आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

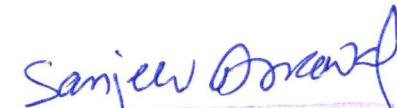# IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

IFTM University Moradabad
Course Structure & Evaluation Scheme

Masters in Computer Applications

(Effective from Session 2022-23)

Director
School of Computer Science & Applications
IFTM University, Moradabad

Registrar
IFTM University
Moradabad

Semester Courses:

Year –I   Semester-I

S. No	Course Code	Course Title	Course Type	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
				L	T	P	TA	AT	CT	Total			
1.	MCAFC-11	Programming in C	FC	3	1	0	5	5	10+10	30	70	100	4
2.	MCACC-12	Operating System	CC	3	1	0	5	5	10+10	30	70	100	4
3.	MCACC-13	Data Structure using C	CC	3	1	0	5	5	10+10	30	70	100	4
4.	MCAGE-01	Generic Elective	GE	3	1	0	5	5	10+10	30	70	100	4
5.	MCACC-14	Computer Organization & Architecture	CC	3	1	0	5	5	10+10	30	70	100	4
PRACTICALS/Seminar/Projects													
6.	MCAAE-01	Office Automation Software Lab	AEC	0	0	4	15	15	30	30	70	100	2
7.	MCAP-11	Computer Organization & Architecture Lab	LAB	0	0	4	15	15	30	30	70	100	2
8.	MCAP-12	Data Structure Lab	LAB	0	0	4	15	15	--	30	70	100	2
9.	MGP-101	G.P		--	--	--	--	--	--	100	---	100	1
		Total		17	3	12	--	--	---	340	560	900	27

Generic Elective (GE)		
S. No	Course Code	Course Title
1.	TPSD301/401	Professional Skill Development-II
2.	MTB103T	Bioinformatics
3.	MBA 101	Management Concepts & Organizational Behaviour
4.	MGET-01(4)	Foundation of Mathematics

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Year –I Semester-II

S. No	Course Code	SUBJECT	Course Type	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
				L	T	P	TA	AT	CT	Total			
1.	MCACC -21	Computer Network	CC	3	1	0	5	5	10+10	30	70	100	4
2.	MCACC-22	Object Oriented Programming using Java	CC	3	1	0	5	5	10+10	30	70	100	4
3.	MCACC-23	Software Engineering	CC	3	1	0	5	5	10+10	30	70	100	4
4.	MCACC-24	Database Management Systems	CC	3	1	0	5	5	10+10	30	70	100	4
5.	MCADS-01	Discipline Specific Electives-1	DSE	3	1	0	5	5	10+10	30	70	100	4
PRACTICALS/Seminar/Projects													
6.	MCAP-21	Java Programming Lab	LAB	0	0	4	15	15	30	30	70	100	2
7.	MCAP-22	Database Management Systems Lab	LAB	0	0	4	15	15	30	30	70	100	2
8.	MCADS-01P	Lab Based on DSE-1	LAB	0	0	4	15	15	30	30	70	100	2
9.	MGP-201	G.P		--	--	--	--	--	--	100	---	100	1
		Total		15	5	12	--	--	---	340	560	900	27

Discipline Specific Electives-1		
S. No	Course Code	Course Title
1.	MDSET-01(1)	Computer Graphics & Animation
2.	MDSET-01(2)	.Net Framework using C#
3.	MDSET-01(3)	Software Testing & Quality Assurance
4.	MDSET-01(4)	Computer Based Numeric & Statistical Techniques

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Year –II   Semester-III

S. No	Course Code	SUBJECT	Course Type	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
				L	T	P	TA	AT	CT	Total			
1.	MCACC-31	Data Science	CC	3	1	0	5	5	10+10	30	70	100	4
2.	MCACC -32	Python Programming	CC	4	0	0	5	5	10+10	30	70	100	4
3.	MCACC -33	Formal Language & Automata Theory	CC	3	1	0	5	5	10+10	30	70	100	4
4.	MCADS -02	Discipline Specific Electives-2	DSE	3	1	0	5	5	10+10	30	70	100	4
5.	MCADS -03	Discipline Specific Electives-3	DSE	3	1	0	5	5	10+10	30	70	100	4
PRACTICALS/Seminar/Projects													
6.	MCAP -31	Python Programming Lab	LAB	0	0	4	15	15	30	30	70	100	2
7.	MCAP -32	Mini Project**	PROJ	0	0	8	15	15	30	30	70	100	4
8.	MCADS -03P	Lab Based on MDSET-03	LAB	0	0	4	15	15	30	30	70	100	2
9.	MGP-201	G.P		--	--	--	--	--	--	100	---	100	1
		Total		16	4	16	--	--	---	340	560	900	29

Discipline Specific Electives-2			Discipline Specific Electives-3		
S. No	Course Code	Course Title	S. No	Course Code	Course Title
1.	MDSET-02(1)	Mobile Computing	1.	MDSET-03(1)	Cloud Computing
2.	MDSET-02(2)	Natural Language Processing	2.	MDSET-03(2)	Digital Image Processing
3.	MDSET-02(3)	Internet of Things	3.	MDSET-03(3)	Big Data
4.	MDSET-02(4)	Client Server Computing	4.	MDSET-03(4)	Deep Learning
5.	MDSET-02(5)	Human Computer Interaction	5.	MDSET-03(5)	Web Applications with Flask

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Year –II   Semester-IV

S. No	Course Code	SUBJECT	Course Type	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
				L	T	P	TA	AT	CT	Total			
1.	MCACC-41	Web Technology	CC	3	1	0	5	5	10+10	30	70	100	4
2.	MCADS -04	Discipline Specific Electives-4	DSE-4	3	1	0	5	5	10+10	30	70	100	4
PRACTICALS/Seminar/Projects													
3.	MCAP-41	Major Project	PROJ	0	0	20	--	--	--	200	300	500	10
4.	MGP-401	G.P		--	--	--	--	--	--	100	---	100	1
		Total		6	2	20	--	--	---	360	440	800	19

ELECTIVE SUBJECT: ** Qualifying Non-credit Course ** The Mini Project (6 weeks) conducted during summer break after II semester and will be assessed during III semester. The Course will be carried out at the Institute under the Guidance of a Faculty Members.

Discipline Specific Electives-4		
S. No	Course Code	Course Title
1.	MDSET-04(1)	Cryptography and Network Security
2.	MDSET-04(2)	Blockchain Architecture
3.	MDSET-04(3)	Digital Marketing
4.	MDSET-04(4)	Privacy & Security in Online Social Media

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Bridge Courses

FOR

STUDENTS

Passed B.Sc./ B.Com./ B.A. with Mathematics at 10+2 level or at Graduation Level

Master of Computer Applications (MCA)

(W. E. F. 2023-23)

Department of Computer Applications
School of Computer Science and Applications
IFTM University, University Campus
Lodhipur Rajput, Delhi Road NH-24
Moradabad -244102 U.P
India

Bridge Courses

DURATION: Four Semesters
Total Credits: 14
L-T-P stands for number of contact hours as Lecture-Tutorial-Practical in a week.
Bridge Courses (BC):

S.No	Course Code	Course Title	Course Type	Marks			L-T-P	Credits
				Internal Assessment	Semester Exam	Total		
1	MBC01PCT	Discrete Mathematics	BC	30	70	100	3-1-0	4
2	MBC02PCT	Information & Communication Technology	BC	30	70	100	3-1-0	4
3	MBC03PCT	Introduction to Computer System & Hardware	BC	30	70	100	3-1-0	4
4	MBC04PCP	Management Information System	BC	30	70	100	3-1-0	4
						Total	12-4-0	16

Bridge Courses:

1. For Bridge course students are required to score at least the minimum marks i.e 35% marks both in theory and practical separately. These marks however will not be added to the final score of semester / programme.
2. For Bridge course, only cleared or not cleared will be mentioned in the mark sheet. No separate certificate will be issued.
3. Total Duration of Completion of MCA Program will be Four Semester with maximum attempt of four more semesters and same applies for the Bridge course.
4. No Grace marks for the bridge course.
5. Grace marks for MCA program subjects will be given as per university examination system likewise other PG program/s.
6. Exam paper pattern will be as follows.
   1. Five big questions of (10 marks each) of 50 marks (2 questions from each Unit with an OR option).

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Choice Based Credit System (CBCS):

Choice based credit system (CBCS), provides a learning platform wherein the student or knowledge seeker has the flexibility to choose their course from a list of elective, core and soft skill courses. This is a student-centric approach to achieve his target number of credits as specified by the UGC and adopted by our University.

Groups of CBCS:

07 Groups of courses have been identified to provide student comprehensive exposure to a large number of areas, leading to the holistic development of an individual. These groups / clusters are as follows:
1. Foundation Course (FC)
2. Core Courses (CC)
3. Discipline Specific Elective (DSE)
4. Ability Enhancement Course (AEC)
5. Generic Elective(GE)
6. Laboratory Courses (Lab)
7. Co-and Extra – Curricular Activities (EC & CC)

1. Foundation Course (FC): The Foundation Courses are the courses based upon the content that leads to Knowledge enhancement considering Computer Skills.

2. Core Courses (CC) : Core courses of M.C.A. Program will provide a holistic approach in computer education, giving students an overview of the field, a basis to build and specialize upon. The core courses will provide more practical-based knowledge, case-based lessons and collaborative learning models based on computer applications.

3. Discipline Specific Electives (DSE): It is an elective course that adds proficiency to the students in the discipline.

4.Ability Enhancement Course (AEC): The Ability Enhancement (AE) courses are value-based or skill-based are aimed at providing hands-on-training, competencies, skills, etc.

5. Generic Elective (GE): It is an elective course taken from other engineering disciplines and enhances the generic proficiency and interdisciplinary perspective of students.

6. Laboratory Courses (Lab): These courses includes various laboratories of Engineering designed to provide the student solid foundation to the domain of engineering. In each practical, the student will be required to carry out the number of experiments as specified in the syllabus. Each practical conducted will be assessed by the teacher based on the experiment done during the lab, submission of the practical file, and understanding of the experiment done.

7. Co-and Extra – Curricular Activities (EC & CC): A student shall opt for anyone of the following activities in the first four semesters offered in the college

- N.S.S / N.C.C./Rotary Activities / Rovers and Rangers
- Sports and Games / Activities related to Yoga
- A Small project work concerning the achievements of Indian in different fields
- Evolution of study groups/seminar circles on Indian thoughts and ideas
- Interaction with local communities in their neighborhood and learn about and from them
- Exploring different aspects of Indian civilizations
- Other activities such as Cultural Activities as prescribed by the University.

PROGRAMME STRUCTURE:

Course Type	Abbreviation	Credits
Foundation Course (FC)	FC	04
Core Course	CC	44
Discipline Specific Elective	DSE	16
Generic Elective (Interdisciplinary)	GE	04
Ability Enhancement Course	AEC	02
Projects	PROJ	14
Laboratory Courses	Lab	14
GP		04
Total Credits		**102**

L-T-P stands for number of contact hours as Lecture-Tutorial-Practical in a week.

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	I		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MBC01PCT		Subject Name	Discrete Mathematics	

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):
- ✓ The main aims of this course are to prepare the students to develop and understand the mathematical foundations and create mathematical arguments require in learning many mathematics and computer sciences courses.
- ✓ To motivate students how to solve practical problems using discrete mathematics. Also, in this course basic concepts of Graph theory such as Trees, Regular Graph, Eulerian Graphs, Vertex colourings and learn about the basic knowledge of Algebraic structures, Combinatories, Boolean Algebra, prepositions *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of basic Mathematics

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Develop ability to understand of set and groups and their properties *for skill development and employability.*

CO2: Develop ability to understand of functions and their properties and demonstrate an understanding of relations and be able to determine their properties *for skill development and employability.*

CO3: Familiar with the basic concepts of propositions, connectives and normal forms and write an argument using logical notation and determine if the argument is or is not valid *for skill development and employability.*

CO4: Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra *for skill development and employability.*

CO5: Familiar with different type of graphs and trees and demonstrate different traversal methods for trees and Graphs *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	1	2	1	1	1	1	1	1
CO2	1	2	2	1	2	1	1	1	2	1	1	2
CO3	3	1	2	2	2	2	1	1	1	1	1	1
CO4	1	1	1	2	1	2	1	1	1	1	1	2
CO5	2	1	1	1	2	1	1	1	2	1	1	1

Content:(Units)

UNIT 1   **(10 Sessions)**

Algebraic structures: Binary operations, Algebraic structures, Semi-groups, Groups, Abelian group, Finite and Infinite groups, Factor group, Permutations, Order of an element of a group, Isomorphism of groups, Subgroup, Cosets, Cayley,s theorem, Normal subgroups, Homomorphisms of groups, Automorphisms of a group, Rings and Fields (only definition and examples) *for skill development and employability.*

UNIT 2   **(12 Sessions)**

Functions: Introduction, Functions, Identity function, One to one, Onto and invertible functions, Composition of functions, Mathematical functions, Exponential and logarithmic functions, Recursively defined function.

Relations: Introduction, Ordered pair, Cartesian product, Relations, Domain and Range, Pictorial representation

of relations, Inverse relation, Identity relation, Universal relation, Composition of relations, Types of relations, Equivalence relations and Partial order relations *for skill development and employability*.

UNIT 3 (10 Sessions)

Propositional Logic: Proposition, First order logic, Basic logical operations, Truth table, Tautologies, Contradictions, Algebra of propositions, Logical implications, Logical equivalence, Predicates, Universal and Existential quantifiers *for skill development and employability*.

Combinatories: Basic counting technique, Pigeon –hole principle, Recurrence relation, Generating function and counting principle.

UNIT 4 (08 Sessions)

Boolean Algebra: Introduction, Basic Definitions, Duality, Basic theorems, Boolean algebras. Sum of product and Product of sums form in Boolean algebra, Minimal Boolean expressions, Logic gates, Truth tables, Boolean functions and Karnaugh Maps *for skill development and employability*.

UNIT 5 (10 Sessions)

Graphs: Simple graph , Multi graph, Graph terminology, Representation of graphs, Bipartite, Regular, Planar and Connected graph, Graph coloring, Chromatic number, Isomorphism and Homomorphism of graphs, Incidence matrix, Adjacency matrix, Circuit matrix and Path matrix.

Trees: Definition, Rooted tree, Properties of trees, Binary trees, Binary search trees, Path length *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	2	1
CO3	3	2	1
CO4	3	3	2
CO5	2	2	1

Text Book:

1	C.L.Liu, "Elements of Discrete Mathematics" Mc Graw Hill Book Co., 1985.
2	N.Deo, "Graph Theory with application to Engineering and Computer Science," PHI.1993.
3	Kolman, Busby and Ross, "Discrete Mathematical structure," PHI.
4	Olympia Nicodemi, "Discrete Mathematics" CBS Publication, Delhi.
5	S.K.Sarkar, " Discrete Mathematics" S. Chand Publication, New Delhi

Reference Books:

1	Olympia Nicodemi, "Discrete Mathematics" CBS Publication, Delhi.
2	S.K.Sarkar, "Discrete Mathematics" S. Chand Publication, New Delhi .

MOOC/ Certification Courses:

1	www.pdfdrive.com
2	www.dmi.gov.in
3	www.yourarticlelibrary.com
4	onlinecourses.nptel.ac.in
5	en.wikipedia.org

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications			Branch/Spec.	Master of Computer Applications	
Semester	Bridge Course			Version	1.0.0.0	
Effective from Academic Year		2022-23		Effective for the batch Admitted in		2022
Subject code	MBC02PCT	Subject Name		Information & Communication Technology		

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total			CE	SEE	Total
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory		30	70	100
Hours	3	1	-	-	4	Practical		-	-	-

Objective(s):

✓ One of the main aims of ICT is to help students to become competent and confident users who can use the basic knowledge and skills acquired to assist them in their daily lives related to computer system *to inculcate skill, provide employability & entrepreneurship skill.*

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: to develop ICT capability in finding, selecting and using information *for skill development and employability.*
CO2: to use ICT for effective and appropriate communication *for skill development and employability.*
CO3: to monitor and control events both real and imaginary *for skill development and employability.*
CO4: To understand the Information Technology Application *for skill development and employability.*
CO5: Discuss the Information Technology Projects in India *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	3	2	1	2	3	3	2	3
CO2	1	2	3	2	3	2	1	2	3	3	2	2
CO3	2	2	3	2	3	1	1	1	2	2	3	3
CO4	2	2	2	3	3	1	2	2	3	3	2	2
CO5	2	2	2	2	3	2	1	1	2	2	3	2

Pre-requisites:

✓ Basic knowledge of programming.

