the relational data model. [L-1]
- CO-2. Construct simple and moderately advanced database queries using SQL. [L-2]
- **CO-3.** Analyze logical database design principles, entity-relationship diagrams and normalization. [L-3]
- **CO-4.** Specify, implement and evaluate SQL queries for suitable applications. [L-4]
- **CO-5.** Analyze database projects with security and recovery techniques. [L-5]

Sr.	Units	Unit Outcomes
No		After the successful completion of the
		unit, the learner should be able to:
1	Unit 1: Introduction to DBMS	1. Define DBMS
	Need for DBMS	2. Compare database and file systems.
	<ul> <li>Database Systems versus File Systems</li> </ul>	3. Discuss the approaches, applications
	Database Approaches	and users of the database.
	Database Applications	
	Database Users	
2	Unit 2: Database Systems and Architecture	1. Explain data models and categories.
	<ul> <li>Data Models, Schema and Instances</li> </ul>	2. Analyze the three levels in DBMS
	<ul> <li>Categories of Data Models</li> </ul>	architecture.
	Three Levels of DBMS Architecture	3. Discuss data independence.
	Mapping Between Levels	
	Data Independence	

3	Unit 3: Database Languages and Interfaces	1. Discuss DDL and DML
	Introduction	2. Construct various types of interfaces
	<ul> <li>Data Definition Languages (DDL)</li> </ul>	in DBMS.
	<ul> <li>Data Manipulation Language (DML)</li> </ul>	
	<ul> <li>Interfaces: Menu-based, GUI, Mobile App-based</li> </ul>	
	• Interfaces: Keyword-based, Speech I/O	
4	Unit 4: Database System Environment	1. Represent the given application using
	<ul> <li>The DBMS Component Modules</li> </ul>	DBMS components and system
	<ul> <li>Database System Utilities</li> </ul>	utilities.
	<ul> <li>Database Application Tools and Communication</li> </ul>	2. Discuss database application tools.
	Data Dictionary Systems	3. Explain the importance of a data
		dictionary system.
5	Unit 5: Relational Model	1. Design a conceptual database model.
	<ul> <li>Definition and Terms in the Relational Model</li> </ul>	2. Design a database using different
	<ul> <li>Conceptual Model for Database Design</li> </ul>	types of keys.
	<ul> <li>Tuples, Attributes, Relations, Domain</li> </ul>	3. Discuss constraints in DBMS.
	<ul> <li>Keys: Primary, Foreign, Super and Candidate Keys</li> </ul>	4. Perform operations using relational
	• Relational Constraints: Domain, Key and Integrity	algebra.
	Constraints	
	Relational Algebra: Basic Set Operations, Cartesian	
	Product, Relational Operations	
6	Unit 6: Structured Query Languages	1. Perform SQL operations.
	<ul> <li>Overview of SQL, Data Definition</li> </ul>	2. Design SQL queries.
	• Basic Structure of SQL Queries: select, from, where,	
	join, order-by,	
	<ul> <li>Set Operations: Union, Intercept, except</li> </ul>	
	Null Values	
	• Views in SQL	
	Examples of SQL Queries	
7	Unit 7: Relational Database Design	1. Explain function redundancy and
	<ul> <li>Function Redundancy and Normalization</li> </ul>	normalization concept.
	<ul> <li>Normal Forms (NFs): First, Second, Third, BCNF</li> </ul>	2. Realize 1NF, 2NF, 3NF and BCNF
	<ul> <li>Multivalued Dependency and Fourth Normal Form</li> </ul>	3. Explain the fourth NF
8	Unit 8: Decomposition in Relational Database	1. Explain decomposition in a relationa
	Desirable Properties of Decomposition	database.
	Attribute Preservation	2. Apply loss-less decomposition and
	<ul> <li>Loss-less Join Decomposition</li> </ul>	reduce redundancy.
	Dependency Preservation	
	Lack of Redundancy	
9	Unit 9: Data Storage in DBMS	3. Discuss physical storage media.
	Overview of Physical Storage Media	4. Evaluate different types of disks fo
	Data Storage on Different Types of Disks	storage on physical media.
	Overview of RAID	
10	Unit 10: File Structures and DBMS	1. Explain types of file structures
	• Types of File Structures	2. Develop heap, sequential, indexed
	• Heap	hash file systems.
	Sequential	

11	• Unit 11: Overview of Indexing in File Structures	1. Implement indexing in file
	<ul> <li>Indexed hash</li> </ul>	structures.
	<ul> <li>Single Level Indexing</li> </ul>	2. Discuss single and multi-level
	<ul> <li>Multi-level Indexing</li> </ul>	indexing.
12	Unit 12: The Transactions	1. Build a locking protocol.
	<ul> <li>Concurrent Transactions</li> </ul>	2. Develop deadlock prevention
	• Locking Protocol: Serializable Schedules, Locks, Two-	methods.
	phase Locks	3. Realize optimistic concurrency
	<ul> <li>Deadlocks and their Prevention</li> </ul>	control.
	<ul> <li>Optimistic Concurrency Control</li> </ul>	
13	Unit 13: Recovery Techniques	1. Discuss recovery techniques
	Introduction	2. Perform shadow paging
	<ul> <li>Recovery Techniques</li> </ul>	
	<ul> <li>Shadow Paging</li> </ul>	
14	Unit 14: Database Security	1. Describe the database security
	Introduction	techniques.
	<ul> <li>Discretionary and Mandatory Access Control</li> </ul>	2. Perform encryption for protecting
	Encryption	confidentiality.
	Public Key Infrastructures	

