

Department of computer Applications

LIST OF COURSE OUTCOMES (2020 SCHEME)

SEMESTER	SUBJECT CODE	SUBJECT NAME	CO NO:	CO DESCRIPTION
S1	20MCA101	MATHEMATICAL FOUNDATIONS FOR COMPUTING	1	Understand mathematical reasoning in order to read, comprehend and construct mathematical arguments
			2	Count or enumerate objects and solve counting problems and analyze algorithms
			3	Solve problems in almost every conceivable discipline using graph models
			4	Solve the linear system of equations and calculate the eigen values and eigen vectors of matrices.
			5	Apply the principles of correlation and regression in practical problems.
S1	20MCA103	DIGITAL FUNDAMENTALS & COMPUTER ARCHITECTURE	1	Apply the basics of digital electronics to design and realize simple combinational logic circuits
			2	Apply the digital electronics principles to design sequential logic circuits.
			3	Understand the different design features of computer architecture, five key components of a computer, processor and memory making technologies, addressing modes & instruction formats.
			4	Understand Processor logic design conventions and data path, pipelining and hazards, I/O organization, Interrupts and direct memory access
			5	Understand and different types of memories RAM/ROM/,Cache memory, Virtual memory etc. Apply the different memory design techniques.
			6	Understand the concept of single board computer like Arduino, Raspberry Pi etc. and apply the same in practical applications

S1	20MCA105	ADVANCED DATA STRUCTURES	1	Remember the Basic Data Structures and understand the Set Data Structure and its implementation.
			2	Understand Advanced Tree Structures for the design of efficient algorithms
			3	Understand Advanced Heap Structures suitable for solving Computational problems involving Optimisation and analysing these data structures using amortised analysis.
			4	Understand Advanced Graph algorithms suitable for solving advanced computational problems
			5	Understand the basic operation of Blockchaining along with the data structures used in it and the challenges in Blockchain data.
S1	20MCA107	ADVANCED SOFTWARE ENGINEERING	1	Get a full view of the Software life cycle
			2	Gain a deep knowledge of Software Planning, Analysis and Design and Software Engineering Models
			3	Have a great comprehension of Coding Practices, Version Control using 'git' and Software Quality
			4	Acquire ample grasp of Design Patterns
			5	Get deeply familiarised with Software Testing and its automation
			6	Start using Agile methodology
			7	Begin to apply CI/CD techniques in S/w development
S1	20MCA131	PROGRAMMING LAB	1	Understands basics of Python Programming language including input/output functions, operators, basic and collection data types
			2	Implement decision making, looping constructs and functions
			3	Design modules and packages - built in and user defined packages
			4	Implement object-oriented programming and exception handling.
			5	Create files and form regular expressions for effective search operations on strings and files.

S1	20MCA133	WEB PROGRAMMING LAB	1	Explore markup languages features and create interactive web pages using them.
			2	Learn and design client-side validation using scripting languages.
			3	Design front end web page and connect to the back-end databases.
			4	Do Client-side & Server-side scripting
			5	Develop Web Applications
S1	20MCA135	DATA STRUCTURES LAB	1	Use Debuggers, Profilers and advanced Compiler options.
			2	Implement the Set and Disjoint Set Data Structures.
			3	Understand the practical aspects of Advanced Tree Structures.
			4	Realise Modern Heap Structures for effectively solving advanced Computational problems.
			5	Implement Advanced Graph algorithms suitable for solving advanced computational problems.
S2	20MCA102	ADVANCED DATABASE MANAGEMENT SYSTEMS	1	Understand the fundamentals of relational database systems including: data models, database architectures and ER features.
			2	Analyze and apply the different normalization techniques.
			3	Assess the basic issues of transaction processing and concurrency control.
			4	Understand the roles that databases play in organizations and familiarize with basic database storage, file organization, database accessing techniques.
			5	Understand the basics of query processing, object-oriented, distributed databases.
			6	Analyze non-relational database systems and structures and XML
S2	20MCA104	ADVANCED COMPUTER	1	Comprehend the terminology and concepts of basic communication model, analyse the protocol layers and design application layer protocols.
			2	Understand and analyse the various transport layer protocols.

