ಬಿ.ಎಂ.ಎಸ್. ತಾಂತ್ರಿಕ ಮತ್ತು ವ್ಯವಸ್ಥಾಪನಾ ಮಹಾವಿದ್ಯಾಲಯ

(ವಿ.ಟಿ.ಯು. ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

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)

(Accredited by NBA, New Delhi)

CURRICULUM

Scheme of Teaching and Examination: 2022 - 23

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 w.e.f. 2021-22 will be responsibility of the institute. The high-quality faculty and 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 8 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.

Program Information - MCA

Name of the Programme	**Master of Computer Applications - MCA**
Scheme	Choice Based Credit System
Duration of the course	2 years (4 Semesters)
Duration of Semester	16 Weeks
Total credits	100
CIE : SEE	50:50
Maximum duration of course completion	4 years
10-12 hours of Teaching-Learning Process	1 credit
2 hours Laboratory/Tutorial per week	
25 hours of Teaching-Learning Process	2 credits
40 hours of Teaching-Learning Process	3 credits
50 hours of Teaching-Learning Process	4 credits
40 hours of Teaching-Learning Process with 10-12 laboratory sessions	4 credits (IPCC)

Semester-wise Credit Distribution

Sem	Core	Elective	Mini Project	Major Project	Internship	Mathematics	Humanities, Ethics & Management	Co-Curricular	Total
I	18	-	-	-	-	4	2	-	24
II	18	6	2	-	-	-	-	-	26
III	16	6	2	-	-	-	-	2	26
IV	-	-	-	18	4	-	-	2	24
Total	**52**	**12**	**4**	**18**	**4**	**4**	**2**	**4**	**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.

Curriculum 2022-24 Scheme – MCA

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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Scheme of Teaching and Examination: Effective from AY 2022 – 23

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	BSC	**22MCA101**	Mathematical Foundation for Computer Applications	3	2	0	4	3	50	50	100
2	IPCC	**22MCA102**	Operating Systems	3	0	2	4	3	50	50	100
3	IPCC	**22MCA103**	Data Structures and Algorithms	3	0	2	4	3	50	50	100
4	IPCC	**22MCA104**	Database Management Systems	3	0	2	4	3	50	50	100
5	PCC	**22MCA105**	Computer Networks	3	0	0	3	3	50	50	100
6	PCCL	**22MCA106**	Python Lab	0	3	3	3	3	50	50	100
7	MCC	**22MCA107**	Research Methodology and IPR	2	0	0	2	3	50	50	100
8	BC - Audit	**22MCA1BC**	Bridge Course*	3	0	0	0	3	100	-	100
			TOTAL	**20**	**5**	**9**	**24**		**450**	**350**	**800**

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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	IPCC	**22MCA201**	Software Engineering	3	0	2	4	3	50	50	100
2	IPCC	**22MCA202**	Mobile Application Development	3	0	2	4	3	50	50	100
3	IPCC	**22MCA203**	Web Technologies	3	0	2	4	3	50	50	100
4	IPCC	**22MCA204**	Java Programming	3	0	2	4	3	50	50	100
5	PEC	**22MCA205X**	Elective Course – I	3	0	0	3	3	50	50	100
6	PEC	**22MCA206X**	Elective Course – II	3	0	0	3	3	50	50	100
7	PCCL	**22MCA207**	Software Testing Lab	0	1	3	2	3	50	50	100
8	MP	**22MCA208**	Mini Project - I	0	0	4	2	3	50	50	100
9	Audit	**22MCA2AUD**	Audit Course – Online Course	-	-	-	0	-	-	-	-
			TOTAL	**18**	**1**	**15**	**26**		**400**	**400**	**800**

Elective Course - I	
Course Code	**Course Title**
22MCA2051	Data Warehousing & Data Mining
22MCA2052	Big Data Analytics
22MCA2053	No SQL
22MCA2054	Wireless Sensor Networks
22MCA2055	Artificial Intelligence

Elective Course - II	
Course Code	**Course Title**
22MCA2061	Professional Communication and Ethics
22MCA2062	Entrepreneurship & Mgmt.
22MCA2063	Operations Research
22MCA2064	Supply Chain Management
22MCA2065	Digital Marketing

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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	IPCC	**22MCA301**	Machine Learning	3	0	2	4	3	50	50	100
2	IPCC	**22MCA302**	Cloud Computing	3	0	2	4	3	50	50	100
3	IPCC	**22MCA303**	Advanced Programing (C# .NET)	3	0	2	4	3	50	50	100
4	IPCC	**22MCA304**	IOT	3	0	2	4	3	50	50	100
5	PEC	**22MCA305X**	Elective Course – III	3	0	0	3	3	50	50	100
6	PEC	**22MCA306X**	Elective Course – IV	3	0	0	3	3	50	50	100
7	MP	**22MCA307**	Mini Project - II	0	0	4	2	3	50	50	100
8	CC	**22MCA308**	Coding Skills	0	2	2	2	-	50	-	50
9	SP	**22MCA309**	Societal Project	0	0	0	0	-	50	-	50
			TOTAL	**18**	**2**	**14**	**26**	-	**450**	**350**	**800**

Elective Course - III	
Course Code	**Course Title**
22MCA3051	Robotic Process Automation
22MCA3052	Augmented and Virtual Reality
22MCA3053	Cyber Security
22MCA3054	Advanced DBMS
22MCA3055	Distributed OS

Elective Course - IV	
Course Code	**Course Title**
22MCA3061	User Interface Design & UX
22MCA3062	Natural Language Processing
22MCA3063	Cryptography and Network Security
22MCA3064	Blockchain Technology
22MCA3065	Social Network Analysis

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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		Duration	CIE Marks	SEE Marks	Total Marks
1	IN	**22MCA401**	Internship	0	0	0	**4**	3	50	-	50
2	SEM	**22MCA402**	Seminar	0	0	2	**2**	-	50	-	50
3	PW	**22MCA403**	Project Work	0	0	5	**18**	3	50	50	100
4	CC	**22MCA404**	MOOC – Online Course	0	2	0	**0**	-	-	-	-
			TOTAL	**0**	**2**	**0**	**24**	**6**	**150**	**50**	**200**

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CONTINUOUS INTERNAL EVALUATION AND SEMESTER END EXAMINATION PATTERN
ACADEMIC BATCH 2022-23 (MCA)

CONTINUOUS INTERNAL EVALUATION (CIE): IPCC Course (3-0-2)

Max. Marks: 50

		Internal Assessments (IAs)	Max. Marks	Average /Sum	Marks after scale-down	Final Marks
Theory Component (60% of CIE)	IA Tests	IA-1 (1.5 Hr)	40	40	20	20+ 10+ 10+ 10= 50
		IA-2 (1.5 Hr)	40			
		IA-3 (1.5 Hr)	40			
	Assignment	ASMT	10	20	10	
	AAT	AAT	10			
Practical Component (40% of CIE)	Cumulative Marks of Programs	10 Marks for each program (Execution-4, Viva-2, Record-4)	100 or 120	-	10	
	IA Tests	IA-1 (02 Hr)	50	100	10	
		IA-2 (02 Hr)	50			

SEMESTER END EXAMINATION (SEE): IPCC Courses (3-0-2)

Examination Duration: 03 Hrs — Max. Marks: 50

			Max. Marks	Marks after scale-down	Final Marks
Theory Component (100% of SEE)	No. of Modules	05	100	50	50
	Questions/Module	02			
	Marks/Question	20			
	No. of Questions to be answered/ module	01			
	No. of Questions to be answered/	05			

The minimum marks to be secured in CIE to appear for SEE shall be 25. (50% of maximum marks (30M) under theory component i.e., 15M and 50% of maximum marks (20) under laboratory component i.e., 10)).

A minimum of 40% in SEE is required i.e., 20M.

In addition to the minimum CIE and SEE requirements, an aggregate of 50% marks from CIE and SEE, put together, is required for passing the course i.e., 50M.

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CONTINUOUS INTERNAL EVALUATION AND SEMESTER END EXAMINATION PATTERN
ACADEMIC BATCH 2022-23 (MCA)

CONTINUOUS INTERNAL EVALUATION (CIE): PCC or PCE Course (0:3:3) (0:1:3)

Max. Marks: 50

		Internal Assessments (IAs)	Max. Marks	Average/ Sum	Marks after scale-down	Final Marks
Practical Component	Cumulative Marks of Programs	10 Marks for each program (Execution-4, Viva-2, Record-4)	100/120	-	30	30+ 20= 50
	IA Tests	IA-1 (02 Hr)	50	200	20	
		IA-2 (02 Hr)	50			
	Open Ended Programs	Prg 1	50			
		Prg 2	50			

SEMESTER END EXAMINATION (SEE): PCC or PCE Course (0:3:3) (0:1:3)

Examination Duration: 03 Hrs — Max. Marks: 50

			Max. Marks - 100	Marks after scale-down	Final Marks
Practical Component	Write up	20%	20	50	50
	Conduction procedure and result	60%	60		
	Viva-Voce	20%	20		
	Change of experiment	-10% from marks allotted for procedure part	-6	-	

The minimum marks to be secured in CIE to appear for SEE shall be 25.

A minimum of 40% in SEE is required i.e., 20M.

In addition to the minimum CIE and SEE requirements, an aggregate of 50% marks from CIE and SEE, put together, is required for passing the course i.e., 50M.