	Pro	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO- 2	PSO-3	PSO-4
CO-1	2	3	2	2	2	1	1	2	1	3	1		3	3	2	2
CO-2	2	1	1	1	1		1	2	2	2	1	2	2	3	2	2
CO-3	3	3	3	3	2		2	3	3	3	2	2	3	3	3	3
CO-4	<b>)-4</b> 2 2 3 2 2 1 2 2 2 2 3 2 2										3					
CO-5	3	2	3	3	2		2	3	2	2	1	3	2	3	3	3
		3: Ver	y Stro	ng Co	ntribu	tion, 2	: Stro	ng Cor	ntribut	tion, 1:	Modera	ate Con	tributio	n		

#### 5. Course Resources

#### a. Essential Reading

- 1. Elmasri and Navathe. (2007). *Fundamentals of Database Systems* 4<sup>th</sup> ed., Pearson/Addison Wesley Publication.
- 2. Silber Schatz, A, Korth, H.F. (2011). and Sudarshan S., *Database System Concepts*, 7<sup>th</sup> ed., McGraw Hill Publication.

#### b. Recommended Reading

- 1. Ramakrishnan R. and Gehrke J. (2010). *Database Management System*, 3<sup>rd</sup> Ed., McGraw Hill Publication.
- 2. Leon A. and Leon M. (2007). *Database Management Systems*, 1<sup>st</sup> Ed., Tata McGraw Hill Publication.

#### c. Magazines and Journals

- 1. IEEE transaction on DBMS
- 2. Distributed and Parallel Databases Springer

#### d. Websites

- 1. https://www.coursera.org/
- 2. http://nptel.ac.in/

#### e. Other Electronic Resources

1. https://ocw.mit.edu/index.htm

## **OMC 203 - Data Communication and Computer Networks**

Programme	Master of Computer Applications
Semester	2
Course Title	Data Communication and Computer Networks
Course Code	OMC 203
Course Credit	3
Course Type	Core Theory Course

#### 1. Course Summary

Data communication is the exchange of data between two devices through a computer network. A computer network interconnects two or more computing devices. Since implementing computer networking software is a highly complex task, it has been implemented in different layers. Every layer has a well-defined service to perform. The fundamental concepts of computer networks, different network models, and topologies are covered in this course. The course also includes the thorough treatment of layers of the OSI model and TCP/IP, their functions, and the protocols used at these layers. The routing algorithms and multimedia networks are also emphasized.

#### 2. Course Outcomes (COs)

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

- CO-1. Outline the basic concepts of data communication and different types of computer networks. (L1)
- CO-2. Interpret data and signals in data communication. (L2)
- **CO-3.** Illustrate the network layer protocols, transport layer protocols, and application layer protocols. (L2)
- **CO-4.** Solve problems based on routing algorithms. (L3)
- CO-5. Evaluate the performance of data transmission. (L5)

Sr. No	Units	Unit Outcomes				
		After the successful completion of the				
		unit, the learner should be able to				
1	Unit 1: Introduction	1. Outline the basic concepts of data				
	Data Communications	communication.				
	Network Types	2. Explain the different network models				
	Network Models	and types.				
2	Unit 2: Computer Networks and the Internet	1. Define the Internet.				
	<ul> <li>What Is the Internet?</li> </ul>	2. Describe the basic concepts of				
	The Network Edge	Computer Networking and the				
	The Network Core	Internet				