Content:

UNIT I(8 Session)
Information: Concept of Information and Information Processing; Information Gathering, Storage, Processing, Retrieval, and Dissemination; Evolution of Information Processing. Elements of Modern Information Processing System: Hardware: Processor, Input/ output devices, Storage devices & media, Data Communication equipment *for skill development and employability.*

UNIT II(8 Session)
Software: System and Application. Programming Languages: Machine, Assembly, HLL; Generation of Languages. Operating Systems: Single user/ Multiuser, Batch/ Interactive, Real-time, Network OS, File server, Distributed OS; Command Shell, GUI- Windows; Examples: DOS, UNIX, Windows 95/ NT, Novell Netware *for skill development and employability.*

UNIT III(8 Session)
Computer &Communication: Computer Networks- LAN, WAN, Communication services across network protocols, e-mail, Internet facilities through World Wide Web; Communication devices *for skill development*

and employability.
UNIT IV(8 Session)
Information Technology Application: Scientific, Business, Educational, Industrial, Medical, Entertainment, Communication etc *for skill development and employability*.
UNIT V(8 Session)
Information Technology Projects in India. Laboratory: Word processing, Spreadsheet, Graphics, Web page creation *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	2	3	1
CO3	3	3	2
CO4	3	2	1
CO5	3	2	1

Text Book:

1.	Rajaraman V., Adabala N. : Fundamentals of Computers, PHI; 6th Revised edition edition (17 December 2014)
2.	Trainer T.N., Computers, 4th Edn, McGrawHil

MOOC/ Certification Courses:

1	https://www.tutorialspoint.com
2	https://www.javatpoint.com
3	onlinecourses.nptel.ac.in
4	https://www.programiz.com

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	Bridge Course		Version	1.0.0.0	
Effective from Academic Year		2022-23	**Effective for the batch Admitted in**		2022
Subject code	MBC03PCT		**Subject Name**	Introduction to Computer System & Hardware	

Teaching scheme (Per week)	Lecture		Practical(Lab.)		Total	Examination scheme (Marks)		CE	SEE	Total
	L	TU	P	TW						
Credit	3	1	-	-	4		Theory	30	70	100
Hours	3	1	-	-	4		Practical	-	-	-

Objective(s):

✓ One of the main aims of Introduction to Computer System & Hardware is to help students to become competent and confident users who can use the basic knowledge and skills acquired to assist them in their daily lives related to computer hardware and software *to inculcate skill, provide employability & entrepreneurship skill*.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Demonstrate the knowledge of the basic structure, components, features and generations of computers *for skill development and employability.*

CO2: Describe the concept of computer languages, language translators and construct algorithms to solve problems using programming concepts *for skill development and employability.*

CO3: Demonstrate architecture, functioning & services of the Internet and basics of multimedia *for skill development and employability.*

CO4: To understand the Green computing, Big data analytics, Grid computing for skill development and employability.

CO5: learning with Emerging Technologies *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	1	1	1	2	1	1	2
CO2	2	3	1	1	2	3	1	1	2	1	2	2
CO3	2	1	2	1	3	2	2	1	1	3	2	3
CO4	3	2	1	2	3	1	1	1	1	1	3	2
CO5	3	1	2	1	2	2	1	1	2	1	3	2

Pre-requisites:

✓ Basic knowledge of programming.

Content:

UNIT I: (8 Session)

Computer Languages: Introduction, Concept of Compiler, Interpreter & Assembler Problem solving concept: Algorithms – Introduction, Definition, Characteristics, Limitations, Conditions in pseudo-code, Loops in pseudo code *for skill development and employability.*

UNIT II: (8 Session)

Operating system: Definition, Functions, Types, Classification, Elements of command based and GUI based operating system. Computer Network: Overview, Types (LAN, WAN and MAN), Data communication, topologies *for skill development and employability*.

UNIT III: (8 Session)

Internet : Overview, Architecture, Functioning, Basic services like WWW, FTP, Telnet, Gopher etc., Search engines, E-mail, Web Browsers. Internet of Things (IoT): Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things *for skill development and employability*.

UNIT IV: (8 Session)

Block chain: Introduction, overview, features, limitations and application areas fundamentals of Block Chain. Crypto currencies: Introduction, Applications and use cases *for skill development and employability*.

UNIT V: (8 Session)

Emerging Technologies: Introduction, overview, features, limitations and application areas of Augmented Reality, Virtual Reality, Grid computing, Green computing, Big data analytics, Quantum Computing and Brain Computer Interface *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	2	3	1
CO3	2	3	1
CO4	3	2	1
CO5	3	3	2

Text Book:	
1.	Norton P., "Introduction to Computers", McGraw Hill Education.
2.	Goel A., "Computer Fundamentals", Pearson

MOOC/ Certification Courses:	
1	https://www.tutorialspoint.com
2	https://www.javatpoint.com
3	onlinecourses.nptel.ac.in
4	https://www.programiz.com

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications
Semester	Bridge Course		Version	1.0.0.0

Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MBC04PCT		Subject Name	Management Information System	

Teaching scheme

Teaching scheme (Per week)	Lecture		Practical(Lab.)		Total	Examination scheme (Marks)		CE	SEE	Total
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory		30	70	100
Hours	3	1	-	-	4	Practical		-	-	-

Objective(s):

- ✓ To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
- ✓ To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used.
- ✓ To enable students understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive *to inculcate skill, provide employability & entrepreneurship skill*.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: To enable the students to use information to assess the impact of the Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulner abilities of computer systems *for skill development, employability and entrepreneurship development.*

CO2: To provide the theoretical models used in database management systems to answer business questions *for skill development and employability.*

CO3: To understand the Concepts of planning & control of the system *for skill development, employability and entrepreneurship development.*

CO4: To understand the Internet & electronic commerce with its applications *for skill development and employability.*

CO5:To understand the different management systems and its applications *for skill development, employability and entrepreneurship development.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	2	1	1	1	2	1	1	2
CO2	1	2	3	2	2	1	1	3	1	1	1	2
CO3	2	3	2	2	3	1	1	1	1	2	1	1
CO4	3	3	1	1	1	1	1	1	1	1	1	1
CO5	2	2	1	1	1	1	1	1	1	1	1	2

Pre-requisites:

- ✓ Basic knowledge of programming.

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Content:

UNIT I
(8 Session)

Foundation of Information Systems: Introduction to information system in business, fundamentals of information systems, Solving business problems with information systems, Types of information systems, Effectiveness and efficiency criteria in information system *for skill development, employability and entrepreneurship development*.

UNITII
(8 Sessions)

An overview of Management Information Systems: Definition of a management information system, MIS versus Data processing, MIS & Decision Support Systems, MIS & Information Resources Management, Concept of an MIS, Structure of MIS, End user computing *for skill development and employability*.

UNITIII
(8 Sessions)

Concepts of planning & control: Concept of organizational planning, The Planning Process, Computational support for planning, Characteristics of control process, The nature of control in an organization *for skill development, employability and entrepreneurship development*.

UNIT IV
(8 Sessions)

Business applications of information technology: Internet & electronic commerce, Intranet, Extranet& Enterprise Solutions, Information System for Business Operations, Information System for Managerial Decision Support, Information System for Strategic Advantage *for skill development and employability*.

UNITV
(8 Sessions)

Managing Information Technology: Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes. Advanced Concepts in Information Systems: Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, and Procurement Management *for skill development, employability and entrepreneurship development*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	3
CO2	3	3	2
CO3	3	3	3
CO4	2	2	2
CO5	3	2	3

Text Book:

1. OBrian, "IntroductiontoInformationSystem", MCGRAWHILL
2. Murdick,"InformationSystemforModernManagement",PHI.
3. Jawadekar,"Management InformationSystem",TMH.
4. JainSarika,"InformationSystem",PPM

MOOC/ Certification Courses:

1. https://www.tutorialspoint.com
2. https://www.javatpoint.com
3. onlinecourses.nptel.ac.in
4. https://www.programiz.com

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications			Branch/Spec.	Master of Computer Applications	
Semester	I			Version	1.0.0.0	
Effective from Academic Year		2022-23		Effective for the batch Admitted in		2022
Subject code	MCAFC-11		Subject Name	Programming in C		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	3	1	--	-	4	Theory	30	70	100
Hours	3	1	--	-	4	Practical	--	--	--

Objective(s):

After completing the subject, students should be able to:
- ✓ The course is designed to provide complete knowledge of C language.
- ✓ Students will be able to develop logics which will help them to create programs, applications in C.
- ✓ Also by learning the basic programming constructs they can easily switch over to any other language in future *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of Computer

Course Outcomes(COs):

After completing the subject, students should be able to:

CO1:To gain knowledge of basic C programming and Install and run the C language software *for skill development and employability.*

CO2:To gain knowledge of C Statements *for skill development and employability.*

CO3:To develop proficiency in creating applications using C Programming Language and Arrays *for skill development and employability.*

CO4:Understand the concepts of file I/O, Function *for skill development and employability.*

CO5:Understand the concepts of Structure, Union & Pointer using appropriate C libraries *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak				
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	2	1	1	2	1	2	2	2
CO2	3	2	2	2	2	1	1	2	2	1	3	1
CO3	2	2	3	1	1	2	1	1	1	1	2	2
CO4	1	1	3	1	1	2	1	1	2	1	3	1
CO5	3	2	3	1	1	1	1	1	3	1	3	2

Content:(Units)

UNIT – I: : (8 Session)

Introduction to programming – definitions and developing Algorithms and flowcharts for simple programs. Introduction to C Programming: Origin and history of c programming character set, Identifiers and keywords data types, constants, variables, operators, special operators, constants, Expressions, compound statements, structure of C program, Input and output function *for skill development and employability*.

UNIT-II: (8 Session)

C Statements – selection statements – if nested if's, the if-else –if ladder the conditional expressions, switch statement

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nested switch statements, iteration statements – the for loop, for loop variations, the while loop, the do-while loop, declaring variable with in selection and iteration statements, jump statement, the return statement, the go to submit, break statement, exit ( ) function, the continue statement, expression statement. Block statements *for skill development and employability*.

UNIT – III: (8 Session)

Arrays – Array what is an array? – Array Declaration, Array Initialization – Accessing individual elements of an array – Two Dimensional Arrays – Multi Dimensional Array, Passing an array element to a function – Rules of using an array. What are strings? String I/O, string Manipulation *for skill development and employability*.

UNIT – IV: (8 Session)

Functions – The General Form of a Function, Math functions, elements of function, function categories, types of functions, Function Arguments Call by value, Call by Reference, return statement. Uses of functions. C pre – processor, storage classes – Automatic – Register, Static and external. Pointers – definition, pointer variables, pointer expressions, arithmetic pointers, pointers and arrays, initializing pointers and functions and problems with pointers *for skill development and employability*.

UNIT – V:(8 Session)

Structures – definition, accessing structure members, structure assignments, array of structures, passing structures, structure pointers, uses of structures Unions – definitions, difference between structure and union, type def. Files – introduction to streams and files, basics of files – file pointer, opening and closing files, writing and reading character, file functions *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	3	3	2
CO3	3	3	1
CO4	2	3	1
CO5	3	3	2

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2	Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition [India Edition], 2007.
3	Computer Fundamental and Concepts by V. Raja Raman.
4	Let Us C by Yaswant P. Kanetkar.BPB Publications New Delhi.

Reference Books:

1	Ashok N. Kamthane "Programming with ANSI and TURBO C". Pearson Education 4 Programming in C
2	Programming in C, a complete introduction to the programming language, Stephan G. Kocham, third edition
3.	C in Depth, S.K Srivastava and Deepali Srivastava

MOOC/ Certification Courses:

| 1 | https://www.cs.bu.edu/~hwxi/academic/courses/CS520/Fall02/notes/lectures.pdf |

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2	https://nptel.ac.in/courses/106/102/106102067/
3	http://www.svecw.edu.in/Docs%5CITIIBTechIISemLecPPL.pdf
4	https://www.computer-pdf.com/programming/703-tutorial-principles-of-programming-languages.html
5	https://www.tutorialspoint.com/computer_programming/index.htm
6.	https://www.geeksforgeeks.org/principles-of-programming-languages-gq/

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	I		Version	1.0.0.0	
Effective from Academic Year		2022-21	Effective for the batch Admitted in		2022
Subject code	MCACC-12	Subject Name	Operating System		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

The course should enable the students to:
- ✓ About operating systems, what they are, and what are their major components
- ✓ How to add to and/or modify C code in a large system written by others
- ✓ How to write and/or modify concurrent programs
- ✓ Some basic principles about system performance *to inculcate skill, provide employability & entrepreneurship skill.*

Pre-requisites:

Basic knowledge of Computer Fundamentals

Course Outcomes(COs):

After completing the subject, students should be able to:

CO1:Describe the general architecture of computers *for skill development and employability.*

CO2:Describe, contrast and compare differing structures for operating systems *for skill development and employability*.

CO3: Understand and analyze theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files *for skill development and employability.*

CO4:Storage management and Disk structure management *for skill development and employability.*

CO5:To understand the Security & Case Study about the operating system *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)									3 strong, 2 medium, 1 weak			
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	3	1	1	1	2	2	1	2
CO2	2	2	1	2	3	1	1	1	1	2	3	2
CO3	2	2	3	2	1	1	1	1	3	2	2	2
CO4	2	2	1	2	1	1	1	1	2	2	2	1
CO5	1	2	3	2	1	1	1	1	3	2	2	2

Content:(Units)

Unit-I :   (8 Session)

Introduction: Definition and types of operating systems, Batch Systems, multi programming, time–sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls Virtual machines *for skill development and employability*.

Unit-II :   (8 Session)

Process Management: Process concept, Process scheduling, Cooperating processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation *for skill development and employability*.

Unit-III :   (8 Session)

Process Synchronization: The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling *for skill development and employability*.

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Unit-IV:(8 Session)

Storage management: Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging in MULTICS and Intel 386, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, Secondary Storage Structure, File concept, access methods, Directory implementation, Efficiency and performance, Recovery, , disk scheduling methods, Disk management, Swap-Space management, Disk reliability *for skill development and employability*.

Unit-V:(8 Session)

Security & Case Study: Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	3	2
CO4	2	3	1
CO5	3	3	2

Practical content:

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Abraham Siberschatz and Peter Baer Galvin, "Operating System Concepts", Fifth Edition, Addision-Wesley
2	Milan Milankovic, "Operating Systems, Concepts and Design", McGraw-Hill.
3	Harvey M Deital, "Operating Systems", Addison Wesley.
4	Richard Peterson, "Linux: The Complete Reference", Osborne McGraw-Hill.

Reference Books:

1	W Richard Stevens, Stephen A Rago, "Advanced Programming in the UNIX Environment"; 3/E, Addison Wesley Professional, 2013.
2	A Tanenbaum,A Woodhull: "Operating Systems - Design and Implementation", 3/E, PHI EEE, 2006.
3	Crawley: "Operating Systems - A Design Oriented Approach", 1/E, McGraw Hill, 1998.
4	A Tanenbaum,A Woodhull: "Operating Systems - Design and Implementation", 3/E, PHI EEE, 2006.
5	Kernighan & Pike: "UNIX programming Environment", 2/E, PHI-EEE, 2001.

MOOC/ Certification Courses:

1	https://www.tutorialspoint.com/operating_system/os_overview.htm#:~:text=An%20Operating%20System%20(OS)%20is,as%20disk%20drives%20and%20printers.
2	https://edu.gcfglobal.org/en/computerbasics/understanding-operating-systems/1/
3	https://www.geeksforgeeks.org/introduction-of-operating-system-set-1/
4	https://www.webopedia.com/TERM/O/operating_system.html
5	https://nptel.ac.in/courses/106/105/106105214/
6	https://nptel.ac.in/courses/106/106/106106144/

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications				Branch/Spec.	Master of Computer Applications	
Semester	I				Version	1.0.0.0	
Effective from Academic Year			2022-23		Effective for the batch Admitted in		2022
Subject code	MCACC-13		Subject Name		Data Structure using C		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	3	1	3	-	7	Theory	30	70	100
Hours	3	1	3	-	7	Practical	30	70	100

Objective(s):
✓ To provide the knowledge of basic data structures and their implementations.
✓ To understand importance of data structures in context of writing efficient programs.
✓ To develop skills to apply appropriate data structures in problem solving *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:
Basic knowledge of C programming.

Course Outcomes(COs):
After completing the subject, students should be able to:

CO1: Learn the basic types for data structure, implementation and application *for skill development and employability*.
CO2: Know the strength and weakness of different data structures *for skill development and employability*.
CO3: Use the appropriate data structure in context of solution of given problem *for skill development and employability*.
CO4: Develop programming skills which require solving given problem *for skill development and employability*.
CO5:To gain the knowledge about Time Complexity and File Structures *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	1	1	1	1	2	1	1
CO2	2	3	2	1	2	1	2	2	1	1	1	1
CO3	1	1	3	1	1	1	1	2	2	1	1	2
CO4	1	2	2	3	2	1	1	1	1	1	2	1
CO5	1	2	2	1	1	1	2	1	1	2	1	1

Content:(Units)

UNIT – 1:(8 Session)
Introduction to Data Structures
Definition of data structure, abstract data type, static and dynamic implementations. Complexity Analysis: time and space complexity of algorithms, asymptotic analysis of algorithm, importance of efficient algorithm, arrays, address calculation in a single and multi-dimensional array, sparse matrices., recursion technique *for skill development and employability*.