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CONTINUOUS INTERNAL EVALUATION AND SEMESTER END EXAMINATION PATTERN
ACADEMIC BATCH 2022-23 (MCA)

CONTINUOUS INTERNAL EVALUATION (CIE): PCC or PCE Course (3:2:0) (2:0:0) (3:0:0)

Max. Marks: 50

		Internal Assessments (IAs)	Max. Marks	Average/ Sum	Marks after scale-down	Final Marks
Theory Component	IA Tests	IA-1 (1Hr)	40	40	30	30+ 20= 50
		IA-2 (1Hr)	40			
		IA-3 (1Hr)	40			
	Assignment	ASMT-1	10	40	20	
		ASMT-2	10			
	AAT	AAT-1	10			
		AAT-2	10			

SEMESTER END EXAMINATION (SEE): PCC or PCE Course (3:2:0) (2:0:0) (3:0:0)

Examination Duration: 03 Hrs — Max. Marks: 50

			Max. Marks	Marks after scale-down	Final Marks
Theory Component	No. of Modules	05	100	50	50
	Questions/Module	02			
	Marks/Question	20			
	No. of Questions to be answered/ module	01			
	No. of Questions to be answered/	05			

The minimum marks to be secured in CIE to appear for SEE shall be 25.

A minimum of 40% in SEE is required i.e., 20M.

In addition to the minimum CIE and SEE requirements, an aggregate of 50% marks from CIE and SEE, put together, is required for passing the course i.e., 50M.

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MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2022-23

SEMESTER – I

Mathematical Foundations for Computer Applications

Course Code	22MCA101	CIE Marks	50
Contact Hours (L:T:P)	3:2:0	SEE Marks	50
Total Number of Lecture Hours	42L 14T	Exam Hours	3

Credits: 04

Course objectives:

This course will enable students to

1. Understands the concepts of sets
2. Perform various basic operations on propositional logic
3. Solve problems using concepts of relations
4. Apply the abstract concepts of graph theory to solve problems
5. Compute statistical measures for the given set of data
6. Apply the concepts of probability distributions

Module – 1

Introduction: Implication and Scope of Mathematical Foundations for Computer Application 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.

Set Theory: Sets, operations of Sets, Inclusion-exclusion principle, Pigeonhole principle.
Logic: Propositional logic, propositional Equivalences, Introduction to proof.

(09 Hours)

Module – 2

Probability Distribution: Concept of Random variable, discrete probability distributions, continuous probability distributions, Mean and Variance of random variables. Binomial and Poisson distribution, Exponential and normal distribution.

(08 Hours)

Module – 3

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

(08 Hours)

Module – 4

Graphs: Graphs and Graphs models, Graph Terminology and special types of graphs, Representing graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path problems, Planar Graphs, Graph Colouring.

(08 Hours)

Module – 5

Statistical methods and Curve Fitting: Correlation, Coefficient of Correlations, Lines of Regression – Principle of Least Square. Curve Fitting – Graphical Method, Principle of Least Square – to fit a straight line and parabola. Fitting of other curves of the form $y=ax^b$, $y=ae^{bx}$

Recap: Summary of MFCA concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Apply the concepts of set theory and propositional logic to solve problems.
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 to solve problems.
CO5: Fit an appropriate curve for the given data.

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Kenneth H Rosen, "Discrete Mathematics and its Applications", McGraw Hill publications,7th edition.
2. Dr. B. S. Grewal," Higher Engineering Mathematics", Khanna Publishers, 40th Edition

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 Trembly and R Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill, 2017.
4. Walpole Myers, "Probability and Statistics for Engineers and Scientists", Pearson, 8th Edition.

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MASTER OF COMPUTER APPLICATIONS
Scheme of Teaching and Examination: 2022-23

SEMESTER – I

Operating Systems

Course Code	22MCA102	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

Credits: 04

Course objectives:

This course will enable students to

1. To understand the services of operating system
2. To know about various types of operating systems
3. To analyse and understand the need for processes, threads and their implementation models.
4. To learn CPU and Memory management technique.
5. To study the architecture of a Linux system

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.

Operating System Basics: Introduction to Operating System, Mainframe Systems, Desktop Systems, Multiprocessor Systems, Distributed Systems, Clustered Systems, Real - Time Systems, Handheld Systems, Feature Migration, Computing Environments, System Components, Operating – System Services, System Calls, System Programs, System Structure.

(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 algorithms, problems.

(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.

Recap: Summary of Operating system concepts (09 Hours)

Laboratory
Following concepts have to be implemented in lab: 1. Basic Unix commands to deal with files 2. Pipe and Filter commands 3. Unix special files 4. Command-line arguments **5.** Pattern matching **6.** Linux administration **7.** Advanced filters: sed and awk
Course outcomes: The students will be able to: CO1: Explore operating system concepts CO2: Apply the suitable OS algorithm for any given use case CO3: Analyze the file concepts, memory management and disk scheduling techniques CO4: Explore Linux features and commands CO5: Build shell scripts using Linux commands and language constructs
CIE: • CIE is based on Theory and Laboratory Components of the course. • Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks. • CIE involves tests, assignments, case studies, reports etc.
SEE: • SEE will be conducted for 100 marks.
Text Books: 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.

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MASTER OF COMPUTER APPLICATIONS
Scheme of Teaching and Examination: 2022-23

SEMESTER – I

Data Structures and Algorithms

Course Code	22MCA103	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

Credits: 04

Course objectives:

This course will enable students to

1. Understand the internal representation and perform operations on arrays, linked structures, stacks, queues, trees, and graphs
2. Describe common applications of various data structures
3. Demonstrate different methods for traversing trees
4. Implement dynamic and static data structures
5. Analyze the efficiency of various algorithms

Module – 1

Introduction: Implication and Scope of Data Structures 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: Operations on Stacks and its Applications.
Queues: Queues, Circular Queues, Priority queues, Dequeue and Operations.

(08 Hours)

Module – 3

Linked Lists: Single Linked Lists, Double Linked Lists, Circular Linked Lists and Operations.
Trees: Introduction, Binary Trees and traversals, Binary Search Trees.

(08 Hours)

Module – 4

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, Brute-Force Algorithms - Bubble Sort, String search.

(08 Hours)

Module – 5

Algorithms: Divide and Conquer – Quick sort, Binary Search, Greedy method – Dijkstra's algorithm, Prim's and Kruskal algorithm, Decrease and Conquer – DFS, BFS.

Recap: Summary of the Data Structures covered (09 Hours)

Laboratory
Lab Programs covering the following concepts using C: 1. Arrays 2. Operations on Stacks 3. Operations on Queues and Dequeues 4. Singly linked lists 5. Circular Linked Lists 6. Doubly linked lists 7. Binary search trees 8. Sorting and Searching Techniques
Course outcomes: The students will be able to: CO1: Explore various types of data structures CO2: Implement different data structures in multiple scenarios CO3: Compute the efficiency of algorithms with respect to different criteria CO4: Analyse various algorithm implementation techniques CO5: Develop solutions for real world problems using data structures and algorithms
CIE: • CIE is based on Theory and Laboratory Components of the course. • Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks. • CIE involves tests, assignments, case studies, reports etc.
SEE: • SEE is conducted for 100 marks
Text Books: 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.

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MASTER OF COMPUTER APPLICATIONS
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SEMESTER – I

Database Management Systems

Course Code	22MCA104	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

Credits: 04

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 Management 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.

Overview: 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 vs Non-Relational DBMS, 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 DBMS concepts

(09 Hours)

Laboratory

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 for any given database use-case
CO3: Formulate SQL queries for a given problem scenario
CO4: Improve the database design by normalization
CO5: Build database for any given application

CIE:

- CIE is based on Theory and Laboratory Components of the course.
- Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE:

- SEE will be conducted for 100 marks.

Text Books:

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

References:

1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3rd Edition, McGraw-Hill, 2003.
2. Silberschatz, Korth and Sudarshan, "Data base System Concepts", 6th Edition, Tata McGraw Hill, 2011.

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SEMESTER – I

Computer Networks

Course Code	22MCA105	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:
This course will enable students to
1. Learn the Basic concepts of Computer Networking
2. Understand the concepts of OSI and TCP/IP model
3. Describe the functions of Physical and Data Link layers
4. Describe the functions of Network and Transport layers
5. Demonstrate the TCP/IP sockets in UNIX operating System.

Module – 1

Introduction: Implication and Scope of Computer Network 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: Networks, protocols and standards, layered tasks, the OSI model, layers in the OSI model, TCP/IP protocol suite, addressing.

(09 Hours)

Module – 2

Physical Layer and Media: Periodic analog signals, digital signals, transmission impairment, data rate limits, performance, Transmission Media.
Data Link Layer: Error Detection and Correction, Data Link Control, Multiple Access.

(08 Hours)

Module – 3

Network Layer: Logical Addressing, Internet Protocol, Address Mapping, Error Reporting and Multicasting, Delivery Forwarding and Routing

(08 Hours)

Module – 4

Transport Layer: Process-to-Process Delivery: UDP, TCP and SCTP, Congestion Control and Quality of Service.
Application Layer: Overlay networks in cloud deployment

(08 Hours)

Module – 5

Linux Networking: Introduction, The Transport Layer: TCP, UDP and SCTP, Elementary Sockets: Sockets Introduction, Elementary TCP Sockets, TCP Client/Server Example.

Recap: Summary of CN concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Explore the Basic Concepts of Computer Networking

CO2: Apply the concepts of OSI model and TCP/IP model on Computer Network

CO3: Analyze the functioning of various protocols of any given Network.

CO4: Implement Networking concepts in UNIX operating system.

CO5: Design a topology with router using any network simulator

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Forouzan, "Data Communications and Networking 5E", McGraw Hill Education.
2. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, "UNIX Network Programming", Volume 1, 3rd Edition, PHI Learning Publication, 2010

References:

1. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson Publication, 2011
2. Larry Peterson and Bruce Davie, "Computer Networks: A Systems Approach", Version 6.2, MK Publication.

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SEMESTER – I

Python Lab

Course Code	22MCA106	CIE Marks	50
Contact Hours (L:T:P)	0:3:3	SEE Marks	50
Total Number of Lecture Hours	42T 42P	Exam Hours	3

Credits: 03

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.