3	Unit 3: Physical Layer1	1. Define data and signals in the context
	<ul> <li>Data and Signals</li> </ul>	of communication.
	Digital Signals	2. Differentiate between analog and digital
	Transmission Impairment	signals.
	Data Rate limits	3. Describe sources of transmission
	Performance.	impairment.
		4. Define the data rate and describe the
		data rate limit.
		5. Define the different parameters to
		evaluate the performance of data
		transmission.
4	Unit 4: Physical Layer 2	1. Discuss the conversion of digital data
	<ul> <li>Digital Transmission</li> </ul>	to digital signals.
	<ul> <li>Bandwidth Utilization</li> </ul>	2. Describe different bandwidth
		utilization techniques.
5	Unit 5: The Link Layer	1. Summarize several important link-layer
	<ul> <li>Introduction to the Link Layer</li> </ul>	concepts and technologies.
	<ul> <li>Error Detection and Correction</li> </ul>	2. Identify error detection and
	<ul> <li>Multiple Access Links and Protocols</li> </ul>	correction methods.
	<ul> <li>Random Access Protocols</li> </ul>	3. Explore the importance of switching.
	<ul> <li>Switched Local Area Networks</li> </ul>	4. Outline the architecture of Wireless
	WiFi: 802.11 Wireless LANs	LANs and list their benefits.
6	Unit 6: The Network Layer1	1. Describe the host-to-host
	<ul> <li>Virtual Circuit and Datagram Networks</li> </ul>	communication service.
	• The Internet Protocol (IP): Forwarding	2. Compare Virtual Circuit and Datagram
	and Addressing in the Internet	Networks
7	Unit 7: The Network Layer2	1. Identify different routing algorithms.
	Routing Algorithms	2. Compare Link-State and Distance-
	<ul> <li>The Link-State Routing Algorithm</li> </ul>	Vector routing algorithms.
	The Distance-Vector Routing	
_	Algorithm	
8	Unit 8: Transport Layer	1. Explain the working of UDP and TCP
	<ul> <li>Introduction and Transport-Layer</li> </ul>	transport protocols.
	Services	2. Describe the techniques used to avoid
	<ul> <li>Connectionless Transport: UDP</li> </ul>	and recover from congestion within the
	<ul> <li>Connection-Oriented Transport: TCP</li> </ul>	network.
	TCP Congestion Control	
9	Unit 9: Application Layer	1. Examine conceptual and
	<ul> <li>Principles of Network Applications</li> </ul>	implementation aspects of network
	The Web and HTTP	applications.
	File Transfer: FTP	2. Explain the working of Application
	DNS—The Internet's Directory Service	Layer protocols.
10	Unit 10: Multimedia Networking	1. Outline the taxonomy of multimedia
	Multimedia Networking Applications	applications.
	Streaming Stored Video	2. Classify the multimedia applications.
	Voice-over-IP	5. Describe audio/video streaming and

	Programme Outcomes (POs)												Progra Outco	amme mes (I	Specifi PSOs)	c
	PO-	PO-	PO-	PO-	PO-	PO6	PO-	PO-8	PO-9	PO-	PO-11	PO-	PSO-1	PSO-	PSO-3	PSO-4
	1	2	3	4	5		7			10		12		2		
CO-1	3				1	3		3	1		3				3	3
CO-2	3	3	1	2		1		1	3		3		3		3	3
CO-3	3	2		2		2	2		3		3	1	3		3	3
CO-4	3	1		1			1		3		3		3		3	3
CO-5	3	3		3					3		3	2	3			3
	3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

#### 5. Course Resources

#### a. Essential Reading

- 1. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth Edition, Pearson, 2017.
- 2. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition.

#### b. Recommended Reading

1. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson.

## **OMC204** - Software Engineering

Programme	Master of Computer Applications
Semester	2
Course Title	Software Engineering
Course Code	OMC204
<b>Course Credits</b>	3
Course Type	Core Theory Course

#### 1. Course Summary

The aim of this course is to create a strong foundation in Software Engineering (SE). The students are taught the basic phases of the software development life cycle (SDLC) and the process of their implementation. The students are also taught agile software development approach, project management, and quality control measures. This course also emphasizes different styles such as function- and object-oriented designs and coding. The different design tools and coding styles are taught with their merits and demerits. Students are trained to employ various unit and system testing methods for the development of a good software product. The activities in risk management and maintenance of the deployed software are discussed with suitable case studies.

#### 2. Course Outcomes (COs)

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

- **CO-1.** Explain the basics of SE and ethical and professional issues of software engineers [L-1]
- **CO-2.** Discuss the phases and activities of SDLC and compare different models including waterfall, incremental, prototyping, and spiral. [L-2]
- **CO-3.** Prepare designs using data flow diagrams and unified modeling language tools for functionand object-oriented approaches [L-3]
- **CO-4.** Develop test cases, perform testing, and analyze activities in the maintenance of software [L-4]
- **CO-5.** Design software project plans, size, and cost metrics, and assess risks in the software development. [L-5]

Sr.	Units	Unit Outcomes
No		After the successful completion of the
		unit, the learner should be able to:
1	Unit 1: Introduction	1. Define SE.
	<ul> <li>SE Fundamentals, Software Cost, and Projects</li> </ul>	2. Explain the attributes of good
	• Professional Software Development, FAQs in SE,	software.
	Software Products	3. Discuss the generic and customized
	<ul> <li>Attributes of a good software</li> </ul>	software products.
	Importance of SE	4. Discuss the importance of SE and its
		applications.

