BMS Institute of Technology and Management

(An Autonomous Institution, Affiliated to VTU, Belagavi)
Approved by AICTE New Delhi, Accredited by NAAC with 'A' Grade
Yelahanka, Bengaluru - 560064

Master of Computer Applications (MCA)

CURRICULUM

Scheme of Teaching and Examination: 2021 – 22

1st to 4th Semester MCA

BMS EDUCATIONAL TRUST, BENGALURU

Dharmaprakasha Rajakarya Prasaktha

Late. Sri B. M. Sreenivasaiah

Founder, BMSCE

Late Sri. B. S. Narayan

Founder, BMS Educational Trust
Founder Donor Trustee

Vision of BMS Educational Trust

"Promoting Prosperity of Mankind by Augmenting Human Resource Capital Through Quality Technical Education and Training"

Mission of BMS Educational Trust

"Accomplish Excellence in the Field of Technical Education Through Education Research and Service Needs of Society"

About BMS Educational Trust

The history of BMS educational institutions can be traced back to 1946, when a noted philanthropist Dharmaprakasha, Rajakarya Prasaktha late Sri. B.M. Sreenivasaiah established the first-ever private engineering college in the country named, BMS College of Engineering (BMSCE). He had a great vision of promoting the prosperity of mankind by augmenting human resource capital through quality education and training. After his sad demise, his illustrious son Late Sri B.S. Narayan strived hard to realize the vision set through the formation of BMS Educational Trust in 1953. He was instrumental in establishing several educational institutions under the Trust. After his passing away, his wife Dr. B.S. Ragini Narayan continued with unwavering devotion the tradition of contributing high-quality human resource to the society, the objective with which the Trust was established. She is now the Chairperson, Donor Trustee and Member Secretary of the Trust. The activities of BMS educational institutions are well guided by a Council of Trustees appointed by her. It has established a conducive academic environment in all its institutions to effectively realize the vision.

Presently, the Trust runs the following 10 high quality and reputed institutions.

1. BMS College of Engineering (BMSCE), Bengaluru
2. BMS College of Law (BMSCL), Bengaluru
3. BMS Pre-University College for Women (BMSPUCW), Bengaluru
4. BMS Degree college for Women (BMSCW), Bengaluru
5. BMS Evening College of Engineering (BMSECE), Bengaluru
6. BMS Institute of Technology and Management (BMSIT&M), Bengaluru
7. BMS School of Architecture (BMSSA), Bengaluru.
8. BMS Evening College of Arts and Commerce (BMSCE), Bengaluru
9. BMS College of Architecture (BMSCA), Bengaluru
10. BMS College of Commerce and Management (BMSCCM), Bengaluru

About BMS Institute of Technology and Management

BMS Institute of Technology and Management was established in 2002 to cater to the need for high-quality technical education in India. The 18-acre lush green and serene campus of BMSIT&M is located in Northern Bengaluru closer to the Kempegowda International Airport(KIAL). Currently, there are eight UG programs, three PG programs and ten Ph.D programs catering to the educational needs of close to 4000 students. All the programs are being run as per the VTU guidelines for affiliated institutions. Now that BMSIT&M has been granted fresh autonomous status by the UGC and VTU from the academic year 2021-22, the curriculum design, delivery and assessment & evaluation with respect to the batch of students getting admitted in 2021-22 will be responsibility of the institute. The high-quality faculty & staff members, excellent academic and support infrastructure, quality learning aids, productive collaborations with industry, research institutes and government have together created a highly conducive ambience for students to realize their full potential. With continuous improvement in all dimensions, BMSIT&M has become one of the preferred destinations for engineering education for students across the country and from neighboring countries too.

About the Department of MCA

The Department of Master of Computer Applications (MCA) was established during the academic year 2003-04, with an approved intake of 60, to develop quality IT professionals to meet the human resource demand. The department is accredited by NBA and obtained academic autonomy in the year 2021-22. The department is recognized as a Research Centre under Visvesvaraya Technological University in the academic year 2016-17. The Department has 10 qualified and dedicated teaching staff and 02 technical staff members who put in their best possible efforts to ensure that the students gain the knowledge along with other life-skills, which helps them to face the world confidently and with high self-esteem. Disciplined environment, conducive to Teaching-Learning, with rigorous academic monitoring is maintained.

VISION OF THE INSTITUTE

To emerge as one of the finest technical institutions of higher learning to develop professionals who are technically competent, ethical and environment friendly for betterment of society.

MISSION OF THE INSTITUTE

Accomplish stimulating learning environment through high quality academic instruction, innovation and industry-institute interface.

VISION OF THE DEPARTMENT

To develop quality professionals in Computer Applications who can provide sustainable solutions to the societal and industrial needs.

MISSION OF THE DEPARTMENT

Facilitate effective learning environment through quality education, state-of-the-art facilities, and orientation towards research and entrepreneurial skills.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Develop innovative IT applications to meet industrial and societal needs

PEO2: Adapt themselves to changing IT requirements through life-long learning

PEO3: Exhibit leadership skills and advance in their chosen career

PROGRAM OUTCOMES (POs)

PO1: Apply knowledge of computing fundamentals, computing specialization, mathematics and domain knowledge to provide IT solutions.

PO2: Identify, analyse and solve IT problems using fundamental principles of mathematics and computing sciences.

PO3: Design, Develop and evaluate software solutions to meet societal and environmental concerns.

PO4: Conduct investigations of complex problems using research based knowledge and methods to provide valid conclusions.

PO5: Select and apply appropriate techniques and modern tools for complex computing activities.

PO6: Understand professional ethics, cyber regulations and responsibilities.

PO7: Involve in life-long learning for continual development as an IT professional.

PO8: Apply and demonstrate computing and management principles to manage projects in multidisciplinary environments by involving in different roles.

PO9: Comprehend& write effective reports and make quality presentations.

PO10: Understand the impact of IT solutions on socio-environmental issues.

PO11: Work collaboratively as a member or leader in multidisciplinary teams.

PO12: Identify potential business opportunities and innovate to create value for the society and seize that opportunity.

Preamble:

Technical education, today, is faced with extremely complex challenges due to the pressing need for comprehensive, inclusive, optimal and sustainable solutions to global and local problems. Hence, there is a need for engineering colleges to utilize the academic autonomy granted to them in full measure to assess the gaps in the present system, review and redesign the curriculum, its delivery and evaluation processes to effectively meet all such challenges. Such an exercise should be broad based and take into consideration:

- The ever-increasing influence of science and technology on human society.
- The faster pace of new developments and the rapid obsolescence of prevailing practices.
- Penetration of Information and Communication Technology in all sectors of human activity and economic development.
- Service sector becoming a major avenue for the employment of technical professionals and economic gains.
- Increasing multicultural work environment and fading organizational boundaries
- Very volatile, uncertain, complex and ambiguous business environment.

A higher education institute with academic autonomy should see opportunities in these challenges. From that perspective, these institutions are responsible for producing graduates who among others, will have:

- A strong foundation in the basics of science, technology, mathematics and engineering disciplines. The command over the chosen area of technical specialization.
- The capacity to apply the professional knowledge and skills acquired to solve complex engineering problems most optimally.
- Ability to self-learn and for life-long learning.
- The expertise in analysis, design, modeling and simulation of complex systems.
- The ability for rational, logical and critical thinking.
- The leadership qualities to inspire team members to achieve grand shared vision.

BMSIT&M intends to produce such graduates who strive to be complete engineers in all respects and to succeed in addressing the challenges posed by the modern world. BMSIT&M exercises the academic freedom given by the University:

- With a great sense of responsibility and accountability
- To enhance the visibility and credibility of the institute in the national and international Higher Education segment.
- To demonstrate its research prowess, creativity, innovativeness and entrepreneurial capabilities.
- To gain the confidence and respect of all its stakeholders, especially students, alumni, parents and the society at large.

Semester-wise Credit Distribution

Sem	Core	Elective	Mini Project	Major Project	Internship	Mathematics	Humanities, Ethics & Management	Co-Curricular	Bridge Course	Total
I	19					4	2			25
II	15	9	3							27
III	12	9	3					2		26
IV				16	4			2		22
Total	46	18	6	16	4	4	2	4	0	100

1. **MOOC assessments are based on the following:**
   Platforms – Swayam (NPTEL)
   Min 8 weeks duration followed by assessment and certificate

2. **Coding Skills assessments are based on the following:**
   Platforms - Hackerrank / Hackerearth / CodeChef / LeetCode:
   Students will be assessed through one of the above platforms at the Department level.

3. **Bridge Courses** are mandatory for all the students and will be scheduled in the beginning of the semester for a duration of 10 days.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

Scheme of Teaching and Examination: Effective from AY 2021 – 22
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

PG PROGRAM: MASTER OF COMPUTER APPLICATIONS (MCA) | **Semester: I**

Sl. No	Course category	Course Code	Course Title	Teaching Hours /Week			Credits	Examination			
				L	T	P		Duration	CIE Marks	SEE Marks	Total Marks
1	PC	21MCA101	Data Structures and Algorithms	3	0	0	3	3	40	60	100
2	PC	21MCA102	Operating Systems	3	0	0	3	3	40	60	100
3	PC	21MCA103	Database Management Systems	3	0	0	3	3	40	60	100
4	MAT	21MCA104	Mathematical Foundation for Computer Applications	4	0	0	4	3	40	60	100
5	HSS	21MCA105	Professional Ethics & Management	2	0	0	2	3	40	60	100
6	PC	21MCA106	Python Programming	0	1	3	2	3	40	60	100
7	PC	21MCA107	Java and Web Programming	0	1	3	2	3	40	60	100
8	PC	21MCA108	Data Structures and Algorithms Lab	0	1	3	2	3	40	60	100
9	PC	21MCA109	Linux Lab	0	1	3	2	3	40	60	100
10	PC	21MCA110	Database Lab	0	1	3	2	3	40	60	100
11	BC - Audit	21MCA1BC	* Bridge Course - 1	3	0	0	0	3	40	60	100
			TOTAL	**18**	**5**	**15**	**25**		**440**	**660**	**1100**

* Bridge Course - 1: Basics of Computing

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

Scheme of Teaching and Examination: Effective from AY 2021 – 22
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

PG PROGRAM: MASTER OF COMPUTER APPLICATIONS (MCA) | **Semester: II**

Sl. No	Course category	Course Code	Course Title	Teaching Hours /Week			Credits	Examination			
				L	T	P		Duration	CIE Marks	SEE Marks	Total Marks
1	PC	21MCA201	Software Engineering and Design	3	0	0	3	3	40	60	100
2	PC	21MCA202	Advanced Java Programming	3	0	0	3	3	40	60	100
3	PC	21MCA203	Advanced Web Programming	3	0	0	3	3	40	60	100
4	PE	21MCA204X	Elective Course – I	3	0	0	3	3	40	60	100
5	PE	21MCA205X	Elective Course – II	3	0	0	3	3	40	60	100
6	PE	21MCA206X	Elective Course – III	0	3	3	3	3	40	60	100
7	PC	21MCA207	Software Engineering and Design Lab	0	1	3	2	3	40	60	100
8	PC	21MCA208	Advanced Java Programming Lab	0	1	3	2	3	40	60	100
9	PC	21MCA209	Advanced Web Programming Lab	0	1	3	2	3	40	60	100
10	MP	21MCA210	Mini Project – 1	0	0	2	3	3	40	60	100
11	BC-Audit	21MCA2BC	*Bridge Course -2 Computer Networks	3	0	0	0	3	0	0	0
			TOTAL	**15**	**5**	**15**	**27**		**400**	**600**	**1000**

Elective Course - I	
Course Code	Course Title
21MCA2041	Data Warehousing & Data Mining
21MCA2042	NO SQL
21MCA2043	Big Data Analytics

Elective Course - II	
Course Code	Course Title
21MCA2051	Research Methodology
21MCA2052	Entrepreneurship & Mgmt.
21MCA2053	Operations Research

Elective Course - III	
Course Code	Course Title
21MCA2061	R Programming
21MCA2062	ASP .NET
21MCA2063	Software Testing
21MCA2064	Mobile Applications

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

Scheme of Teaching and Examination: Effective from AY 2021 – 22
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

PG PROGRAM: MASTER OF COMPUTER APPLICATIONS (MCA) | **Semester: III**

Sl. No	Course category	Course Code	Course Title	Teaching Hours /Week			Credits	Examination			
				L	T	P		Duration	CIE Marks	SEE Marks	Total Marks
1	PC	21MCA301	Machine Learning	3	0	2	4	3	40	60	100
2	PC	21MCA302	Cloud Computing	3	0	2	4	3	40	60	100
3	PC	21MCA303	IOT	3	0	2	4	3	40	60	100
4	PE	21MCA304X	Elective Course – IV	3	0	0	3	3	40	60	100
5	PE	21MCA305X	Elective Course – V	3	0	0	3	3	40	60	100
6	PE	21MCA306X	Elective Course - VI	3	0	0	3	3	40	60	100
7	MP	21MCA307	Mini Project – 2	0	0	2	3	3	40	60	100
8	CC	21MCA308	Coding Skills	0	2	2	2	-	40	-	40
			TOTAL	**18**	**2**	**10**	**26**		**320**	**420**	**740**