Tutorial Syllabus

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.
3. Python Collection Objects, Classes.
4. Strings, Files, I/O.
5. Data Wrangling using Numpy and Pandas.

Laboratory

1. a. Program to find the power of a number.
   b. Program to compute the GCD of two numbers.
   c. Program to display prime numbers in a given range.

2. a. Program to display palindrome numbers in a given range.
   b. Program to print a triangle of '*'.
   c. Program to print a triangle with numbers.

3. a. Program to find maximum of a list of numbers.
   b. Program to find the sum of even and odd numbers separately in a list.
   c. Program to search for an element in a list.

4. a. Program to perform matrix multiplication.
   b. Program to perform Set operations.

5. Program to demonstrate String Operations.

6. a. Program to find the Mean, Median and Mode for a given set of numbers in a list with user-defined functions
   b. Program to define a function that can find all duplicate values in a list.

7. Using the OOPs concepts, write a program for basic working of ATM Machine.

8. Demonstrate various graphs and plots that enable data visualization (Bar graph, Pie chart, Histogram, Box plot, Scatter plot).

9. Program related to comprehension- map, filter and reduce.

10. Program related to Image processing.

Course outcomes:

The students will be able to:

CO1: Demonstrate the fundamental concepts of Python Programming.
CO2: Implement OOP concepts in Python.
CO3: Perform various operations by importing suitable libraries.
CO4: Analyze the real-time data sets using Visualization packages.

CIE:

- 60% of CIE is based on Cumulative assessment of laboratory program conduction comprising Program execution, Viva and Record writing.
- 40% of CIE is based on IA Tests and Alternate Assessment Methods.

SEE:

- SEE will be conducted for 100 marks.

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.

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SEMESTER – I

Research Methodology and IPR

Course Code	22MCA107	CIE Marks	50
Contact Hours (L:T:P)	2:0:0	SEE Marks	50
Total Number of Lecture Hours	27L	Exam Hours	3

Credits: 02

Course objectives:

This course will enable students to

1. Understand the objectives of scientific research
2. Understand the various research methods and methodologies of the given use case.
3. Understand the importance of literature study in the course of doing research.
4. Understand the research design and applying the suitable research design for the given problem.
5. Understanding the writing of research reports and articles.

Module – 1

Introduction: Implication and Scope of RM & IPR 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, Criteria of Good Research.

(06 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. ‘

(05 Hours)

Module – 3

Reviewing the literature: Bringing clarity and focus to your research problem, improving research methodology, broadening knowledge base in research area, 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.

(05 Hours)

Module – 4

Research Design: Important Concepts Relating to Research Design, Different Research Designs.

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection.

(05 Hours)

Module – 5

Interpretation and Report Writing: Meaning, Technique and Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Mechanics and Precautions of Writing a Research Reports.

Intellectual Property (IP) Acts: Different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970.Design Act: Industrial Design act 2000. Copy right acts: Copyright Act 1957. Trademark Act, 1999

Recap: Summary of RM & IPR concepts (06 Hours)

Course outcomes:

The students will be able to:

CO1: Explore the various research methodologies and IP Acts.

CO2: Review the existing literature to narrow down the problem statement.

CO3: Compile data from relevant sources to strengthen research problem.

CO4: Write effective research article / report.

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

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

References:

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

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SEMESTER – I

Bridge Course - 1

Course Code	22MCA1BC	CIE Marks	100
Contact Hours (L:T:P)	3:0:0	SEE Marks	-
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, 1's and 2's complement

(08 hours)

Module – 2

Computer Basics: Functional units of computers, operational concepts, byte addressability, instruction types, sequencing, addressing modes.

(08 hours)

Module – 3

Memory: Basic memory concepts, Memory types, Semi-Conductor RAM organization, Memory hierarchy, cache memory, virtual memory, secondary storage devices

(08 hours)

Module – 4

C Basics: Data Types, Operators, Control structures, Arrays, Procedures and Functions, Parameter passing, Recursion.

(08 hours)

Module – 5

C Basics: Structures and Unions, Pointers, Memory allocation functions, 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:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 Marks.

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"

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SEMESTER – II

Software Engineering

Course Code	22MCA201	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

Credits: 04

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 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, Professional software development, case studies. Software Process: software process with models, process activities, coping with change, process improvement. Agile Software development: Agile methods, techniques, project management, scaling agile methods.

(09 Hours)

Module – 2

Requirements Engineering: Functional and non-functional requirements, requirements engineering process, requirements elicitation, requirements specification, requirements validation, requirements management.
System Modeling: Context models, interaction models, structural models, behavioral models, model-driven engineering.

(08 Hours)

Module – 3

Design and implementation: Object- oriented design using the UML, Design patterns, implement issues, open-source development.
Domain-Driven-Design: Communication and use of the language, binding model and implementation.

(08 Hours)

Module – 4

Software Evolution: Evolution process, program evolution dynamics, software maintenance, Legacy system management.
Software Testing: Development testing, Test-driven development, Release testing, user testing.
Sociotechnical systems: Complex systems, systems engineering, system procurement, system development.

(08 Hours)

Module – 5

Project Management: Risk management, managing people, teamwork.
Project planning: Software pricing, plan-driven development, project scheduling, Agile planning, Estimation techniques.
Quality Management: Software quality, software standards, reviews and inspection, software measurements and metrics.

Recap: Summary of SE concepts (09 Hours)

Laboratory

List of Programs:

Using UML tools implement the patterns with different types of modeling such as class diagram, sequence diagram, use case diagram, activity diagram etc. Implement using Java programming.

1. Publisher-Subscriber pattern
2. Command pattern
3. Client-dispatcher pattern
4. Proxy pattern
5. Forwarder-Receiver pattern
6. Polymorphism pattern

Course outcomes:

The students will be able to:

CO1: Explore the basic aspects of Software Engineering.
CO2: Analyze the requirements of a software systems
CO3: Perform testing for the software system.
CO4: Create different models for the given problem.
CO5: Evaluate the project in terms of risk and quality

CIE:

- CIE is based on Theory and Laboratory Components of the course.
- Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education Ltd, 2011.
2. Eric Evans "Domain-Driven Design: Tackling Complexity in the Heart of Software", Wesley,2003.URL:https://sd.blackball.lv/library/Domain-Driven_Design_Tackling_Complexity_in_the_Heart_of_Software.pdf

References:

1. Pankaj Jalote: Software Engineering, Wiley India Pvt Ltd (2010)
2. Roger S Pressman: Software Engineering-A Practitioners approach, 6th Edition, McGraw-Hill, 2010.

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SEMESTER – II

Mobile Application Development

Course Code	22MCA202	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

Credits: 04

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 one of the marketing tools of mobile.

Module – 1

Introduction: Implication and Scope of Mobile Application 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.

Overview: Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in the Business World – Effective use of Screen Real Estate – Understanding Mobile Applications: Understanding Mobile Applications Users – Understanding Mobile Information Design – Understanding Mobile Platforms – Using the Tools of Mobile Interface Design.

(09 Hours)

Module – 2

Getting Started with Android Programming: What is Android – Obtaining the required tools– Anatomy of an Android Application – Components of Android Applications – Activities – Fragments – Utilizing the Action Bar

(08 Hours)

Module – 3

Android UI Design and Location Based Services: Views and View Groups – Basic Views – Fragments – Displaying Maps – Getting Location Data – Publishing for Publishing – Deploying APK Files

(08 Hours)

Module – 4

Android Messaging and Networking: SMS Messaging – Sending Email – Networking – Downloading Binary Data, Text files – Accessing Web Services – Performing Asynchronous Call – Creating your own services – Communicating between a service and an activity – Binding, activities to services

(08 Hours)

Module – 5

Feedback and Oscillator Circuits: iOS – Obtaining the tools and SDK – Components of XCODE – Architecture of iOS – Building Derby App in iOS – Other useful iOS things.
Flutter: Creating a basic app using flutter.

Recap: Summary of MAD concepts (09 Hours)

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: Design an application using image capturing and location based.
CO5: Develop a mobile application based on societal and environmental issues.

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

CIE:

- CIE is based on Theory and Laboratory Components of the course.
- Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", 1st Edition, 2012, ISBN: 978-1-118-20390-3
2. Wei-Meng Lee, "Beginning Android Application Development", Wiley 2011.
3. Marco L Napoli, "Beginning Flutter Hands on Guide to App Development", Wrox Publications 2020

References:

1. Reto Meier, "Professional Android 4 Application Development", Wrox Publications 2012.

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SEMESTER – II

Web Technologies

Course Code	22MCA203	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

Credits: 04

Course objectives:

This course will enable students to

1. Explore the various web scripting technologies.
2. Use HTML/XHTML, CSS, and Bootstrap to Design and Decorate simple to complex web pages.
3. Validate the web page at client side, server side using either JavaScript / ES6 Script.
4. Build a societal related problem based web application.

Module – 1

Introduction: Implication and Scope of Web Technologies 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.

Responsive Web Page 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.

(09 Hours)

Module – 2

JavaScript and DOM Model: JavaScript primitives, operations, expressions, keyboard input and screen output, control statements, object creation and modification, Arrays, Functions, Constructors, Pattern Matching using regular expressions, Errors in scripts. Javascript execution environment, the document object model, Elements access in Javascript.

(08 Hours)

Module – 3

Handling Events in JavaScript: Events and Event Handling. Handling Events from Body Elements, Handling Events from Text Box and Password elements, the DOM2 Model, the navigator object, Dom Tree Traversal and Modification.

Dynamic Documents with JavaScript: Positioning elements, moving elements, element visibility, changing colors and fonts, dynamic content, stacking elements, locating the mouse cursor, reacting to a mouse click, slow movement of elements, dragging and dropping elements.