	Issues in SE	
	<ul> <li>Internet and Web-Based SE, SE Applications</li> </ul>	
2	Unit 2: Software Process	1. Explain the activities in SDLC.
	<ul> <li>Activities in the software process, SDLC</li> </ul>	2. Compare different SDLC models.
	<ul> <li>Software process models: waterfall model</li> </ul>	
	<ul> <li>Incremental development model</li> </ul>	
	<ul> <li>Software prototyping model</li> </ul>	
	<ul> <li>Boehm's spiral model</li> </ul>	
3	Unit 3: Agile Software Development	1. Discuss agile and rapid software
	<ul> <li>Overview of Agile software development</li> </ul>	development.
	<ul> <li>Agile methods: Principles</li> </ul>	2. Analyze agile methods in various
	<ul> <li>Plan-driven and Agile Development</li> </ul>	applications.
	• Extreme programming	
4	Unit 4: Software Requirements	1. Represent functional and non-
	<ul> <li>Importance of Requirement Analysis, User Needs</li> </ul>	functional requirements for the given
	<ul> <li>User and System requirements, examples</li> </ul>	software application.
	<ul> <li>Functional and Non-functional requirements</li> </ul>	2. Discuss the IEEE standard for SRS.
	<ul> <li>Requirement Engineering Process</li> </ul>	3. Explain requirement verification and
	<ul> <li>Characteristics of Software Requirement</li> </ul>	validation methods.
	Specification (SRS)	
	IEEE SRS standard	
	<ul> <li>Case Study of SRS for a Real-Time System</li> </ul>	
5	Unit 5: Software Design: Introduction	1. Prepare a software design.
	<ul> <li>Goals of Good Software Design</li> </ul>	2. Analyze the coupling and cohesion of
	<ul> <li>Top-Down and Bottom-Up Approach</li> </ul>	different modules.
	<ul> <li>Function- and Object-oriented design</li> </ul>	3. Compare functional and object-
	• Structured Design: Structure Charts, Data Flow	oriented design approaches.
	Diagrams	
	• Concepts in software design: Coupling, Cohesion,	
	Modular Structure	
6	Unit 6: Object-oriented Design	1. Demonstrate knowledge of
	<ul> <li>Object-oriented software design and its activities</li> </ul>	techniques and tools used in object-
	• Unified modeling language (UML) diagrams for	oriented design.
	object-oriented design	2. Design UML diagrams for different
	• Structural, interaction, and behavioral diagrams	applications.
	• Use-case, class, sequence, activity, state-machine	3. Develop software architecture and
	diagrams	explain unerent patterns.
	Architectural software design and patterns	
_	• Client-server, repository and pipe, and filter	
7	Unit 7: Software Development	1. Discuss coding guidelines.
	Introduction to the coding	2. Assess the coding standard for a
		good programming style.
	Coding guidelines     Coding documentation	good programming style.

8	Unit 8: Software Testing	1. Explain testing objectives.
	<ul> <li>Testing Objectives</li> </ul>	2. Construct test cases and plan.
	<ul> <li>Verification versus validation</li> </ul>	3. Perform structural and functional
	<ul> <li>Development testing: unit, integration testing</li> </ul>	testing on developed software.
	• Structural Testing: requirements-based, scenario,	
	performance testing, and types	
	• System testing: alpha, beta, and acceptance testing,	
	types	
	<ul> <li>White box and black box testing</li> </ul>	
9	Unit 9: Software Maintenance	1. Discuss software configuration and
	<ul> <li>Software Maintenance: Definition and Types</li> </ul>	management.
	• Forward and Reverse Engineering, Software Re-	2. Apply software re-engineering
	engineering	methods.
	<ul> <li>Software Configuration Management: Introduction,</li> </ul>	3. Apply CASE tools in software
	SCM Process	development.
	Overview of Computer-aided Software Engineering	
	(CASE) Tools	
10	Unit 10: Software Project Management	1. Construct a software project
	<ul> <li>Responsibilities of a Software Project Manager</li> </ul>	management plan.
	<ul> <li>Project planning, software project management plan</li> </ul>	2. Estimate the project size and cost
	(SPMP) structure	metrics.
	• Project size estimation metric: lines of code, function	
	point	
	• Project estimation techniques: COCOMO model:	
	types and examples	
	• Software Measurement and Metrics: Various Size	
	Oriented Measures:	
	• Halstead's software science, function point-based	
	measures	
11	Unit 11: Risk Management	1. Identify the risks in the software.
	Risk identification	2. Assess and monitor different
	Risk, assessment, and monitoring	categories of risks.
	Risk containment	
12	Unit 12: Software Quality	1. Discuss quality parameters for
	Quality concepts	the software.
	<ul> <li>Software Quality Management System</li> </ul>	2. Compare product and process
	<ul> <li>Evolution of Quality Systems</li> </ul>	metrics.
	<ul> <li>Product Metrics versus Process Metrics</li> </ul>	

#### Programme Outcomes (POs) Programme Specific **Outcomes (PSOs)** PSO- PSO- PSO- PSO-PO-PO-PO-PO-1 PO-2 PO-3 PO-4 PO-5 PO-6 PO-7 PO-8 PO-12 CO-1 CO-2 CO-3 CO-4 CO-5 3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

#### 4. Course Articulation Matrix (CO-PO-PSO Map)

#### 5. Course Resources

#### a. Essential Reading

- 1. Sommerville, Ian. (2010). Software Engineering, 10th Ed., Addison-Wesley
- 2. Pressman, Roger S. (2009), *Software Engineering: A Practitioner's Approach*, 7<sup>th</sup> Ed., McGraw-Hill.