Elective Course - IV		Elective Course - V		Elective Course - VI	
Course Code	Course Title	Course Code	Course Title	Course Code	Course Title
21MCA3041	Advanced Programming	21MCA3051	Wireless Sensor Networks	21MCA3061	Augmented & Virtual Reality
21MCA3042	User Interface Design & UX	21MCA3052	Cryptography & Network Security	21MCA3062	Blockchain Technology
21MCA3043	Robotic Process Automation	21MCA3053	Cyber Security	21MCA3063	Natural Language Processing

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

Scheme of Teaching and Examination: Effective from AY 2021 – 22
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

PG PROGRAM: MASTER OF COMPUTER APPLICATIONS (MCA) | **Semester: IV**

Sl. No	Course category	Course Code	Course Title	Teaching Hours /Week				Credits	Examination			
				L	T	P	PW		Duration	CIE Marks	SEE Marks	Total Marks
1	IN	21MCA401	Internship	0	0	4	0	**4**	-	40	-	40
2	HSS	21MCA402	Seminar	0	2	0	0	**2**	-	40	-	40
3	PW	21MCA403	Project Work	0	0	0	6	**16**	3	40	60	100
4	CC	21MCA404	MOOC – Online Course	0	0	0	0	**0**	-	-	-	-
			TOTAL	**0**	**2**	**4**	**6**	**22**	**3**	**120**	**60**	**180**

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Data Structures and Algorithms

Course Code	21MCA101	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
2. Describe common applications for arrays, records, linked structures, stacks, queues, trees and graphs.
3. Demonstrate different methods for traversing trees
4. Compare and contrast the benefits of dynamic and static data structures implementations
5. Design and implement an appropriate hashing function for an application

Module – 1

Introduction: Implication and Scope of Data structure concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Basic Concepts: Introduction to arrays, pointers and dynamic memory allocation, dynamic array representations, Structures and unions.

(09 hours)

Module – 2

Stacks: Stack operations and Applications.

Queues: Queues, Circular Queues, Priority queues, Dequeue and operations.

(08 hours)

Module – 3

Linked List: Singly Linked lists, Double linked lists, Circular Linked Lists and operations.

Trees: Introduction, Binary Trees and traversals, Binary Trees traversals, Heaps, Binary Search Trees.

(08 hours)

Module – 4

Introduction, Fundamentals of the Analysis of Algorithm Efficiency: Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental data Structures. Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non- recursive algorithms.

(08 hours)

Module – 5

Algorithms: Brute-Force – Bubble Sort, String search, Divide and Conquer – Quick sort, Binary Search, Greedy method – Dijkstra's algorithm, Prim's and Kruskal algorithm, Decrease and Conquer – DFS, BFS, Topological Sorting.

Recap: Summary of Data structure concepts

(09 hours)

Course outcomes:

The students will be able to:

CO1: Differentiate various data structures.

CO2: Apply the data structures for different applications

CO3: Build solutions for real world problems using data structure concepts

CO4: Analyse the searching and sorting techniques

CO5: Compute the efficiency of algorithms in terms of asymptotic notations for any given problem.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Horowitz, Sahni, Anderson-Freed, "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2007.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson, 2nd Edition.

References:

1. Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures A Pseudocode Approach with C", Thomson, 2005.
2. Robert Kruse & Bruce Leung, "Data Structures & Program Design in C", Pearson Education, 2007.
3. Debasis Samanta, "Classic Data Structures", 2nd Edition, PHI, 2009.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Operating Systems

Course Code	21MCA102	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Learn Operating Systems and their Functionalities
2. Apply scheduling techniques for efficient usage
3. Analyse deadlock prevention methods
4. Explain various memory and file access techniques
5. Build Shell scripts

Module – 1

Introduction: Implication and Scope of Operating System concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Introduction to Operating Systems, System Structure What operating systems do, Operating System Operations, Operating System Services, System Calls, Types of System Calls.

(09 hours)

Module – 2

Process Management: Process Concept, Scheduling Criteria, Scheduling Algorithms.

Process Synchronization: The Critical Section Problem, Semaphores, Readers-Writers Problem, Dining Philosopher's Problem using Semaphores.

(08 hours)

Module – 3

Deadlocks: System model, Deadlock Characterization, Methods for handling deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from deadlock.

(08 hours)

Module – 4

Memory Management: Memory Management Strategies, Basic hardware, Swapping, Contiguous Memory Allocation, Paging, Segmentation. Virtual Memory: Demand Paging, Page Replacement.

(08 hours)

Module – 5

File System: File System Implementation, File concepts, Access methods, Directory overview, Allocation methods, Free space management. Secondary Storage Structures Magnetic disks, Disk Management, Disk Scheduling, Swap Space Management.

Recap: Summary of Operating system concepts

(09 hours)

Course outcomes:

The students will be able to:

CO1: Explore operating system concepts.

CO2: Apply the various OS Concepts.

CO3: Compare various techniques used to solve synchronization problems.

CO4: Analyse various scheduling algorithms

CO5: Differentiate between the memory management techniques.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating Systems Principles", 8th Edition, Wiley – India.

References:

1. D M Dhamdhere, "Operating Systems – A Concept Based Approach", 2nd Edition, Tata McGraw – Hill, 2002
2. Behrouz A Forouzan and Richard F Gilberg, "LINUX and Shell Programming", 1st Edition, Thomson Course Technology, 2005.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Database Management Systems

Course Code	21MCA103	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the fundamental concepts of Database Management Systems
2. Compare between file systems and database systems
3. Design ER diagrams, schema and relational tables
4. Formulate SQL queries
5. Develop real-time database applications

Module – 1

Introduction: Implication and Scope of Database concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, Data models, schemas and instances, Three -schema architecture and data independence, Entity-Relationship Model: Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, Relationship Sets, Roles and Structural Constraints Weak Entity Types.

(09 hours)

Module – 2

Relational Model: Relational Model and Relational Algebra: Relational Model Concepts, Relational Model Constraints and Relational Database Schema Update Operations, Transactions and Dealing with Constraint violations, Unary Relational operations, Relational Algebra Operations from Set Theory, Binary Relational Operations, JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra Relational Database Design Using ER-to-Relational Mapping.

(08 hours)

Module – 3

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic structure of SQL Queries, Additional Basic Operations, Null values, Aggregate Functions, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization. Database programming issues and techniques, Embedded SQL.

(08 hours)

Module – 4

Database Design: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms based on Primary Keys, General Definitions of 2nd and 3rd Normal Forms, Boyce Codd Normal Forms, Stored Procedures and functions, Triggers, Views.

(08 hours)

Module – 5

Transaction Management:

Transaction Concept, A Simple Transaction Model, Desirable properties of Transaction, Concurrency Control: Lock Based Protocols, Recovery techniques: recovery concepts, recovery in multi-database systems, database backup and recovery from catastrophic failures.

Recap: Summary of Database concepts

(09 hours)

Course outcomes:

The students will be able to:

CO1: Apply the basic concepts of database management.
CO2: Design entity-relationship diagrams to solve simple database applications
CO3: Formulate SQL queries in Oracle
CO4: Improve the database design by normalization
CO5: Build database for any given problem

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Elmasri and Navathe, "Fundamentals of Database Systems", 5th Edition, Addison - Wesley, 2011.

References:

1. C.J. Date, A. Kannan, S. Swaminathan, "An Introduction to Database Systems", 8th Edition, Pearson education, 2009.
2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3rd Edition, McGraw-Hill, 2003.
3. Silberschatz, Korth and Sudharshan, "Data base System Concepts", 6th Edition, Tata McGraw Hill, 2011.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Mathematical Foundation for Computer Applications

Course Code	21MCA104	CIE Marks	40
Contact Hours (L:T:P)	4:0:0	SEE Marks	60
Total Number of Lecture Hours	52L	Exam Hours	3

Credits: 04

Course objectives:

This course will enable students to

1. Perform various basic operations on propositional logic and set concepts.
2. Compute statistical measures of random variables and probability distributions
3. Solve problems using concepts of relations.
4. Apply the abstract concepts of graph theory in modelling to solve problems
5. Fit appropriate curves for the given data.

Module – 1

Introduction: Implication and Scope of Mathematical concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Basics: Propositional Logic, Propositional Equivalences, Introduction to Proofs, Proof Methods, Inclusion-Exclusion Principle, Pigeonhole principle.

(11 hours)

Module – 2

Probability and Probability Distributions: Introduction to Probability, Axioms, Conditional Probability, Baye's Theorem. Concept of Random variable, discrete probability distributions, continuous probability distributions, mean and variance of random variables, Binomial and Normal distribution, Exponential and Poisson distribution.

(10 hours)

Module – 3

Relations: Relations and their properties, n-ary Relations and their applications, Representing Relations, Closure of Relations, Equivalence Relations, Partial Orderings.

(10 hours)

Module – 4

Graph Theory: Graph and Graph models, Graph Terminology and special types of graphs, Representing graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest Path Problems, Planar Graphs, Graph Coloring.

(10 hours)

Module – 5

Statistical methods and Curve Fitting: Correlation, coefficient of correlations, lines of regression – principle of least square, Rank Correlation. Curve Fitting - Graphical method, Principle of least square – to fit a straight line and parabola. Fitting of other curves of the form $y=ax^b$, $y=ae^{bx}$$xy^n = b$

Recap: Summary of Mathematical concepts

(11 hours)

Course outcomes:

The students will be able to:

CO1: Prove mathematical statements and logical propositions using inference rules / truth tables.

CO2: Compute statistical measures of random variables and probability distributions

CO3: Solve problems using concepts of relations.

CO4: Apply the abstract concepts of graph theory in modeling to solve problems

CO5: Fit an appropriate curve for the given data.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Kenneth H Rosen, "Discrete Mathematics and its Applications", McGraw Hill publications,7th edition. [Module-1,3,4][Chapters- 1.1, 1.2, 1.6, 1.8, 5.2, 6.5, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8]
2. Walpole Myers, "Probability and Statistics for Engineers and Scientists", Pearson Education, 8th Edition [Module-2] [Chapter-2.1-2.8, 3.1-3.3, 4.1-4.7,5.3,5.6, 6.2-6.5, 6.6]
3. Dr. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40th Edition. [Module-5] [Chapter-24]

References:

1. Ralph P. Grimaldi and B V Ramana, Discrete and combinatorial Mathematics", 5th Edition, Pearson,2011.
2. J K Sharma, "Discrete Mathematics", MacMillan Publishers India Ltd, 3rd Edition, 2011
3. J P Trembley and R Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill, 2017.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Professional Ethics and Management

Course Code	21MCA105	CIE Marks	40
Contact Hours (L:T:P)	2:0:0	SEE Marks	60
Total Number of Lecture Hours	28L	Exam Hours	3

Credits: 02

Course objectives:

This course will enable students to

1. Realize the importance of ethics in organizations.
2. Acquire knowledge of ethical practices for effective management
3. Make effective presentations
4. Acquire knowledge on team creation and management
5. Acquire leadership qualities.

Module – 1

Introduction: Implication and Scope of Professional Ethics and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Basics of Technical Communication: Introduction, Importance of Technical Communication, General and Technical Communication, Objectives and Characteristics of Technical Communication, Process of Communication, Levels of Communication, Flow of Communication, Visual Aids in Technical Communication.

(06 hours)

Module – 2

Communication Barriers and Listening skills: Introduction, Classification of Barriers, Verbal and Non-verbal Communication, Introduction, Types of Listening, Listening for General Content and Specific Information.

Verbal Communication: Introduction, Planning, Outlining and Structuring, Nuances of Delivery, Guidelines for Effective Delivery, Introduction to Group Discussion, Use of Body Language in Group Communication, GD Technique.

(05 hours)

Module – 3

Ethics Overview: What is ethics? Ethics for business world, Including Ethical Considerations in Decision Making, Ethics in Information Technology, Ethics for IT Workers & IT users: IT Professionals, IT Users.

Privacy: Privacy protection & laws, Key privacy & anonymity issues, Social networking ethical issues, Online Social Networks.

(05 hours)

Module – 4

Leadership and Motivation: Leadership styles, Theories of Motivation, Understanding and managing group processes, Characteristics of Work group, Work group behaviour and productivity, Team creation and management.

(05 hours)

Module – 5

Management functions: Functions of Management – Planning, Types of Plans, Planning process, Organizing: Span of Control, line and staff functions, centralization and decentralization, delegation, staffing: manpower planning.

Recap: Summary of Professional Ethics and Management concepts

(06 hours)

Course outcomes:

The students will be able to:

CO1: Demonstrate the communication skills effectively
CO2: Involve in Group Discussions
CO3: Imbibe professional ethics
CO4: Explore protection and privacy laws
CO5: Inculcate leadership and managerial qualities.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
  - **CO4 and CO5 to be assessed based on IA Tests.**
- 50% of CIE is based on Alternate Assessment Methods
  - **CO1 and CO2 to be assessed by Group Discussion activity**
  - **CO3 to be assessed based on Group Discussion report**

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
  a. There will be a maximum of three sub-questions from each module.
  b. There will be a choice from two full questions from each module.