UNIT II :(8 Session)
Stacks, Queues and Lists
Definition, Array based implementation of stack, Linked List based implementation of stack, Infix, postfix, prefix representation of expression, applications of stack Evaluation, Definition: Queue & List: Array based implementation of Queue / List, Linked List implementation of Queue / List, Circular implementation of Queue and Singly linked List, Straight / circular implementation of doubly linked Queue / List, Priority queue *for skill development and employability*.

UNIT III :   (8 Session)
Trees & Graphs
Definition of tree, properties of binary tree, binary tree traversal - preorder, post order, in-order traversal, binary search tree, threaded trees, balanced trees: AVL- tree ,B-tree .Graph: Matrix and   other representations of graphs, undirected and directed graphs, connected components of graphs, spanning trees, Graph Traversal-Breadth First Search, Depth First Search. Applications of Graphs: Topological Sorting, Shortest-Path Algorithms, Minimum spanning tree- Prim's Algorithm and Kruskal's Algorithm *for skill development and employability.*

UNIT IV :(8 Session)
Sorting Algorithms Introduction
Sorting by exchange, insertions, bubble sort, selection sort, Insertion sort, shell sort, merge sort, quick sort, Heap sort, Radix sort, Efficiency of above algorithms, External Sorting *for skill development and employability.*

UNIT V :(8 Session)
Running time & Searching Algorithms
Time Complexity: Best Case, Worst Case, Average Case, non –recursive and recursive algorithm of straight sequential search, binary Search. File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files *for skill development and employability.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	2	3	2
CO4	3	3	3
CO5	2	3	1

Practical content:

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

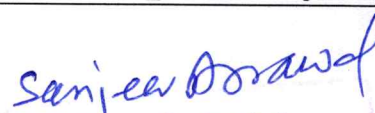| 1 | Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub, 6 th Edition. |
| 2 | How to Program C++ by Paul Deitel , Harvey Deitel, Prentice Hall; 8 edition. |
| 3 | Theory & Problems of Data Structures by Jr. SymourLipschetz, Schaum's outline by TMH 2006,Special Indian Edition. |

Reference Books:

1	Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
2	Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 1983,AW, 1st Edition.
3	Data Structures and Program Design in C By Robert Kruse, PHI, 2nd Edition.

MOOC/ Certification Courses:

1	http://www.cs.yale.edu/homes/aspnes/classes/223/notes.pdf
2	http://masterraghu.com/subjects/Datastructures/ebooks/rema%20thareja.pdf
3	https://www.geektonight.com/data-structures-and-algorithms-notes/
4	http://www.darshan.ac.in/Upload/DIET/Documents/CE/2130702_DS_2015_24112015_025019AM.pdf

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications				Branch/Spec.	Master of Computer Applications	
Semester	I				Version	1.0.0.0	
Effective from Academic Year		2022-23			Effective for the batch Admitted in		2022
Subject code	MCACC-14		Subject Name		Computer Organization & Architecture		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	3	1	3	-	7	Theory	30	70	100
Hours	3	1	3	-	7	Practical	30	70	100

Objective(s):

To understand the structure, function and characteristics of computer systems. To understand the design of the various functional units and components of computers.
- ✓ To identify the elements of modern instructions sets and their impact on processor design.
- ✓ To explain the function of each element of a memory hierarchy,
- ✓ To identify and compare different methods for computer I/O *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of Computer Basics & Digital Electronics.

Course Outcomes(COs):

After completing the subject, students should be able to:

CO1: Identify, understand and apply different number systems and codes *for skill development and employability*.
CO2: Understand the digital representation of data in a computer system *for skill development and employability*.
CO3: Understand the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design *for skill development and employability*.
CO4: Understand computer arithmetic formulate and solve problems, understand the performance requirements of systems *for skill development and employability*
CO5: To Understand the Memory Organization and Memory Hierarchy *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	1	1	2	1	1	2	1	1
CO2	2	1	1	1	1	1	1	2	2	1	2	1
CO3	3	2	2	1	3	1	1	1	1	1	1	1
CO4	2	1	2	2	1	2	1	1	1	1	1	1
CO5	3	2	1	2	2	1	2	1	1	1	2	1

Content:(Units)

UNIT-I : (8 Session)

Introduction of Digital Electronics: Introduction of Logic Gates, Number System. Simplifications of Boolean equations using K-maps, Circuit Designing techniques (SOP, POS), Flip Flops, Adder & Subtractor, Multiplexer, Decoder, Counter, Number representation; Fixed and Floating point number representation, IEEE standard for Floating point numbers *for skill development and employability*.

UNIT-II : (8 Session)

Register Transfer: Register Transfer Language, Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Microoperation,, Addition and Subtraction of signed numbers, Multiplication: Signed operand multiplication, Booths algorithm Pipeline And Vector Processing Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors *for skill development and employability*.

UNIT-III: (8 Session)

Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (Register Transfers, Performing of arithmetic or

logical operations, Fetching a word from memory, storing a word in memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control (Microinstruction, Micro program sequencing, Wide-Branch addressing, Microinstruction with Next-address field, Prefetching Microinstruction) *for skill development and employability*.

UNIT-IV: **(8 Session)**

General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, RISC & CISC. Input-Output Organization: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor *for skill development and employability*.

UNIT-V :   **(8 Session)**

Memory Organization: Memory Hierarchy, Main Memory (RAM and ROM Chips), Auxiliary memory, Associative Memory, Cache memory, miss rate and miss penalty, Virtual Memory, Memory management hardware *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	2	1
CO3	3	2	1
CO4	2	3	1
CO5	2	3	1

Practical content:

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Computer Architecture (PHI) 1998: M.M. Mano
2	Digital Electronics (TMH) 1998 :Malvino and Leach
3	Computer Organization and Architecture: William Stallings
4	Leventhal, L.A, "Introduction to Microprocessors", Prentice Hall of India
5	Mathur, A.P., "Introduction to Microprocessors", Tata McGraw Hill
6	Rao,P.V.S., "Prospective in Computer Architechture" , Prentice Hall of India.

Reference Book:

1	Computer Organization: By Stallings.
2	Computer Architecture and Organization: By Hayes.
3	Computer Organization and Design by P. Pal Chaudhury.

MOOC/ Certification Courses:

1	http://nptel.iitm.ac.in
2	http://highered.mheducation.com/sites/0072465638/student_view0/index.html
3	https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/
4	https://www.geektonight.com/computer-organization-and-architecture-notes/
5	http://www.cs.iit.edu/~virgil/cs470/Book/

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	I		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MCAAE-01	Subject Name	Office Automation Software Lab		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	2	1	0	-	4	Theory	30	70	100
Hours	2	1	0	-	4	Practical	30	70	100

Objective(s):

✓ Office tools course would enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools. To familiarize the students in preparation of documents and presentations with office automation tools *to inculcate skill, provide employability & entrepreneurship skill.*

Pre-requisites:

Basic knowledge of Computer Basics

Course Outcomes(COs):

By learning the course, the students will be able.

CO1: to perform documentation *for skill development and employability.*

CO2: to perform accounting operations *for skill development and employability.*

CO3: to perform presentation skills *for skill development and employability.*

CO4: Creating project abstract Features to be covered different functions *for skill development and employability.*

CO5: To perform MS Power Point function *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak						
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	2	3	1	1	1	1	2	2	2
CO2	3	1	2	1	2	1	1	1	1	1	2	2
CO3	2	2	2	3	3	1	1	2	3	2	3	2
CO4	3	2	2	3	2	2	2	2	2	1	2	3
CO5	2	2	2	2	3	1	1	2	1	2	3	2

Content:(Units)

Word

Word Orientation: The instructor needs to give an overview of Microsoft word & Importance of MS Word as word Processor, Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter .

Task 1: Using word to create project certificate. Features to be covered: -Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

Task 2: Creating project abstract Features to be covered: -Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 3: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs

Task 4: Creating a Feedback form - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Excel

Excel Orientation : The instructor needs to tell the importance of MS Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered Excel – Accessing, overview of toolbars, saving excel files, Using help and

resources {Comdex Information Technology course tool kit Vikas }

Task1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2 : Calculations - Features to be covered:- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task 3 : Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Task 4 : Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

MS Power Point

Task1: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered includes: - PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows

Task 2: This session helps students in making their presentations interactive. Topics covered includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

Task 3: Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topics covered includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing

Task 4: Power point test would be conducted. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	2	2
CO4	3	2	1
CO5	3	2	1

Practical content:

List of programs specified by the subject teacher based on above mentioned topics.
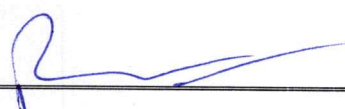
Text Book:

1	Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech,2005
2	The Complete Computer upgrade and repair book,3rd edition Cheryl A Schmidt, WILEY Dreamtech
3	Introduction to Information Technology, ITL Education Solutions limited, Pearson Education

Reference Book:

| 1 | PC Hardware and A + Handbook – Kate J. Chas PHI (Microsoft) |

MOOC/ Certification Courses:

| 1 | https://www.udemy.com/topic/automation/ |
| 2 | https://www.nielit.gov.in/delhi/delhi/delhi/archive-academic-news |

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	Generic Elective		Version	1.0.0.0	

Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	TPSD301/401		Subject Name	Professional Skill Development-II	

Teaching scheme

(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Examination scheme (Marks)

Objective(s):

The objectives of Professional Skill Development-II are:
- ✓ To develop knowledge and abilities to make correct use of the grammar in own writing English.
- ✓ To build vocabulary and to enhance the ability to correct the sentences.
- ✓ To enhance competencies in written and oral communication.
- ✓ To increase understanding and recall of what is read and listen including facts and importance of the main idea.
- ✓ To groom the overall personality of the students *to inculcate skill, provide employability & entrepreneurship skill*.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Develop knowledge and abilities to make correct use of the grammar in own writing English *for skill development and employability.*

CO2: Build vocabulary and enhance the ability to correct the sentences *for skill development and employability.*

CO3: Develop adequate Soft Skills required for the workplace *for skill development, employability and entrepreneurship development.*
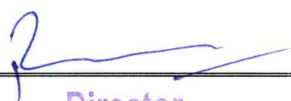
CO4: Compete successfully in the business environment *for skill development, employability and entrepreneurship development.*

CO5: Participate confidently in Group Discussions, Debate etc. Attend job interviews and to be successful in them. Also, Orient the students towards grooming as a professional *for skill development, employability and entrepreneurship development.*
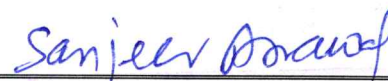
Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	2	2	2	1	3	2	2
CO2	2	2	2	1	2	2	2	1	2	2	2	1
CO3	1	2	1	1	2	1	2	2	3	2	3	1
CO4	3	2	1	2	1	2	3	2	1	2	1	2
CO5	2	3	1	1	1	2	1	1	2	3	2	1

Pre-requisites:

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✓ Basic knowledge of programming.

Content:

Unit I:Communicative Skills (05 Sessions)
Communication: Concept, Classification, Purpose, Process, Importance, Flow & Level of Communication, Barriers & Gateways in Communication, 7 C's of Communication, Types of Communication & communication without words *for skill development and Employability.*

Unit II: Intrapersonal Relationship Skills (07 Sessions)
Personality: Characteristics of Healthy & Sick Personality Self-awareness Self Esteem Self Confidence Assertiveness V/S Aggressiveness Values:Types & Importance *for skill development and employability*

Unit III: Interpersonal Relationship Skills (08 Sessions)
Group:Concepts, Types, Stages Team:Concepts, Elements, Types, Stages Presentation Skills& strategies Interview:Concepts, Types, Process, Interview Preparation Checklist, Interview Handling Skills, Common Interview mistakes *for skill development, employability and entrepreneurship development*

Unit IV: Argumentative Skills (10 Sessions)
Debate Role Play Speeches Elocution Group Discussion *for skill development, employability and entrepreneurship development*

Unit V: Campus to Company Skills (08 Sessions)
The corporate Fit: Dressing and Grooming Basic Etiquette: Office (Do's and Don'ts for men and women), Telephone, Email Dealing with People in Corporate *for skill development, employability and entrepreneurship development.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	2	3	1
CO3	3	3	3
CO4	2	3	2
CO5	3	2	3

Text Book:

1.	M.K. Sehgal & V. Khetrapal's Business Communication published by Excel Books.
2.	Rajendra Pal's Business Communication published by Sultan Chand & Sons Publication.
3.	P. D. Chaturvedi's Business Communication published by Pearson Education, Delhi.
4.	Elizabeth B. Hurlock's Personality Development by Tata McGraw Hills, Delhi.

MOOC/ Certification Courses:

1	www.fluenu.com
2	www.skilluneed.com
3	www.campus2-corporate.in
4	www.thebalancecareers.com

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications	Branch/Spec.	Master of Computer Applications	
Semester	Generic Elective	Version	1.0.0.0	

Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MTB103T	Subject Name	Bioinformatics		

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total			CE	SEE	Total
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory		30	70	100
Hours	3	1	-	-	4	Practical		-	-	-

Objective(s):

✓ Offers advanced level training on gene expression and gene therapy by covering topics such as genome mapping, proteomic techniques and new targets for drug discovery.

✓ To deal with sequence alignment algorithm and matrices are introduced to solve the complex biological problems *to inculcate skill, provide employability & entrepreneurship skill*.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Bioinformatics tools for sequence alignment and gene prediction *for skill development and employability.*

CO2: Algorithm and Matrices to solve the biological problem *for skill development and employability.*

CO3: Able to visualize the 3D structure of protein molecules *for skill development and employability.*

CO4: Designing of new drug molecules *for skill development and employability.*

CO5: Getting the information about ADME or QSAR *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	2	2	2	1	2	1	3
CO2	2	1	2	3	3	3	1	1	1	1	1	2
CO3	2	2	2	3	2	1	2	1	2	2	1	3
CO4	3	2	2	2	2	3	1	2	1	1	2	1
CO5	2	3	2	1	3	2	3	2	1	1	1	2

Pre-requisites:

✓ Basic knowledge of programming.

Content:

UNIT I: (8 Sessions)

Introduction and applications of Bioinformatics: Biological databases in Bioinformatics, Classification of biological databases, biological database retrieval system. Sequence and molecular file formats *for skill development and employability.*

UNIT II: (8 Sessions)

Sequence Alignment: Dot matrix analysis, dynamic programming algorithm (Needleman-Wunsch algorithm and Smith Waterman algorithm), heuristic methods (BLAST, FASTA).Iterative methods of multiple sequence alignment (Genetic Algorithm, HMM) *for skill development and employability.*

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UNIT III: (8 Sessions)

Protein structure prediction: Protein identification and characterization, primary structure analysis and prediction, secondary structure analysis and prediction. Microarray Data Analysis *for skill development and employability*.

UNIT IV: (8 Sessions)

Protein modeling: Methods of protein modeling, homology modeling, fold recognition, *Ab-initio* modeling. Protein classification and protein structure visualization: Protein structure database, Protein structure visualization databases and tools, Protein classification approaches *for skill development and employability*.

UNIT V: (8 Sessions)

Introduction to drug discovery: Target discovery strategies, Target validation, Computer aided Drug Designing: Introduction, drug-design approaches, ADME- Tox property prediction. Introduction to QSAR *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	3	2
CO4	3	3	2
CO5	2	3	1

Text Book:
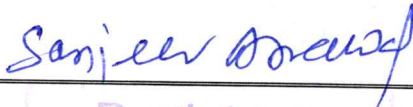
1.	Bioinformatics: Sequence and Genome Analysis by David W. Mount.
2.	Bioinformatics and Functional Genomics by Jonathan Pevsner.
3.	Developing Bioinformatics Computer skills by Gibas and Jambeck.
4.	Bioinformatics: Principles and Applications by ZhumurGhosh and Mallick.
5.	Bioinformatics: Genomics, Proteomics and drug discovery by S.C. Rastogi.
6.	A text book of Bioinformatics by Singhal and Singhal

MOOC/ Certification Courses:

1	www.ncbi.nlm.nih.gov
2	http://www.bic.nus.edu.sg/
3	http://bioinfo.ernet.in/
4	http://www.bioinform.com/index

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications	Branch/Spec.	Master of Computer Applications
Semester	Generic Elective	Version	1.0.0.0

Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MBA 101	Subject Name	Management Concepts & Organizational Behaviour		

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical (Lab.)		Total			CE	SEE	Total
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory		30	70	100
Hours	3	1	-	-	4	Practical		-	-	-

Objective(s):

This course is designed to expose the students to fundamental concepts of management, its processes and behavioral dynamics in organizations *to inculcate skill, provide employability & entrepreneurship skill.*

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Understand the basic concepts, evolution and thoughts related to management *for skill development, employability and entrepreneurship development.*

CO2: Demonstrate the roles, skills and functions of management starting from Planning till controlling *for skill development, employability and entrepreneurship development.*

CO3: Describe the general history of organizational theory and practice and frame how organizational behaviour has developed from these into a discrete field *for skill development and employability.*

CO4: Analyze the behaviour of individuals and groups in organisations in terms of organizational behaviour theories, models and concepts *for skill development and employability.*

CO5: Apply the same to real life management situations *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak						
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	3	1	3	3	1	2	2
CO2	3	3	3	2	2	1	2	2	1	3	1	1
CO3	2	2	3	2	2	2	1	2	2	3	2	2
CO4	2	2	2	3	1	2	1	2	2	2	2	2
CO5	3	3	2	3	1	2	1	2	2	2	2	2

Pre-requisites:

✓ Basic knowledge of Management Concepts

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Content:

UNIT I (08Sessions)

Introduction to Management:Meaning, Nature and Functions of Management, Evolution of Management thoughts, Management by Objectives(MBO) *for skill development, employability and entrepreneurship development.*

UNIT II (10Sessions)

Process of Management:Planning, Organizing, Staffing, Directing, Coordinating and Controlling *for skill development, employability and entrepreneurship development.*

UNIT III (12Sessions)

Fundamentals of Organizational Behaviour (OB): Meaning, Models of OB, Emergence of OB as a discipline, OB Trends, Organizational Culture and Climate, Leadership and their Styles and Motivation theories *for skill development and employability.*

UNIT IV (10Sessions)

Individual & Group Behaviour: Individual determinants of OB, Perception, Learning, Emotions, Attitudes, Personality, Stress, Group Dynamics and Work Teams, Power, Politics, Interpersonal behavior and relations, Transactional Analysis *for skill development and employability.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	3
CO2	3	3	3
CO3	3	2	2
CO4	2	2	2
CO5	2	2	2

Text Book:

1.	George,J.M.&Jones,G.R.:UnderstandingandManagingOrganizationalBehaviour,PearsonEducation.
2.	Berg,G.J.&Baron,R.A.:BehaviourinOrganization.PrenticeHallofIndia
3.	Mcshane,S.L.,VonGlinow,M.A.&Sharma,R.R.:OrganizationalBehaviour.TataMcGrawHill
4.	Pierce,J.L.&Gardner,D.G.:ManagementandOrganizationalBehavior.CengageLearning
5.	Robbins,S.P.,Judge,T.A.&Sanghi,S.:OrganizationalBehaviour.PearsonEducation
6.	Schermerhorn, J:Organizational Behaviour, Wiley &Sons.