#### b. Recommended Reading

- 1. Jalote, Pankaj. (1997). *An Integrated Approach to Software Engineering*, Springer Science and Business Media.
- 2. Mall Rajib. (2014), *Fundamentals of Software Engineering*, 4<sup>th</sup> Ed., PHI Publication.
- 3. Carlo Ghezzi, M. Jarayei, D. Manodrioli. (2002). *Fundamentals of Software Engineering*, PHI Publication.

#### c. Magazines and Journals

- 1. IEEE Transaction on Software Engineering
- 2. Springer Empirical Software Engineering

#### d. Websites

- 1. https://www.coursera.org/
- 2. http://nptel.ac.in/

#### e. Other Electronic Resources

- 1. https://ocw.mit.edu/index.htm
- 2. Course Video Lectures on Bright Space

## **OMC205** - Introduction to Artificial Intelligence

Programme	Master of Computer Applications
Semester	2
Course Title	Introduction to Artificial Intelligence
Course Code	OMC205
Course Credits	3
Course Type	Core Theory Course

#### 1. Course Summary

Artificial intelligence (AI) is a branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. AI is an interdisciplinary science with multiple approaches, but advancements in machine learning and deep learning have recently created a paradigm shift in virtually every sector of the industry.

Al allows machines to model and improve the human mind's capabilities. From self-driving cars to smart assistants like Siri and Alexa, Al is becoming a growing part of everyday life. As a result, many technology companies are investing in Al technologies.

This course includes basic principles, techniques, and applications of AI. The syllabus covers a foundation of AI, applications of AI, intelligent agents, knowledge representation, search algorithms, nature-inspired algorithms, fuzzy logic, and artificial neural networks (ANNs).

#### 2. Course Outcomes (COs)

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

- **CO-1.** Discuss the basics of AI [L-1].
- **CO-2.** Explain the basic concepts of knowledge representation and reasoning [L-2].
- **CO-3.** Fuzzify and defuzzify natural variables [L-3].
- **CO-4.** Develop basic versions of evolutionary and swarm intelligence algorithms [L-6].
- **CO-5.** Develop elementary artificial neural networks for simple applications [L-6].

Sr.	Units	Unit Outcomes
No		After the successful completion of the
		unit, the learner should be able to:
1	Unit 1: Background to Artificial Intelligence	1. Define AI in multiple ways.
	Introduction	2. Discuss fundamentals of AI,
	Definition of AI	history, and industrial
	The History of AI	applications.
	• Al in the industry	3. Classify the AI systems.
	Types of AI	

2	Unit 2: Intelligent Agents: Introduction	1. Define agents.
	<ul> <li>Agents and Environments</li> </ul>	2. Explain the structure of the agent.
	Structure of agent	3. Discuss the intelligent agents and
	<ul> <li>Intelligent agents</li> </ul>	knowledge-based agents.
	Knowledge-based agent	4. Discuss the relationship of an
	<ul> <li>Environment and its types</li> </ul>	agent with its environment.
	Relationship between the agent and	5. Discuss and classify the agent
	environment	environments, and their
		characteristics
3	Unit 3: Types of Agents	Discuss the following types of agents
	<ul> <li>Simple reflex agents</li> </ul>	used in AI systems:
	<ul> <li>Model-based reflex agents</li> </ul>	a. Simple Reflex Agents
	<ul> <li>Goal-based agents</li> </ul>	b. Model-based Reflex Agents
	<ul> <li>Utility-based agents</li> </ul>	c. Goal-based Agents
	Learning agents	d. Utility-based Agents
		e. Learning Agents
4	Unit 4: Solving Problems by Searching	1. Evaluate uninformed and informed
	<ul> <li>Uniformed search strategies</li> </ul>	search strategies.
	<ul> <li>Breadth-first search</li> </ul>	2. Discuss depth-first and breadth-first
	<ul> <li>Depth-first Search</li> </ul>	search techniques.
	<ul> <li>Adversarial Search: Min-max problem</li> </ul>	3. Explain the mini-max algorithm with
	<ul> <li>Min-max problem using Alpha-beta pruning</li> </ul>	alpha-beta pruning.
	<ul> <li>Informed search strategies</li> </ul>	4. Discuss the best first and A*
	<ul> <li>Greedy best-first search</li> </ul>	algorithms.
	A* search	
5	Unit 5: Local Search Algorithms and Optimization	1. Explain nature-inspired
	<ul> <li>Heuristic and metaheuristic algorithms</li> </ul>	algorithms from computational
	Hill-climbing algorithm	intelligence paradigms.
	<ul> <li>Evolutionary Computing, Genetic Algorithm</li> </ul>	2. Develop evolutionary and swarm
	<ul> <li>Swarm Intelligence, Particle Swarm</li> </ul>	intelligence algorithms.
	Optimization algorithm	
6	Unit 6: Knowledge Representation and Reasoning	1. Apply propositional and
	<ul> <li>Propositional and predicate logic</li> </ul>	predicate logic to knowledge
	<ul> <li>Atomic and complex sentence</li> </ul>	representation.
	<ul> <li>Forward and backward chaining</li> </ul>	2. Summarize probabilistic
	<ul> <li>Probabilistic reasoning</li> </ul>	reasoning.
	<ul> <li>Introduction to Bayesian Theory</li> </ul>	3. Apply Bayes' theory to suitable
	<ul> <li>Bayesian Networks with example</li> </ul>	applications.
7	Unit 7: Fuzzy Logic and Fuzzy Sets	1. Discuss fuzzy logic and fuzzy
	<ul> <li>Introduction to Fuzzy Logic</li> </ul>	sets.
	Fuzzy and crisp logic	2. Fuzzify and defuzzify natural
	Membership function	variables.
	Fuzzy sets	3. Perform operations on fuzzy sets
	<ul> <li>Operations on fuzzy sets</li> </ul>	and variables
	Fuzzy Inference Systems	