Textbooks:

1. Meenakshi Raman and Sangeeta Sharma, "Technical Communication -Principles and Practices" 3rd Edition, Oxford University Press.
2. Koontz and Wechrick, "Management", McGraw Hill Inc.
3. George W Reynolds, "Ethics in Information Technology", 5th Edition, Cengage

References:

1. L N Prasad, "Principles of Management"
2. R. Subramanian, "Professional Ethics", Oxford University Press, 2013

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Python Programming

Course Code	21MCA106	CIE Marks	40
Contact Hours (L:T:P)	0:1:3	SEE Marks	60
Total Number of Lecture Hours	14T42P	Exam Hours	3

Credits: 02

Course objectives:

This course will enable students to

1. Apply the basics of Python Programming.
2. Design GUI using Python basics
3. Develop real-time applications using Python.
4. Acquire the knowledge of programming constructs in Python
5. Apply Pre-processing techniques for real-time data.

Laboratory

1. Python Basic Concepts – Python Program Environment, Data types, Variables, Strings, Operators, Loops, Control statements.
2. Built-in Functions, Modules, Command Line Arguments, Keyword Arguments, *args and **kwargs
3. Python Collection Objects, Classes
4. Strings, Files, I/O
5. Data Pre-processing and Data Wrangling using Numpy and Pandas

Course outcomes:

The students will be able to:

CO1: Demonstrate the fundamental concepts of Python Programming
CO2: Apply Python concepts to build applications
CO3: Apply pre-processing techniques for the given data sets
CO4: Perform Data processing using Numpy and Pandas
CO5: Analyze the real-time data sets using Visualization packages.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- The students have to execute programs based on any TWO concepts.

References:

1. Paul Gries, Jennifer Campbell, Jason Montojo**, "**Practical Programming: An introduction to Computer Science using Python", The Pragmatic Bookshelf.
2. Allen Downey, Jeffrey Elkner, "Learning with Python: How to think like a computer scientist paperback", 2015.
3. Hans Fangohr, "Introduction to Python for Computational Science and Engineering"
4. Timothy A Budd, "Exploring Python", McGraw Hill Education.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Java and Web Programming

Course Code	21MCA107	CIE Marks	40
Contact Hours (L:T:P)	0:1:3	SEE Marks	60
Total Number of Lecture Hours	14T42P	Exam Hours	3

Credits: 02

Course objectives:

This course will enable students to

1. Apply the basics of Java Programming.
2. Design GUI using basics of web technologies
3. Develop real-time applications using Java and web concepts
4. Acquire the knowledge of programming constructs in Java and Web
5. Build applications using Java and Web concepts.

Laboratory

1. Java Basics
2. OOP Concepts in Java
3. Packages and interfaces
4. Exception Handling in Java
5. Multithreading
6. Web Programming basics
7. CSS , Javascript

Course outcomes:

The students will be able to:

CO1: Demonstrate OOP concepts in Java.
CO2: Explore the basics of Web Programming.
CO3: Develop applications using Java concepts
CO4: Design GUI using Web programming concepts
CO5: Build real-time applications using Java and web concepts.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- The students have to execute TWO programs based on Java and Web each.

References:

1. Herbert Schildt (2010), "The complete reference", 7th edition, Tata McGraw Hill, New Delhi
2. Chris Bates, "Web Programming", Wiley Publications
3. HTML5 Black Book by Dreamtech

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Data Structures and Algorithms Lab

Course Code	21MCA108	CIE Marks	40
Contact Hours (L:T:P)	0:1:3	SEE Marks	60
Total Number of Lecture Hours	14T42P	Exam Hours	3

Credits: 02

Course objectives:

This course will enable students to

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
2. Describe common applications for arrays, records, linked structures, stacks, queues, trees and graphs.
3. Demonstrate different methods for traversing trees
4. Compare and contrast the benefits of dynamic and static data structures implementations
5. Design and implement an appropriate hashing function for an application

Programs covering the following concepts using C / C++:

1. Arrays
2. Stack applications
3. Queue and variants of queue
4. Singly linked lists
5. Circular Linked Lists
6. Doubly linked lists
7. Binary search trees
8. Sorting and Searching Techniques
9. Time Complexity of Algorithms

Course outcomes:

The students will be able to:

CO1: Differentiate various data structures.

CO2: Apply the data structures for different applications

CO3: Build solutions for real world problems using data structure concepts

CO4: Analyse the searching and sorting techniques

CO5: Compute the efficiency of algorithms in terms of asymptotic notations for any given problem.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

- The students have to execute programs based on any TWO concepts.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS
Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Linux Lab

Course Code	21MCA109	CIE Marks	40
Contact Hours (L:T:P)	0:1:3	SEE Marks	60
Total Number of Lecture Hours	14T42P	Exam Hours	3

Credits: 02

Course objectives:
This course will enable students to
1. Learn Operating Systems and their Functionalities
2. Apply scheduling techniques for efficient usage
3. Analyse deadlock prevention methods
4. Explain various memory and file access techniques
5. Build Shell scripts

Programs covering the following concepts:
1. Exploring vi editor
2. General Purpose Utilities: man, cal, date, echo, printf, bc, script, who, uname, tty
3. File and Directory Handling commands: cat, cp, rm, mv, file, wc, pwd, cd, mkdir, rmdir, File Permissions, Hard Links, Symbolic Links
4. Understanding the Shell: Wild cards, Escaping, Quoting, Redirection, Pipes, tee, Command Substitution, Shell Variables
5. Simple Filters: pr, head, tail, cut, paste, sort, uniq, tr
6. Filters using Regular Expressions: grep, sed
7. The Process: Process status, Process Creation, Running and Killing Processes, at, batch, cron
8. Simple Shell scripts.
9. System Administration
10. AWK

Course outcomes:
The students will be able to:
CO1: Explore the Linux environment, file systems and hierarchy.
CO2: Apply Linux commands to extract, interpret and process data and files.
CO3: Execute commands for system administration.
CO4: Analyze the usage of different shell commands, variables and AWK filtering.
CO5: Build shell scripts for various applications.

CIE:
- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- The students have to execute programs based on any TWO concepts.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS
Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Database Lab

Course Code	21MCA110	CIE Marks	40
Contact Hours (L:T:P)	0:1:3	SEE Marks	60
Total Number of Lecture Hours	14T42P	Exam Hours	3

Credits: 02

Course objectives:
This course will enable students to
1. Understand the fundamental concepts of Database Management Systems
2. Compare between file systems and database systems
3. Design ER diagrams, schema and relational tables
4. Formulate SQL queries
5. Develop real-time database applications

Programs covering the following concepts:
1. Create a Database including primary key and foreign key concepts.
2. Create a database and demonstrate the usage of aggregate functions.
3. Create a database and demonstrate the usage of Group by / having clause.
4. Create a database and illustrate the usage of stored procedures / functions.
5. Demonstrate the usage of triggers.
6. Demonstrate the usage of views.
7. Build a database for any given application (Open Ended).

Course outcomes:
The students will be able to:
CO1: Apply the basic concepts of database management.
CO2: Design entity-relationship diagrams to solve simple database applications
CO3: Formulate SQL queries in Oracle
CO4: Improve the database design by normalization
CO5: Build database for any given problem

CIE:
- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:
- SEE will be conducted for 100 marks.
- The students have to execute programs based on any TWO concepts.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – I

Bridge Course - 1

Course Code	21MCA1BC	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	40L	Exam Hours	03

Credits: 0

Course objectives:

This course will enable students to

1. Realize the functionality of logic gates
2. Apply Boolean axioms to simplify Boolean expressions, combinational and sequential circuits.
3. Explain the basic principles and operations of different components of a digital computer
4. Apply C concepts to simple programs
5. Obtain a thorough understanding of fundamentals.

Module – 1

Introduction: Digital logic gates, number systems, Boolean algebra, simplification, construction of logic circuits, adders, subtractors, Register, Counter, 1's and 2's complement

(08 hours)

Module – 2

Computer Basics: Functional unit of computers, operational concepts, instruction types, sequencing, big endian/little endian, addressing modes.

(08 hours)

Module – 3

Memory: Memory management, cache memory, virtual memory, secondary storage devices

(08 hours)

Module – 4

Programming Basics: Basics of programming – flowchart, pseudocode, algorithm development

(08 hours)

Module – 5

C Basics: Data types, Control structures, Structures and Unions, Pointers, file concepts, I/o formatting

(08 hours)

Course outcomes:

The students will be able to:

CO1: Explore the functionality of logic gates.

CO2: Apply Boolean axioms to simplify Boolean expressions, combinational and sequential circuits

CO3: Explore the basic principles and operations of different components of a digital computer.

CO4: Explore the basic programming constructs
CO5: Apply C concepts to simple programs.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. M.Morris Mano, "Digital Logic and Computer Design", Pearson, 2012.
2. Carl Hamacher, Zvonko Vranesic Safwat Zaky, "Computer Organization", 5th edition, TataMcGraw-Hill, 2011
3. Balaguruswamy, "Basics of C Programming"

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Software Engineering and Design

Course Code	21MCA201	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the software development process.
2. Analyse the system requirements
3. Design the system with UML tools
4. Explore the basic principles of software testing and debugging.
5. Apply different levels of testing, test case, test plan for any given project.

Module – 1

Introduction: Implication and Scope of Software Engineering and Design concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Introduction: Professional Software Development, Attributes of good software, software engineering diversity, IEEE/ ACM code of software engineering ethics, case studies, Software Process & Agile Software Development

Software Process models: waterfall, incremental development, reuses oriented, Process activities; Coping with change, The rational Unified process. Agile methods, Plan-driven and agile Development, Extreme Programming, Agile project management, Scaling agile methods.

(09 hours)

Module – 2

Requirements Engineering: Functional and non-functional requirements, The software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirements validation, Requirements management

Component-based software engineering: Components and component model, CBSE process, Component composition.

(08 hours)

Module – 3

System Modeling, Architectural Design

Context models, Interaction models, Structural models, Behavioral models, Model driven engineering, Software architecture: the role of software architecture, architectural views, component and connector view, Architectural styles for C&C view, Documenting architectural design.

(08 hours)

Module – 4

Planning a software Project: Process planning, Effort estimation, Project scheduling and staffing, Software configuration management plan, Quality plan, Risk Management, Project monitoring plan.

Software Testing: Testing fundamentals, Black-box testing, White-box testing, Testing process.

(08 hours)

Module – 5

Design and implementation: Design: Design concepts, Function oriented design, detailed design, verification, matrix (Complexity matrix for function oriented design)

Distributed Software engineering: Distributed system issues, Client-server computing, Architectural patterns for distributed systems, Software as a service**.**

Recap: Summary of Software Engineering and design concepts

(09 hours)

Course outcomes:

The students will be able to:

CO1: Explore the basic aspects of Software Engineering
CO2: Define the requirements for a software system
CO3: Formulate a testing strategy for a software system.
CO4: Evaluate the quality of the requirements, analysis and design work done
CO5: Make effective use of UML to create appropriate designs.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Ian Sommerville: Software Engineering, 9th edition, Person Education Ltd, 2011.
2. Pankaj Jalote: Software Engineering, Wiley India Pvt Ltd (2010)

References:

1. Roger S Pressman: Software Engineering-A Practitioners approach, 6th Edition, McGraw-Hill, 2010.
2. Hans Van Vliet: Software Engineering Principles and Practices, 3rd Edition, Wiley–India, 2010

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Advanced Java Programming

Course Code	21MCA202	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand how to use java concepts in programming
2. Gain the ability to write a computer program to solve specified problems.
3. Design and program standalone Java applications
4. Implement Object Oriented designs in a multi-tier application
5. Understand the deployment of multi-tier application in real time

Module – 1

Introduction: Implication and Scope of Advanced Java Programming concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

File Handling and AWT: I/O Streams, Concepts of Streams, Stream classes – Byte and Character stream, Reading console input and writing console output, File Handline. The AWT class hierarchy, user interface components – Labels, Button, Text Components, Check Box, Check Box Group, Choice, List Box, Panels – Scroll pane, Menu, Scroll Bar.

(09 hours)

Module – 2

Servlets: Servlet Structure, packaging, lifecycle, HTTP Request and response, Handling client request, form data, HTTP status request headers, HTTP Status codes, HTTP response headers, handling cookies, session tracking.

(08 hours)

Module – 3

Java Server Pages (JSP): Need of JSP, basic syntax, scripting elements, limiting java code in JSP, JSP expression, JSP directives, JSP attributes, JSP Applets, JSTL.