		NETWORKS	3	Compare and contrast various routing algorithms in the network layer.
			4	Understand and analyse the concepts of link layer and physical layer.
			5	Understand how modern cellular and wireless networks work
S2	20MCA172	ADVANCED OPERATING SYSTEMS	1	Identify synchronization problems in operating systems and issues in distributed systems.
			2	Explain classification of mutual exclusion algorithms and security violations
			3	Explain the design of distributed shared memory and issues in load distribution
			4	Explain design issues and synchronization in multiprocessor systems.
			5	Explain synchronization and concurrency control in database systems.
S2	20MCA192	IPR and CYBER LAWS	1	Explain the fundamentals of IPR and patents
			2	Apply intellectual property related tools such as trademark and copying to real problems
			3	Discuss industrial designs, trade secret and geographic indications
			4	Describe laws governing cyberspace and analyze the role of internet governance in framing policies for internet security
			5	Discuss different types of cybercrimes and penalties under IT act
S2	20MCA182	BUSINESS MANAGEMENT	1	Understand management as a process.
			2	Critically analyse and evaluate management theories and practices
			3	Perform planning and organising for an organisation
			4	Do staffing and related human resource development function
			5	Take proper decisions to get competitive advantage

			6	Understand basic concepts in book keeping and accounting
S2	20MCA132	OBJECT ORIENTED PROGRAMMING LAB	1	Understand object-oriented concepts and design classes and objects to solve problems
			2	Implement arrays and strings.
			3	Implement object-oriented concepts like inheritance, overloading and interfaces
			4	Implement packages, exception handling, multithreading and generic programming. Use java.util package and Collection framework
			5	Develop applications to handle events using applets
			6	Develop Applications using files and networking concepts
S2	20MCA134	ADVANCED DBMS LAB	1	Design and build a simple relational database system and demonstrate competence with the fundamentals tasks involved with modelling, designing and implementing a database.
			2	Apply PL/SQL for processing databases
			3	Comparison between relational and non-relational (NoSQL) databases and the configuration of NoSQL Databases.
			4	Apply CRUD operations and retrieve data in a NoSQL environment.
			5	Understand the basic storage architecture of distributed file systems
			6	Design and deployment of NoSQL databases with real time requirements.

S2	20MCA136	NETWORKING & SYSTEM ADMINISTRATION LAB	1	Install and configure common operating systems.
			2	Perform system administration tasks.
			3	Install and manage servers for web applications.
			4	Write shell scripts required for system administration.
			5	Acquire skill sets required for a DevOps.

S3	20MCA201	DATA SCIENCE & MACHINE LEARNING	1	Discuss the fundamental concepts of data science and data visualization techniques.
			2	Explain the basics of machine learning and use lazy learning and probabilistic learning algorithms to solve data science problems.
			3	Describe decision trees, classification rules & regression methods and how these algorithms can be applied to solve data science problems.
			4	Solve data science problems using neural networks and support vector machines.
			5	Discuss clustering using k-means algorithm and evaluate & improve the performance of machine learning classification models.
S3	20MCA203	DESIGN & ANALYSIS OF ALGORITHMS	1	Discuss the basic concepts in computer algorithms and their analysis & design using Divide and Conquer.
			2	Explain the concepts of Greedy Strategy and Dynamic Programming to use it in solving real world problems.
			3	Explain the Branch & Bound technique, Backtracking technique and Lower bounds.
			4	Describe the fundamental concepts of Computational Complexity and Network Flows.
			5	Discuss the concepts of Approximation and Randomized Algorithms.
S3	20MCA265	CLOUD COMPUTING	1	Understand the basic concepts in cloud computing and OpenStack logical architecture
			2	Discuss OpenStack cloud controller and common services
			3	Compare different OpenStack compute service components and storage types
			4	Describe the OpenStack Networking-Connection types and networking services
			5	Discuss orchestration, HA and failover in OpenStack