MOOC/ Certification Courses:

1	http://www.sxccal.edu/TwinningProgramme/downloads/MBAManagementConceptsOrganisationalBehaviour-1stYear.pdf
2	http://www.ddegjust.ac.in/studymaterial/mcom/mc-101.pdf
3	https://easynotes4u.com/management-process-organizational-behaviour-notes/

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications	Branch/Spec.	Master of Computer Applications
Semester	Generic Elective	Version	1.0.0.0

Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MGET-01(4)	Subject Name	Foundation of Mathematics		

Teaching scheme

Teaching scheme (Per week)	Lecture		Practical (Lab.)		Total	Examination scheme (Marks)	CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

The main aims of this course are to prepare the students to develop and understand the mathematical foundations and create mathematical arguments require in learning many mathematics and computer sciences courses. To motivate students how to solve practical problems using discrete mathematics. Also, in this course basic concepts of Graph theory such as Trees, Regular Graph, Eulerian Graphs, Vertex colourings *to inculcate skill, provide employability & entrepreneurship skill*.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Develop ability to understand of set and groups and their properties and develop ability to understand of functions and their properties and demonstrate an understanding of relations and be able to determine their properties *for skill development and employability*.

CO2: Apply the concept of vector for evaluating directional derivatives, tangent and normal planes, line, surface and volume integrals *for skill development*.

CO3: Familiar with different type of graphs and trees and demonstrate different traversal methods for trees and Graphs *for skill development and employability*.

CO4: Familiar with the matrix and its types and perform the matrix operations of addition, multiplication, transposition, inverse , system of simultaneous linear equations in matrix form *for skill development.*

CO5: Develop the ability to use the Cay ley Hamilton theorem and Linear dependency and Independency of vector *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	1	1	2	2	2	1	1
CO2	1	2	3	2	3	2	1	1	2	1	1	2
CO3	3	2	1	2	1	2	2	1	1	3	1	1
CO4	1	2	1	1	1	2	3	1	1	2	1	2
CO5	2	1	1	1	2	1	2	1	1	2	1	3

Pre-requisites:

✓ Basic knowledge of programming.

Content:

UNIT 1   (12 Sessions)

Sets, Set Operations, Relations, Classification of relations, Equivalence Relations, Closures of Relations, Matrix Representation of Relations, Partial Ordering, n-ary Relations, Functions *for skill development and employability*.

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UNIT 2   **(10 Sessions)**

Vector Calculus: Point functions, Gradient, Divergence and Curl of a vector and their properties, Line, Surface and Volume integrals, Green's, Stoke's and Gauss divergence theorems, Statements and problems (without proof) *for skill development.*

UNIT 3   **(10 Sessions)**

Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Directed Graph, Multigraph, Connected graph, Euler circuit and trail, Planar and Non-planar Graphs *for skill development and employability.*

UNIT 4   **(10 Sessions)**

Matrices : Introduction of matrices, Special type of matrices, Elementary row and column transformation, Adjoint& inverse of matrices , Rank of matrix, , Consistency of linear system of equations, Characteristic equation *for skill development.*

UNIT 5   **(10 Sessions)**

Cayley-Hamilton theorem, Eigen values and Eigen vectors, Linear dependency and Independency of vector, Diagonalisation of matrices *for skill development and employability.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

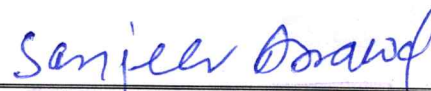|	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	1
CO3	3	3	2
CO4	3	2	1
CO5	3	3	2

Text Book:	
1.	Prasad C. Advanced Mathematics for Engineers, Prasad Mudralaya.
2.	B. S .Grewal, Engineering Mathematics, Khanna Publishers
3.	E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
4.	Olympia Nicodemi, "Discrete Mathematics" CBS Publication, Delhi
5.	S.K.Sarkar, " Discrete Mathematics" S. Chand Publication, New Delhi

MOOC/ Certification Courses:	
1	www.pdfdrive.com
2	www.dmi.gov.in
3	www.yourarticlelibrary.com
4	onlinecourses.nptel.ac.in
5	en.wikipedia.org

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	I		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MCAP-11		Subject Name	Computer Organization & Architecture Lab	

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	0	0	3	-	3	Theory			
Hours	0	0	3	-	3	Practical	30	70	100

Objective(s):

The objectives are to study
- ✓ To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- ✓ To prepare students to perform the analysis and design of various digital electronic circuits *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of Computer Basics & Digital Electronics.

Course Outcomes(COs):

After completing the subject, students should be able to:

CO1: After studying this course the students would gain enough knowledge Have a thorough understanding of the fundamental concepts and techniques used in digital electronics *for skill development and employability*.

CO2: To understand and examine the structure of various number systems and its application in digital design *for skill development and employability*.

CO3: The ability to understand, analyze and design various combinational and sequential circuits *for skill development and employability*.

CO4:Code conversion circuits – Binary to Gray & Vice-Versa *for skill development and employability*.

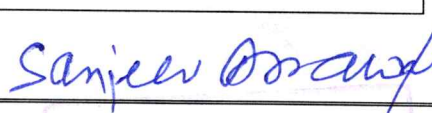CO5: Design of Sequential Counter with irregular sequences *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	1	1	1	1	1	1	1	1
CO2	2	1	1	1	1	1	2	1	1	1	2	1
CO3	3	2	2	1	3	1	1	1	1	1	1	1
CO4	2	1	2	2	1	2	1	1	2	1	1	1
CO5	3	2	1	2	2	1	2	1	1	1	2	2

Content: Program List

1. Realization of basic gates using Universal logic gates.
2. Code conversion circuits- BCD to Excess-3 and vice-versa.
3. Four-bit parity generator and comparator circuits.
4. Construction of simple Decoder and Multiplexer circuits using logic gates.
5. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer.
6. Construction of simple arithmetic circuits-Adder, Subtractor.
7. Realization of RS-JK and D flip-flops using Universal logic gates.
8. Realization of Universal Register using JK flip-flops and logic gates.
9. Realization of Universal Register using multiplexer and flip-flops.
10. Realization of Asynchronous Up/Down counter.
11. Realization of Synchronous Up/Down counter.
12. Realization of Ring counter and Johnson's counter.

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13. Construction of adder circuit using Shift Register and full Adder.
14. Code conversion circuits – Binary to Gray & Vice-Versa. (Innovative)
15. Design of Sequential Counter with irregular sequences. (Innovative)

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	2	2	1
CO5	2	3	2

Practical content:

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Computer Architecture (PHI) 1998 : M.M. Mano
2	Digital Electronics (TMH) 1998 : Malvino and Leach
3	Computer Organization and Architecture : William Stallings
4	Leventhal, L.A, "Introduction to Microprocessors", Prentice Hall of India
5	Mathur, A.P., "Introduction to Microprocessors" , Tata McGraw Hill
6	Rao,P.V.S., "Prospective in Computer Architechture" , Prentice Hall of India.

Reference Book:

1	Computer Organization: By Stallings.
2	Computer Architecture and Organization: By Hayes.
3	Computer Organization and Design by P. Pal Chaudhury.

MOOC/ Certification Courses:

1	http://nptel.iitm.ac.in
2	http://highered.mheducation.com/sites/0072465638/student_view0/index.html
3	https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/
4	https://www.geektonight.com/computer-organization-and-architecture-notes/
5	http://www.cs.iit.edu/~virgil/cs470/Book/

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications			Branch/Spec.	Master of Computer Applications	
Semester	I			**Version**	1.0.0.0	
Effective from Academic Year			2022-23	**Effective for the batch Admitted in**		2022
Subject code	MCAP-12		**Subject Name**	Data Structure Lab		

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total			TS/PS	TE/PE	Total
	L	TU	P	TW						
Credit	0	0	3	-	3	Theory				
Hours	0	0	-	-	3	Practical		30	70	100

Objective(s):

After completing the subject, students should be able to:
- ✓ The aim of this course is to provide students the theoretical knowledge needed to understand and analyze the behavior of different data structures *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of C programming.

Course Outcomes(COs):

After completing the subject, students should be able to:

CO1: Learn the basic types for data structure, implementation and application *for skill development and employability*.
CO2: Know the strength and weakness of different data structures *for skill development and employability*.
CO3: Use the appropriate data structure in context of solution of given problem *for skill development and employability*.
CO4: Develop programming skills which require solving given problem *for skill development and employability*.
CO5: Learn the Matrix representation of graphs *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)								3 strong, 2 medium, 1 weak				
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	1	1	1	2	1	1	2
CO2	1	3	2	2	2	1	2	1	2	2	1	1
CO3	2	1	3	1	1	1	2	1	1	1	1	1
CO4	1	2	2	3	2	1	1	1	1	1	1	1
CO5	2	1	2	1	1	1	1	1	1	1	1	1

Content:(Units)

Topic 1: Sorting – Searching

- Write a program to implement Bubble Sort.
- Write a program to implement selection sort.
- Write a program to implement Quick Sort.
- Write a program to implement Insertion Sort.
- Write a program to implement Merge Sort.
- Write a program to implement Binary Search.

Topic 2: Arrays –Stacks-Recursion

- Write and test a function that transposes a square matrix.
- Write and test a recursive function that prints all the permutations of the first n characters of a string.
- Write and test a recursive function that returns the power xn
- Write a program to implement a stack of strings (illustrate the operations push (), pop(), size(), empty() and top()).
- Write a program to show the linked implementation of the Stack class.
- Write a program to covert infix to postfix.
- Write a program to implement Towers of Hanoi using Stack. Queues-Linked-Lists

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- Write a program to implement a linear list and perform the operation such as insert(), search() and delete().
- Write a program to implement a queue by adding the functions such as (i) Determine the size (ii) input queue (iii) output a queue (iv) split a queue into two queues
- Write a program to search a circular linked list with a header node.

Topic 3: Binary Trees - Binary Tree Traversal
- Write a program to implement Binary Search Tree.
- Priority queue implementation.
- Write a program to create a binary tree and find the height of a binary tree.
- Write a program to perform the binary tree traversals.
- Write a program to perform a deletion from a Binary Tree (using a delete () function).

Topic 4: Graphs
- Matrix representation of graphs
- DFS traversal
- BFS traversal

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	2
CO3	2	3	2
CO4	3	3	1
CO5	3	3	2

Practical content
List of programs specified by the subject teacher based on above mentioned topics.

Text Book:
1	Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub, 6 th Edition.
2	How to Program C++ by Paul Deitel , Harvey Deitel, Prentice Hall; 8 edition.
3	Theory & Problems of Data Structures by Jr. SymourLipschetz, Schaum's outline by TMH 2006,Special Indian Edition.

Reference Books:
1	Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
2	Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 1983,AW, 1st Edition.
3	Data Structures and Program Design in C By Robert Kruse, PHI, 2nd Edition.

MOOC/ Certification Courses:
1	http://www.cs.yale.edu/homes/aspnes/classes/223/notes.pdf
2	http://masterraghu.com/subjects/Datastructures/ebooks/rema%20thareja.pdf
3	https://www.geektonight.com/data-structures-and-algorithms-notes/

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	II		**Version**	1.0.0.0	
Effective from Academic Year		2022-23	**Effective for the batch Admitted in**		2022
Subject code	MCACC-21		**Subject Name**	Computer Network	

Teaching scheme (Per week) | **Examination scheme (Marks)**

(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):
- ✓ Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- ✓ Acquire knowledge of Application layer and Presentation layer paradigms and protocols.
- ✓ Study Session layer design issues, Transport layer services, and protocols.
- ✓ Gain core knowledge of Network layer routing protocols and IP addressing *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:
Basic knowledge of Computer Fundamental

Course Outcomes(COs):
After completing the subject, students should be able to:

CO1: Recognize the technological trends of Computer Networking *for skill development*.
CO2: Discuss the key technological components of the Network *for skill development and employability*.
CO3: Evaluate the challenges in building networks and solutions *for skill development and employability*.
CO4: To Understand the Transport Layer *for skill development and employability*.
CO5: To Understand the Application Layer, Cryptography and Network, Security and multimedia and compression Techniques *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	3	1	2	1	2	1	1	3
CO2	1	2	2	1	2	1	1	2	2	1	2	2
CO3	3	1	1	2	1	2	2	1	1	2	1	1
CO4	3	1	1	1	1	1	1	1	1	1	1	1
CO5	2	2	1	1	2	1	1	1	1	1	1	1

Content:(Units)

Unit-I: (8 Session)
Introduction: Uses of networks (goals and applications), OSI reference model, and its Evolution, TCP/IP model, Example Network- Novell Netware, ARPANET, NSFNET, The Internet, Different type of networks, LAN, MAN, WAN Topologies used in the Networks, Physical Layer- transmission, switching methods, Integrated services digital networks *for skill development*.

Unit-II: (8 Session)
Medium access sub layer: Channel allocations, LAN protocols, ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, Ethernet, FDDI, Data Link Layer- basic design issues, error correction & detection algorithms, elementary data link layer protocols, sliding window protocols, error handling, HDLC, SDLC *for skill*

development and employability.

Unit-III: (8 Session)

Network Layer: Network layer design issue, shortest path routing, Flooding, Flow-based routing Broadcast routing, Congestion control and prevention policies; Internetworking connectionless internetworking, tunneling Internet work, Routing, Fragmentation, Firewall, IP address, Internet Controls Protocols *for skill development and employability.*

Unit-IV: (8 Session)

Transport Layer: Design issues, connection management, Internet Transport Protocol (UDP), Ethernet transport Protocol *for skill development and employability.*

Unit-V: (8 Session)

Application Layer: Domain Name System, SNMP, E mail, FTP, HTTP, Introduction to Cryptography and Network Security (DES, RSA algorithms), Communication Security (IPSec, Firewalls), Authentication protocols such as authentication based on shared key (Diffie Helleman Key exchanger), Introduction to multimedia and compression Techniques *for skill development and employability.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	2
CO3	3	3	2
CO4	2	3	1
CO5	3	3	1

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Tanenbaum, A. S, Computer Networks. Prentice Hall of India, 3rd Edition.
2	Ross, Kurose, Computer Networking, Pearson Education, 3rd Edition..
3	Prakash C. Gupta, Data Communications, Prentice Hall of India, New Delhi, 1996.
4	Leon W. Couch-II, Modern Communication Systems, Prentice Hall of India, New Delhi, 1998.
5	Stallings William, Data and Computer Communications. Prentice Hall of India, 5th Edition
6	Forouzon, A. Behrouz, Data communications & Networking, McGraw Hill, 4th Edition

MOOC/ Certification Courses:

1	https://www.geeksforgeeks.org/computer-network-tutorials/
2	https://www.geeksforgeeks.org/computer-network-tutorials/
3	https://www.gatevidyalay.com/computer-networks/

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications			Branch/Spec.	Master of Computer Applications	
Semester	II			Version	1.0.0.0	
Effective from Academic Year		2020-21		Effective for the batch Admitted in		2020
Subject code	MCACC-22		Subject Name	Object Oriented Programming using Java		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	3	1	3	-	7	Theory	30	70	100
Hours	3	1	3	-	7	Practical	30	70	100

Objective(s):

The course should enable the students to:
- ✓ Understand the basic object-oriented programming concepts and apply them in problem solving.
- ✓ Illustrate inheritance concepts for reusing the program.
- ✓ Demonstrate on the multi-tasking by using multiple threads.
- ✓ Develop data-centric applications using JDBC.
- ✓ Understand the basics of java console and GUI based programming *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes(COs):

After completing the subject, students should be able to:

CO1: Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs *for skill development and employability.*

CO2: Read and make elementary modifications to Java programs that solve real-world problems *for skill development and employability.*

CO3: Validate input in a Java program *for skill development and employability.*

CO4: Identify and fix defects and common security issues in code *for skill development and employability.*

CO5: Learn about Java Servlets, basics and Introduction to Java Server pages *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	1	1	1	1	1	1	1	1
CO2	1	2	1	1	1	2	2	1	2	1	1	2
CO3	3	2	1	1	1	1	1	1	2	1	1	1
CO4	1	1	3	1	2	2	2	1	1	2	1	1
CO5	2	1	1	1	1	2	1	1	1	2	1	2

Content:(Units)

Unit-I :   (8 Session)

Internet: Internet, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing *for skill development and employability*.