(08 hours)

Module – 4

JDBC: JDBC Drivers, Steps to connect to the database, Connectivity with Oracle or MySQL, DriverManager, Connection, Statement, ResultSet interfaces, PreparedStatement, ResultSetMetaData, DatabaseMetaData , Storing image, Retrieving image Storing file, Retrieving file, Stored procedures and functions, Transaction Management, Batch Processing, JDBC New Features.

(08 hours)

Module – 5

Introduction to JavaBeans: Working with Java Beans. Introspection, creating java bean, manifest file, Bean Jar file, new bean, adding controls, Bean properties, Simple properties, Server Side Component Types, Session Beans, Message Driven Beans, Entity Beans, The Java Persistence Model. Container services, Instance pooling n caching, Life Cycle Call-back, The Stateless Session Bean, the Stateful Session Bean, the Singleton Session Bean, Message-Driven Beans. EJB and Persistence

Recap: Summary of Advanced Java Programming concepts

(09 hours)

Course outcomes:

The students will be able to:

CO1: Demonstrate file handling and AWT in Java
CO2: Design web applications using servlets
CO3: Apply JSP tags and its services for a given application
CO4: Build applications using JDBC.
CO5: Develop business applications using EJB.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Herbert Schildt, Java The Complete Reference, 8th Edition. Comprehensive coverage of the Java Language. Tata McGraw-Hill Edition – 2011.
2. Marty Hall, Larry Brown. Core Servlets and Java Server Pages. Volume 1: Core Technologies. 2nd Edition.
3. Andrew LeeRubinger, Bill Burke. Developing Enterprise Java Components. Enterprise JavaBeans 3.1. O'reilly.

References:

1. Java 6 Programming Black Book, Dreamtech Press. 2012
2. Michael Sikora, EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard, Shroff Publishers & Distributors Pvt. Ltd. 2008

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Advanced Web Programming

Course Code	21MCA203	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand web technology concept
2. Design user interface for web application
3. Develop web application using server coding language
4. Understand mobile framework sing advanced web platform
5. Understand responsive design in web application.

Module – 1

Introduction: Implication and Scope of Advanced Web Programming concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Introduction to the Web concepts and Technologies, Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS.

(09 hours)

Module – 2

Responsive Web Design: Concept of Bootstrap. Bootstrap file structure, basic html template. Global styles, Default Grid System. Basic Grid Html, offsetting columns, nesting columns, fluid grid system, container layouts, responsive design, typography, emphasis classes, Lists, code, Tables, Optional Table classes, Table row classes, Forms, buttons, Images, Icons.

(08 hours)

Module – 3

PHP: Overview of PHP: Input and output statements, Validating user input, Arrays, Functions, Form Handling, Pattern matching, Cookies and sessions, Database application, Overview of Ruby: Types, control Statements, Arrays and Hashes Methods, Code blocks and Iterators, Pattern matching.

(08 hours)

Module – 4

AJAX and JSON: Introduction to Ajax, Web services and Ajax, Ajax using HTML, CSS, Javascript, Ajax Framework and DOM, XMLHttpRequest, Ajax Architecture.

JSON: Introduction, Need of JSON, JSON Syntax Rules, JSON Data – a Name and a Value, JSON Objects, JSON Arrays, JSON Uses JavaScript Syntax, JSON files.

(08 hours)

Module – 5

Introduction to Node.js: Modules, packages Events, File system, Application examples, Overview of React Native, Components, Properties, Forms, Life cycle, events, Building Applications. Styling.

Recap: Summary of Advanced Web Programming concepts

(09 hours)

Course outcomes:

The students will be able to:

CO1: Design web pages using JavaScript and JQuery
CO2: Validate web pages using Javascript / PHP
CO3: Design rich User interface using bootstrap
CO4: Implement concepts of Node.JS
CO5: Develop web applications using server sided languages

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Randy Connolly, Ricardo Hoar, & Quot, "Fundamentals of Web Development", 1st Edition, Pearson Education India.
2. HTML5 Black Book by Dreamtech
3. Ethon Brown, Web Development with Node and Express, O'Reilly, 2020

References:

1. Alessandra, Flutter for Beginners, Packet Publishing -2019
2. Bonnie Eisemann, "Learning React Native", 3rd Edition, Oreilly, 2009

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

DataWarehousing and Data Mining

Course Code	21MCA2041	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Learn the basic principles, concepts and applications of data warehousing and data mining
2. Understand the task of data mining as an important phase of knowledge discovery process
3. Familiarize with conceptual, logical, and physical design of data warehouse
4. Explore various algorithms used for data mining
5. Acquire knowledge of fundamental concepts that provide the foundation of data mining

Module – 1

Introduction: Implication and Scope of Datawarehousing and Data Mining concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Data Mining: Motivation, Importance, Definition of Data Mining, Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of A Data Mining System with A Database or Data Warehouse System, Major Issues in Data Mining, Types of Data Sets and Attribute Values, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity.

Preprocessing: Data Quality, Major Tasks in Data Preprocessing, Data Reduction, Data Transformation and Data Discretization, Data Cleaning and Data Integration.

(09 hours)

Module – 2

Data warehousing and on-line analytical processing: Data Warehouse basic concepts, Data Warehouse Modelling - Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction.

Data cube technology: Efficient Methods for Data Cube Computation, Exploration and Discovery in Multidimensional Databases.

(08 hours)

Module – 3

Mining frequent patterns, associations and correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Are All the Pattern Interesting, Pattern Evaluation Methods, Applications of frequent pattern and associations.

Frequent pattern and association mining: A Road Map, Mining Various Kinds of Association Rules, Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns.

(08 hours)

Module – 4

Classification: Basic Concepts, Decision Tree Induction, Bayesian Classification Methods, Rule-Based Classification, Support Vector Machines, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification.

(08 hours)

Module – 5

Cluster Analysis: Basic Concepts of Cluster Analysis, clustering structures, Major Clustering Approaches, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model Based Clustering - The Expectation-Maximization Method, Other Clustering Techniques, Clustering High-Dimensional Data, Semi-Supervised Clustering and Classification.

Outlier Analysis: Why outlier analysis, Identifying and handling of outliers, Distribution Based Outlier Detection: A Statistics-Based Approach, Classification-Based Outlier Detection, Clustering-Based Outlier Detection.

Recap: Summary of Datawarehousing and Data Mining concepts

(09 hours)

Course outcomes:

The students will be able to:

CO1: Design a data mart or data warehouse for any organization
CO2: Demonstrate skills to write queries using DMQL
CO3: Extract knowledge using data mining techniques
CO4: Adapt to new and variety of data mining tools
CO5: Apply various clustering techniques to real world data

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Jiawei Han, Micheline Kamber, Jian Pei (2012), Data Mining: Concepts and Techniques, 3rd Edition, Elsevier

References:

1. Margaret H Dunham (2006), Data Mining Introductory and Advanced Topics, 2nd Edition, Pearson Education, New Delhi, India
2. Amitesh Sinha (2007), Data Warehousing, Thomson Learning, India.
3. Xingdong Wu, Vipin Kumar (2009), the Top Ten Algorithms in Data Mining, CRC Press, UK.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

No SQL

Course Code	21MCA2042	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the significant properties and potential uses of NoSQL
2. Compare between structured and unstructured data
3. Work with key-value and document databases
4. Write Map-Reduce programs for analysis
5. Explain about key-value, document and graph databases

Module – 1

Introduction: Implication and Scope of No SQL concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Introduction to NoSQL: Definition of NoSQL, History of NoSQL and Different NoSQL products.

Exploring NoSQL: Exploring Mongo DB Java/Ruby/Python, Interfacing and Interacting with NoSQL.

(09 hours)

Module – 2

NoSQL Basics: NoSQL Storage Architecture, CRUD operations with Mongo DB, Querying, Modifying and Managing.

Data Storage in NoSQL: NoSQL Data Stores, Indexing and ordering datasets (MongoDB/CouchDB/Cassandra).

(08 hours)

Module – 3

Advanced NoSQL: NoSQL in Cloud, Parallel Processing with Map Reduce, Big Data with Hive.

(08 hours)

Module – 4

Working with NoSQL: Surveying Database Internals, Migrating from RDBMS to NoSQL, Web Frameworks and NoSQL, using MySQL as a NoSQL.

(08 hours)

Module – 5

Developing Web Application with NOSQL and NOSQL Administration: Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP

Recap: Summary of NoSQL concepts

(09 hours)

Course outcomes:

The students will be able to:

CO1: Explore the characteristics of unstructured data.

CO2: Analyse CRUD operations

CO3: Apply map reduce programs to given data set.

CO4: Analyse the framework of NoSQL

CO5: Develop applications using NoSQL

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Shashank Tiwari, "Professional NOSQL", WROX Press, 2011

References:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addision Wesley, 2012.
2. Eelco Plugge, Peter Membrey and Tim Hawkins, "The Definitive Guide to Mongo DB, The NOSQL Database for cloud and Desktop Computing", Apress, 2005

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Big Data Analytics

Course Code	21MCA2043	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the types of data, analytical process model and requirements
2. Differentiate between predictive and descriptive analytics
3. Explain the process of putting the analytical model together
4. Work with Hadoop Distributed File System
5. Write Map Reduce programs for data analysis

Module – 1

Introduction: Implication and Scope of Big Data Analytics concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Big Data and Analytics: Example applications, Basic Nomenclature, Analytics Process Model, Job Profiles Involved, Analytics, Analytical Model Requirements, Types of Data Sources, Sampling, Types of Data Elements, Visual Data Exploration and Exploratory Statistical Analysis, Missing Values, Outlier Detection and Treatment, Standardizing Data, Categorization.

(09 hours)

Module – 2

Predictive and Descriptive Analytics: Target Definition, Linear Regression, Logistic Regression, Decision Trees, Neural Networks, Support Vector Machines, Ensemble Methods, Multiclass Classification Techniques, Evaluating Predictive Models; Association Rules, Sequence Rules, Segmentation.

(08 hours)

Module – 3

Analytics: Putting it All to Work: Back testing Analytical Models, Benchmarking, Data Quality, Software, Privacy, Model Design and Documentation, Corporate Governance; Example Applications: Credit Risk Modelling, Fraud Detection, Recommender Systems, Business Process Analytics.

(08 hours)

Module – 4

Hadoop Ecosystem and The Hadoop Distributed File System: Comparison of Hadoop with other systems, Hadoop Ecosystem; The Design of HDFS, HDFS Concepts, Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command-Line Interface, Basic Filesystem Operations, Hadoop Filesystems Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the FileSystem API, Writing Data, Directories, Querying the Filesystem, Deleting Data, Data Flow Anatomy of a File Read, Anatomy of a File Write, Coherency Model, Parallel Copying with distcp.

(08 hours)

Module – 5

Map Reduce: A Weather Dataset ,Data Format, Analysing the Data with Unix Tools, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner functions, Running a Distributed MapReduce Job, Hadoop Streaming, Hadoop Pipes, Compiling and Running, Developing a MapReduce Application, The Configuration API, Combining Resources, Variable Expansion, Configuring the Development Environment, Managing Configuration, GenericOptionsParser, Tool and ToolRunner, Writing a Unit Test, Mapper, Reducer, Running Locally on Test Data, Running a Job in a Local Job Runner, Testing the Driver, Running on a Cluster, Packaging, Launching a Job, The MapReduce Web UI, Retrieving the Results, Debugging a Job, Hadoop Logs, Remote Debugging.

Recap: Summary of Big Data Analytics concepts.

(09 hours)

Course outcomes:

The students will be able to:

CO1: Explore the need for analytical model for a given problem context
CO2: Apply various algorithms for handling large volumes of data
CO3: Analyse various data analytical models in different domains
CO4: Illustrate the architecture and functioning of HDFS clusters
CO5: Analyse the usage of Map-Reduce techniques for solving big data problems.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications" Wiley
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012

References:

1. Chris Eaton, Dirk Deroos et al., "Understanding Big data", McGraw Hill, 2012.
2. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Research Methodology

Course Code	21MCA2051	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Demonstrate the ability to choose methods appropriate to research aims and objectives
2. Understand the limitations of particular research methods
3. Develop skills in qualitative and quantitative data analysis and presentation
4. Develop advanced critical thinking skills.
5. Demonstrate enhanced writing skills

Module – 1

Introduction: Implication and Scope of Research Methodology concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.

(09 hours)

Module – 2

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.

Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

(08 hours)

Module – 3

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. Design of Sample Surveys, Sample Design, Sampling and Non-sampling Errors.

(08 hours)

Module – 4

Surveys and Data Collection: Introduction, Sample Survey versus Census Survey, Types of Sampling Designs, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

(08 hours)

Module – 5

Report Writing and IPR: Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. Intellectual Property Acts, different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970.Design Act: Industrial Design act 2000. Copyright acts: Copyright Act 1957. Trade Mark Act, 1999.

Recap: Summary of Research Methodology concepts.