(08 Hours)

Module – 4

ECMAScript 6 (ES6): Differences between ES5 and ES6, features, Source Maps, Block Scope, Default Parameters, Rest Parameters , Spread Operator , Destructuring, Arrow Functions, Enhanced Object Literals, Classes, Getters and Setters, New Math Functions, New Number Functions, Numeric Literals, New String Methods, Template Strings, New Array Functions and Methods, New Object Functions, Reflect Object, for-of Loops, Collections (Set, Map, WeakSet, WeakMap), Promises, Modules, jspm, Iterators and Iterables, Generators, Proxies, Tail Call Optimization, async and await , Type Annotations.

(08 Hours)

Module – 5

AJAX (Asynchronous JavaScript) Basics:
AJAX Principles, HTTP Primer, AJAX Communication Techniques, Cache Control, AJAX Patterns: Communication Control Patterns – Predictive Fetch, Page Preloading Example, Submission Throttling, Incremental Form and field validation example, Periodic refresh, Multi-stage Download. Fallback Patterns – Cancel Pending Requests, Try Again.

Recap: Summary of Web technologies concepts (09 Hours)

Laboratory

1. Design a web page of Karnataka Tourism and apply appropriate CSS styles to the web page using HTML/XHTML elements
2. Design an Entertainment portfolio and apply appropriate web contents
3. Design a web page of Complaint registration form and apply the following:
4. Design a Login web page to accept the username and password as input and perform modifications.
5. Design an attractive event registration web page to accept the name, primary contact, address, email, type of event to participate, gender, age-group and terms & conditions field and perform the various actions.
6. Design a simple 2D game web page, which uses XHTML, CSS and Dynamic Javascript.
7. Build a department web application page using AJAX.
8. Build a college single page web application using ReactJS.

Course outcomes:
The students will be able to:
CO1: Explore Basic Concepts and tools of web technologies.
CO2: Design simple to complex web pages using suitable web technologies.
CO3: Validate the web page at client side, server side using suitable scripting technologies.
CO4: Apply the creativity in building web pages using suitable GUI code.
CO5: Build a web application with data handling capability.

CIE:
- CIE is based on Theory and Laboratory Components of the course.
- Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE:
- SEE will be conducted for 100 marks.

Text Books:

1. Jake Spurlock, "Bootstrap – Responsive Web Development", O'Reilly, First Edition, 2013.
2. Nicholas C. Zakas, et.Al., "Professional Ajax", 2nd Edition, Wiley India Edition, 2010.
3. Mark Volkmann, "ECMAScript (ES) 6", Object Computing Inc, 2014.

References:

1. Robert W. Sebesta, "Programming the World Wide Web" 8th Edition, Pearson, 2014
2. DT Editorial Services,"HTML5 Black Book" Dreamtech Press, 2nd Edition,2016
3. Fabio Cimo, Bootstrap Programming Cookbook, Exelixis Media P. C., 2015

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MASTER OF COMPUTER APPLICATIONS
Scheme of Teaching and Examination: 2022-23

SEMESTER – II

JAVA PROGRAMMING

Course Code	22MCA204	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L 28P	Exam Hours	3

Credits: 04

Course objectives:

This course will enable students to

1. Understand the basic constructs of Java programming.
2. Solve any given problem by applying various OOP concepts.
3. Understand the concepts of Multithreading to develop complex applications.
4. Design web applications using Servlets and JSP.
5. Develop applications using JDBC and EJB.

Module – 1

Introduction: Implication and Scope of Java and 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.

Java Programming Fundamentals: Java Programming Fundamentals, Introducing Data Types and Operators, Program Control Statements, Introducing Classes, Objects and Methods. **Methods, Classes and Inheritance:** Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Constructors and Inheritance, using super to Call Superclass constructors, using super to Access Superclass Members, creating a Multilevel Hierarchy, Superclass References and Subclass Objects, Method Overriding, Overridden Methods, Polymorphism, Using Abstract Classes, Using final.

(09 Hours)

Module – 2

Interfaces, Packages, and Exception Handling: Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Package Fundamentals, Packages and Member Access, Importing Packages, The Exception Hierarchy, Exception Handling Fundamentals, the Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, Throwing an Exception, Throwable, using finally, using throws.

(08 Hours)

Module – 3

Multithreaded Programming and Enumerations: Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads, Enumerations, The Values() and Valueof() Methods, Instance variables and enumerations.

(08 Hours)

Module – 4

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.

Java Server Pages: Need of JSP, Basic syntax, Scripting elements, Limiting Java code in JSP, JSP expression, JSP directives, JSP attributes.

(08 Hours)

Module – 5

JDBC: Steps to connect to the database, Connectivity with Oracle or MySQL, DriverManager, Connection, Statement, ResultSet interfaces, PreparedStatement, ResultSetMetaData, DatabaseMetaData.

Server Side Component Types: The Stateless Session Bean, the Stateful Session Bean, the Singleton Session Bean, Message Driven Bean, Entity Bean.

Recap: Summary of Java and Advanced Java Programming concepts (09 Hours)

LABORATORY

Lab Programs covering the Concepts:

1. Constructor Overloading and Method Overloading
2. Classes and Objects
3. Inheritance
4. Packages and Interfaces
5. Servlets
6. JSP directives and attributes
7. JDBC
8. Entity Beans

Course outcomes:

The students will be able to:

CO1: Demonstrate the basic programming constructs of Java and OOP concepts to develop Java applications.

CO2: Illustrate the concepts of generalization and run time polymorphism to develop reusable components.

CO3: Exemplify the usage of Multithreading in building efficient applications.

CO4: Build web applications using Servlets and JSP.

CO5: Design applications using JDBC and Enterprise Java Beans.

CIE:

- CIE is based on Theory and Laboratory Components of the course.
- Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE:

- SEE will be conducted for 100 marks

Text Books:

1. Herbert Schildt, Dale Skrien, "Java Fundamentals: A comprehensive Introduction", Tata McGraw Hill Edition 2013.
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. Hari Mohan Pandey, "Java Programming", Pearson Education, 2012.
2. "Java 6 Programming: Black Book", Dreamtech Press, 2012.
3. Michael Sikora, "EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard", SPD, 2008

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Master of Computer Applications
Scheme of Teaching and Examination: 2022-23

SEMESTER – II

Data Warehousing and Data Mining

Course Code	22MCA2051	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Be familiar with mathematical foundations of data mining tools.
2. Implement classical models and algorithms in data warehouses and data mining
3. Discover interesting patterns using association rule mining, classification and clustering
4. Apply data mining techniques to societal, scientific and environmental use cases.
5. Develop skill in selecting the appropriate data mining algorithm for solving practical problems

Module – 1

Introduction: Implication and Scope of Data Warehousing 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 warehousing and OLAP: Data Warehouse basic concepts, Data Warehouse Modeling, Data Cube and OLAP: Characteristics of OLAP systems, Multidimensional view and Data cube, Data Cube Implementations, Data Cube operations, Implementation of OLAP and overview on OLAP Software.

(09 Hours)

Module – 2

Data Mining and its applications: Introduction, What is Data Mining?, Motivating Challenges, Data Mining Tasks, Which technologies are used for data mining, Kinds of pattern that can be mined, Data Mining Applications, Data Preprocessing, Data cleaning, data integration, data reduction and data transformation.

(08 Hours)

Module – 3

Association Analysis: Basic Concepts and Algorithms, Frequent Item set Generation, Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for generating Frequent Item sets, FP Growth Algorithm

(08 Hours)

Module – 4

Classification: Methods, Improving accuracy of classification, Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbor Classifiers. Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of classification methods, Evaluation criteria for classification methods, Multiclass Problem.

(08 Hours)

Module – 5
Clustering Techniques: Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis. **Recap:** Summary of Data Warehousing and Data Mining concepts (09 Hours)
Course outcomes: The students will be able to: CO1: Identify the scope and necessity of Data Warehousing and Data Mining. CO2: Apply data mining techniques and methods to data sets CO3: Analyze the frequent patterns using association analysis algorithms. CO4: Design various algorithms based on data mining tools. CO5: Compare and contrast the various classifiers
CIE: • 60% of CIE is based on Internal Assessment Tests • 40% of CIE is based on Alternate Assessment Methods
SEE: • SEE will be conducted for 100 marks.
Text Books: 1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Addison-Wesley, 2005. 2. G. K. Gupta, "Introduction to Data Mining with Case Studies", 3rd Edition, PHI, New Delhi, 2009. **References:** 1. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.

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MASTER OF COMPUTER APPLICATIONS
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SEMESTER – II

Big Data Analytics

Course Code	22MCA2052	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the basics of analytics process model and its requirements.
2. Solve any given analytics problem by applying various algorithms for handling large volumes of data.
3. Understand the HDFS architecture and Map-Reduce techniques for solving the big data problems.
4. Explore Spark architecture and its APIs.
5. Use Hive Query Language against large datasets.

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, Analysis Process Model, Analytical Model Requirements, Types of Data Sources, Sampling, Types of Data Elements, Data Exploration, Exploratory Statistical Analysis, Missing Values, Outlier Detection and Treatment, Standardizing Data Labels, 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

The Hadoop Distributed File system: The Design of HDFS, HDFS Concepts, Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, Anatomy of a File Read, Anatomy of a File Write.

Map Reduce: A Weather Dataset, Data Format, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner functions, Running a Distributed MapReduce Job.

(08 Hours)

Module – 4

Big Data and Spark: What is Apache Spark? Spark's Architecture, it's language API, Data Frames, Partitions, Lazy Evaluation, Spark's Toolset, Overview of Structured API Execution.