S3	20MCA287	BIOINFORMATICS	1	Explain the fundamentals of Computational Biology and Bioinformatics.
			2	Classify various biological databases.
			3	Use suitable algorithm for Biological Sequence Analysis and make use of database search tools.
			4	Discuss Gene structure and expression of Prokaryotic and Eukaryotes.
			5	Apply data mining & machine learning methods to analyse and visualize biological data.
S3	20MCA263	CYBER SECURITY & CRYPTOGRAPHY	1	Explain various types of security attacks, security mechanisms, security services and classical encryption techniques.
			2	Make use of Symmetric and Asymmetric encryption techniques to solve cryptographic problems.
			3	Describe the concepts of message authentication codes, hash functions and digital signing techniques for ensuring secure transactions.
			4	Discuss security services in Application, Transport and Network layers.
			5	Explain common web application security vulnerabilities and various prevention mechanisms.
S3	20MCA283	DEEP LEARNING	1	Explain the basic concepts of deep learning.
			2	Design neural networks using TensorFlow
			3	Solve real world problems with CNN
			4	Solve real world problems with RNN.
			5	Describe the concepts of GAN
S3	20MCA243	MOBILE APPLICATION DEVELOPMENT	1	Design and develop user interfaces for mobile apps using basic building blocks, UI components and application structure using Emulator
			2	Write simple programs and develop small applications using the concepts of UI design, layouts and preferences

		LAB	3	Develop applications with multiple activities using intents, array adapter, exceptions and options menu.
			4	Implement activities with dialogs, spinner, fragments and navigation drawer by applying themes
			5	Develop mobile applications using SQLite.
S3	20MCA245	MINI PROJECT	1	Identify a real-life project which is useful to society / industry
			2	Interact with people to identify the project requirements
			3	Apply suitable development methodology for the development of the product / project
			4	Analyze and design a software product / project
			5	Test the modules at various stages of project development
			6	Build and Integrate different S/W modules
			7	Document and deploy the product / project
S3	20MCA241	DATA SCIENCE LAB	1	Use different python packages to perform numerical calculations, statistical computations and data visualization
			2	Use different packages and frameworks to implement regression and classification algorithms.
			3	Use different packages and frameworks to implement text classification using SVM and clustering using k-means
			4	Implement convolutional neural network algorithm using Kera's framework.
			5	Implement programs for web data mining and natural language processing using NLTK

S4	20MCA242	COMPREHENSIVE VIVA	1	Articulate the concepts in the core courses learned through this programme.
			2	Attend technical interviews with confidence.
			3	Interpret questions and answer them with clarity.
			4	Make use of the concepts learned through this programme in future.
S4	20MCA244	SEMINAR	1	Annotate the ideas presented in technical papers
			2	Comprehend a concept by referring different technical documents
			3	Prepare technical documents
			4	Present a topic before an audience
			5	Interact with the audience
S4	20MCA246	MAIN PROJECT	1	Identify a real-life project which is useful to society / industry
			2	Interact with people to identify the project requirements
			3	Apply suitable development methodology for the development of the product / project
			4	Analyse and design a software product / project
			5	Test the modules at various stages of project development
			6	Build and integrate different software modules
			7	Document and deploy the product / project

Programme outcomes (POs)

Graduate Attributes (GA)	Programme outcomes (POs)
Computational Knowledge	Apply knowledge of mathematics, management, computing fundamentals, computing specialization and domain knowledge for the abstraction and conceptualization of computing models from defined problems to various real-life applications for any given requirements.
Problem analysis	Understand and analyze a given real-world problem and propose feasible computing solutions.
Design /Development of Solutions	Analyze customer requirements, create high-level design, and select modern computing tools and techniques and use them with dexterity and integrate it to all computer applications.
Conduct investigations of complex Computing problems	Transform complex business scenarios and contemporary issues to problems, investigate, understand and propose integrated solutions to meet desired needs within realistic constraints such as safety, security and applicability especially following cyber regulations using emerging technologies.
Modern Tool Usage	Develop the expertise in using modern hardware and software tools which can applied in professional career consecutively to provide innovative software solutions.
Professional Ethics	Recognize the social, professional, cultural and ethical issues involved in the use of computer technology and give them due consideration in developing software systems as broadly educated, expressive, ethical and responsible citizens with proven expertise to solve computer problems for the betterment of the society.
Life-long Learning	Recognize the importance of goal setting and to recognize the need for life-long learning for a continued career development and progress as a computer professional.
Project management and finance	Master fundamental project management skills, concepts and techniques, set attainable objectives and ensure positive results, meeting scope, time and budget constraints.
Communication Efficacy	Communicate technical information effectively, both orally and in writing such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and

	receive clear instructions.
Societal and Environmental Concern	An ability to devise and conduct experiments, interpret data and provide well informed conclusions for problems which will have high social and environmental impact.
Individual and Team Work	Work collaboratively as a member or leader in multidisciplinary teams with positive attitude to demonstrate computing and management skills and acquire good conflict resolutions skills.
Innovation and Entrepreneurship	Develop the talent to articulate innovative ideas and implement them using the acquired expertise and apply the inherent skills with absolute focus to function as an successful entrepreneur.