(09 hours)

Course outcomes:

The students will be able to:

CO1: Explore the basic research methodology concepts.
CO2: Carry out a comprehensive literature survey
CO3: Formulate a problem statement.
CO4: Conduct appropriate survey for data collection.
CO5: Explore the various IPR Acts.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
2. Research Methodology a step-by- step guide for beginners. (For the topic Reviewing the literature under module 2) Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011 Study Material.
3. Intellectual property, Debirag E. Bouchoux, Cengage learning, 2013

References:

1. Research Methods: the concise knowledge base Trochim, Atomic Dog Publishing, 2005.
2. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Management and Entrepreneurship Development

Course Code	21MCA2052	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Explain fundamentals management functions of a manager.
2. Describe the understanding of motivation and different control systems in management
3. Explain understanding of Entrepreneurships and Entrepreneurship development process.
4. Summarize the preparation of project report, need significance of report
5. Realize the importance of Entrepreneurship.

Module – 1

Introduction: Implication and Scope of Management and Entrepreneurship development concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Introduction - Meaning - nature and characteristics of Management, Scope and Functional areas of management - Management as art or science, art or profession - Management & Administration - Roles of Management, Levels of Management, Modern management approaches

(09 hours)

Module – 2

Nature, importance and purpose of planning process objectives - Types of plans (meaning only) - Decision making, Importance of planning - steps in planning & planning premises - Hierarchy of plans. Nature and purpose of organization, Principles of organization – Types of organization-Departmentation Committees-Centralization Vs Decentralization of authority and responsibility.

(08 hours)

Module – 3

Leadership and Motivation: Meaning and nature of directing Leadership styles, Motivation, meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control.

(08 hours)

Module – 4

Entrepreneurship in Detail: Meaning of Entrepreneur; Evolution of the Concept; Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur - an emerging. Class. Concept of Entrepreneurship - Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship - its Barriers.

(08 hours)

Module – 5

Project and Partnership: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation, Identification of. Business Opportunities: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study. Definition and meaning of Partnership, Characteristics of Partnership, Kinds of Partners, Partnership Agreement or Partnership Deed, Registration of Partnership Firm, Rights, Duties and Liabilities of Partners.

Recap: Summary of Management and Entrepreneurship development concepts.

(09 hours)

Course outcomes:

The students will be able to:

CO1: Explore the role of entrepreneurs in the economic development
CO2: Explore the nature and characteristics of Management
CO3: Analyse the need and significance of partnership
CO4: Exhibit leadership skills
CO5: Interpret any given business case study to provide a suitable solution

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. P. C. Tripathi, P.N. Reddy, "Principles of Management" Tata McGraw Hill
2. Vasant Desai, "Dynamics of Entrepreneurial Development & Management", Himalaya Publishing House
3. Poornima. M. Charantimath, "Entrepreneurship Development", Pearson Education, 2006

References:

1. Robers Lusier, "Management Fundamentals - Concepts, Application, Skill Development", Thomson.
2. S. S. Khanka, " Entrepreneurship Development", S. Chand & Co. New Delhi.
3. Stephen Robbins, "Management", Pearson Education/PHI - 17th Edition, 2003

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Operations Research

Course Code	21MCA2053	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Analyse managerial problems in industry so that they are able to use resources more effectively.
2. Formulate mathematical models for quantitative analysis of managerial problems in industry.
3. Analyse the mathematical models of real problems in Operations Research
4. Frame LP Problems with solutions to solve them.
5. Improve decision making and develop critical thinking.

Module – 1

Introduction: Implication and Scope of Operations Research concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Introduction: Operations Research – A Quantitative approach to Decision making, Features of OR, OR Approaches to problem solving, Methodology of Operations Research.

Linear Programming: Introduction, Structure of Linear Programming Model, Advantages, General Mathematical Model of LPP, Examples of LP Model Formulation, Graphical Solution methods of LP Problem.

(09 hours)

Module – 2

Linear Programming: The Simplex Method, Two-Phase Method, Big M Method.

(08 hours)

Module – 3

Duality: Duality in Linear Programming, Formulation of Dual Linear Programming Problem and examples.

Assignment Problem: Mathematical model of Assignment Problem, Hungarian method for solving assignment problem.

(08 hours)

Module – 4

Transportation Problem: Transportation problem, Mathematical model of Transportation problem, Methods of finding initial solution (North-West corner rule, Least cost method, Vogel's Approximation method), Test for Optimality in TP using MODI method (uv-method).

(08 hours)

Module – 5

Theory of Games: Introduction, Two-person zero-sum game, pure strategies (Minimax and Maximin principles), Mixed strategies, The rule principles of dominance, Algebraic method to solve games without saddle point, Graphical method to solve the games.

Sequencing Problems: Processing n jobs through two machines (Johnson's Procedure).

Recap: Summary of Operations Research concepts

(09 hours)

Course outcomes:

The students will be able to:

CO1: Explore the importance of Operations Research
CO2: Apply the different approaches of OR to problem solving
CO3: Formulate a LPP for a given problem
CO4: Solve LPP using appropriate methods
CO5: Obtain optimal solutions for any given problem

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
    a. There will be a maximum of three sub-questions from each module.
    b. There will be a choice from two full questions from each module.

Textbooks:

1. S D Sharma "Operation Research", Kedarnath, Ramnath and Co, 2002
2. J K Sharma, "Operations Research Theory and Applications", 5th Edition, McMillan Publication, India.

References:

1. Taha H A, "Operations Research – An Introduction", 7th Edition, 2006.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

R Programming

Course Code	21MCA2061	CIE Marks	40
Contact Hours (L:T:P)	0:3:3	SEE Marks	60
Total Number of Lecture Hours	42T42P	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Apply the basics of R Programming.
2. Design GUI using R basics
3. Develop real-time applications using R.
4. Acquire the knowledge of programming constructs in R
5. Apply Pre-processing techniques for real-time data.

Laboratory

1. R Environment, Data frames, R Packages
2. Data Manipulation
3. Data Visualization
4. Supervised Learning
5. Unsupervised Learning
6. Testing and Package checking

Course outcomes:

The students will be able to:

CO1: Demonstrate the fundamentals of R programming.
CO2: Apply various data manipulation operations using R
CO3: Analyse given data set using data visualization packages.
CO4: Implement supervised and unsupervised learning methods with appropriate algorithms
CO5: Build R solutions for any given problem.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- The students have to execute programs based on any TWO concepts.

References:

1. Thomas Mailund, "Beginning Data Science in R", Apress, 2017.
2. Thomas Rahlf, Data Visualization with R, Springer.
3. Lillian Pierson, Data Science for Dummies, 2nd Edition, 2017

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

ASP .NET

Course Code	21MCA2062	CIE Marks	40
Contact Hours (L:T:P)	0:3:3	SEE Marks	60
Total Number of Lecture Hours	42T42P	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand C# programming
2. Apply OOP concepts
3. Demonstrate GUI based standalone application
4. Implement web based application
5. Implement ASP.NET applications

Laboratory

1. C# Basics, .NET Framework, Classes and objects
2. C# Properties
3. OOP Concepts
4. GUI Concepts
5. Web App Development using ADO.NET and AJAX
6. ASP.NET

Course outcomes:

The students will be able to:

CO1: Acquire the knowledge of .Net framework
CO2: Apply OOP concepts in .Net framework.
CO3: Implement the .Net framework in standalone applications.
CO4: Develop web applications using ASP .Net
CO5: Design suitable GUI for a given application

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- The students have to execute programs based on any TWO concepts.

References:

1. Black Book, ".NET 4.0 Programming (6-in-1)", Kogent Learning Solutions Inc., Wiley-Dream Tech Press.
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education
3. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiley-Apress
4. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series..
5. Herbert Schildt: Complete Reference C# 4.0, Tata McGraw Hill, 2010

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Software Testing

Course Code	21MCA2063	CIE Marks	40
Contact Hours (L:T:P)	0:3:3	SEE Marks	60
Total Number of Lecture Hours	42T42P	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Learn the basic concepts of testing
2. Apply Boundary, Equivalence class testing
3. Analyse the path, data flow testing concepts
4. Analyse quality process in testing
5. Implement testing concept using Selenium

Laboratory

1. Create Software Testing Test case format using Microsoft Excel. Take an Example and try to fill out in the format specified.
2. Write Test Cases for Amazon Login Page
3. Write Test cases for Phone field- Apply Specification based techniques
4. Test VTU Result page and report Bugs
5. Writing Test cases: Equivalence Partitioning Exercise
6. Writing Test cases: Decision Table Exercise
7. Writing Test cases: Boundary Value Exercise
8. Using Test Techniques Write Test cases for Login page- Page consists of Two editable fields (“User Name”, “Password”) and Two Buttons (“Sign In”, “Clear”)
9. Track Bugs in Mantis/Bugzilla
10. Selenium Installation and Record and Run any standard website
11. Test any given Web page / mailbox account using Selenium
12. Using Selenium IDE,
    - Write a test suite containing minimum 4 test cases.
    - Design a test suite for any *one* web site
13. Test Web Application using Selenium Webdriver

Course outcomes:

The students will be able to:

CO1: Explore the basic principles of software testing and debugging.
CO2: Apply different levels of testing for any given project.
CO3: Test any given Web page for bug tracking.
CO4: Develop test cases for any given application.
CO5: Validate any real-time application using Selenium.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- The students have to execute programs based on any TWO concepts

References:

1. Adithya P. Mathur "Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011
2. Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012
3. Selenium Testing Tools Cookbook by Unmesh Gundecha
4. Kshirasagara Naik, Priyadarshi Tripathy: Software Testing and Quality Assurance, Wiley India 2012 2. M.G.Limaye: Software Testing-Principels, Techniques and Tools – McGraw Hill, 2009

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Mobile Applications

Course Code	21MCA2064	CIE Marks	40
Contact Hours (L:T:P)	0:3:3	SEE Marks	60
Total Number of Lecture Hours	42T42P	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the preliminary requirements to build mobile applications
2. Design the GUI based activity screens using one of the tools of mobile application
3. Analyze the flows of activities of mobile applications
4. Apply the technologies to create mobile adaptive web applications
5. Implement and Test Builds using the one of the marketing tools of mobile.

Laboratory

1. Views
2. Activities
3. Fragments
4. Intents
5. Layouts and Layout Managers
6. Graphics & Media
7. Internal & External Database
8. SMS Messaging
9. Image capturing and Location based applications
10. Notification
11. Flutter Framework

Course outcomes:

The students will be able to:

CO1: Explore the design features of mobile devices.
CO2: Develop applications using views, intents, fragments and graphics.
CO3: Design an application using internal and external database.
CO4: Build mobile applications using open source software.
CO5: Develop android applications with societal / environmental relevance.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- The students have to execute programs based on any TWO concepts

References:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", 1st Edition, 2012, ISBN: 978-1-118-20390-3
2. Reto Meier, "Professional Android 4 Application Development", Wrox Publications 2012.
3. Wei-Meng Lee, "Beginning Android Application Development", Wiley 2011.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS
Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Software Design Lab

Course Code	21MCA207	CIE Marks	40
Contact Hours (L:T:P)	0:1:3	SEE Marks	60
Total Number of Lecture Hours	14T42P	Exam Hours	3

Credits: 02

Course objectives:
This course will enable students to

1. Understand the software development process.
2. Analyse the system requirements
3. Design the system with UML tools
4. Explore the basic principles of software testing and debugging.
5. Apply different levels of testing, test case, test plan for any given project.

Laboratory

The student has to draw the necessary UML diagrams using any suitable UML drawing tool (**Class Diagram, Use-Case, Sequence diagrams, Activity Diagrams)**

1. Publisher-Subscriber
2. Command Processor
3. Client-Dispatcher
4. Polymorphism
5. Whole-Part
6. Forwarder-Receiver
7. Proxy
8. Model-View-Controller

Course outcomes:
The students will be able to:
CO1: Analyse the requirements of the given system
CO2: Build use case models for a given system
CO3: Design behavioural models for a given application
CO4: Generate source code from design diagrams
CO5: Apply appropriate patterns to provide solution for the given problem.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

- The students have to execute programs based on any TWO concepts.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS
Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Advanced Java Programming Lab

Course Code	21MCA208	CIE Marks	40
Contact Hours (L:T:P)	0:1:3	SEE Marks	60
Total Number of Lecture Hours	14T42P	Exam Hours	3

Credits: 02

Course objectives:
This course will enable students to

1. Understand how to use java concepts in programming
2. Gain the ability to write a computer program to solve specified problems.
3. Design and program standalone Java applications
4. Implement Object Oriented designs in a multi-tier application
5. Understand the deployment of multi-tier application in real time

Laboratory

Demonstrate the following concepts:

1. I/O Streams
2. File Handling
3. AWT Controls
4. a. Data Structure Classes
   b. Event Handling
5. a. Java Servlets
   b. Cookies
6. a. Sessions
   b. Java Server Pages
7. Java Beans
8. a. JDBC with integrated database
   b. JDBC with external database
9. Enterprise Beans

Course outcomes:
The students will be able to:
CO1: Demonstrate file handling and AWT in Java
CO2: Design web applications using servlets
CO3: Apply JSP tags and its services for a given application
CO4: Build applications using JDBC.
CO5: Develop business applications using EJB.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- The students have to execute programs based on any TWO concepts.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Advanced Web Programming Lab

Course Code	21MCA209	CIE Marks	40
Contact Hours (L:T:P)	0:1:3	SEE Marks	60
Total Number of Lecture Hours	14T42P	Exam Hours	3

Credits: 02

Course objectives:

This course will enable students to

1. Understand web technology concept
2. Design user interface for web application
3. Develop web application using server coding language
4. Understand mobile framework sing advanced web platform
5. Understand responsive design in web application.