8	Unit 8: Artificial Neural Networks	1. Discuss ANN architecture,
	<ul> <li>Introduction to Neuron, Biological inspiration</li> </ul>	characteristics, and algorithms.
	for ANN	2. Develop elementary artificial
	Architecture of ANN	neural networks for simple
	<ul> <li>Single-layer Perceptron</li> </ul>	applications.
	<ul> <li>Multi-layer neural networks</li> </ul>	
	<ul> <li>Backpropagation algorithm</li> </ul>	

		Programme Outcomes (POs)													Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO- 2	PSO-3	PSO-4		
CO-1	3														3			
CO-2	3														3			
CO-3	3	3	3	2	3			1	1			1	3	3	3			
CO-4	3	3	3	2	3			1	1			1	3	3	3			
CO-5	3	3	3	2	3			1	1			1	3	3	3			
		3:	Very	Strong	g Conti	ributio	on, 2: 9	Strong	Conti	ributior	n, 1: Mo	derate	Contrib	ution				

#### 5. Course Resources

#### a. Essential Reading

- 1. Russell, S., and Norvig, P., *Artificial Intelligence: A Modern Approach*, 3<sup>rd</sup> Edition, Prentice-Hall, 2010.
- 2. Engelbrecht, A. P., *Computational Intelligence: An Introduction*, 2<sup>nd</sup> Edition, Chichester, England, John Wiley & Sons, 2007.

#### b. Recommended Reading

- 1. Nilsson N. J., Artificial Intelligence: A New Synthesis, Harcourt Asia Pvt. Ltd., 1998.
- 2. Rich, E., and Knight, K., Artificial Intelligence, 3rd Edition, Tata McGraw-Hill, 2017.
- 3. Eberhart, R. C., *Computational Intelligence: Concepts to Implementations*, San Francisco, CA, USA, Morgan Kaufmann Publishers Inc, 2007.
- 4. Konar, A., *Computational Intelligence: Principles, Techniques, and Applications*, Syracuse, NJ, USA, Springer-Verlag New York, Inc., 2005.

## **OMC221** - Design and Analysis of Algorithms Laboratory

Programme	Master of Computer Applications
Semester	2
Course Title	Design and Analysis of Algorithms Laboratory
Course Code	OMC221
Course Credits	2
Course Type	Core Practical Course

#### 1. Course Summary

This course gives an overview of algorithm design techniques and estimating their performance. The students are trained to choose the appropriate design methods to effectively solve problems. They are taught to estimate the time and space complexities of the algorithms. The students are trained to compare the different algorithms based on their time and space complexities and choose an appropriate one for the application. They are trained to implement the algorithms using different design methods like Divide and Conquer, Greedy Method, Dynamic Programming, Backtracking, and Branch and Bound.

#### 2. Course Outcomes (COs)

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

- **CO-1.** Illustrate asymptotic notations and efficiency classes. [L-1]
- CO-2. Use recursion to solve problems. [L-3]
- CO-3. Apply algorithm design methods to solve different types of problems. [L-3]
- **CO-4.** Compare the time and space complexities of different algorithms. [L-4]