(08 Hours)

Module – 5
Programming Hive: Hive in the Hadoop Ecosystem, Data Types and File Formats, HiveQL: Data Definition, Databases in Hive, Alter Database, Creating Tables, External Tables, Partitioned Tables, External Partitioned Tables, Dropping Tables, Alter Tables, HiveQL: Data Manipulation, Queries (till GROUP BY Clauses). **Recap:** Summary of BDA concepts (09 Hours)
Course outcomes: The students will be able to: CO1: Identify the business problem for a given context and frame the objectives to solve it using data analytics tools. CO2: Differentiate various types of analytics algorithms and context of their application. CO3: Illustrate the architecture of HDFS and MapReduce. CO4: Explore Spark architecture and its language APIs CO5: Write Hive queries against large datasets on clusters
CIE: • 60% of CIE is based on Internal Assessment Tests • 40% of CIE is based on Alternate Assessment Methods
SEE: • SEE will be conducted for 100 marks
Text Books: 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. 3. Bill Chambers, Matei Zaharia, "Spark: The Definitive Guide", O'reilly, 2018. 4. Jason R, Dean W, Edward C, "Programming Hive", O'reilly, 2012. **References:** 1. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley. 2. Chris Eaton, Dirk Deroos et al., "Understanding Big data", McGraw Hill, 2012.

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MASTER OF COMPUTER APPLICATIONS
Scheme of Teaching and Examination: 2022-23

SEMESTER – II

NoSQL

Course Code	22MCA2053	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
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 NoSQL 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 MapReduce, 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:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

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 Addison Wesley, 2012.
2. Eelco Plugge, Peter Membrey and Tim Hawkins, "The Definitive Guide to MongoDB, The NoSQL Database for cloud and Desktop Computing", Apress, 2005.

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SEMESTER – II

Wireless Sensor Networks

Course Code	22MCA2054	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the fundamentals of wireless networks.
2. Learn and analyze the different wireless technologies.
3. Evaluate Ad-hoc networks and wireless sensor networks.
4. Understand and evaluate emerging wireless technologies and standards.
5. Understand design considerations for wireless networks.
6 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: • 60% of CIE is based on Internal Assessment Tests • 40% 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

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MASTER OF COMPUTER APPLICATIONS
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SEMESTER – II

Artificial Intelligence

Course Code	22MCA2055	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.
2. Introduce the concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems
3. Review the different stages of development of the AI field from human like behaviour to Rational Agents.
4. Impart basic proficiency in representing difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing.
5. Create an understanding of the basic issues of knowledge representation and Logic and blind and heuristic search, as well as an understanding of other topics such as minimal, resolution, etc. that play an important role in AI programs.

Module – 1

Introduction: Implication and Scope of AI 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: What is Artificial Intelligence: The AI problems, the underlying assumption, what is an AI Technique? The Level of the model, Criteria for success, some general references, One final word and beyond. Problems, problem spaces, and search: Defining, the problem as a state space search, Production systems, Problem characteristics, Production system characteristics.

(09 Hours)

Module – 2

Heuristic search techniques: Generate-and-test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Mean-ends analysis. Knowledge representation issues: Representations and mappings, Approaches to knowledge representation, Issues in knowledge representation, The frame problem.

(08 Hours)

Module – 3

Predicate logic: Representing simple facts in logic, representing instance and ISA relationships, Computable functions and predicates, Resolution, Natural Deduction.

Symbolic Reasoning Under Uncertainty: Introduction to non-monotonic reasoning, Logic for non-monotonic reasoning.

(08 Hours)

Module – 4

Implementation: Depth-first search, Implementation: Breadth-first search.

Statistical Reasoning: Probability and Bayes Theorem, Certainty factors and rule-based systems, Bayesian Networks, Fuzzy logic.

(08 Hours)

Module – 5

Weak Slot-and-filter structures: Semantic Net Frames, Strong slot-and –filler structures: Conceptual dependency, scripts, CYC.

Recap: Summary of AI concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Analyze searching techniques, constraint satisfaction problem and example problems-game playing techniques.

CO2: Apply these techniques in applications which involve perception, reasoning and learning.

CO3: Analyze AI technique to any given concrete problems.

CO4: Use different machine learning techniques to design AI machine and enveloping applications for real world problems.

CO5: Analyze and design a real world problem for implementation and understand the dynamic behavior of a system.

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Elaine Rich, Kevin Knight, Shivashankar B Nair, "Artificial Intelligence", Tata McGraw Hill, 3rd Edition, 2013.
2. Stuart Russel, Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson 3rd Edition, 2013.

References:

1. Nils J. Nilsson, "Principles of Artificial Intelligence", Elsevier.

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MASTER OF COMPUTER APPLICATIONS

Scheme of Teaching and Examination: 2022-23

SEMESTER – II

Professional Communication and Ethics

Course Code	22MCA2061	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

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

Module – 1

Introduction: Implication and Scope of Professional Communication 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.

(09 Hours)

Module – 2

Communication Barriers: Introduction, Classification of Barriers, Non-verbal Communication: Introduction, Kinesics, Proxemics, Chronemics, Correlating Verbal and Non-verbal, Communication, Cross-cultural, Classroom activity.

(08 Hours)

Module – 3

Active Listening: Introduction, Meaning and Art of Listening, Importance of Listening and Empathy in Communication, Reasons for Poor Listening, Listening versus Hearing, Poor Listening Habits, Traits of a Good Listener, Listening Modes, Active versus Passive Listening, Types of Listening.

(08 Hours)

Module – 4

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

(08 Hours)

Module – 5
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. **Recap:** Summary of Professional Ethics and Management concepts (09 Hours)
Course outcomes: The students will be able to: CO1: Implement the communication skills effectively CO2: Build good Group Discussions skill CO3: Develop good presentation skill CO4: Imbibe professional ethics CO5: Explore protection and privacy laws
CIE: • 60% of CIE is based on Internal Assessment Tests • 40% of CIE is based on Alternate Assessment Methods
SEE: • SEE will be conducted for 100 marks.
Text Books: 1. Meenakshi Raman and Sangeeta Sharma, "Technical Communication -Principles and Practices", 3rd Edition, Oxford University Press. 2. 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.

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MASTER OF COMPUTER APPLICATIONS
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SEMESTER – II

Entrepreneurship and Management

Course Code	22MCA2062	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
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. Also explain planning and decision making processes
2. Explain the organizational structure, staffing and leadership process
3. Describe the understanding of motivation and different control systems in management
4. Explain understanding of Entrepreneurships and Entrepreneurship development process
5. Illustrate Small Scale Industries, various types of supporting agencies and financing available for an entrepreneur

Module – 1

Introduction: Implication and Scope of entrepreneurship 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.

Management: 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, Development of Management Thought - early management approaches - Modem management approaches. Planning: 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.

(09 Hours)

Module – 2

Organizing and staffing: Nature and purpose of organization, Principles of organization – Types of organization-Departmentation, Committees-Centralization Vs Decentralization of authority and responsibility - Span of control - MBO and MBE (Meaning only) Nature and importance of staffing- Process of Selection & Recruitment.

Directing: Meaning and nature of directing Leadership styles, Motivation, Theories, Communication - Meaning and importance - coordination, meaning and importance and Techniques of coordination.

(08 Hours)

Module – 3

Entrepreneur: 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 – 4

Small scale industries: Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI, Steps to start an SSI - Government policy towards SSI; Different Policies of SSI; Government Support for SSI during 5 year plans. Impact of Liberalization, Privatization, Globalization on SSI Effect of WTO/GA TT Supporting Agencies of Government for SSI, Meaning

Institutional support: Different Schemes; TECKSOK, KIADB, KSSIDC, KSIMC, DIC Single Window Agency, SISI, NSIC, SIDBI, KSFC.

(08 Hours)

Module – 5

Preparation of project: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of. Business Opportunities: Market Feasibility Study; Technical Feasibility Study, Financial Feasibility Study & Social Feasibility Study.

Industrial ownership: 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, Advantages and Disadvantages of Partnership, Sole proprietorship, Features, Scope Advantages and Disadvantages of Sole Proprietorship.

(09 Hours)

Course outcomes:

The students will be able to:

CO1: Learn the context of Digital Marketing and Traditional Marketing
CO2: Design a Digital Marketing Plan to promote a product/service
CO3: Develop various strategies for Digital Marketing
CO4: Evaluate various communication tools and Digital media to promote a product/service
CO5: Prepare a budget for digital marketing campaign

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

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, Small Business Enterprises", Pearson Education - 2006 (2 & 4).

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 - 17thEdition, 2003.

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SEMESTER – II

Operations Research

Course Code	22MCA2063	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
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.

Overview: 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: Primal-Dual Relationship, Solving the Dual given the primal, Interpreting the results of Dual and Primal, Dual Simplex Method.

PERT and CPM: Network Representation, Critical Path (CPM) computations – Steps and procedures, Problems based on CPM computation, PERT networks – Introduction, Steps and procedure involving PERT networks, Problems based on PERT networks.

(08 Hours)

Module – 4

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

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, Dominance Rule, Algebraic method to solve games without saddle point, Graphical method to solve the games, Solving games using LPP method. 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: Obtain optimal solutions for any given problem CO5: Compute the critical path in any given network.
CIE: • 60% of CIE is based on Internal Assessment Tests • 40% of CIE is based on Alternate Assessment Methods
SEE: • SEE will be conducted for 100 marks.
Text Books: 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.

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SEMESTER – II

Supply Chain Management

Course Code	22MCA2064	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:

This course will enable students to

1. Understand the basic concepts of Supply Chain Management and identify SC drivers.
2. Discuss the role of each SC drivers play and their impact on SC performance.
3. Take simple SC and analyze it using concepts of SCM.