Laboratory

1. JQuery Selectors
2. JQuery Events
3. Bootstrap – web application creation
4. Client-Side PHP and Server-Side PHP
5. Database Application with PHP
6. JSON
7. Node.JS
8. React.JS

Course outcomes:

The students will be able to:

CO1: Design web pages using JavaScript and JQuery
CO2: Validate web pages using Javascript / PHP
CO3: Design rich User interface using bootstrap
CO4: Implement concepts of Node.JS
CO5: Develop web applications using server sided languages

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.
- The students have to execute programs based on any TWO concepts.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – II

Mini Project - 1

Course Code	21MCA210	CIE Marks	40
Contact Hours (L:T:P)	0:0:2	SEE Marks	60
Total Number of Lecture Hours	28P	Exam Hours	3

Credits: 03

Course Objectives:

This course will enable students to

1. Apply knowledge of mathematics and fundamentals of computer science to meet the given requirements.
2. Analyze and design models that are consistent with the requirements.
3. Implement and test using modern tools and technologies.
4. Follow ethical principles do impartial evaluation and draw conclusions.
5. Work on applications that provide solutions in industrial, societal and environmental context.

Project Guidelines

Develop an application using appropriate tools and technologies with suitable user interface.

Guidelines:

1. A team of maximum two students must develop the project.
2. The project can be implemented any time during the duration of 1st and 2nd sem. It should be completed before the end of 2nd semester.
3. Project has to be demonstrated in the examination individually by each student at the end of 2nd semester.
4. The team must submit a brief project report (20-30 pages) that may include the following:
   - Introduction
   - Requirement Analysis
   - Software Requirement Specification
   - Analysis and Design
   - Implementation
   - Testing
   - Conclusion

   The above can be considered as a general report template with suitable changes per project basis.

Course outcomes:

The students will be able to:

CO1: Analyse the given requirements.
CO2: Design a suitable system model.
CO3: Develop the solution using appropriate tools.
CO4: Prepare effective documentation.
CO5: Involve in team work.

CIE:

- 50% of CIE is based on Internal Assessments
- 50% of CIE is based on Alternate Assessment Methods

SEE: SEE will be conducted for 50 marks.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

Machine Learning

Course Code	21MCA301	CIE Marks	40
Contact Hours (L:T:P)	3:0:2	SEE Marks	60
Total Number of Lecture Hours	42L 28P	Exam Hours	3

Credits: 04

Course objectives:

This course will enable students to

1. Understand the fundamental issues and challenges of machine learning
2. Analyze data, model selection and model complexity
3. Understand the strengths and weaknesses of many popular machine learning approaches.
4. Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
5. Design and implement various machine learning algorithms in a range of real-world applications.

Module – 1

Introduction: Implication and Scope of Machine Learning concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Machine Learning Basics: Well posed learning problems, Designing a learning system, Perspectives and issues in Machine Learning, Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version Space, Candidate Elimination Algorithm.

(09 Hours)

Module – 2

Decision Tree Learning – Decision Tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Issues in decision tree learning.

(08 Hours)

Module – 3

Artificial Neural Networks – Introduction, Neural Network representation, Appropriate problems, Perceptions, Backpropagation algorithm.

(08 Hours)

Module – 4

Bayesian Learning – Introduction, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naïve Bayes Classifier, Bayesian belief networks.

(08 Hours)

Module – 5

Evaluating Hypothesis – Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms, Instance based learning: Introduction, K-Nearest Neighbor learning.

Recap: Summary of Machine Learning concepts (09 Hours)

Laboratory

Programs covering the following concepts:

1. Web Scraping
2. Data Pre-processing
3. Find-S Algorithm
4. Candidate Elimination Algorithm
5. Linear Regression
6. K-NN Algorithm
7. SVM Algorithm
8. Naïve-Bayes Classifier

Course outcomes:

The students will be able to:

CO1: Design the process of learning models from data.
CO2: Build suitable Decision tree for a given data set.
CO3: Apply machine learning algorithms for the given problems.
CO4: Perform statistical and probabilistic analysis of machine learning techniques.
CO5: Implement machine learning algorithms for a given use case.

CIE:

- CIE is based on Theory and Laboratory Components of the course.
- Theory component is evaluated for 60% of CIE i.e., 24 Marks and Laboratory component is evaluated for 40% of CIE i.e., 16 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education

References:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, 2nd Edition, Springer series in statistics.
2. Ethem Alpaydin, Introduction to Machine learning, 2nd Edition, MIT Press.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

Cloud Computing

Course Code	21MCA302	CIE Marks	40
Contact Hours (L:T:P)	3:0:2	SEE Marks	60
Total Number of Lecture Hours	42L 28P	Exam Hours	3

Credits: 04

Course objectives:

This course will enable students to

1. Learn cloud computing concepts, genesis and its applications
2. Relate cloud computing with other computing environments
3. Explore Virtual machine and Virtualization for cloud computing environment
4. Analyze various cloud computing models and platforms

Module – 1

Introduction: Implication and Scope of Cloud Computing concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Cloud Computing Basics: Distributed System Models and Enabling Technologies - Scalable Computing Service over the Internet, Distributed algorithms, System Models for Distributed and Cloud Computing, Performance, Security and Energy efficiency.

(09 Hours)

Module – 2

Virtualization: Virtual Machines and Virtualization of Clusters and Data Centers- Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource Management.

(08 Hours)

Module – 3

Cloud Computing Architecture: Introduction, Cloud reference model: Architecture, IaaS, PaaS, SaaS, Types of Cloud- Public, Private, Hybrid and Community clouds, Economics of the cloud, Open challenges.

Public Cloud Platforms: GAE, AWS, and Azure, Cloud Security defense strategies.

(08 Hours)

Module – 4

Cloud Tools: OpenStack, Amazon web service, Google App Engine, Microsoft Azure.

Cloud Applications: Healthcare, Biology, CRM/ERP, Online Social Networking.

(08 Hours)

Module – 5

Cloud Security: Cloud security risks, Security - The top concern for cloud users, Privacy and privacy impact assessment, Trust, Security of virtualization, Security risks posed by shared images.

Cloud Application Development: Amazon web services - EC2 instances, connecting clients to cloud instances through firewalls, how to launch an EC2 Linux instance and connect to it, using S3 in AWS.

Recap: Summary of Cloud Computing concepts (09 Hours)

Laboratory

Following concepts have to be practiced in the lab:

1. Opening a Cloud account in AWS
2. Using EC2 instances to create Virtual machines
3. Running a web application
4. Creating storage using S3
5. Demonstrating a Database application
6. Flexible Infrastructure
7. Hosting a sample application in Cloud
8. Billing management
9. Cloud Watch

Course outcomes:

The students will be able to:

CO1: Explore the evolution of cloud computing and enabling technologies
CO2: Analyze different computing environments
CO3: Classify various cloud service models and their providers
CO4: Compare various cloud deployment models
CO5: Demonstrate AWS services to host and manage cloud applications.

CIE:

- CIE is based on Theory and Laboratory Components of the course.
- Theory component is evaluated for 60% of CIE i.e., 24 Marks and Laboratory component is evaluated for 40% of CIE i.e., 16 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Kai Hwang, Geoffrey C. Fox. Jack J Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", MK Publishers, 2012.
2. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", Tata McGraw Hill, New Delhi, India, 2013
3. Dan C Marinescu, Cloud Computing - Theory and Practice, Elsevier(MK), 2013.

URL for Distributed Algorithms (Module1):

https://www.youtube.com/watch?v=WbswphJAwt0

References:

1. Judith Hurwitz, R.Bloor, M. Kanfman, F.Halper , "Cloud Computing for Dummies" (Wiley India Edition).
2. J.Vette, Toby J. Vette, Robert Elsenpeter, "Cloud Computing: A Practical Approach", (Tata McGraw Hill).

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

Internet of Things

Course Code	21MCA303	CIE Marks	40
Contact Hours (L:T:P)	3:0:2	SEE Marks	60
Total Number of Lecture Hours	42L 28P	Exam Hours	3

Credits: 04

Course objectives:

This course will enable students to

1. Learn the fundamentals about IoT.
2. Understand about IoT Access technologies.
3. Describe the design methodology and different IoT hardware platforms.
4. Learn the basics of IoT Data Analytics and supporting services.
5. Demonstrate various IoT case studies and industrial applications.

Module – 1

Introduction: Implication and Scope of Internet of Things concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Basics: What is IoT? Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.

(09 Hours)

Module – 2

The "Things" in IoT, Sensors, Actuators and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.

(08 Hours)

Module – 3

IP as the IoT Network Layer, The Business Case for IP, the need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.

(08 Hours)

Module – 4

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT. A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.

(08 Hours)

Module – 5

IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints – Raspberry Pi: Introduction to Raspberry Pi, About the Raspberry Pi Board - Hardware Layout, Operating Systems on Raspberry Pi, Configuring Raspberry Pi, Programming Raspberry Pi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from

DS18B20 sensors, Remote access to Raspberry Pi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City use case with IFTTT.

Recap: Summary of IoT concepts (09 Hours)

Laboratory

List of Programs:

1. Run the python programs on Pi:
   a. Read your name and print Hello message with name.
   b. Read two numbers and print their sum, difference, product and division.
   c. Count the number of words and characters of a given string
   d. Determine the area of a given shape (circle, triangle and rectangle) by reading appropriate values from the standard input
   e. To print a name "n" times where n and name are read from standard input using loops.
   f. Handle divided by zero Exception
   g. Print current time for 10 minutes with an interval of 10 seconds
2. Get input from two switches and switch on corresponding LEDs
3. Flash an LED at a given on time and off time cycle, where the two times are taken from a file
4. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
5. Access an image through web page.
6. Control a light source using web page.
7. Implement an intruder system that sends an alert to the given email.
8. Get the status of a bulb at a remote place (on the LAN) through web.
9. Get an alarm from a remote area(through LAN) if smoke is detected.

Course outcomes:

The students will be able to:

CO1: Apply IoT concepts for a given use case.
CO2: Analyse the impact of application protocol and transport layer methods in IoT application.
CO3: Design IoT based solution for data analytics.
CO4: Develop real-time IoT applications for Societal/Environmental issues.

CIE: CIE is based on Theory and Laboratory Components of the course.

- Theory component is evaluated for 60% of CIE i.e., 24 Marks and Laboratory component is evaluated for 40% of CIE i.e., 16 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE: SEE will be conducted for 100 marks.

Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint)
2. Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017
3. https://www.computerworld.com/article/3239304/what-is-ifttt-how-to-use-if-this-then-that-services.html (For IFTTT Concepts)

References:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

Advanced Programming

Course Code	21MCA3041	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Learn .NET Framework and OOPS concept in C#
2. Implement the concepts of Delegates, Events, AJAX and ADO .NET
3. Develop window application using C# .NET
4. Implement Web application using ASP .NET and AJAX

Module – 1

Introduction: Implication and Scope of C# and .NET Programming concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Getting started with .NET Framework 4.0 and C#: Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0, .NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ.

Introducing C#: Creating a Simple C# Console Application, Identifiers and Keywords. System Data Types, Variables and Constants: Value Types, Reference Types, Understanding Type Conversions, Boxing and UnBoxing. Namespaces, The System namespace, .NET Array Types.

(09 Hours)

Module – 2

Classes, Objects and Object Oriented Programming: Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Members, Properties: Read-only Property, Static Property, Indexers, Structs: Syntax and Access Modifiers for structs, System. Object Class Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods.

Polymorphism: Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.

(08 Hours)

Module – 3

Delegates, Events, Exception Handling and ADO.NET: Creating and using Delegates, Multicasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers.

Exception Handling: The try/catch/throw/finally statement, Custom Exception.System. Exception, Handling Multiple Exception.

Data Access with ADO.NET: Understanding ADO.NET: Describing the Architecture of ADO.NET, ADO.NET, ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings. Creating a Connection to a Database: SQL Server Database, OLEDB Database, ODBC Data Source. Creating a Command Object. Working with DataAdapters: Creating DataSet from Data Adapter.

(08 Hours)

Module – 4

Graphical User Interface with Windows Forms and WPF: Windows Forms: Introduction, Event Handling: A Simple Event- Driven GUI, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI) Windows.

WPF: New WPF Controls, WPF Architecture: Presentation Framework, Presentation Core, WindowsBase, MIL or Milcore, Working with WPF Windows: Using XAML in WPF 4.0.

Applications: Contents of XAML and WPF Applications: XAML Elements Namespace and XAML, XAML Property Syntax, Markup Extensions.