Sr. No	Units	<b>Unit Outcomes</b> After the successful completion of the unit, the learner should be able to:
1	Unit 1: Introduction	Analyze simple algorithms and represent
	<ul><li>Basic Terminology</li><li>Asymptotic notations</li></ul>	notations.
	<ul> <li>Algorithm Complexity</li> <li>Efficiency classes</li> </ul>	
4	Unit 2: List of Experiments	
i.	Write a C Program to find the GCD of two numbers. Use recursion	Distinguish static and dynamic memory allocation.
ii.	Write a C program using recursive function to implement towers of Hanoi problem.	Express the solutions recursively.
iii.	Sort a given set of numbers using the merge sort method and determine the time required to sort them.	Demonstrate the Divide and Conquer method.
iv.	Sort a given set of numbers using the quick sort	Demonstrate the Divide and Conquer

	method and determine the time required to sort the	method.
	them.	
v.	Given a set of $n$ jobs, with $d_i$ and $p_i$ as deadline and profit for job $i$ , write a program to find an optimal sequence of jobs, i.e., find the sequence of jobs that can be completed by their deadline and giving a maximum profit. Estimate the time complexity of the algorithm.	Use the greedy method to solve job sequencing problem.
vi.	Write C programs to find the minimum cost spanning tree using Kruskal's method.	Use the Greedy method to implement Kruskal's algorithm.
vii.	Write C programs to find the minimum cost spanning tree using Prim's method.	Use the Greedy method to implement Prim's algorithm.
viii	Write C program to implement the Dijkstra's Algorithm to find the shortest paths from a given source vertex to all other vertices.	Use the Greedy method to implement Dijkstra's algorithm.
ix.	Write C program to find all pairs of shortest paths using Floyd's algorithm.	Demonstrate dynamic programming to find all pairs of shortest paths.
х.	Write C program to implement 0/1 knapsack problem using dynamic programming.	Demonstrate dynamic programming to get the solution to the 0/1 knapsack problem.
xi	<ul> <li>Write C program to perform the following operations on a graph.</li> <li>Depth First Search</li> <li>Breadth First Search</li> </ul>	Create the graphs and traverse them.
xii	Write a C program to find a subset $S = \{s_1, s_2, \dots, s_m\}$ of a set $U$ such that the sum of the elements of the subset $S$ is equal to a given integer $d$ .	Demonstrate the backtracking method.
xiii	Write a C program to implement $n - queen's$ problem using backtracking.	Demonstrate the backtracking method to find non attacking positions for $n$ queens on a chess board.

		Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	2	2	1	1						1		3	3	2	2
CO-2	1	1	1								1		3	3	3	3
CO-3	3	3	3	3	2						2		1	1		
CO-4	2	2	2	2							1		3	3		2
		3	: Very	Stron	g Cont	ributio	on, 2: :	Strong	Contr	ibutior	n, 1: Mo	derate	Contrib	ution		

#### 5. Course Resources

#### a. Essential Reading

- 1. Ellis Horowitz, Sartraj Sahni, S Rajasekaran, 1998, *Fundamentals of Computer Algorithms*, 2<sup>nd</sup>Ed., Galgotia Publication.
- 2. Anany Levitin., 2011, Introduction to The Design and analysis of algorithms, 3<sup>rd</sup> Ed., Pearson India Publishers.

#### b. Recommended Reading

- 1. Harsh Bhasin, 2015, *Algorithms: Design and Analysis*, 1<sup>st</sup> Ed., Oxford University Press India.
- 2. Richard E. Neapolitan, Kumarss Naimipour, 2009, *Foundations of Algorithms*, 4<sup>th</sup> Ed., Jones and Bartlett.

## **OMC222 - Database Management Systems Laboratory**

Programme	Master of Computer Applications
Semester	2
Course Title	Database Management Systems Laboratory
Course Code	OMC222
<b>Course Credits</b>	2
Course Type	Practical Course

#### 1. Course Summary

This course aims to create a strong foundation for the design and development of database applications. The students are taught the structured query language (SQL) to store, retrieve, and manipulate data in the database management system. This course emphasizes training the students to develop database applications and interact with the front-end interface. This course also includes the maintenance of databases under different constraints.

#### 2. Course Outcomes (COs)

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

- **CO-1.** Design entity-relationship diagrams for a given problem. [L-1]
- **CO-2.** Construct a schema with suitable fields to develop a database for a given application [L-2]
- **CO-3.** Develop SQL queries for the manipulation of data on the database. [L-3]
- **CO-4.** Apply normalization techniques for reducing redundancy and inconsistency in the database. [L-4]
- **CO-5.** Design, develop and implement mini projects using SQL and a suitable programming language. [L-5]

Sr.	List of Experiments	Unit Outcomes			
No		After the successful completion of the			
		unit, the learner should be able to:			
1	The GO_TRACK is a company that manages the	1. Design suitable ER Diagrams for a			
	tracking of items that are shipped.	given application.			
	The items can be identified by item number (unique),	2.Identify attributes, entities,			
	details, amount, destination, and final delivery date.	relationships, types of relationships,			
	The items are received at the retail shops.	keys, etc.			
	The retailers are with the RetailID, and address.	3.Design and implement elementary			
	The transport is managed by the company TRANS with	SQL queries suitable for the			
	fields VehicleID, VehicleNo, Destination_Place,	database.			
	• Design an Entity Relationship diagram that captures	4. Design and implement SQL queries			
	this information about the GO_TRACK system.	with different types of keys for			
	• Indicate the attributes, operations, and cardinality	checking conditions suitable to the			
	constraints	database.			