CO-PO mapping details

CO-PO MAPPING: REGULAR MCA 2 YEAR 2020 SCHEME												
Semester-1												
20MCA10 1	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	3	0	-	3					
CO 2	3	3	3	3	-	-	3					
CO 3	3	3	3	3	-	-	3					
CO 4	3	3	3	3	-	-	3					
CO 5	3	3	3	3	-	-	3					
AVG	3.0 0	3.0 0	3.0 0	3.0 0			3					
20MCA10 3	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	1			1					
CO 2	3	3	2	1			1					
CO 3	1	1		1			1					
CO 4	1	1					1					
CO 5	2	2	1	1			1					
CO 6	1	1	2		2		2	2	2		2	2
AVG	1.8 3	1.8 3	1.7 5	1.0 0	2.0 0		1.1 7	2.0 0	2.0 0		2.00	2.00
20MCA10 5	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2		1							
CO 2	2	2	3	2	1		1					

CO 3	2	3	3	2	1		1					
CO 4	3	3	2	1	2		1					
CO 5	3	2	2	2	3		1					
AVG	2.6	2.4	2.4	1.7	1.6		1					
20MCA10 7	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO 1		2	2					3			1	1
CO 2		3	3					3				
CO 3					3				3	2	2	
CO 4			3		3							
CO 5					3					2	3	
CO 6					2			2	2		2	3
CO 7					3			1		2		
AVG		2.5	2.6		2.8			2.2	2.5	2	2	2
20MCA13 1	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	2	1	2							
CO 2	3	3	3	2	2							
CO 3	3	3	3	3	3						1	
CO 4	3	3	3	3	3						1	
CO 5	3	3	3	3	3						1	
AVG	2.8	2.8	2.8	2.4	2.6						1	
20MCA13 3	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2			3	3			
CO 2	3	3	3	2	2			3	3	1		
CO 3	3	3	3	2	2			3	3			
CO 4	3	3	3	2	2			3	3			2
CO 5	3	3	3	3	3			3	3		2	2
AVG	3.0	3.0	3.0	2.2	2.2			3.0	3.0	1.0		2.00
	0	0	0	0	0			0	0	0		2.00
20MCA13 5	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2				3		1					
CO 2	3	2	2		1							
CO 3	2	2	3	2	1		1					
CO 4	2	3	3	2	1		1					
CO 5	3	3	2	1	2		1					
AVG	2.4	2.5	2.5	1.6	1.6		1					

Semester-2

20MCA10 2	PO											
	1	2	3	4	5	6	7	8	9	10	11	12

CO 5	3	3	3		3	2			3		3	
CO 6	3	3	3		3	2			3		3	
AVG	2.8 3	2.3 3	2.3 3	2.0 0	3.0 0	2.0 0			3.0 0		3.00	
20MCA13 4	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3	2	2					1	1	
CO 2	2	2	2		1							
CO 3	2	2	2	2						1	1	
CO 4	2	2	3	1	2		1			1	1	1
CO 5	3	2	2				1				1	1
CO 6	2	2	3	1	1			1		1	1	2
AVG	2.3 3	2.0 0	2.5 0	1.5 0	1.5 0		1.0 0	1.0 0		1.00	1.00	1.33
20MCA13 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1		2		2							
CO 2	1		2									
CO 3			2		2							
CO 4					2							
CO 5	2				2							
AVG	1.3 3		2.0 0		2.0 0							

SEMESTER- 3

20MCA20 1	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	1					3					
CO 2	3	3	3	2			3					
CO 3	3	3	3	2			3					
CO 4	3	3	3	2			3					
CO 5	3	3	3	2			3					
AVG	2.6	2.6	3	2			3					
20MCA20 3	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	1	2			2					
CO 2	3	3	1	2			2					
CO 3	3	3	1	2			2					
CO 4	3	3	1	2			2					
CO 5	3	3	1	2			2					
AVG	3.0 0	3.0 0	1.0 0	2.0 0			2.0 0					
20MCA26 3	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	1				1					
CO 2	2	2	2	1			1					