Unit- II: (8 Session)

Core Java: Introduction, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling, Introduction to AWT, AWT controls, Layout managers, Menus, Images, Graphics *for skill development and employability*.

Unit-III : (8 Session)

Java Swing: Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.

JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database *for skill development and employability*.

Unit-IV : (8 Session)

Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB), Introduction to RMI (Remote Method Invocation): A simple client-server application using RMI *for skill development and employability*.

Unit-V: (8 Session)

Java Servlets: Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servlets, HTTP Redirects, Cookies, Introduction to Java Server pages (JSP).

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	2	2	1
CO4	3	3	2
CO5	3	3	2

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Margaret Levine Young, "The Complete Reference Internet", TMH
2	Naughton, Schildt, "The Complete Reference JAVA2", TMH
3	Balagurusamy E, "Programming in JAVA", TMH
4	Dustin R. Callway, "Inside Servlets", Addison Wesley

Reference Books:

1	"Introduction to Programming with Greenfoot: Object-Oriented Programming in Java with Games and Simulations" by Michael Kolling.
2	"Modular Programming in Java 9" by Koushik Kothagal.
3	Mark Wutica, "Java Enterprise Edition", QUE
4	Steven Holzner, "Java2 Black book", dreamtech

MOOC/ Certification Courses:

1	http://index-of.es/Java/Object%20oriented%20Programming%20and%20java.pdf.
2	https://beginnersbook.com/2013/04/oops-concepts/
3	https://www.cl.cam.ac.uk/teaching/0910/OOProg/OOP.pdf
4	https://nptel.ac.in/courses/106/105/106105191/
5	https://onlinecourses.nptel.ac.in/noc19_cs84/preview
6	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs08/

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	II		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MCACC-23	Subject Name	Software Engineering		

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total			CE	SEE	Total
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory		30	70	100
Hours	3	1	-	-	4	Practical		-	-	-

Objective(s):

After completing the subject, students should be able to:
- ✓ To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- ✓ To explain methods of capturing, specifying, visualizing and analyzing software requirements.
- ✓ To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.
- ✓ To know basics of testing and understanding concept of software quality assurance and software configuration management process *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming

Course Outcomes(COs):

After completing the subject, students should be able to:

CO1: Basic knowledge and understanding of the analysis and design of complex systems *for skill development and employability.*

CO2: Ability to apply software engineering principles and techniques *for skill development and employability.*

CO3: Ability to develop, maintain and evaluate large-scale software systems *for skill development and employability.*

CO4: To produce efficient, reliable, robust and cost-effective software solutions *for skill development and employability.*

CO5: Ability to perform independent research and analysis and Hardware Reliability & Software Reliability *for skill development, employability and entrepreneurship development.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	2	2	2	1	1	3
CO2	1	2	2	2	2	2	1	2	2	1	1	2
CO3	3	1	1	2	1	2	1	1	1	2	1	1
CO4	1	2	2	1	1	1	1	1	1	2	2	1
CO5	2	1	1	1	2	1	1	1	1	1	2	1

Content:(Units)

Unit-I: (8 Session)

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models *for skill development and employability*.

Unit-II: **(8 Session)**

Requirement engineering, requirement elicitation techniques like FAST, QFD & Use case approach, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS. Size Estimation like lines of Code & Function Count, Cost Estimation Models, Static single & Multivariable Models, COCOMO *for skill development and employability*.

Unit-III: **(8 Session)**

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Cohesion & Coupling, Classification of Cohesiveness & Coupling, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design, User Interface Design *for skill development and employability*.

Unit-IV: **(8 Session)**

Software Testing: Testing process, Design of test cases, functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Path Testing, Data flow and mutation testing, Unit Testing, Integration and System Testing, Debugging, Alpha & Beta Testing, Regression Testing, Testing Tools & Standards *for skill development and employability*.

Unit-V: **(8 Session)**

Software Reliability: Importance, Hardware Reliability & Software Reliability, Failure and Faults, Reliability Models, Basic Model, Logarithmic Poisson Model, Calendar time Component. Software Quality Assurance (SQA): Verification and Validation, ISO 9000 Models, SEI-CMM Model *for skill development, employability and entrepreneurship development*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	2	3	2
CO5	3	2	3

Text Book:
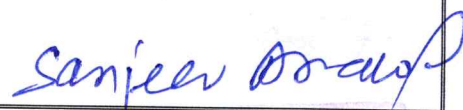
1	R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2	Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3	K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4	Pankaj Jalote, Software Engineering, Wiley
5	Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6	Ian Sommerville, Software Engineering, Addison Wesley.

MOOC/ Certification Courses:

1	https://www.tutorialspoint.com/software_engineering/index.htm.
2	https://www.javatpoint.com/software-engineering-tutorial.
3	https://www.geeksforgeeks.org/software-engineering/

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications						Branch/Spec.	Master of Computer Applications		
Semester	II						Version	1.0.0.0		
Effective from Academic Year			2022-23				Effective for the batch Admitted in			2022
Subject code	MCACC-24		Subject Name				Database Management Systems			

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total			TS/PS	TE/PE	Total
	L	TU	P	TW						
Credit	3	1	3	-	7	Theory		30	70	100
Hours	3	1	3	-	7	Practical		30	70	100

Objective(s):

The course should enable the students to:
- ✓ Understand the basic concepts and the applications of database systems.
- ✓ Master the basics of SQL and construct queries using SQL
- ✓ Understand the relational database design principles.
- ✓ Familiar with the basic issues of transaction processing and concurrency control.
- ✓ Familiar with database storage structures and access techniques *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Master the basic concepts and appreciate the applications of database systems *for skill development and employability*.

CO2: Master the basics of SQL and construct queries using SQL *for skill development and employability*.

CO3: Be familiar with the relational database theory, and be able to write relational algebra expressions for queries *for skill development and employability*.

CO4: Master the basics of query evaluation techniques and query optimization *for skill development and employability*.

CO5: Be familiar with the basic issues of transaction processing and concurrency control and Database Migration *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	1	1	2	1	1	1	1	1
CO2	2	2	2	1	1	2	1	1	1	1	1	2
CO3	2	1	2	2	2	1	2	1	2	2	1	1
CO4	2	1	2	1	1	1	1	2	1	2	1	2
CO5	1	2	1	2	1	1	2	1	2	2	2	1

Content:(Units)

Unit- I : (8 Session)

Introduction: An overview of database management system, Database System Vs File System, Database system concepts and architecture, Data definitions language, DML, Overall Database Structure. Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys *for skill development and employability*.

Unit- II : (8 Session)

Relational data Model, integrity constraints, entity integrity, referential integrity, Keys constraints.Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions,

Insert, update and delete operations, Joins, Sequences, Synonyms, Indexes, Unions, Intersection, Minus, Cursors in SQL. PL/SQL, Triggers and cursors, Procedures and Packages *for skill development and employability*.

Unit- III :   **(8 Session)**

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design. Transaction Processing Concepts: Transaction system, Testing of Serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log-based recovery, checkpoints, deadlock handling. Performance Tuning, Database Security Management *for skill development and employability*.

Unit- IV: **(8 Session)**

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation-based protocol, multiple granularity, Recovery with concurrent transaction *for skill development and employability*.

Unit- V: **(8 Session)**

Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database. Backup and Recovery Solutions including RMAN, Database Migration *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	3	2
CO4	2	3	2
CO5	3	3	2

Practical content:

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Date C J, "An Introduction To Database System", Addision Wesley
2	Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
3	Elmasri, Navathe, "Fundamentals Of Database Systems", Addision Wesley
4	Paul Beynon Davies, "Database Systems", Palgrave Macmillan
5	Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication

Reference Books:

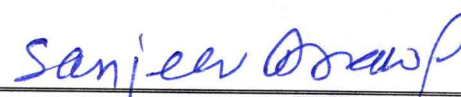| 1 | Database systems, 6th edition, RamezElmasri, ShamkantB.Navathe, Pearson Education. |
| 2 | Database Systems Design, Implementation, and Management, Peter Rob & Carlos Coronel, 7th Ed. |
| 3 | Fundamentals of Database Systems, ElmasriNavrate, Pearson Education |

MOOC/ Certification Courses:

1.	https://onlinecourses.nptel.ac.in/noc18_cs15/preview
2.	http://nptel.ac.in/courses/106106093/
3.	http://nptel.ac.in/courses/106106095/
4.	https://www.youtube.com/watch?v=EUzsy3W4I0g
5.	https://www.youtube.com/playlist?list=PL52484DF04A264E59

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	II		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-01(1)		Subject Name	Computer Graphics and Animation	

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total	
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory	30	70	100	
Hours	3	1	-	-	4	Practical	-	-	-	

Objective(s):

After completing the subject, students should be able to:
- ✓ To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
- ✓ To learn the basic principles of 3- dimensional computer graphics.
- ✓ Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
- ✓ Provide an understanding of mapping from a world coordinate to device coordinates, clipping, and projections *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of C and C++ programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Understand the basic objectives and scope of computer graphics *for skill development and employability*.
CO2: Identify computer graphics applications common graphics APIs *for skill development and employability*.
CO3: Understand the basic structures of 2D and 3D graphics systems *for skill development and employability*.
CO4: Construct transforms including translation, rotation, scaling, shearing, and reflection *for skill development and employability*.
CO5: To Understand the 3D Graphics *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	1	2	1	2	1	3	1
CO2	1	3	1	2	1	1	1	2	3	2	1	1
CO3	2	3	2	2	1	1	2	1	2	3	3	1
CO4	1	2	2	1	1	2	1	2	3	3	2	1
CO5	1	3	1	2	1	2	1	1	2	3	2	1

Content:(UNIT)

UNIT- I : (8 Session)

Graphics Primitives: Display Devices: Refresh Cathode Ray Tube, Raster Scan Display, Plasma display, Liquid Crystal display, Plotters, Printers. Input Devices: Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet, and Digitizing Camera. Input Techniques: Positioning techniques, Positioning Constraints, Scales & Guidelines, Rubber-Band techniques, Dragging, Pointing and Selection: the use of selection points, defining a boundary rectangle, multiple selections, Menu selection *for skill development and employability*.

UNIT-II : (8 Session)

Mathematics for Computer Graphics: Point representation, Vector representation, Matrices and operations

related to matrices, Scalar product of two vectors, Vector product of two vectors. Line Drawing Algorithms: DDA algorithms, Bresenham's Line algorithm. Segment & Display files *for skill development and employability*.

UNIT-III: (8 Session)
Graphics Operations: Introduction to Clipping, Point Clipping, Line Clipping, parametric line clipping algorithm (Cyrus Beck), Polygon Clipping. Filling: Inside Tests, Flood fill algorithm, Boundary-Fill Algorithm and scan-line polygon fill algorithm.
Curves and Surfaces: Parametric representation of curves, Spline & Bezier Representations: Interpolation Method, Bezier curves and surfaces *for skill development and employability*.

UNIT-IV: (8 Session)
Transformation: Basic Transformations, 2D Transformation, Composite Transformations, Reflection, Shearing, Transformation between coordinate systems, Basics of 3D transformations *for skill development and employability*.

UNIT-V: (8 Session)
3 D Graphics: 3D Display Methods, Projection, Parallel Projection, Perspective Projection. Animation: Introduction to Animation, Principles of Animation, Types of Animation, Animation and Flash Overview, Using Layer and Creating Animation *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	2	3	1
CO4	3	3	1
CO5	3	3	2

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:
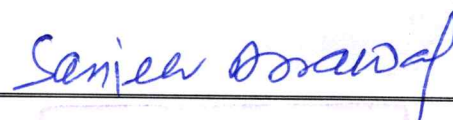
1	Donald Hearn and M. Pauline Baker, "Computer Graphics", PHI
2	Steven Harrington, "Computer Graphics: A Programming Approach", TMH
3	Prajapati A. K, "Computer Graphics", PPM Ed 2
4	Foley James D, "Computer Graphics", AW Ed 2
5	Newman and Sproul, "Principle of to Interactive Computer Graphics", McGraw Hill
6	Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
7	Rogers and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill

MOOC/ Certification Courses:

1	https://www.javatpoint.com/computer-graphics-animation
2	https://www.tutorialspoint.com/computer_graphics/computer_animation.htm
3	https://www.geeksforgeeks.org/computer-animation/
4	http://cs.wellesley.edu/~cs110/lectures/M01-color/graphics.pdf
5	https://www.javatpoint.com/computer-graphics-animation

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	II		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-01(2)		Subject Name	.Net Framework using C#	

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total			TS/PS	TE/PE	Total
	L	TU	P	TW						
Credit	3	1	3	-	7	Theory		30	70	100
Hours	3	1	3	-	7	Practical		30	70	100

Objective(s):

The course should enable the students to:

✓ Understand the basic concepts and the applications of database systems.
✓ Gain a thorough understanding of the philosophy and architecture of .NET
✓ Acquire a working knowledge of the .NET programming model and .NET Security
✓ Learn how to implement database applications using .NET
✓ Learn how to debug .NET applications using .NET diagnostic classes and tools *to inculcate skill, provide employability & entrepreneurship skill.*

Pre-requisites:

Basic knowledge of object oriented programming

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Use an integrated development environment to write, compile, run, and test simple object-oriented C# programs *for skill development and employability*.

CO2: Read and make elementary modifications to C# programs that solve real-world problems *for skill development and employability*.

CO3: Validate input in a C# program *for skill development and employability*.

CO4: Identify and fix defects and common security issues in code for *skill development and employability*.

CO5: Document a C# program using .Net. To understand the .Net Assemblies and Attribute *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	1	3	1	1	1	1	1	1	1
CO2	1	2	3	1	2	1	1	1	1	1	1	1
CO3	1	2	3	2	3	2	2	1	2	1	1	1
CO4	2	1	3	1	3	2	1	1	1	2	1	2
CO5	2	1	3	1	1	2	1	1	1	2	1	1

Content:(Units)

Unit-1: (8 Session)

The .Net framework: Introduction, The Origin of .Net Technology, components of the .Net architecture, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes *for skill development and employability*.

Unit-II: (8 Session)

C -Sharp Language (C#): Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings,

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Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion *for skill development and employability*.

Unit-III: (8 Session)

C# Using Libraries: Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling *for skill development and employability*.

Unit-IV: (8 Session)

Advanced Features Using C#: Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C# *for skill development and employability*.

Unit-V: (8 Session)

.Net Assemblies and Attribute: .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	2
CO3	3	2	1
CO4	3	3	1
CO5	3	3	2

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Wiley," Beginning Visual C# 2008",Wrox
2	Fergal Grimes," Microsoft .Net for Programmers". (SPI)
3	Balagurusamy," Programming with C#", (TMH)
4	Mark Michaelis, "Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education
5	ShibiParikkar, " C# with .Net Frame Work" , Firewall Media.

Reference Books:

1	S. ThamaraiSelvi and R. Murugesan —A Textbook on C# —, Pearson Education,2003
2	Stephen C. Perry — Core C# and .NET‖, Pearson Education,2006.
3	Thuan Thai and Hoang Q. Lam, —. NET Framework Essentials‖, Second Edition, O'Reilly, 2002.
4	Jesse Liberty, —Programming C#‖, Second Edition, O'Reilly Press, 2002.

MOOC/ Certification Courses:

1	https://sites.google.com/a/rku.ac.in/net_technologies/coursepack/clo
2	https://docs.microsoft.com/en-us/archive/msdn-magazine/2010/july/csharp-4-0-new-csharp-features-in-the-net-framework-4
3	https://dotnet.microsoft.com/learn/csharp
4	https://www.introprogramming.info/wp-content/uploads/2013/07/Books/CSharpEn/Fundamentals-of-Computer-Programming-with-CSharp-Nakov-eBook-v2013.pdf
5	http://www.sasurieengg.com/e-course-material/CSE/IV-Year%20Sem%207/CS2041%20-%20C%20Sharp%20and%20.NET%20Framework(CNF).pdf

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	II		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-01(3)	Subject Name	Software Testing & Quality Assurance		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

After completing the subject, students should be able to:
- ✓ Understand software testing and quality assurance as a fundamental component of software life cycle
- ✓ Define the scope of SW T&QA projects
- ✓ Efficiently perform T&QA activities using modern software tools *to inculcate skill, provide employability & entrepreneurship skill.*

Pre-requisites:

Basic knowledge of programming

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Estimate cost of a T&QA project and manage budgets *for skill development and employability*.