Module – 1

Introduction: Implication and Scope of Supply Chain Management 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: Supply chain basics (Definition of SC, Objectives of SC, SC stages, SC flows, SC Examples), decision phases in a supply chain (SC Strategy or Design, SC Planning and SC Operation), supply chain efficiency and responsiveness. Process view of a supply chain (Cycle view, Push/Pull View), Supply Chain Macro Processes in a firm, drivers of supply chain performance (Facilities, Inventory, Transportation, Information and Sourcing), Supply Chain performance: Competitive and supply chain strategies, achieving strategic fit.

(09 Hours)

Module – 2

Planning and Managing Inventories in a Supply Chain: Review of inventory concepts, Role of cycle inventory in a SC, Economies of scale to exploit fixed costs, Economics of scale to exploit quantity discounts, short-term discounting (Trade promotions). Role of safety inventory in a SC, safety inventory determination, Impact of supply uncertainty, aggregation and replenishment policies on safety inventory.

(08 Hours)

Module – 3

Designing distribution networks in a SC: Role of distribution in the SC, factors influencing distribution network design, Design options for distribution network, E-Business and the distribution network.

Transportation in a SC: Role of Transportation in a SC, Modes of transportation and their performance characteristics, Design options for a transportation network, tailored transportation, Trade-offs in transportation design, Risk management in transportation.

(08 Hours)

Module – 4

Sourcing decisions in a SC: Role of sourcing in a SC, In-house and Outsource, supplier scoring & assessment, Supplier selection – Auctions and Negotiations, Contracts, Role of IT in sourcing. Pricing and Revenue.

Management in a SC: Role of Pricing and Revenue Management in a supply chain, Pricing and Revenue management for Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts, Role of IT in pricing and revenue management.

(08 Hours)

Module – 5

Information Technology in a SC: The role of IT in a Supply Chain, The Supply Chain IT framework, CRM, ISCM, SRM, Transaction Management Foundation (TMF), Future of IT in 24 SC. The role of E-business in a supply chain, E-business framework, E-business in practice. Case discussion.

Co-ordination in a SC: Lack of SC Co-ordination and the Bullwhip effect, effect on performance of lack of co-ordination, Obstacles to Co-ordination in a SC. Managerial levers to achieve co-ordination.

Recap: Summary of Supply Chain Management concepts (09 Hours)

Course outcomes:

The students will be able to:

CO1: Explore the basic concepts of Supply Chain Management.

CO2: Analyze the importance of Supply Chain drivers and their performance.

CO3: Apply the Supply Chain Management principles on real time use cases.

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Text Books:

1. Supply Chain Management – Strategy, Planning & Operation. Sunil Chopra & Peter Meindl; Pearson Education Asia, ISBN: 9788120331587.

References:

1. Supply Chain Redesign – Transforming Supply Chains into Integrated Value Systems - Robert B Handfield, Ernest L Nichols - Jr., 2002, Pearson Education Inc, ISBN: 81-297-0113-8.
2. Modelling the Supply Chain -Jeremy F Shapiro, Duxbury -Thomson Learning -2002, ISBN 0-534-37363.
3. Designing & Managing the Supply Chain -David Simchi Levi, Philip Kaminsky & Edith Simchi Levi -McGraw Hill

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SEMESTER – II

Digital Marketing

Course Code	22MCA2065	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:
This course will enable students to
1. Explore the basics of Marketing and types.
2. Prepare a plan to run a digital campaign.
3. Conduct market research and analyze the trends.
4. Learn to manage e-marketing.
5. Evaluate various strategies to select a cost effective e-marketing strategy.

Module – 1

Introduction: Implication and Scope of MARTEK 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.

E-Marketing in Context: Past, Present, and Future, E-Marketing Landscape, What Works? Internet, E-Marketing Is Bigger Than the Web, E-Marketing Is Bigger Than Technology, E-Marketing's Past: Web 1.0, E-Marketing Today: Web 2.0, The Future: Web 3.0: Appliance Convergence, Traditional and Social Media Lose Their Distinction, Wireless Networking Increases, Semantic Web, What Will Characterize Web 3.0?

(09 Hours)

Module – 2

E-Marketing Plan: Overview of the E-Marketing Planning Process, Creating an E-Marketing Plan, The Napkin Plan, The Venture Capital E-Marketing Plan, A Seven-Step E-Marketing Plan.

(08 Hours)

Module – 3

E-Marketing Research: Data Drive Strategy, Marketing Knowledge Management; The Electronic Marketing Information System: Source 1: Internal Records, Source 2: Secondary Data, Source 3: Primary Data; Monitoring the Social Media, Other Technology-Enabled Approaches: Client-Side Data Collection, Server-Side Data Collection.

Segmentation and Targeting Strategies: Segmentation and Targeting Overview, Three Markets: Business Market, Government Market, Consumer Market; Market Segmentation Bases and Variables, Geographic Segments, Important Geographic Segments for E-Marketing.

(08 Hours)

Module – 4
E- Marketing Management: Product: The Online Offer: Many Products Capitalize on Internet Properties, Creating Customer Value Online, Product Benefits, Product Benefits, Attributes, Branding, Support services, Labeling. **Pricing:** The Online Value: The Internet Changes Pricing Strategies, Buyer and Seller Perspectives, Payment Options, Pricing Strategies: Fixed, Dynamic and Renting software. (08 Hours)
Module – 5
E-Marketing Communication Tools: E-Marketing Communication, Internet Advertising, Marketing Public Relations, Sales Promotion Offers, Direct Marketing. New Digital Media-Marketing Communication Media, Media Characteristics, Digital Media- Search Engines as Reputation Aggregators, Online Communities, Blogs, Social Networks; Branding Goals in Digital and Physical Media, Which Media to Buy? **Recap:** Summary of Digital Marketing concepts. (09 Hours)
Course outcomes: The students will be able to: CO1: Learn the context of Digital Marketing and Traditional Marketing CO2: Design a Digital Marketing Plan to promote a product/service CO3: Develop various strategies for Digital Marketing CO4: Evaluate various communication tools and Digital media to promote a product/service CO5: Prepare a budget for digital marketing campaign
CIE: • 60% of CIE is based on Internal Assessment Tests • 40% of CIE is based on Alternate Assessment Methods
SEE: • SEE will be conducted for 100 marks.
Textbooks: 1. Judy Strauss and Raymond Frost, E-Marketing, Pearson Education International, 5th Edition. **References:** 1. Godfrey Parkin, "Digital Marketing: Strategies for Online Success", New Holland Publishers, 2009. 2. Damian Ryan, "Understanding Digital Marketing- Marketing Strategies for Engaging the Digital Generation", Kogan Page, 3rd Edition, 2014. 3. Deepak Bansal, "A Complete Guide to Search Engine Optimization", B.R Publishing Corporation, 1st Edition, 2009.

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SEMESTER – II

Software Testing Lab

Course Code	22MCA207	CIE Marks	50
Contact Hours (L:T:P)	0:1:3	SEE Marks	50
Total Number of Lecture Hours	14T 42P	Exam Hours	3

Credits: 02

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.

Tutorial Syllabus
1. Basics of Software Testing, Basic Principles, Test case selection and Adequacy.
2. A perspective on Testing.
3. Boundary value testing, Equivalence class testing, Decision table based testing.
4. Path Testing, Data flow testing, Levels of Testing, Integration Testing.
5. Fault Based Testing, Planning and Monitoring the Process.

Laboratory

11. Create Software Testing Test case format using Microsoft Excel. Take an Example and try to fill out in the format specified.
12. Write Test cases for Phone field- Apply Specification based techniques.
13. Write a program and test cases for Decision Table.
14. Write a program and test cases for Equivalence Portioning
15. Write a program and test cases for Boundary Value Exercise.
16. Using Test Techniques Write Test cases for Login page- Page consists of Two editable fields (“User Name”, “Password”) and Two Buttons (“Sign In”, “Clear”).
17. Track Bugs in Mantis/Bugzilla.
18. Selenium installation, record and run any standard website using selenium IDE.
19. Using Selenium IDE, w rite a test suite containing minimum 4 test cases.
20. Test Web Application using Selenium Webdriver.
21. Using Selenium Webdriver implement automation testing for new account creation/registration form.

Course outcomes:
The students will be able to:
CO1: Explore the basic principles of software testing.
CO2: Apply different levels of testing for a 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:

- 60% of CIE is based on Cumulative assessment of laboratory program conduction comprising Program execution, Viva and Record writing.
- 40% of CIE is based on IA Tests and Alternate Assessment Methods.

SEE:

- SEE will be conducted for 100 marks.

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

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SEMESTER – II

Mini Project - 1

Course Code	22MCA208	CIE Marks	50
Contact Hours (L:T:P)	0:0:2	SEE Marks	50
Total Number of Lecture Hours	28P	Exam Hours	3
Credits: 02			

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 template:

- Introduction
- Requirement Analysis
- Software Requirement Specification
- Analysis and Design
- Implementation
- Testing
- Conclusion

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.

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SEMESTER – II

Audit Course – Online Course

Course Code	22MCA2AUD	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 semester to 2nd semester.
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 2nd semester.

Course outcomes:

The students will be able to:

CO1: Acquire knowledge on cutting-edge technologies

CO2: Involve in self-learning

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SEMESTER – III

Machine Learning

Course Code	22MCA301	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
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.

Overview: Data objects and Attribute types, Overview of Machine Learning Algorithms – Basics of Supervised and Unsupervised Algorithms.
Machine Learning Basics: Well posed learning problems, 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, Problems based on ID3 algorithm, Issues in decision tree learning.

(08 Hours)

Module – 3

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

(08 Hours)

Module – 4

Unsupervised Learning – Association Analysis - basic concepts and methods, Frequent itemset Generation, Apriori algorithm, FP-Growth Algorithm, Categorization of Major Clustering Methods, K-Means– Partitioning Methods, Hierarchical Methods.