CO 3	2	1	1				1						
CO 4	2	1	1				2	1					
CO 5	2	1	1				2	1					
AVG	2.0 0	1.2 0	1.2 0	1.0 0			2.0 0	1.0 0					
20MCA26 5	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
CO 1	2					3		2					1
CO 2	2					3		2					1
CO 3	2					3		2					1
CO 4	2					3		2					1
CO 5	2					3		2					1
AVG	2.0 0					3.0 0		2.0 0					1.00
20MCA28 3	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
CO 1	2	2											
CO 2	3	3	3			3		3					
CO 3	3	3	3			3		3					
CO 4	3	3	3			3		3					
CO 5	2	3				2		2					
AVG	2.6 0	2.8 0	3.0 0			2.7 5		2.7 5					
S20MCA2 87	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
CO 1	3	1	1					1					
CO 2	3	3	1					2					
CO 3	3	3	2					2					
CO 4	3	2	1					1					
CO 5	3	3	2			2		2					
AVG	3.0 0	2.4 0	1.4 0			2.0 0		1.6 0					
20MCA24 1	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
CO 1	3	3	3	1	3	2	3		2				
CO 2	3	3	3	2	3	2	3		2				
CO 3	3	3	3	2	3	2	3		2				
CO 4	3	3	3	2	3	2	3		2				
CO 5	3	3	3	2	3	3	3		2				
AVG	3.0 0	3.0 0	3.0 0	1.8 0	3.0 0	2.2 0	3.0 0		2.0 0				
20MCA243	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
CO 1	3	3	3	1	3	2	3		2				
CO 2	3	3	3	2	3	2	3		2				
CO 3	3	3	3	2	3	2	3		2				
CO 4	3	3	3	2	3	2	3		2				
CO 5	3	3	3	2	3	3	3		2				
AVG	3.0 0	3.0 0	3.0 0	1.8 0	3.0 0	2.2 0	3.0 0		2.0 0				

20MCA245	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	3	3	1	2	3	3	3	3	3	3
CO 2	2	3	2	3	2	3	2	1	3	2	3	
CO 3	3	3	3	3	3	1	3	3	1		2	
CO 4	3	3	3	3	3		3	3	1	1	2	
CO 5	3	3	3	3	3		2	3			1	
CO 6	3	3	3	3	3	2	3	3		2	3	3
CO 7	1	1	3	3	3	2	3	3	2	1	2	
AVG	2.4 3	2.7 1	2.8 6	3.0 0	2.5 7	2.0 0	2.7 1	2.7 1	2.0 0	1.80	2.29	3.00

SEMESTER- 4

20MCA242	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3		2	2		2		3			
CO 2	3	3	1	2	3	2	3		3			
CO 3	1	2				2	2		3			
CO 4	3	2	3	2	2	3	3		2			
AVG	2.5 0	2.5 0	2.0 0	2.0 0	2.3 3	2.3 3	2.5 0		2.7 5			
20MCA244	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	1	3	2		3		3	2		2
CO 2	2	3	1	3	2		3		3	2		2
CO 3	2		1	2	3	2	3		3	2		2
CO 4	2	2			3	3			3		2	
CO 5	2	2			3	3			3		2	
AVG	2.0 0	2.5 0	1.0 0	2.6 7	2.6 0	2.6 7	3.0 0		3.0 0	2.00	2.00	2.00
20MCA246	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	3	3	1	2	3	3	3	3	3	3
CO 2	2	3	2	3	2	3	2	1	3	2	3	
CO 3	3	3	3	3	3	1	3	3	1		2	
CO 4	3	3	3	3	3		3	3	1	1	2	
CO 5	3	3	3	3	3		2	3			1	
CO 6	3	3	3	3	3		3	3		2	3	3
CO 7	1	1	3	3	3	2	3	3	2	1	2	
AVG	2.4 3	2.7 1	2.8 6	3.0 0	2.5 7	2.0 0	2.7 1	2.7 1	2.0 0	1.80	2.29	3.00