CO2: Prepare test plans and schedules for a T&QA project *for skill development and employability*.

CO3: Develop T&QA project staffing requirements *for skill development and employability*.

CO4: Effectively manage a T&QA project *for skill development and employability*.

CO5:To understand the Software Quality Assurance *for skill development, employability and entrepreneurship development.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	1	1	2	1	1	3
CO2	1	2	2	2	2	1	1	2	2	1	2	2
CO3	3	2	1	2	1	2	2	1	1	2	1	1
CO4	1	1	2	1	1	2	1	1	1	1	1	1
CO5	2	1	1	1	2	1	2	1	1	1	1	2

Content:

UNIT--1:
(8 Session)

Software Testing: Introduction, Meaning, What is Bug? Reasons of Bugs, Cost of Bugs, Software Tester Task. Introduction to Software Development Models Software Testing: Testing Axioms, Terms & Definitions, Testing Fundamentals: Types, Black Box, White Box, Static & Dynamic Testing. Static Black Box Testing. Dynamic Black Box Testing: Test to Pass & Test to Fail, Equivalence Partitioning, Data Testing, State Testing, , Other Black Box Testing Techniques *for skill development and employability*.

UNIT--II:
(8 Session)

Static White Box Testing: Formal Reviews, Peer Reviews, Coding Standards and Guidelines. Review Check List Dynamic White Box Testing: Comparison with Debugging, Testing Pieces: UNIT- & Integration Testing. Data Coverage & Code Coverage.

Configuration Testing: Overview, Software and Hardware Devices. Deciding Hardware Configurations. Compatibility Testing: Overview, Backward and Forward Compatibility. Testing Multiple versions. Data Sharing Compatibility User

Interface Testing: Effective UI, Testing for Disabled *for skill development and employability*.

UNIT--III: (8 Session)

Documentation Testing: Types of Documentation, Importance of Documentation Testing. Security Testing: Threat Modelling, Buffer Overrun, Safe String Functions, Computer Forensics

Web Site Testing: Web Page Fundamentals, Black Box Testing: Text, Hyperlinks, graphics, Forms. Gray Box Testing & White Box Testing, Configuration and Compatibility Testing *for skill development and employability.*

UNIT--IV: (8 Session)

Testing Tools: Benefits of Automation and Tools. Test Tools, Software Test Automation. Random Testing: Monkeys & Gorillas. Bug Bashes & Beta Testing: Test Sharing, Beta Testing, Outsourcing.

Planning Testing: Goals, Test phases, Strategy, Resource Requirements, Schedule, Test Cases, Bug Reporting, Metrics. Test Cases: Test Case Planning, Design, Cases, Procedures, Organization and Tracking. Bug Life Cycle and Tracking System *for skill development and employability*.

UNIT--V: (8 Session)

Software Quality Assurance: What is Quality? Testing and Quality Assurance in Workplace. Test Management Organizational Structures: CMM Capability Maturity Model, ISO 9000 *for skill development, employability and entrepreneurship development.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	2
CO3	2	3	1
CO4	3	2	1
CO5	3	3	3

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:	
1	Software Testing And Quality Assurance-Theory and Practice, KshirasagarNakPriyadarshi Tripathy, John Wiley & Sons Inc,2008
2	Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Jeff Tian, John Wiley & Sons, Inc., Hoboken, New Jersey. 2005.
3	Software Quality Assurance - From Theory to Implementation, Daniel Galin, Pearson Education Ltd UK, 2004.
4	Software Quality Assurance, Milind Limaye, TMH ,New Delhi, 2011

MOOC/ Certification Courses:	
1	https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/SOFTWARE%20PROJECT%20MANAGEMENT.pdf
2	https://www.tutorialspoint.com/software_engineering/software_project_management.htm
3	https://www.srividyaengg.ac.in/coursematerial/CSE/104831.pdf

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	II		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-01(4)		Subject Name	Computer based numerical and Statistical Techniques	

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total			CE	SEE	Total
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory		30	70	100
Hours	3	1	-	-	4	Practical		-	-	-

Objective(s):
✓ The main aims of this course are to provide an introduction to a broad range of numerical methods and statistics for solving mathematical problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis, and use of these numerical methods, along with a rudimentary understanding of finite precision arithmetic and the conditioning and stability of the various problems and methods. This will help you choose, develop and apply the appropriate numerical and statistical techniques for your problem, interpret the results, and assess accuracy *to inculcate skill, provide employability & entrepreneurship skill*.

Course Objectives (COs):
After completing the subject, students should be able to:

CO1: Apply various interpolation methods and finite difference concepts *for skill development and employability*.

CO2: Work out numerical differentiation and integration whenever and wherever routine methods are not applicable *for skill development and employability.*

CO3: Apply numerical methods to find our solution of algebraic equations using different methods under different Conditions, and numerical solution of system of algebraic equations *for skill development and employability*.

CO4: Develop the ability to understand concepts of curve fitting and regression analysis *for skill development and employability.*

CO5: Familiar with test of significance and different type of test like chi-square test, F-test, student's t test *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	1	2	1	2	1	1
CO2	1	2	3	2	3	1	1	1	2	2	1	2
CO3	3	1	2	2	2	2	2	1	2	3	1	1
CO4	1	1	1	2	1	1	3	1	1	2	2	2
CO5	2	2	1	1	1	1	2	1	1	1	1	3

Pre-requisites:
Basic knowledge of programming and Statistics

Content:

UNIT 1:(8 Session)
Interpolation with Equal Intervals: Introduction, Forward differences, Backward differences, Differences tables, Shift operator, Newton's forward and Newton's Backward interpolation formulae *for employability.*
Central Differences Interpolation Formulae: Introduction, Gauss's forward and Gauss's backward interpolation formulae and Stirling's formula *for skill development.*
Interpolation with Unequal Intervals: Introduction, Divided differences, Divided difference table, Newton's

divided difference formula, Lagrange's interpolation formula and Lagrange's inverse interpolation formula *for skill development*.

UNIT 2:(8 Session)

Numerical Differentiation: Introduction, Derivatives of Newton's forward and Newton's backward interpolation formulae, Derivatives of Stirling's formula, Derivatives of Newton's divided difference formula.

Numerical Integrations: Introduction, General quadrature formula, Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule and Boole's rule *for skill development*.

Numerical Solution of Ordinary Differential Equations: Introduction, Picard's method, Taylor's series method, Euler's method, Runge–Kutta's fourth order methods *for skill development and employability* .

UNIT 3:(8 Session)

Solution of Simultaneous Algebraic Equations: Introduction, Gauss's elimination method and with pivoting, Gauss-Jordan Method, Jacobi's iteration method and Gauss- Seidal iteration method and Ill-Conditioned system of linear equations *for skill development*.

Solution of Algebraic and Transcendental Equations: Introduction, Bisection method, Regula-falsi method, Newton-Raphson method and its rate of convergence and Iteration method *for skill development and employability*.

UNIT 4:(8 Session)

Curve Fitting: Introduction, Principle of least squares, Fitting a straight line, Fitting of second degree parabolic curve, Exponential curve *for skill development*.

Regression Analysis: Regression, Linear regression, Lines of regression y on x and x on y, Regression coefficients, Properties of regression coefficients, Angle between two lines of regression *for skill development and employability*..

UNIT 5:(8 Session)

Test of Significance: Hypothesis, Statistical hypothesis, Null hypothesis, Alternative hypothesis, level of significance *for skill development*.

Student's 't' Test: t-test, Applications of t-test, Test the significance of sample mean, Testing the significance of the difference between the sample means and Paired t- test for difference of means, Assumptions for t-test.

F- Test: F-test for equality of population variances, Assumptions for F-test *for skill development*.

Chi–Square Test: Chi-square variate, Applications of chi-square test, Chi-square test for population variance, Chi-square test of Goodness of fit, Chi-square test for independence of attributes *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	2	1
CO3	3	2	1
CO4	3	3	2
CO5	3	3	2

Practical content			
List of programs specified by the subject teacher based on above mentioned topics.			
Text Book:			
1	Rajaraman V. : "Computer Oriented Numerical Methods", PHI		
2	Gupta & Malik : "Numerical Analysis",		
3	Grewal B. S.: "Numerical methods in Engineering and Science", Khanna Publishers, Delhi		

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4	Pradip Niyogi : "Numerical Analysis and Algorithms", TMH
5	Gupta S. C. & Kapoor V.K. : "Fundamentals of Mathematical Statistics", Sultan chand& Sons, Delhi.

MOOC/ Certification Courses:

1	www.pdfdrive.com
2	www.dmi.gov.in
3	www.yourarticlelibrary.com
4	onlinecourses.nptel.ac.in
5	en.wikipedia.org

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	II		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MCAP-21	Subject Name	Java Programming Lab		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	0	0	3	-	3	Theory			
Hours	0	0	-	-	3	Practical	30	70	100

Objective(s):

After completing the subject, students should be able to:
- ✓ To understand object-oriented programming concepts, and apply them in problem solving.
- ✓ To learn the basics of java Console, GUI based programming and networking programming *to inculcate skill, provide employability & entrepreneurship skill.*

Pre-requisites:

- Basic knowledge of computer fundamentals
- Student must have knowledge of some programming languages (such as C ,C++)

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Understanding of OOP concepts and basics of Java programming (Console and GUI based) *for skill development and employability.*

CO2: The skills to apply OOP and Java programming in problem solving *for skill development and employability.*

CO3: Should have the ability to extend his/her knowledge of Java programming further on his/her own *for skill development and employability.*

CO4: To implements a stack ADT that converts infix expression into postfix expression *for skill development and employability.*

CO5 To learnabout handle the mouse events and keyboard events *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak				
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	1	1	1	2	1	2	1	2
CO2	1	2	1	1	1	2	2	1	1	1	2	1
CO3	3	2	1	1	1	1	1	2	2	1	1	1
CO4	1	1	3	2	2	2	2	1	1	1	1	2
CO5	2	1	1	1	2	2	1	2	2	2	1	1

Content:(Units)

List of Programs:

1. Write a program to find the factorial of a given number.

2. Write a program to print numbers in sorting order.

3. Create a class Odometer that displays the number of kilometers a vehicle run. Give samples as trip information like number of kilometers travelled, fuel consumption per litre. The task is to find the mileage of the vehicle running at different samples of trip information.

4. Create a class Day that represents day, month and year of the calendar day. The class Day should be able to accept the date, update the date, and delete the date from a calendar list of activities. Create a class Time that represents hours, minutes, seconds of a clock. The class Time should accept the timeupdates the time, delete the time from a list of events created for a day using the Day Class.

5. Write a program on illustration of use of packages.

6. Write a program to implement interfaces.

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7. Write a program that implements a stack ADT that converts infix expression into postfix expression
8. Write a program to read a file and displays the file on the screen within line number before each line
9. Write a program to copy contents of a file into another file using File streams.
10. Write a program for handling Array Index OutofBounds Exception and Divide-by-zero Exception.
11. Write a program for custom exception creation.
12. Write a program on multi-threading showing how CPU time is shared among all the threads.
13. Write a program for Producer-Consumer problem using threads.
14. Write an applet that displays a simple message.
15. Write an applet to handle the mouse events and keyboard events.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	3	2
CO4	3	3	2
CO5	2	3	1

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Margaret Levine Young, "The Complete Reference Internet", TMH
2	Naughton, Schildt, "The Complete Reference JAVA2", TMH
3	Balagurusamy E, "Programming in JAVA", TMH
4	Dustin R. Callway, "Inside Servlets", Addison Wesley

Reference Books:

1	"Introduction to Programming with Greenfoot: Object-Oriented Programming in Java with Games and Simulations" by Michael Kolling.
2	"Modular Programming in Java 9" by Koushik Kothagal.
3	Mark Wutica, "Java Enterprise Edition", QUE
4	Steven Holzner, "Java2 Black book", dreamtech

MOOC/ Certification Courses:

1	http://index-of.es/Java/Object%20oriented%20Programming%20and%20java.pdf.
2	https://beginnersbook.com/2013/04/oops-concepts/
3	https://www.cl.cam.ac.uk/teaching/0910/OOProg/OOP.pdf
4	https://nptel.ac.in/courses/106/105/106105191/
5	https://onlinecourses.nptel.ac.in/noc19_cs84/preview
6	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs08/

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications			Branch/Spec.	Master of Computer Applications	
Semester	II			**Version**	1.0.0.0	
Effective from Academic Year		2022-23		**Effective for the batch Admitted in**		2022
Subject code	MCAP-22		**Subject Name**	Database Management System Lab		

Teaching scheme						Examination scheme (Marks)			
(Per week)	**Lecture**		**Practical(Lab.)**		**Total**		TS/PS	TE/PE	**Total**
	L	TU	P	TW					
Credit	0	0	3	-	3	Theory			
Hours	0	0	-	-	3	Practical	30	70	100

Objective(s):

After completing the subject, students should be able to:
- ✓ To emphasize the importance of normalization in databases.
- ✓ To facilitate students in Database design
- ✓ To familiarize issues of concurrency control and transaction management *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

At the end of the course the students are able to:

CO1: Apply the basic concepts of Database Systems and Applications for skill development and employability.

CO2: Use the basics of SQL and construct queries using SQL in database creation and interaction for skill development and employability.

CO3: Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system for skill development and employability.

CO4: Analyze and Select storage and recovery techniques of database system for skill development and employability.

CO5: Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger for skill development and employability.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	1	1	1	2	2	1	1	1
CO2	2	1	2	2	2	1	1	1	1	1	1	1
CO3	2	1	2	1	2	1	2	1	1	2	2	1
CO4	2	1	2	1	1	2	1	1	1	1	2	1
CO5	1	2	1	1	1	1	2	1	1	1	1	2

Content:(Units)

Experiment 1 Student should decide on a case study and formulate the problem statement.

Experiment 2 Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.) Note: Student is required to submit a document by drawing ER Diagram to the Lab teacher.

Experiment 3 Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys) Note: Student is required to submit a document showing the database tables created from ER Model.

Experiment 4 Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form

Experiment 5 Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables

Experiment 6 Practicing DML commands- Insert, Select, Update, Delete

Experiment 7 Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, CONSTRAINTS etc.

Experiment 8 Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi).

Experiment 9 Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.

Experiment 10 Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger

Experiment 11 Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure. Experiment 12 Cursors- Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	3	1
CO4	2	3	2
CO5	3	3	2

Practical content:

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Date C J, "An Introduction To Database System", Addision Wesley
2	Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
3	Elmasri, Navathe, "Fundamentals Of Database Systems", Addision Wesley
4	Paul Beynon Davies, "Database Systems", Palgrave Macmillan
5	Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication

Reference Books:

1	Database systems, 6th edition, RamezElmasri, ShamkantB.Navathe, Pearson Education.
2	Database Systems Design, Implementation, and Management, Peter Rob & Carlos Coronel, 7th Ed.
3	Fundamentals of Database Systems, ElmasriNavrate, Pearson Education

MOOC/ Certification Courses:

1.	https://onlinecourses.nptel.ac.in/noc18_cs15/preview
2.	http://nptel.ac.in/courses/106106093/
3.	http://nptel.ac.in/courses/106106095/
4.	https://www.youtube.com/watch?v=EUzsy3W4I0g
5.	https://www.youtube.com/playlist?list=PL52484DF04A264E59

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	III		**Version**	1.0.0.0	
Effective from Academic Year		2022-23	**Effective for the batch Admitted in**		2022
Subject code	MCACC-31		**Subject Name**	Data Science	

Teaching scheme						Examination scheme (Marks)			
(Per week)	**Lecture**		**Practical(Lab.)**		**Total**		**TS/PS**	**TS/PS**	**Total**
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

Students will try to learn:
- ✓ To provide an in-depth knowledge of the various libraries and packages required to perform data analysis, data visualization, web scraping and machine learning using python.
- ✓ To apply machine learning algorithms for big data analytics *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of computer programming.

Course Outcomes (COs):

CO1: Explain the roles and stages of data science projects for skill development and employability.
CO2: Describe the data structures provided by numpy library for arrays and vectorized computation *for skill development and employability.*
CO3: Explain data structures provided by pandas library for data analysis *for skill development and employability*.
CO4: Perform data wrangling, cleaning and transformation using python *for skill development and employability*.
CO5: Use matplotlib for plotting and visualizing the datasets and Demonstrate data aggregation and time series analysis using python programming Language *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	1	1	2	1	2	2	2
CO2	2	2	3	3	2	2	2	1	1	1	2	2
CO3	2	2	1	2	3	1	2	2	2	2	1	1
CO4	3	2	2	2	2	2	1	2	2	2	2	2
CO5	2	3	2	1	1	2	2	1	1	1	1	2

Content:(Units)

Unit: 1(8 Session)

INTRODUCTION TO DATA SCIENCE : Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation *for skill development and employability*.