2	Demonstrate the following SQL queries on the table	5.Design and develop SQL queries for
	Create	union, the intersection of tables and
	• Insert	views.
	• Update	
	Delete	
	Design a table for a PRODUCT with fields ProductID,	
	ProductName, ProductModel, ProductCost	
3	Consider the following schema for an Employee	
	Database:	
	EmpID, EmpFname, EmpLname, Address, DOB,	
	Gender, Salary	
	Write SQL Queries to:	
	<ul> <li>Retrieve details of all employees in the company</li> </ul>	
	• Get the particulars of employees who have a	
	salary of more than 50000.00	
	• Get the particulars of employees who are above	
	50 years.	
4	Consider the following schema for SHOP Database:	
	SALESMAN (Salesman_id, Name, City, Commission)	
	CUSTOMER (Customer_id, Cust_Name, City, points,	
	Salesman_id)	
	Write SQL queries to:	
	• Count the customers with points greater than 10.	
	• List the name and numbers of all salesmen who	
	had more than one customer.	
	<ul> <li>Delete the salesman who does not have</li> </ul>	
	customers.	
5	Design a schema for a STUDENT database with fields	
	RollNo, Name, Class, and Score.	
	Write SQL queries to:	
	• List the students whose name starts with the	
	letter 'B'	
	<ul> <li>Fetch the top 10 records</li> </ul>	
	<ul> <li>Add, Insert, Append and Print the records of the</li> </ul>	
	entire class.	-
6	Design a Schema for a SCHOOL.	
	STUDENT (ID, Name, Gender, Class)	
	MARKS (ID, Subject1, Subject2, Subject3)	
	Write SQL queries to:	
	• List all the students studying in the Fifth standard.	
	Calculate the total marks, and average and update	
	the table for students	
	Declare results using the following	
	IT the average of three subjects is>/5: The distinction	
	1. Average>=60 and 5: First Class</th <th></th>	
	2. Average>=50 and <60: Second Class	
	<ol> <li>Average&gt;=40 and &lt;50: Pass Class</li> <li>Average &lt; 40: Fail</li> </ol>	
1	4. Average< 40: Fall	

7	Create a schema for a BOOK database. Assume the
	suitable fields such as BookID, BookTitle, AuthorName,
	PublicationName, and BookCost.
	• Create a view by selecting fields from one or more
	tables present in the database.
	<ul> <li>Perform the filtering using min, max, and avg</li> </ul>
8	Demonstrate the function of the following keys in
	DBMS
	Primary Key
	• Super Key
	Candidate Key
	Foreign Key
	Compound Key
	Design a Schema TEACHER with fields Name, ID, and
	Experience and Illustrate the application of the above-
	mentioned keys.
9	Create a schema for a database LEARNER. Use the
	fields ID, Name, and CGPA.
	<ul> <li>Create a view for Learners with CGPA &gt; 2</li> </ul>
	Drop View
	Update View
10	Create a tables EMPLOYEE and ORDER with fields
	EMPLOYEE (EmpID, EmpSalary, EmpName)
	ORDER (OrderID, OrderName, OrderCost). Perform the
	following on these tables.
	Union
	Intersection
	<ul> <li>Return columns with values &gt; 10000</li> </ul>

	Programme Outcomes (POs)													Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO- 2	PSO-3	PSO-4	
CO-1	2	3	3	2	2	-	1	2	1	3	1		3	3	2	2	
CO-2	2	1	1	1	1		1	2	2	2	1	2	3	3	2	3	
CO-3	3	3	3	3	2		2	2	3	3	2	2	3	3	2	3	
CO-4	2	2	3	3	2		1	2	2	2	2	2	3	3	2	3	
CO-5	3	3	3	3	2		2	2	2	2	1	3	3	3	2	3	
		3	: Very	Stron	g Cont	ributi	on, 2:	Strong	g Cont	ributio	n, 1: Mo	oderate	Contrib	ution			

#### 5. Course Resources

#### a. Essential Reading

- 1. Elmasri and Navathe. (2007). *Fundamentals of Database Systems* 4<sup>th</sup> ed., Pearson/Addison Wesley Publication.
- 2. Silber Schatz, A, Korth, H.F. (2011). and Sudarshan S., *Database System Concepts*, 7<sup>th</sup> ed., McGraw Hill Publication

#### b. Recommended Reading

- 1. Ramakrishnan R. and Gehrke J. (2010). *Database Management System*, 3<sup>rd</sup> Ed., McGraw Hill Publication
- 2. Leon A. and Leon M. (2007). *Database Management Systems*, 1<sup>st</sup> Ed., Tata McGraw Hill Publication

#### c. Magazines and Journals

- 1. IEEE transaction on DBMS
- 2. Distributed and Parallel Databases Springer

#### d. Websites

- 1. https://www.coursera.org/
- 2. http://nptel.ac.in/

#### e. Other Electronic Resources

1. https://ocw.mit.edu/index.htm