(08 Hours)

Module – 5

Web App Development and Data Access using ADO.NET: Web Basics, Multitier Application Architecture, Your First Web Application: Building Web-Time Application, Examining Web-Time.aspx's Code-Behind File, Understanding Master pages, Standard Web Controls: Designing a Form, Validation Controls, GridView Control, DropDownList, Session Tracking, ASP.NET, Develop window applications using C# and Web application using ASP.NET.

Recap: Summary of C# and .NET Programming concepts (09 Hours)

Course outcomes: The students will be able to:

CO1: Explore C# concepts using .NET framework

CO2: Apply delegates, events and exception handling with ASP, Win Form and ADO.NET

CO3: Analyse the usage of .NET Components for a given usecase

CO4: Design Win and web based .NET applications

CO5: Build console/web application(s) with Database connectivity

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Black Book, ".NET 4.0 Programming (6-in-1)", Kogent Learning Solutions Inc., Wiley-Dream Tech Press.
2. Paul Deitel and Harvey Deitel, "C# 2010 for Programmers", Pearson Education, 4th Edition.

References:

1. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework", Wiley-Apress, 6th Edition.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

User Interface Design & UX

Course Code	21MCA3042	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Realize the importance of interface design.
2. Acquire knowledge of design guidelines, principles and theories.
3. Develop a framework for design management.
4. Evaluate design using suitable methods and evaluation tools.
5. Use software tools to develop interfaces for various software systems.

Module – 1

Introduction: Implication and Scope of User Interface Design concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Overview: Introduction to user interface, usability requirements, measures, motivations, universal usability - variations in physical abilities and physical workplaces, diverse cognitive and perpetual abilities, personality differences, cultural and international diversity, users with disabilities, designing for and with children, accommodating hardware and software diversity.

(09 Hours)

Module – 2

Guidelines, Principles and Theories: Introduction, guidelines - navigating the interface, organizing the display, user's attention, facilitating data entry. Principle: determine user's skill levels, identify tasks, choosing interaction style, 8 Golden rules of interface design, prevent errors. Theories: levels of analysis theories, stages of action models, GOMS and the keystroke level model, consistency through grammar, widget-level theories. Object action interface models.

(08 Hours)

Module – 3

Managing Design: Organizational design to support usability, 3 pillars of design - guidelines documents and processes, UI software tools, expert reviews and usability testing. Developmental methodologies, ethnographic observation, participatory design, scenario development, social impact statement for early design review, legal issues.

(08 Hours)

Module – 4

Evaluating Design: Expert reviews, usability testing and laboratories, survey instruments, acceptance testing, evaluation during active use, controlled psychologically oriented experiments.

Software Tools: Specification methods; grammars, menu selection and dialog box trees, transition diagrams, state charts. Interface building tools, evaluation and critiquing tools.

(08 Hours)

Module – 5

Direct Manipulation & Virtual Environments: Examples of direct manipulation: command-line v/s display editors v/s word processors, the VisiCalc spreadsheet and its descendants, special data management, video games, office automation, continuing evolution of direct manipulation, discussion on direct manipulation - OAI model, visual thinking and icons, direct manipulation programming, 3D interfaces, teleoperation, virtual and augmented reality.

Recap: Summary of User Interface Design & UX concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Explore the basics of User interface design
CO2: Apply design theories and practices in UI
CO3: Analyse the different design management methods
CO4: Design user interface for a given application
CO5: Evaluate the user interface using static and dynamic tools

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks

Text Books:

1. Ben Shneiderman, Plaisant, "Designing the User Interface", 4th Edition, Pearson Education, 2009

References:

1. Tim Frick, "Designing for Sustainability", 1st Edition, Oreilly 2016.
2. Unger and Chandler, "A Project Guide to UX Design", 2nd Edition, New Riders, 2012.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

Robotic Process Automation

Course Code	21MCA3043	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. To develop knowledge in various robot structures and their workspace
2. Perform spatial transformations associated with rigid body motions
3. Handle singularity issues associated with the operation of robotic systems

Module – 1

Introduction: Implication and Scope of Robotic Process Automation concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Automation: History of Automation, Reasons for automation, Disadvantages of automation, Automation systems, Types of automation – Fixed, Programmable and Flexible automation, Automation strategies.

(09 Hours)

Module – 2

Robotics: Definition of Robot, History of robotics, Robotics market and the future prospects, Robot Anatomy, Robot configurations: Polar, Cartesian, cylindrical and Jointed- arm configuration. Robot motions, Joints, Work volume, Robot drive systems, Precision of movement – Spatial resolution, Accuracy, Repeatability, End effectors – Tools and grippers.

(08 Hours)

Module – 3

Controllers and Actuators: Basic Control System concepts and Models, Transfer functions, Block diagrams, characteristic equation, Types of Controllers: on-off, Proportional, Integral, Differential, P-I, P-D, P-I-D controllers, Control system and analysis.

Robot actuation and feedback components: Position sensors – Potentiometers, resolvers, encoders, velocity sensors. Actuators - Pneumatic and Hydraulic Actuators, Electric Motors, Stepper motors, Servomotors, Power Transmission systems.

(08 Hours)

Module – 4

Robot Sensors and Machine vision system: Sensors in Robotics - Tactile sensors, Proximity and Range sensors, use of sensors in robotics.

Machine Vision System: Introduction to Machine vision, the sensing and digitizing function in Machine vision, Image processing and analysis, Training and Vision systems.

(08 Hours)

Module – 5

Robots Technology of the future: Robot Intelligence, Advanced Sensor capabilities, Telepresence and related technologies, Mechanical design features, Mobility, locomotion and navigation, the universal hand, system integration and networking.

Artificial Intelligence: Goals of AI research, AI techniques – Knowledge representation, Problem representation and problem solving, LISP programming, AI and Robotics, LISP in the factory.

Recap: Summary of Robotic Process Automation concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Explore the purpose, pros and cons of Robotics

CO2: Apply spatial transformation to obtain kinematics equation of robotic manipulators.

CO3: Analyse the working of robotics.

CO4: Realize the training process for robots.

CO5: Apply artificial intelligence through programming.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. John J. Craig, "Introduction to Robotics Mechanics and Control", 3rd Edition, Prentice-Hall, 2005

References:

1. Gerardus Blokdyk, "Robotic Process Automation: A Complete Guide", 2020 Edition

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

Wireless Sensor Networks

Course Code	21MCA3051	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Learn and analyze the different wireless technologies.
2. Evaluate Ad-hoc networks and wireless sensor networks.
3. Understand and evaluate emerging wireless technologies and standards.
4. Understand design considerations for wireless networks.
5. Analyse the security threats and related security standards.

Module-1

Introduction: Implication and Scope of Wireless Sensor Networks and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Basics of WSN: The vision of Ambient Intelligence, Application examples, Types of Applications, challenges of WSNs, why sensor networks are different?

(09 Hours)

Module-2

Single-node architecture: Hardware components, Energy consumption of sensor nodes, operating systems and execution environment, examples of sensor nodes.

Network Architecture: Sensor network scenarios, optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.

(08 Hours)

Module-3

Localization and Positioning: Properties of localization and positioning procedures, possible approaches, single hop localization, positioning in multi-hop environments.

Topology: motivation and basics ideas, controlling topology in flat networks, Hierarchical networks by dominating sets, Hierarchical networks by clustering, Combining hierarchical topologies and power control, adaptive node activity.

(08 Hours)

Module-4

Routing Protocols: Forwarding and routing, Gossiping and agent based unicast forwarding, Energy-efficient unicast, Broadcast and multicast, Geographic routing, mobile nodes.

Transport layer and quality of Service: the transport layer and QoS in WSNs, coverage and deployment Reliable data transport, single packet delivery, Block delivery, congestion control and rate control.

(08 Hours)

Module-5

Sensor Network Databases: Sensor database challenges, Querying the physical environment, Query interfaces, High-level Data Organization, In-Network Aggregation, Data centric storage, data indices and Range queries, Distributed Hierarchical Aggregation, Temporal Data.

Recap: Summary of Wireless Sensor Networks concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Explore the WSN architecture for various applications.
CO2: Apply suitable WSN routing protocols for a given network.
CO3: Analyze the organization of network nodes and their topology.
CO4: Evaluate the various QoS parameters of WSN.
CO5: Design appropriate database for WSN applications.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons Limited, 2008. [Chapters-1,2,3,9,10,11,13]
2. Feng ZHAO and Leonidas GUIBAS, "Wireless Sensor Networks", Morgan Kaufmann Publisher. [Chapter-6]

References:

1. Wilson, "Sensor Technology handbook", Elsevier publications, 2005.
2. Anna Hac, "Wireless Sensor Networks Design", John Wiley& Sons Limited Publications, 2003

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

Cryptography and Network Security

Course Code	21MCA3052	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Know concepts of classical encryption techniques, finite fields and number theory.
2. Explore the working principles and utilities of various cryptographic algorithms.
3. Explore the design issues and working principles of various authentication protocols.
4. Explore various secure communication standards.
5. Use cryptographic utilities to build programs for secure.

Module – 1

Introduction: Implication and Scope of Cryptography and Network security concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Overview: OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, Model for Network Security. Symmetric Cipher Model, Substitution Techniques, Transposition Techniques. Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles and Modes of operation.

(09 Hours)

Module – 2

Symmetric and Asymmetric Algorithms: Evaluation Criteria for AES, AES Cipher-Encryption and Decryption, Data Structure, Encryption Round. Principles of Public Key Cryptosystem, RSA algorithm, Key management, Diffie Hellman Key exchange.

(08 Hours)

Module – 3

Hashing: Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard. Security of MACs, HMAC, MACs based on block ciphers: DAA and CMAC, authenticated encryption: CCM and GCM, Key Wrapping, Pseudorandom number generation using Hash functions and MACs. SHA-1 hashing algorithm.

(08 Hours)

Module – 4

Kerberos: Kerberos, X.509 Authentication Service Pretty Good Privacy (PGP), S/MIME. IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

(08 Hours)

Module – 5

Security: Web security Considerations; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET). Intruders, Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration.

Recap: Summary of Cryptography and Network Security concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Explore basic concepts of cryptology.

CO2: Analyse security aspects of different cryptographic algorithms.

CO3: Generate suitable cryptographic keys for any given application.

CO4: Apply security principles for a given usecase.

CO5: Build a suitable application using cryptographic algorithms.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. William Stallings, "Cryptography and Network Security – Principles and Practices", 4th Edition, Pearson Education, 2009

References:

1. Behrouz A. Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill, 2010.
2. Atul Kahate, "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS
Scheme of Teaching and Examination: 2021-22

SEMESTER – III

Cyber Security

Course Code	21MCA3053	CIE Marks	40
Contact Hours (L: T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the importance of cyber security practice in day-to-day life.
2. Learn the key terminologies used in the cyber security domain.
3. Understand the tools and technologies used by the cyber security domain.
4. Gain familiarity with the security concepts in the various levels of security.
5. Learn the forensic science life cycle and IPR.

Module – 1

Introduction: Implication and Scope of Cyber Security concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Introduction to Cybercrime & Security: Cybersecurity Foundation Concepts - Cybercrime and Information Security, who are Cyber criminals, Classifications & Categories of Cybercrimes, Social Engineering, Cyber stalking, Cybercafé & How Criminals Plan Attacks, Botnets, Attack Vector, Introduction to Defensive Cybersecurity & Offensive Cybersecurity, Difference between Defensive Cybersecurity & Offensive Cybersecurity, Principles of Defense and Offense.

(09 Hours)

Module – 2

Introduction to Tools and Methods used in Cybercrime: Introduction to basic security hygiene & tools, SIEM (Security Information & Event Management) Tools, UEBA (User & Entity Behavior Analytics) Tools, EDR (Endpoint Detection & Response) Tools, SOAR (Security Orchestration & Response) Tools, Encryption Tools, IRT (Incident Response) Tools, PEN (Penetration testing) Tools.

(08 Hours)

Module – 3

Network Defense Tools: Network Security Monitoring tools, Social Engineering Toolkit, Firewalls and Packet Filters, Network Address Translation (NAT) and Port Forwarding, VPN and Ethical Hacking.

Security Frameworks and Foundations: National Institute of Standards and Technology (NIST) Framework, Cloud Security Alliance (CSA), Cloud Controls Matrix (CCM), MITRE ATTACK, OWASP Foundation, OSINT framework.

(08 Hours)

Module – 4

Intrusion Detection and Prevention: Intrusion, Physical Theft, Abuse of Privileges, Malware Infection. Intrusion detection and prevention techniques, Network-based Intrusion Detection Systems, Host-based Intrusion Prevention Systems.

(08 Hours)

Module – 5

Cyber Security Safeguards: Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Scanning, Security policy, threat management.

Digital Forensics Science: Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life cycle, Forensics of social networking sites, handheld devices-mobile phones, smart phones, printers, scanners, and basics of IPR with cyber security.