Unit: 2(8 Session)

NUMPY BASICS: ARRAYS The NumPy ndarray: A Multidimensional Array Object – Universal Functions: Fast Element wise Array Functions – Data Processing Using Arrays *for skill development and employability*.

Unit: 3(8 Session)

VECTORIZED COMPUTATION AND PANDAS : File Input and Output with Arrays – Linear Algebra – Random Number Generation – Random Walks. Introduction to pandas Data Structures – Essential Functionality – Summarizing and Computing Descriptive Statistics – Handling Missing Data – Hierarchical Indexing – Other pandas Topics *for skill development and employability*.

Unit: 4(8 Session)

VECTORIZED COMPUTATION AND PANDAS : File Input and Output with Arrays – Linear Algebra – Random Number Generation – Random Walks. Introduction to pandas Data Structures – Essential Functionality – Summarizing and Computing Descriptive Statistics – Handling Missing Data – Hierarchical Indexing – Other pandas Topics *for skill development and employability*.

Unit: 5(8 Session)

Data loading, storage, and file formats & data wrangling: clean, transform, merge, reshape 9 hours data loading, storage, and file formats: reading and writing data in text format – binary data formats – interacting with html and web apis – interacting with databases data wrangling: clean, transform, merge, reshape combining and merging data sets – reshaping and pivoting – data transformation – string manipulation – usda food database.plotting and visualization *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	2
CO4	3	2	1
CO5	2	3	1

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	1.Wes McKinney, "Python for Data Analysis", O'Reilly Media.2012. 2. Sebastian Raschka, "Python Machine Learning",Packpub.com,2015 . 3. https://www.datacamp.com/courses/statistical-thinking-in-python-part-1.
2	Big Data Analytics with Rand Hadoop, VigneshPrajapati, PACKT Publishing

MOOC/ Certification Courses:

1	https://www.edx.org/learn/data-analysis
2	https://onlinecourses.nptel.ac.in/noc21_cs69/preview
3	https://nptel.ac.in/courses/106/106/106106212/

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications			Branch/Spec.	Master of Computer Applications	
Semester	III			Version	1.0.0.0	
Effective from Academic Year		2022-23		Effective for the batch Admitted in		2022
Subject code	MCACC-32		Subject Name	Python Programming		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

After completing the subject, students should be able to:
- ✓ Understand the objective of this course is to introduce Python programming language through its core language basics and program design techniques suitable for modern applications.
- ✓ And also to understand the wide range of programming facilities available in Python covering graphics, GUI, data visualization and Databases *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: To gain knowledge of basic python programming *for skill development and employability*.

CO2: Install and run the python language software for *skill development and employability*.

CO3: To develop proficiency in creating applications using python Programming Language *for skill development and employability*.

CO4: Understand the concepts of file I/O, Array, Function *for skill development and employability*.

CO5: To Understand the File Handling and Graphics Programming *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	1	2	1	2	1	2
CO2	1	1	2	2	2	2	1	2	2	1	1	3
CO3	3	2	2	2	1	1	1	1	1	2	1	1
CO4	1	1	1	1	1	2	1	1	1	1	1	1
CO5	2	1	1	1	2	1	2	2	1	1	2	2

Content:(Units)

Unit-I : (8 Session)

Python Programming: Overview of Python Programming Language, History of Python, Installation Pythone, writing and executing the first python program, Internal working of Python, Python character set, Token, Data type, Variables, Assignments, Formatting Number of Strings, Operators and Expression, **Decision statements:** Boolean type, Boolean Operators, Using Number and String with Boolean Operators, Boolean Expression and Relational Operators *for skill development and employability*.

Unit-II : (8 Session)

Decision Making Statements: Introduction, if Statements, if-else statements, nested if statements, multi-way if-elif-else statements, Conditional expression. **Loop Control Statements:** Introduction, The while Loop, for loop, nested loop, break statement, continues statement. **Function:** Introduction, Syntax and Basic of a function, use of a function, Parameter and Arguments in a function, Local and Global scope of a variable, Recursive function, Lamda function, range() function *for skill development and employability*.

Unit-III :   **(8 Session)**

Strings: Fundamental of strings, the str class, The inbuilt python function for strings, the index[] operator, Immutable strings, String Operators, String Operations. **List and Processing:** Introduction, Creating, Accessing, list slicing, inbuilt function for list, List Operators, List Methods, List and String, Parsing List to a function. **Searching and Sorting:** Searching Techniques, Linear search, Binary search, Fundamental of Sorting, Bubble sorting, selection Sort, Insertion Sort, Quick Sort, Merge Sort *for skill development and employability*.

Unit IV: **(8 Session)**

Object-Oriented Programming: Introduction, Defining Class, Self-parameter and Adding Methods to a Class, Display Class Attributes and Method, Accessibility, Passing an Object as Parameter to a Method, Method Overloading, Operator Overloading, Inheritance, Object Class. Tuples, Sets, and Dictionary in Python *for skill development and employability*.

Unit-V :   **(8 Session)**

File Handling: Introduction, Need of file Handling, text Input and Output, Binary Files, Accessing and Manipulating Files and Directories on a disk. **Graphics Programming:** Drawing and moving with Turtle Graphics, Drawing Basic Shape Using Iteration. Fundamentals of Errors and Exceptions, Database with Python, Applications of Python *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	3	2	1
CO5	2	3	2

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Programming and Problem Solving with PYTHON, by Ashok NamdevKamthane and Amit Ashok Kamthane, Mc Graw Hill Education.
2	Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
3	Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015.
4	Core Python Programming, Second Edition, by By Wesley J. Chun, Prentice Hall.

MOOC/ Certification Courses:

1	https://www.tutorialspoint.com
2	https://www.javatpoint.com
3	onlinecourses.nptel.ac.in
4	https://www.programiz.com

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications			Branch/Spec.	Master of Computer Applications	
Semester	III			Version	1.0.0.0	
Effective from Academic Year		2022-23		Effective for the batch Admitted in		2022
Subject code	MCACC-33		Subject Name	Theory of Automata & Formal Language		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		TS/PS	TE/PE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

After completing the subject, students should be able to:
✓ The aim of this course is to provide students the theoretical knowledge needed to understand and analyze the behavior of discrete computing systems *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Acquire a fundamental understanding of the core concepts in automata theory and formal languages *for skill development and employability*.

CO2: An ability to design grammars and automata (recognizers) for different language classes *for skill development and employability*.

CO3: Ability to identify formal language classes and prove language membership properties *for skill development and employability*.

CO4: Ability to prove and disprove theorems establishing key properties of formal languages and automata *for skill development and employability*.

CO5:To understand the Turing machines (TM) *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak				
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	2	2	1	1	1	2	3	2
CO2	2	3	3	2	1	2	1	2	1	1	1	2
CO3	2	3	2	1	2	1	1	1	1	2	2	2
CO4	2	2	2	2	3	2	2	1	2	1	1	1
CO5	2	2	2	2	1	1	2	2	1	2	2	2

Content:(Units)

UNIT – I : (8 Session)

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Non-deterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Myhill-Nerode Theorem *for skill development and employability*.

UNIT–II: (8 Session)

Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for

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Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non-Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA *for skill development and employability*.

UNIT–III: (8 Session)

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG,Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness, Pumping lemma for CFLs *for skill development and employability.*

UNIT–IV: (8 Session)

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA *for skill development and employability.*

UNIT–V: (8 Session)

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem *for skill development and employability.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	3	2
CO3	3	3	2
CO4	3	2	1
CO5	2	2	1

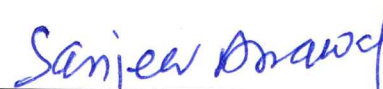| **Text Book:**	
1	Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
2	K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI
3	Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4	Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI
Reference Books:	
1	"Elements of the Theory of Computation" by Harry R Lewis and Christos H Papadimitriou
2	"Introduction to Automata Theory, Languages, and Computation" by John E Hopcroft and Jeffrey D Ullman
3	"Automata and Computability" by Dexter C Kozen
4	"Introduction to Languages and The Theory of Computation" by John Martin

MOOC/ Certification Courses:	
1	https://www.iitg.ac.in/dgoswami/Flat-Notes.pdf
2	https://www.tutorialspoint.com/automata_theory/automata_theory_tutorial.pdf
3	https://mrcet.com/downloads/digital_notes/IT/Formal%20Languages%20Automata%20Thery.pdf
4	https://www.ics.uci.edu/~goodrich/teach/cs162/notes/
5	https://nptel.ac.in/courses/106/103/106103070/
6	https://nptel.ac.in/courses/106/106/106106049/
7	https://nptel.ac.in/courses/111/103/111103016/

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	III		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-02(1)		Subject Name	Mobile Computing	

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total	
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory	30	70	100	
Hours	3	1	-	-	4	Practical	-	-	-	

Objective(s):

After completing the subject, students should be able to:
- ✓ Understand the basic problems, strengths and current trends of mobile computing with the explanation of current wireless networking mechanisms to create novel mechanisms and systems for supporting mobile computing *to inculcate skill, provide employability & entrepreneurship skill.*

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Explain the principles and theories of mobile computing technologies *for skill development and employability.*

CO2: Describe infrastructures and technologies of mobile computing technologies *for skill development and employability.*

CO3: List applications in different domains that mobile computing offers to the public, employees, and businesses *for skill development and employability.*

CO4: Describe the possible future of mobile computing technologies and applications *for skill development and employability.*

CO5: Effectively communicate course work through written and oral presentations *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak				
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	3	3	2	2	1	1	1	2	2
CO2	3	3	2	2	1	1	3	1	1	2	1	1
CO3	2	1	3	1	2	3	2	2	1	1	3	2
CO4	2	2	1	2	3	1	3	1	2	1	1	2
CO5	1	1	3	1	2	2	1	1	2	2	1	2

Content:

UNIT--I: (8 Session)

Issues in Mobile Computing, Wireless Telephony, Digital Cellular Standards, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS *for skill development and employability.*

UNIT- II: (8 Session)

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications *for skill development and employability.*

UNIT- III : (8 Session)

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless

networks, File system, Disconnected operations *for skill development and employability.*

UNIT- IV : (8 Session)

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment *for skill development and employability.*

UNIT- V : (8 Session)

What is Ad-hoc Network? , Problems with Message Routing in Wireless Ad-hoc Mobile Networks, Routing scheme based on signal strength, Dynamic State Routing (DSR), Route Maintenance and Routing error, Fisheye Routing (FSR), Ad-hoc on Demand Distance Vector (AODV) *for skill development and employability.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	3	2	2
CO5	2	3	1

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Shambhu Upadhyaya, Abhijeet Chaudhary, Kevin Kwiat, Mark Weises, "Mobile Computing", Kluwer Academic Publishers
2	UWE Hansmann, Lothar Merk, Martin-S-Nickious, Thomas Stohe, "Principles of Mobile Computing", Springer International Edition

MOOC/ Certification Courses:

1	https://www.tutorialspoint.com
2	https://www.javatpoint.com
3	onlinecourses.nptel.ac.in
4	https://www.programiz.com

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	III		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-02(2)	Subject Name	Natural Language Processing		

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total	
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory	30	70	100	
Hours	3	1	-	-	4	Practical	-	-	-	

Objective(s):

After completing the subject, students should be able to:
- ✓ This course introduces the fundamental concepts and techniques of natural language processing(NLP).
- ✓ Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguisticinformation.
- ✓ The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:
Basic knowledge of programming.

Course Outcomes (COs):
After completing the subject, students should be able to:

CO1: Understand approaches to syntax and semantics in NLP *for skill development and employability*.

CO2: Understand approaches to discourse, generation, dialogue and summarization within NLP *for skill development and employability*.

CO3: Understand current methods for statistical approaches to machine translation *for skill development and employability*.

CO4: Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars, clustering and unsupervised methods, log-linear and discriminative models, and the EM algorithm as applied within NLP *for skill development and employability*.

CO5:To Understand the Context and World Knowledge *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	2	1	1	1	1	1	1	1
CO2	1	2	3	1	2	1	1	1	2	2	1	2
CO3	1	1	1	1	1	2	3	1	1	1	2	1
CO4	2	1	2	3	1	1	1	1	1	2	1	1
CO5	1	2	3	3	2	1	1	2	1	1	1	1

Content:(UNITS)

UNIT--I: (8 Session)

Introduction to Natural Language Understanding, Language as a knowledge base process, Processing Indian Languages, Basic linguistics *for skill development and employability*.

UNIT--II: (8 Session)

Morphology - Types and Parsing, N-gram Model, Maximum Likelihood Estimation, Smoothing techniques on N-gram Model, Words and Word Classes, POS Tagging

Grammar and Parsing - Top Down Parsing, Bottom-up Parsing, Dependency Grammar, Parsing Indian

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Languages *for skill development and employability.*

UNIT—III : (8 Session)

Meaning Representation, First Order Predicate Calculus, Elements of FOPC, Semantics and FOPC, Syntax Driven Semantic Analysis, Principle of Compositionally, Semantic Augmentation of CFG Rules, Robust Semantic Analysis, *for skill development and employability.*

UNIT--IV: (8 Session)

Introduction to Semantic Grammar, Structure of Words, Thematic Roles, Word Sense Disambiguation - Selectional Restrictions, Machine Learning Approaches, Dictionary Based Approaches *for skill development and employability*

UNIT--V: (8 Session)

Context and World Knowledge, Knowledge Representation and Reasoning, Discourse and World Knowledge, Cohesion, Reference Resolution, Various Resolution Algorithms, Discourse Coherence, Coherence Relations, Language Learning *for skill development and employability.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	1
CO3	3	3	2
CO4	3	2	1
CO5	2	2	1

Text Book:

1	James Allen, Natural Language Understanding, 2nd Edition, Pearson Education India, 1995.
2	Akshar Bharti, VineetChaitanya and Rajeev Sangal, Natural Language Processing: A PaninianPerspective, Prentice Hall of India, 1995.
3	Christopher D. Manning and HinrichSchütze, Foundations of Statistical Natural Language Processing, MITPress, 1999.
4	Lucja M Iwanska and Stuart C Shapiro, Natural Language Processing and Knowledge Representation,Universities Press India, 2001.
5	Daniel Jurafsky and James H Martin, Speech and Language Processing, Pearson Education India,2000.

MOOC/ Certification Courses:

1	https://www.cl.cam.ac.uk/teaching/2002/NatLangProc/nlp1-4.pdf
2	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_natural_language_processing.htm
3	https://www.cse.iitb.ac.in/~cs626-460-2012/
4	https://github.com/jacobeisenstein/gt-nlp-class/blob/master/notes/eisenstein-nlp-notes.pdf
5	https://www.cl.cam.ac.uk/teaching/2002/NatLangProc/nlp1-4.pdf

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	III		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-02(3)		Subject Name	Internet of Things	

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total			CE	SEE	Total
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory		30	70	100
Hours	3	1	-	-	4	Practical		-	-	-

Objective(s):

After completing the subject, students should be able to:
- ✓ The aim of this course is to provide students the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Describe what IoT is and how it works today for skill development and employability.

CO2: Recognize the factors that contributed to the emergence of IoT *for skill development and employability*.

CO3: Design and program IoT devices 4. Use real IoT protocols for communication *for skill development and employability*.

CO4: Secure the elements of an IoT device and Design an IoT device to work with a Cloud Computing infrastructure *for skill development and employability*.

CO5: Transfer IoT data to the cloud and in between cloud providers and Developing IoTs Introduction to Python *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	2	1	1	1	1	2	1	1	2
CO2	1	2	1	2	1	2	1	2	2	1	1	2
CO3	2	1	2	2	1	1	2	1	1	2	1	1
CO4	1	2	1	1	2	2	1	1	1	1	1	1
CO5	2	1	1	2	1	2	1	1	1	1	1	1

Content:

UNIT-I: (8 Session)

Introduction to IoT Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs *for skill development and employability.*

UNIT-II : (8 Session)

IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network *for skill development and employability.*
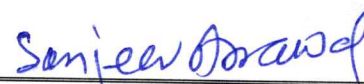
UNIT-III: (8 Session)

Network & Communication aspects Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

Challenges in IoT Design challenges, Development challenges, Security challenges, Other challenges *for skill development and employability.*

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UNIT-IV: (8 Session)

Domain specific applications of IoT Home automation, Industry applications, Surveillance applications, Other IoT applications *for skill development and employability.*

UNIT-V: (8 Session)

Developing IoTs Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python *for skill development and employability.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	3	3	2
CO4	2	3	1
CO5	3	3	1

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

| 1 | Vijay Madisetti, ArshdeepBahga, "Internet of Things: A Hands-On Approach" 2. Waltenegus |
| 2 | Dargie,ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" |

MOOC/ Certification Courses:

1	https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT
2	https://www.i-scoop.eu/internet-of-things-guide/
3	https://www.cisco.com/c/en/us/solutions/internet-of-things/overview.html
4	https://www.oracle.com/in/internet-of-things/what-is-iot.html

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications			Branch/Spec.	Master of Computer Applications		
Semester	III			Version	1.0.0.0		
Effective from Academic Year		2022-23		Effective for the batch Admitted in			2022
Subject code	MDSET-02(4)		Subject Name	Client Server Computing			

Teaching scheme

(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

After completing the subject, students should be able to:
- ✓ This Subject deals with the C/S Computing, GUI.
- ✓ To apply the techniques and features of a client/server development language to construct a moderately complex client/server application.
- ✓ To learn the advantages of client-server systems over monolithic systems *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Understand fundamental concepts of Web Services including: Client Server systems, system models of distributed systems, networks that distributed systems run on, communication protocols between processes in distributed systems, Middleware, Enterprise Application integration, and Web Services Security *for skill development and employability*.