(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. Linear Regression
4. Find-S Algorithm
5. K-NN Algorithm
6. SVM Algorithm
7. Naïve-Bayes Classifier
8. K-Means Clustering

Course outcomes:

The students will be able to:

CO1: Explore the Machine Learning concepts.
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., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 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
2. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining Concepts and Techniques, Morgan Kauffman Publishing
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education Inc, 4th Edition.

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.

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SEMESTER – III

Cloud Computing

Course Code	22MCA302	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
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. Analyse 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, 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 Clouds: 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 services; Google AppEngine; 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
Recap: Summary of Cloud Computing concepts (09 hours)

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: Deploy applications on real-time cloud platform(s).

Lab Programs:

1. Creating an AWS Account.
2. Creating a Virtual Machine using EC2 service.
3. Run a Web Application on AWS.
4. Create Storage using S3.
5. Demonstrate how to manage Billing and CloudWatch services.
6. Using Lambda service in AWS.
7. Launch a Linux instance using EC2.
8. Demonstrate Autoscaling service.

CIE:

- CIE is based on Theory and Laboratory Components of the course.
- Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE:

- SEE will be conducted for 100 marks.

Textbooks:

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. RajkumarBuyya, Christian Vecchiola, and ThamaraiSelci, "Mastering Cloud Computing", Tata McGraw Hill, New Delhi, India, 2013
3. Dan C Marinescu, Cloud Computing - Theory and Practice, Elsevier(MK), 2013.

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).

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SEMESTER – III

Advanced Programming

Course Code	22MCA303	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
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, and ADO .Net
3. Develop window application using C# .Net
4. Implement Web application using ASP .Net

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, Platforms, CD Pipelines using Jenkins.

(09 hours)

Module – 2

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.
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 of a struct 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.

(08 hours)

Module – 3

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

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.

(08 hours)

Module – 5

Web App Development: 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:

- CIE is based on Theory and Laboratory Components of the course.
- Theory component is evaluated for 60% of CIE i.e., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE:

SEE will be conducted for 100 marks.

Textbooks:

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.

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SEMESTER – III

Internet of Things

Course Code	22MCA304	CIE Marks	50
Contact Hours (L:T:P)	3:0:2	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 04

Course objectives:

1. Learn the fundamentals of 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 IoT 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 Examples.

Recap: Summary of IoT concepts (09 hours)

Laboratory

Following programs to be implemented in the lab:

1.Run the python programs on Pi:
a. Count the number of words and characters of a given string

b. Determine the area of a given shape (circle, triangle, and rectangle) by reading appropriate values from the standard input

c. To print a name "n" time where n and name are read from standard input using loops.

d. Handle divided by zero Exception

e. 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. Get the status of a bulb at a remote place (on the LAN) through web.

8. 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 solutions 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., 30 Marks and Laboratory component is evaluated for 40% of CIE i.e., 20 Marks.
- CIE involves tests, assignments, case studies, reports etc.

SEE:

- SEE will be conducted for 100 marks.

Textbooks:

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

References:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014. (ISBN: 978-8173719547)
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224).

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SEMESTER – III

Robotic Process Automation

Course Code	22MCA3051	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
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 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 RPA concepts.

(09 hours)

Course outcomes:

The students will be able to:

CO1: Identify the purpose, pros and cons of Robotics

CO2: Apply spatial transformation to obtain forward kinematics equation of robot manipulators

CO3: Analyse the working of robotics

CO4: Realize the training process for robots

CO5: Apply artificial intelligence through programming

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks

Textbooks:

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.

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SEMESTER – III

Augmented and Virtual Reality

Course Code	22MCA3052	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:
This course will enable students to
1. Learn the fundamentals about AR/VR
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 Augmented and Virtual Reality 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.

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 Augmented and Virtual Reality concepts (09 hours)

Course outcomes:

The students will be able to:

CO1: Explore the concepts of Virtual Reality/Augmented Reality.

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 AR and VR applications for Societal issues.

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks

Textbooks:

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

References:

1. Blender 3D: Designing Objects, Romain Caudron, Pierre-Armand Nicq, Enrico Valenza, 2016, Packt Publishing Ltd.
2. AR and VR Using the WebXR API, Rakesh Baruah, 2021.

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SEMESTER – III

Cyber Security

Course Code	22MCA3053	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
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.

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: Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, who are Cybercriminals? Classifications of Cybercrimes. Categories of Cybercrime. How Criminals Plan Attacks? Social Engineering, Cyber stalking, Cybercafé and Cybercrimes, Botnets, Attack Vector.

(09 hours)

Module – 2

Tools and Methods used in Cybercrime: Introduction, Proxy Server and Anonymizers, Phishing, Password Cracking, Key loggers and Spyware, Virus and Worms, DOS and DDOS attack.

(08 hours)

Module – 3

Cyber Security Vulnerabilities and Cyber Security Safeguards: Cyber Security Vulnerabilities Overview software, System administration, poor cyber security awareness. Cyber Security Safeguards-Overview, Access control, Audit, Authentication, Biometrics. Security policy and threat management.

(08 hours)

Module – 4

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

(08 hours)

Module – 5
Network Defense tools: Firewalls and Packet Filters, Network Address Translation (NAT) and Port Forwarding, VPN. Digital Forensics Science: Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life cycle, Forensics of social networking sites. **Recap:** Summary of Cyber Security concepts (09 hours)
Course outcomes: The students will be able to: CO1: Explore the Cyber Security principles. CO2: Apply the cyber security concepts to secure from cyber-attacks. CO3: Formulate the possibilities of cyber-attacks in a given use case, as a penetration tester. CO4: Analyze cyber security tools to protect individual data. CO5: Apply Digital Forensic tools to address cyber security issues.
CIE: • 60% of CIE is based on Internal Assessment Tests • 40% of CIE is based on Alternate Assessment Methods
SEE: • SEE will be conducted for 100 marks.
Textbooks: 1. Nina Godbole Sunit Belapure, "Cyber Security", 2012, Wiley India. 2. Mike Shema, "Anti-Hacker Tool Kit (Indian Edition)", 4th Edition, McGraw Hill. 3. William Stallings, "Effective Cybersecurity: A Guide to Using Best Practices and Standards", 2018, Addison-Wesley Professional. **References:** 1. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", Cengage Learning. 2. Chwan-Hwa (John) Wu,J. David Irwin, "Introduction to Computer Networks and Cyber security", CRC Press.

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SEMESTER – III

ADVANCED DATABASE MANAGEMENT SYSTEM

Course Code	22MCA3054	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:
This course will enable students to
1. Understand the DBMS architecture and relational database design
2. Work with advanced database concepts
3. Illustrate query processing and evaluation
4. Manage transactions and deal with enhanced data models
5. Analyse the scenarios in which emerging database models and technologies can be used

Module – 1

Introduction: Implication and Scope of Advanced Database Management 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.

DBMS Basics

Basics of DBMS, Database System Architecture: Data Abstraction, Physical DBMS Architecture, Data Models, Relational Database Design: Generalization Hierarchy, Extended ER Features, Functional Dependency Theory and Normalization, Multi-Valued Dependency, Join Dependency and 5NF.

(09 hours)

Module – 2

Database Design and Implementation

Introduction to Query Languages, Advanced SQL and PL/SQL: Views and Assertion, Introduction to Materialized Views, Summary Management and its Components, Functions and Procedures, Packages, Synonyms, Sequences.

(08 hours)

Module – 3

DBMS Advanced Features and Distributed Database

Database System Catalogs, Query Compiler, Query Processing and Evaluation, Transaction Management and Recovery, Database Security and Authorization, Distributed Database.

(08 hours)

Module – 4

Enhanced Database Models

Object-Oriented Database: Limitations of Relational Database, need for complex data type, Collection Types and Structured Types, Data Definition, Persistent Programming Languages, Object-oriented versus Object-Relational Databases, Database and XML: Structured, Semi-Structured and Unstructured data, XML Hierarchical Model, DTD and XML Schema.

(08 hours)

Module – 5

Emerging Database Models, Technologies and Applications

Emergence of Multimedia Database, Differentiation from other types of Data, Structure of Multimedia Database, Deductive Databases, GIS and Spatial Database, Knowledge Database, Information Visualization, Graphical representation, Gnome Database.

Recap: Summary of Advanced DBMS concepts

(09 hours)

Course outcomes:
The students will be able to:
CO1: Explore the context in which advanced database concepts are required
CO2: Design queries and programs with advanced DBMS concepts
CO3: Work with distributed databases and manage transactions
CO4: Develop enhanced database models
CO5: Design database models for changing requirements and technologies

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks

Textbooks:

1. Rani Chakrabarti, Shilbhadra Dasgupta, "Advanced Database Management System" – DreamTech Press.

References:

1. Dr. Sanjeev Sharma, "Advanced Database Management System" – DreamTech Press.
2. Jeffrey A Hoffer, S B Navathe, Thomas M Connolly, Ramez Elmasri, "Advanced Database Management System" – DreamTech Press.

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SEMESTER – III

Distributed Operating Systems

Course Code	22MCA3055	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:
This course will enable students to

1. Understand the different Distributed Systems and the challenges involved in Design of the Distributed Systems.
2. Understand how computing power is created and synchronized in Distributed systems
3. Design and Implement Distributed applications using Technologies like RPC, threads.
4. Learn how to store data in Distributed File System.
5. Explore how Distributed Shared Memory is managed.

Module – 1

Introduction: Implication and Scope of Distributed OS 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.

Fundamentals: What is Distributed Computing System?, Evolution of Distributed Computing Systems, Distributed Commuting System Models, Why are Distributed Computing Systems gaining popularity?, What is a Distributed Operating System? Issues in Designing a Distributed Operating System.

(09 hours)

Module – 2

Message Passing: Introduction, Desirable Features of a Good Message-Passing System, Issues in IPC by Message Passing, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication.

(08 hours)

Module – 3

Remote Procedure Calls: The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs.