Recap: Summary of Cyber Security concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Explore the Cyber Security and IPR Principles.
CO2: Apply the cyber security concepts to secure from cyber-attacks.
CO3: Formulate the possibilities of cyber-attacks in a given usecase, as a penetration tester.
CO4: Analyze cyber security tools to protect individual data.
CO5: Apply Digital Forensic tools to address cyber security issues.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Nina Godbole Sunit Belapure, "Cyber Security", 2012, Wiley India.
2. Yuri Diogenes, Dr. Erdal Ozkaya, "Cybersecurity – Attack and Defense Strategies", 2nd Edition, Packt publishing, 2018.
3. William Stallings, "Effective Cybersecurity: A Guide to Using Best Practices and Standards", 2018, Addison-Wesley Professional.

References:

1. Mike Shema, "Anti-Hacker Tool Kit (Indian Edition)", 4th Edition, McGraw Hill.
2. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", Cengage Learning.
3. Paul Troncone, Carl Albing "Cybersecurity Ops with bash", 2019, O'Reilly.
4. Cesar Bravo, "Mastering Defensive Security - Effective techniques to secure your Windows, Linux, IoT, and cloud infrastructure", Packt publishing, 2021.

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

AUGMENTED AND VIRTUAL REALITY

Course Code	21MCA3061	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Learn the fundamentals about ARVR
2. Understand about programming with Unity
3. Describe the design tools for Virtual Reality.
4. Learn the concepts of Augmented Reality.
5. Demonstrate various ARVR case studies and its applications.

Module – 1

Introduction: Implication and Scope of AR&VR concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Introduction to Virtual Reality: Defining Virtual Reality, Four Key Elements of Virtual Reality Experience, A History of VR.

VR The Medium: Communicating Through a Medium, Common Issues of Human Communication Media, Narrative, Immobile Versus Interactive.

(09 Hours)

Module – 2

Programming with Unity: Unity Basics, Manipulating the Scene, Code blocks and Methods, Debugging Conditional and looping statements, Working with objects, Working with Scripts, Player movement, Camera movement, Menu and UI, Advanced 3D movement.

(08 Hours)

Module – 3

Mouse-Aimed camera: First Person Controller, Third Person Controller. Further Learning for Unity- The Asset Store.

Modeling Tools for VR : An introduction to Blender. Modeling of an object, object Animation, Animating a full sequence.

(08 Hours)

Module – 4

Rendering the Virtual World: Visual Representation in VR, Aural Representation in VR, Haptic Representation in VR, Visual Rendering Systems, Aural Rendering Systems, Haptic Rendering Systems, Importing from Blender to Unity.

(08 Hours)

Module – 5

Introduction to Augmented Reality: Definition and scope, Mixed Reality, Applications of AR & MR Tracking: Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion. Creating an AR website with WebXR: Object creation, spatial tracking, start AR session, animate, create an event handling function for the end of the session.

Recap: Summary of AR&VR concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Apply the concepts of Virtual Reality/Augmented Reality to understand its Applications.

CO2: Demonstrate immersive effects to experience AR/VR through exploration of its environment.

CO3: Analyze the technology for unimodal/multimodal user interaction in AR and VR.

CO4: Design and develop the AR and VR application based on Societal issues.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality", Morgan Kaufmann Publishers, 2003.
2. Casey Hardman, "Game Programming with Unity and C#", 2020, https://doi.org/10.1007/978-1-4842-5656-5.
3. Dieter Schmalstieg, Tobias Höllerer, "Augmented Reality Principles and Practice", Pearson Education, 2016, ISBN-13: 978-0-321-88357-5.

References:

1. Romain Caudron, Pierre-Armand Nicq, Enrico Valenza, "Blender 3D: Designing Objects", Packt Publishing Ltd, 2016.
2. Rakesh Baruah, "AR and VR Using the WebXR API", 2021, https://doi.org/10.1007/978-1-4842-6318-1

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

Blockchain Technology

Course Code	21MCA3062	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the fundamentals of Blockchain and Bitcoin
2. Differentiate variants of Blockchain and Cryptocurrencies
3. Apply complex methods in Blockchain for privacy and conflict resolution
4. Implement the key concepts of Bitcoin
5. Design smart contracts in real-time applications

Module – 1

Introduction: Implication and Scope of Blockchain Technology and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Introduction: Introduction to Blockchain, How Blockchain works, Blockchain vs Bitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Myths about Bitcoin.

(09 Hours)

Module – 2

Architecture: Blockchain: Architecture, versions, variants, use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications.

(08 Hours)

Module – 3

Hashing in Blockchain: Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy, payment verification, Resolving Conflicts, Creation of Blocks.

(08 Hours)

Module – 4

Bitcoin concepts: Introduction to Bitcoin, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency.

(08 Hours)

Module – 5

Smart Contract: Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs Bitcoin, Introduction to Smart contracts, usage, application, working principle, Law and Regulations. Case Study**.**

Recap: Blockchain Technology concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Articulate the building blocks of Blockchain
CO2: Analyse the concepts of block chain and cryptocurrency
CO3: Evaluate the usage of Blockchain features
CO4: Exemplify the usage of bitcoins
CO5: Design smart contracts for various contexts

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Bikramaditya Singhal , Gautam Dhameja, "Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions", APress
2. Arshdeep Bahga, Vijay Madisetti, "Blockchain Applications: A Hands-On Approach", APress

References:

1. Melanie Swan, "Blockchain", Oreilly
2. Arthu.T, "Bitcoin and Blockchain Basics: A non-technical introduction for beginners"
3. Aravind Narayan. Joseph Bonneau, "Bitcoin and Cryptocurrency Technologies", Princeton

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – III

Natural Language Processing

Course Code	21MCA3063	CIE Marks	40
Contact Hours (L:T:P)	3:0:0	SEE Marks	60
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the algorithms available for the processing of linguistic information and computational properties of natural languages.
2. Conceive basic knowledge on various morphological, syntactic and semantic NLP tasks.
3. Familiarize various NLP software libraries and data sets publicly available.
4. Develop systems for various NLP problems with moderate complexity.
5. Learn various strategies for NLP system evaluation and error analysis.

Module – 1

Introduction: Implication and Scope of Natural Language Processing concepts and its Importance in Economic growth of Nation, Impact of the course on Societal Problems / Sustainable Solutions / National Economy, Career Perspective, Overview of the course in current Innovations and Research Trends.

Introduction to NLP: NLP – Introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English.

(09 Hours)

Module – 2

Language Modelling: N-gram and Neural Language Models Language Modelling with N-gram, Simple N-gram models, Smoothing (basic techniques), Evaluating language models; Neural Network basics, Training; Neural Language Model, Case study: application of neural language model in NLP system development.

(08 Hours)

Module – 3

Parts-of-speech Tagging: Parts-of-speech Tagging: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, Introduction to POS Tagging using Neural Model.

(08 Hours)

Module – 4

Parsing Basic concepts: Top down and bottom up parsing, treebank; Syntactic parsing: CKY parsing.

Statistical Parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs. (08 Hours)

Module – 5

Semantics: Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embeddings from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WordNet.

Recap: Summary of NLP concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Describe the concepts of morphology, syntax, semantics, discourse of natural language.
CO2: Demonstrate the relationship between NLP and statistics and machine learning.
CO3: Discover various linguistic and statistical features relevant to the basic NLP.
CO4: Develop systems for various NLP problems with moderate complexity.
CO5:Evaluate NLP systems, identify shortcomings and suggest solutions.

CIE:

- 50% of CIE is based on Internal Assessments – Average of 3 tests will be taken
- 50% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Jurafsky Dan and Martin James H. "Speech and Language Processing" ,3rd Edition, 2018.

References:

1. Jurafsky D. and Martin J. H., "Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.
2. Goldberg Yoav, "A Primer on Neural Network Models for Natural Language Processing".

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – IV

Internship

Course Code	21MCA401	CIE Marks	40
Contact Hours (L:T:P)	0:0:4	SEE Marks	-

Credits: 04

Guidelines

1. Students are required to undergo Internship in an Industry or a R&D Institution, or any academic institution of high repute anywhere in India or abroad.
2. The students are required to submit Internship approval letter from the organization.
3. The students will be working under the mentorship of both internal and external guide.
4. The duration of Internship is for 6 weeks.
5. The student shall carry out internship any time after the completion of Second semester and before the commencement of fourth semester project.
6. At the end of the internship period, students are required to submit a Completion Certificate and Internship report.
7. Internship is assessed only based on CIE.
8. Internship is a mandatory head of passing for the award of degree.

Course outcomes:

The students will be able to:

CO1: Analyse the real-time industry/research work environment with emphasis on organizational structure/job process/different departments and functions / tools /technology.

CO2: Develop applications using modern tools and technologies.

CO3: Demonstrate self-learning capabilities with an effective report and detailed presentation.

CIE:

- The student should present the work carried out during internship which is evaluated for 40 marks (Report – 20 marks, Presentation – 20 marks)

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – IV

Seminar

Course Code	21MCA402	CIE Marks	40
Contact Hours (L:T:P)	0:2:0	SEE Marks	-

Credits: 02

Guidelines

1. Each student should present a technical seminar on a relevant topic for atleast 30 minutes which will be evaluated by the Seminar Evaluation Committee (SEC).
2. Student should identify the topic for the seminar and submit the same to the project guide within one week from the commencement of the 4th semester.
3. Students should submit the seminar report, duly prepared as per the format, within one month from the commencement of the 4th semester.
4. Students must present the seminar as per the schedule notified by the SEC.
5. Seminar is assessed only based on CIE.

Course outcomes:

The students will be able to:

CO1: Formulate the problem/objectives for seminar based on technologies/ issues related to industry/society/environment

CO2: Analyse the problem identified and propose the solution with appropriate algorithms/ mechanisms/ techniques, software engineering and management principles based on research knowledge

CO3: Identify and analyse the modern tools in proposed solution and organize the contents using tools.

CO4: Make effective presentation and prepare a report as per the given guidelines/Rubrics

CO5: Practice ethical principles by giving citations, references in IEEE format and checking for the plagiarism using any open source tool.

CO6: Articulate impact and innovativeness of technology/solution proposed in addressing issues identified.

CIE:

- The student should present seminar which is evaluated for 40 marks (Report – 20 marks, Presentation – 20 marks).

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – IV

Project Work

Course Code	21MCA403	CIE Marks	40
Contact Hours (L:T:PW)	0:0:6	SEE Marks	60

Credits: 16

Guidelines

1. The project shall be carried out individually in Industry / R & D lab / Institution.
2. The project shall be carried out for a semester.
3. The student shall identify the domain / area / topic and place of work where the project will be carried out well in advance.
4. The student shall submit the synopsis within one week from the commencement of 4th semester.
5. An internal guide will be allotted for each student.
6. Student should interact with the internal guide every week to update the progress of the project and submit a report on the same.
7. At the end of the semester, project report in the prescribed format is to be submitted.
8. Project report has to undergo a plagiarism check and the plagiarism should be <=25%.
9. The CIE of the project work will be evaluated by the Guide and Project Evaluation Committee (PEC).
10. The student is required to give demos as part of the CIE of the project work, as per the schedule, which will be evaluated for 40 marks.
11. SEE comprises of project evaluation and viva-voce for a total of 60 marks.
12. The project SEE will be assessed based on project report and viva-voce for 30 marks each jointly by the internal and external examiners as appointed by the COE.

Course outcomes:

The students will be able to:

CO1: Review the existing literature to identify and formulate the problem in contemporary technologies/ issues related to society/environment which leads to development of IT solution.

CO2: Analyse the requirements and prepare Software requirement specifications (SRS) document as per IEEE format in consistency with the problem defined.

CO3: Create models that are consistent with the requirements specified in the SRS.

CO4: Develop the solution by applying appropriate techniques, software engineering and management principles and modern tools to meet the requirements either as an individual or by involving in team.

CO5: Verify & validate the data and results to arrive at valid conclusions and communicate the work done effectively in terms of presentations, writing reports and research article as per the format given.

CO6: Follow ethical principles in all stages of project work by avoiding plagiarism.

CO7: Articulate the impact of IT solutions developed in the project work with respect to societal, environmental and industrial issues at large.

CIE: • Project is assessed based on the progress of the work periodically as per the schedule for 40 marks.
SEE: • SEE will be assessed based on project report and viva-voce for 30 marks each jointly by the internal and external examiners

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institution, Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2021-22

SEMESTER – IV

MOOC – Online Course

Course Code	21MCA404	CIE Marks	-
Contact Hours (L:T:P)	0:0:0	SEE Marks	-

Credits: 0

Guidelines

1. Each student has to register and complete any online technical / professional course of their choice individually in any online Platform.
2. The course can be registered and completed anytime during the entire span of duration between 1st sem to 4th sem.
3. Online Course is a mandatory head of passing for the award of degree.
4. The chosen MOOC course duration must be for a minimum of 25 hours.
5. This course does not have any CIE or SEE; however, student must produce the completion certificate for the course taken up at the end of 4th semester.

Course outcomes:

The students will be able to:

CO1: Acquire knowledge on cutting-edge technologies

CO2: Involve in self-learning