(08 hours)

Module – 4

Distributed Shared Memory: General Structure of DSM Systems, Design and Implementation issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing.

(08 hours)

Module – 5
Synchronization: Clock Synchronization, Event ordering, Mutual Exclusion, Deadlock, Election Algorithms. **Recap:** Summary of Distributed OS concepts (09 hours)
Course outcomes: The students will be able to: CO1: Explore the fundamental concepts of a Distributed OS. CO2: Analyse the various ways of communicating through message passing CO3: Implement the RPC mechanism CO4: Realize the usage of Shared memory CO5: Apply suitable synchronization concept to the give use case.
CIE: • 60% of CIE is based on Internal Assessment Tests • 40% of CIE is based on Alternate Assessment Methods
SEE: • SEE will be conducted for 100 marks.
Textbooks: 1. Pradeep K Sinha, "Distributed Operating Systems", 2007, PHI. **References:** 1. Andrew S Tanenbaum, "Distributed Operating Systems", 3rd Edition, 2017, Pearson Education.

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SEMESTER – III

User Interface Design & UX

Course Code	22MCA3061	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
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.
1. Acquire knowledge of design guidelines, principles and theories.
2. Develop a framework for design management.
3. Evaluate design using suitable methods and evaluation tools.
4. Use software tools to develop interfaces for various software systems.

Module – 1

Introduction: Implication and Scope of User Interface Design & UX 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: Analyze the different design management methods. CO4: Design user interface for a given application. CO5: Evaluate the user interface using static and dynamic tools.
CIE: • 60% of CIE is based on Internal Assessment Tests • 40% of CIE is based on Alternate Assessment Methods
SEE: • SEE will be conducted for 100 marks
Textbooks: 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.

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SEMESTER – III

Natural Language Processing

Course Code	22MCA3062	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	42L	Exam Hours	3

Credits: 03

Course objectives:
This course will enable students to

1. Analyze the natural language text.
2. Define the importance of natural language processing.
3. Understand the concepts of Text mining.
4. Illustrate information retrieval techniques.

Module – 1

Introduction: Implication and Scope of NLP 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.
Origin of NLP: Language and Knowledge, The Challenges of NLP, Language and Grammar, Processing Indian Languages, NLP Applications, Some Successful Early NLP Systems, Information Retrieval.
Language Modelling: Various Grammar-based Language Models, Statistical Language Model.
(09 hours)

Module – 2

Word Level Analysis: Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and Correction, Words and Word Classes, Part-of-Speech Tagging.
Syntactic Analysis: Context-Free Grammar, Constituency, Parsing, Probabilistic Parsing.
(08 hours)

Module – 3

Semantic Analysis: Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation
Discourse Processing: Cohesion, Reference Resolution, Discourse Coherence and Structure
(08 hours)

Module – 4

Natural Language Generation: Architectures of NLG Systems, Generation Tasks and Representations, Applications of NLG.
Machine Translation: Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Direct Machine Translation, Rule-based Machine Translation, Corpus-based Machine Translation, Semantic or Knowledge-based MT systems
(08 hours)

Module – 5

Information Retrieval-1: Design Features of Information Retrieval systems, Information Retrieval Models, Classical Information Retrieval Models, Non-classical models of IR, Alternative Models of IR, Evaluation of the IR System.

Information Retrieval-2: Natural Language Processing in IR, Relation Matching, Knowledge-based Approaches, Conceptual Graphs in IR, Cross-lingual Information Retrieval.

Recap: NLP concepts

(09 hours)

Course outcomes:

The students will be able to:

CO1: Appreciate the applications of NLP in real-world scenario
CO2: Perform word level and syntactic analysis of text
CO3: Implement the concepts of text mining
CO4: Work on NL generation and machine translation
CO5: Design information retrieval systems with cross-lingual features

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks

Textbooks:

1. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

References:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

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SEMESTER – III

Cryptography and Network Security

Course Code	22MCA3063	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
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: • 60% of CIE is based on Internal Assessment Tests • 40% of CIE is based on Alternate Assessment Methods
SEE: • SEE will be conducted for 100 marks.
Textbooks: 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.

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SEMESTER – III

Blockchain Technology

Course Code	22MCA3064	CIE Marks	50
Contact Hours (L:T:P)	3:0:0	SEE Marks	50
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:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Textbooks:

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

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SEMESTER – III

Social Network Analysis

Course Code	22MCA3065	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 social network analysis
2. Differentiate entities and relationships as nodes and edges
3. Perform network related computations
4. Collect network data from various sources
5. Adhere to legal and ethical standards

Module – 1

Introduction: Implication and Scope of Social Network Analysis 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: Graphs, Types of graphs, Representation, Bipartite graphs, Planar networks, The graph Laplacian, Random Walks, Maximum Flow and Minimum Cut Problem, Introduction to Approximation Algorithms, Definitions. Approximation algorithms for vertex cover and TSP

(09 Hours)

Module – 2

Social Networks: Types of Networks: General Random Networks, Small World Networks, Scale-Free Networks; Examples of Information Networks; Static Unweighted and weighted Graphs, Dynamic Unweighted and weighted Graphs, Network Centrality Measures; Strong and Weak ties.

(08 Hours)

Module – 3

Walks: Random walk-based proximity measures, Other graph-based proximity measures. Clustering with random-walk based measures, Algorithms for Hitting and Commute, Algorithms for Computing Personalized PageRank and Sim- rank.

(08 Hours)

Module – 4

Community Detection: Basic concepts, Algorithms for Community Detection: Quality Functions, The Kernighan-Lin algorithm, Agglomerative/Divisive algorithms, Spectral Algorithms, Multi-level Graph partitioning, Markov Clustering; Community Discovery in Directed Networks, Community Discovery in Dynamic Networks, Community Discovery in Heterogeneous Networks, Evolution of Community.

(08 Hours)

Module – 5

Link Prediction: Feature based Link Prediction, Bayesian Probabilistic Models, Probabilistic Relational Models

Event Detection: Classification of Text Streams, Event Detection and Tracking: Bag of Words, Temporal, location, ontology based algorithms. Evolution Analysis in Text Streams, Sentiment analysis.

Recap: Social Network Analysis concepts

(09 Hours)

Course outcomes:

The students will be able to:

CO1: Collect network data from different sources while adhering to legal standards

CO2: Formalize different types of entities and relationships as nodes and edges

CO3: Perform network analytical computations

CO4: Generate visualizations and perform empirical investigations of network data

CO5: Interpret and synthesize the meaning of the results

CIE:

- 60% of CIE is based on Internal Assessment Tests
- 40% of CIE is based on Alternate Assessment Methods

SEE:

- SEE will be conducted for 100 marks.

Textbooks:

1. Charu C. Aggarwal, Social Network Data Analytics, Springer; 2011.
2. S.Wasserman, K.Faust: Social Network Analysis: Methods and Applications, Cambridge Univ Press, 1994

References:

1. Scott, J. (2007). Social network analysis: A handbook (2nd Ed.). Newbury Park, CA: Sage.
2. Knoke (2008). Social Network Analysis, (2nd Ed). Sage

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SEMESTER – III

Mini Project - 2

Course Code	22MCA307	CIE Marks	50
Contact Hours (L:T:P)	0:0:4	SEE Marks	50
Total Number of Lecture Hours	28P	Exam Hours	3
Credits: 02			

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. Project has to be demonstrated in the examination individually by each student at the end of 3rd semester.
4. The team must submit a brief project report (20-30 pages) that may include the following template:
- Introduction
- Requirement Analysis
- Software Requirement Specification
- Analysis and Design
- Implementation
- Testing
- Conclusion

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.

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SEMESTER – III

Societal Project

Course Code	22MCA309	CIE Marks	50
Contact Hours (L:T:P)	0:0:0	SEE Marks	-

Credits: 0

Guidelines

1. The project should be carried out for minimum of 25 hours with active involvement.
2. The place of project execution, targeted beneficiaries, facilitating firm/NGO with clear objectives and precise work schedules as per timelines should be provided as synopsis.
3. Milestones and deliverables have to be clearly mentioned.
4. Detailed report as per the format provided supported by photographs at the work place have to be submitted at the end of the project.
5. The students will be assessed based on the report and a 10-minute video of their presentation submitted at the end of the semester.
6. The final marks will be awarded based on the design of the program, style of execution and effectiveness of the project.

Course outcomes:

The students will be able to:

CO1: Explore potential problem areas where physical, technical and intellectual collaboration is required

CO2: Perform field level studies to understand the depth of the problem

CO3: Plan and execute effective social/environmental initiatives

CO4: Visualize and present the outcomes to draw necessary attention

CIE:

- The student should present the work carried out during the societal project which is evaluated for 50 marks (Report – 25 marks, Presentation – 25 marks)

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SEMESTER – IV

Internship

Course Code	22MCA401	CIE Marks	50
Contact Hours (L:T:P)	0:0:0	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 50 marks (Report – 25 marks, Presentation – 25 marks)

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SEMESTER – IV

Seminar

Course Code	22MCA402	CIE Marks	50
Contact Hours (L:T:P)	0:0:2	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 50 marks (Report – 25 marks, Presentation – 25 marks).

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SEMESTER – IV

Project Work

Course Code	22MCA403	CIE Marks	50
Contact Hours (L:T:PW)	0:0:5	SEE Marks	50
Credits: 18			

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 50 marks.
11. SEE comprises of project evaluation and viva-voce for a total of 50 marks.
12. The project SEE will be assessed based on project report and viva-voce for 50 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 50 marks.
SEE: • SEE will be assessed based on project report and viva-voce for 50 marks each jointly by the internal and external examiners

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SEMESTER – IV

MOOC – Online Course

Course Code	22MCA404	CIE Marks	-
Contact Hours (L:T:P)	0:2:0	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