CO2: To Compile and execute actual programs using sockets, Java RMI, Java Beans, and Web Services *for skill development and employability*.

CO3: To understand the Client/Server Network connectivity and communication interface technology *for skill development and employability*.

CO4: To understand the Data Storage, magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk *for skill development and employability*.

CO5: To learn the Client/Server System Development and raining, Training advantages of GUI Application *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)								3 strong, 2 medium, 1 weak				
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	2	2	2	2	2	1	1
CO2	3	3	2	1	3	1	1	3	1	1	1	2
CO3	2	1	2	2	2	2	1	1	2	2	1	3
CO4	1	1	3	1	1	1	1	1	1	1	1	1
CO5	2	2	1	1	1	1	1	1	1	1	1	3

Content:

UNIT I: (8 Session)

Client/Server Computing: DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing *for skill development and employability*.

UNIT II: (8 Session)

Components of Client/Server application: The client: services, request for services, RPC, windows services, fax, print

services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA). The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system **for skill development and employability**.

UNIT III: (8 Session)

Client/Server Network: connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing UNIT, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware **for skill development and employability**.

UNIT IV: (8 Session)

Data Storage: magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards. Network protection devices, Power Protection Devices, UPS, Surge protectors. Client Server Systems Development: Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Disk, Remote Systems Management Security, LAN and Network Management issues **for skill development and employability**.

UNIT V : (8 Session)

Client/Server System Development: Training, Training advantages of GUI Application, System Administrator is training, Database Administrator training, End-user training. The future of client server Computing Enabling Technologies, The transformational system **for skill development and employability**.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	1
CO3	2	2	1
CO4	3	3	2
CO5	2	3	1

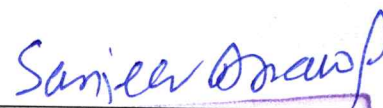| **Text Book:** | | |
|---|---|
| 1 | Patrick Smith &SteaveGuengerich, "Client / Server Computing", PHI |
| 2 | Dawna Travis Dewire, "Client/Server Computing", TMH |
| 3 | Majumdar & Bhattacharya, "Database management System", TMH |
| 4 | Korth, Silberchatz, Sudarshan, "Database Concepts", McGraw Hill |
| 5 | Elmasri, Navathe, S.B, "Fundamentals of Data Base System", Addison Wesley |

MOOC/ Certification Courses:	
1	https://www.tutorialspoint.com/Client-Server-Computing
2	https://pdfs.semanticscholar.org/fe8c/ca2f103875e09a3f7ca72e1542c4022f0729.pdf
3	https://lecturenotes.in/subject/1293/client-server-computing
4	https://www.technicalsymposium.com/CLIENT_SERVER_COMPUTING.html

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	III		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-03(1)	Subject Name	Cloud computing		

Teaching scheme

Teaching scheme (Per week)	Lecture		Practical(Lab.)		Total	Examination scheme (Marks)	CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

After completing the subject, students should be able to:
- ✓ The objective of this course is to provide the basic to understand the concept of cloud and utility computing, various issues in cloud computing, with the lead players in cloud and the emergence of cloud as the next generation computing paradigm *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Explain the core issues of cloud computing such as security, privacy, and interoperability *for skill development and employability*.

CO2: Choose the appropriate technologies, algorithms, and approaches for the related issues *for skill development and employability.*

CO3: Identify problems, and explain, analyze, and evaluate various cloud computing solutions *for skill development and employability.*

CO4: Provide the appropriate cloud computing solutions and recommendations according to the applications used *for skill development and employability.*

CO5: Attempt to generate new ideas and innovations in cloud computing *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	1	2	1	2	2	2	1	1
CO2	3	3	2	1	3	1	1	1	1	1	1	3
CO3	2	1	3	2	1	2	1	1	2	3	1	1
CO4	1	1	1	2	1	1	2	2	1	1	1	2
CO5	2	1	1	1	1	1	2	1	1	2	2	3

Content:

UNIT-I : (8 Session)

Introduction: Cloud-definition, benefits, usage scenarios, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing- issues in Clouds - Eucalyptus - Nimbus - Open Nebula, Cloud Sim *for skill development and employability*.

UNIT-II: (8 Session)

Cloud Services: Types of Cloud services: Software as a Service-Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers-Google, Amazon, Microsoft Azure, IBM, Sales force *for skill development and employability*.

UNIT-III: (8 Session)

Collaborating Using Cloud Services: Email Communication over the Cloud - CRM Management - Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing –

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Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware *for skill development and employability*.

UNIT-IV: **(8 Session)**

Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vim, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - supervisors – Xen, KVM, VMware, Virtual Box, Hyper-V *for skill development and employability*.

UNIT-V: **(8 Session)**

Security, Standards and Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	2
CO3	2	3	1
CO4	3	3	1
CO5	3	3	1

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
2	Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3	Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing : A Practical Approach, Tata McGraw-Hill 2010.
4	Haley Beard, Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
5	G.J.Popek, R.P. Goldberg, Formal requirements for virtualizable third generation Architectures, Communications of the ACM, No.7 Vol.17, July 1974
6	James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.

MOOC/ Certification Courses:

1	https://www.tutorialspoint.com
2	https://www.javatpoint.com
3	onlinecourses.nptel.ac.in
4	https://www.programiz.com

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications				Branch/Spec.	Master of Computer Applications		
Semester	III				Version	1.0.0.0		
Effective from Academic Year		2022-23			Effective for the batch Admitted in			2022
Subject code	MDSET-03(2)		Subject Name		Digital Image Processing			

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

After completing the subject, students should be able to:
- ✓ Describe and explain basic principles of digital image processing.
- ✓ Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
- ✓ Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
- ✓ Assess the performance of image processing algorithms and systems *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Understand the Introduction to Digital Image Processing and need for image transforms different types of image transforms and their properties *for skill development and employability*.

CO2: Develop any image processing application *for skill development and employability*.

CO3: Understand the rapid advances in Machine vision and Image Restoration *for skill development and employability*.

CO4: Learn different techniques employed for the enhancement of images and Introduction to Image Compression *for skill development and employability.*

CO5: Learn different causes for image degradation and overview of image restoration techniques. Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak				
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	2	1	2	1	2	1	1
CO2	1	2	3	1	3	1	1	1	2	1	1	2
CO3	3	1	2	2	2	2	1	1	2	3	1	1
CO4	1	1	1	2	1	2	3	2	1	1	1	2
CO5	2	2	1	1	1	1	2	1	1	1	1	3

Content:

UNIT—I(8 Session)

Introduction to Digital Image Processing, Applications, Components of Image, Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization. Image Enhancement in Frequency Domain Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain *for skill development and employability*.

UNIT—II(8 Session)

Image Enhancement in Spatial Domain Introduction, Basic Gray Level Functions, Piecewise-Linear Transformation Functions, Contrast Stretching, Histogram Specification, Local Enhancement, Enhancement using Arithmetic/Logic Operations–Image Subtraction, Image Averaging, Basics of Spatial Filtering *for skill development and employability*.

UNIT--III: (8 Session)

Image Restoration, Noise Models, Restoration in the presence of Noise only-Spatial Filtering, Mean Filters, Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters, Median Filter, Max and Min filters, Periodic Noise Reduction by Frequency Domain Filtering, Bandpass Filters, Minimum Mean-square Error Restoration *for skill development and employability*.

UNIT—IV: (8 Session)

Introduction to Image Compression, Image compression model, Error-free compression, Lossy compression, Lossless predictive coding, Lossy predictive coding, transform coding, wavelet coding *for skill development and employability*.

UNIT--V:(8 Session)

Introduction to Image Segmentation, Detection of discontinuities, Edge linking and boundary detection, thresholding, region-based segmentation *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	2
CO3	3	3	2
CO4	2	3	1
CO5	3	3	1

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2	Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3	Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.
4	Digital Image Processing, by W.K. Prett, Addison Wesley.

MOOC/ Certification Courses:

1	http://www.vssut.ac.in/lecture_notes/lecture1423722885.pdf
2	https://www.iare.ac.in/sites/default/files/lecture_notes/DIP-LECTURE_NOTES.pdf
3	https://www.cs.nmt.edu/~ip/lectures.html
4	https://mrcet.com/downloads/digital_notes/ECE/IV%20Year/6.Digital%20Image%20Processing.pdf
5	http://www.vssut.ac.in/lecture_notes/lecture1423722885.pdf

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	III		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-03(3)	Subject Name	Big Data		

Teaching scheme

(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Examination scheme (Marks)

Objective(s):

After completing the subject, students should be able to:
- ✓ To Understand the Big Data challenges & opportunities, its applications
- ✓ Gain conceptual understanding of NOSQL Database.
- ✓ Understanding of concepts of map and reduce and functional programming
- ✓ Gain conceptual understanding of Hadoop Distributed File System *to inculcate skill, provide employability & entrepreneurship skill.*

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Understand the key issues in big data management and its associated applications in intelligent business and scientific computing *for skill development and employability*.

CO2: Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics *for skill development and employability*.

CO3: Interpret business models and scientific computing paradigms, and apply software tools for big data analytics *for skill development and employability.*

CO4: Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc. *for skill development and employability.*

CO5:To understand the Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	1	1	2	1	1	1	1	1
CO2	2	3	1	2	1	1	1	2	1	1	2	1
CO3	2	1	3	1	1	1	2	1	2	2	2	1
CO4	1	2	1	3	3	1	1	1	2	2	2	2
CO5	1	1	1	2	1	2	1	1	2	1	1	2

Content:
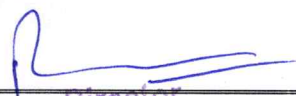
UNIT- I : (8 Session)

INTRODUCTION TO BIG DATA

Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce *for skill development and employability*.
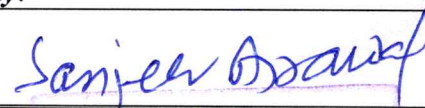
UNIT- II : (8 Session)

INTRODUCTION HADOOP

Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization *for skill development and employability*.

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UNIT-- III : (8 Session)

HADOOP ARCHITECTURE

Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance *for skill development and employability*

UNIT--IV : (8 Session)

HADOOP ECOSYSTEM AND YARN

Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New FeaturesNameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN *for skill development and employability*.

UNIT--V : (8 Session)

HIVE AND HIVEQL, HBASE Hive Architecture and Installation, Comparison with Traditional Database, HiveQL – Querying, Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase conceptsAdvanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	3	3	2
CO3	2	3	1
CO4	2	3	1
CO5	3	3	2

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

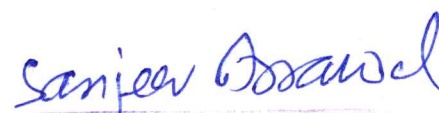**Text Book:**

1	Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2	Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
3	Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.
4	Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.

MOOC/ Certification Courses:

1	https://www.coursera.org/specializations/big-data
2	https://www.simplilearn.com/
3	https://www.upgrad.com/
4	https://www.onlinecourses.nptel.ac.in

Sanjeev Agarwal

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	III		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-03(4)		Subject Name	Deep Learning	

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total	
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory	30	70	100	
Hours	3	1	-	-	4	Practical	-	-	-	

Objective(s):

After completing the subject, students should be able to:
- ✓ Be capable of performing distributed computations;
- ✓ Be capable of performing experiments in Deep Learning using real-world data.
- ✓ Understand complexity of Deep Learning algorithms and their limitations
- ✓ Understand modern notions in data analysis oriented computing *to inculcate skill, provide employability & entrepreneurship skill.*

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Explain the fundamental principles, theory and approaches for learning with deep neural networks *for skill development and employability.*

CO2: Explain the main variants of deep learning and their typical applications *for skill development and employability.*

CO3: Analyze the key concepts, issues and practices when training and modeling with deep architectures *for skill development and employability*

CO4: Analyze the learning tasks *for skill development and employability.*

CO5: Apply deep learning in the context of other ML approaches *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	2	1	1	1	2	1	1	1
CO2	1	2	3	1	2	1	1	1	1	2	1	1
CO3	1	1	1	1	1	2	3	2	1	2	1	1
CO4	2	1	2	3	1	2	1	1	1	2	1	1
CO5	1	2	3	3	2	1	1	1	2	1	1	1

Content:

UNIT 1:   (8 Session)

Introduction to Deep learning : Linear Regression -Nonlinear Regression- Logistic Regression Activation *for skill development and employability.*

UNIT 2:   (8 Session)

Convolutional Neural Networks (CNN) : CNN History- Understanding CNNs- CNN Application *for skill development and employability.*

UNIT 3:   (8 Session)

Recurrent Neural Networks (RNN) : Intro to RNN Model Long Short-Term memory (LSTM) Recursive Neural Tensor Network Theory Recurrent Neural Network Model *for skill development and employability.*

UNIT 4:   (8 Session)

Introduction to Convolutional Neural Networks: Introduction to CNNs, Kernel filter, Principles behind CNNs, Multiple

Filters, CNN applications Introduction to Recurrent Neural Networks: Introduction to RNNs, Unfolded RNNs *for skill development and employability*.

UNIT 5: (8 Session)

Deep Learning applications: Image Processing, Natural Language Processing, Speech Recognition, Video Analytics *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	2	1
CO3	2	3	2
CO4	2	3	2
CO5	3	3	2

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2	Rajiv Chopra, Deep Learning: A Practical Approach, Khanna Publication .
3	Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
4	Adam Gibson, Deep Learning: A Practitioner's Approach, O'Reilly Media,August 2017.

MOOC/ Certification Courses:

1	https://www.coursera.org/specializations/big-data
2	https://www.simplilearn.com/
3	https://www.upgrad.com/
4	https://www.onlinecourses.nptel.ac.in

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications			Branch/Spec.	Master of Computer Applications	
Semester	III			Version	1.0.0.0	
Effective from Academic Year		2022-23		Effective for the batch Admitted in		2022
Subject code	MCAP-31		Subject Name	Python Programming Lab		

Teaching scheme (Per week)

	Lecture		Practical(Lab.)		Total	Examination scheme (Marks)			
	L	TU	P	TW			TS/PS	TE/PE	Total
Credit	0	0	3	-	3	Theory			
Hours	0	0	-	-	3	Practical	30	70	100

Objective(s):

After completing the subject, students should be able to:
- ✓ Understand the objective of this course is to introduce Python programming language through its core language basics and program design techniques suitable for modern applications.
- ✓ And also to understand the wide range of programming facilities available in Python covering graphics, GUI, data visualization and Databases *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):
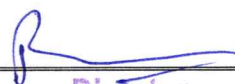
After completing the subject, students should be able to:

CO1: To gain knowledge of basic python programming *for skill development and employability*.

CO2: Install and run the python language software *for skill development and employability*.

CO3: To develop proficiency in creating applications using python Programming Language Understand the concepts of file I/O, Array, Function *for skill development and employability*.

CO4: To understand the different types of list in python *for skill development and employability*.

CO5: To create empty numpy arrays in python *for skill development and employability*.
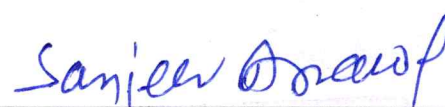
Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	1	1	1	1	1	2	1	1
CO2	2	3	1	3	2	1	1	3	2	1	1	2
CO3	3	1	2	2	2	2	2	1	2	2	1	2
CO4	1	1	1	1	1	2	1	1	1	2	2	3
CO5	2	2	1	1	2	1	2	1	2	2	2	2

Content:(Units)

1. When to use lists and when to use tuples, dictionaries or sets
2. How to select an element from a list?
3. How to transform lists into other data structures?
4. How to determine the size of your list?
5. What's the difference between the python append () and extend() methods?
6. How to concatenate lists
7. How to sort a list
8. How to clone or copy a list
9. How does list comprehension work in python?
10. How to count occurrences of a list item in python
11. How to split a list into evenly sized chunks
12. How to loop over a list

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13. How to create flat lists out of lists
14. How to get an intersection of two lists
15. How to remove duplicates from a list
16. Why numpy instead of lists?
17. How to create empty numpy arrays
18. How to do math with lists.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	2
CO3	3	3	2
CO4	2	3	1
CO5	2	3	1

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Programming and Problem Solving with PYTHON, by Ashok NamdevKamthane and Amit Ashok Kamthane, Mc Graw Hill Education.
2	Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
3	Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015.
4	Core Python Programming, Second Edition, by By Wesley J. Chun, Prentice Hall.

MOOC/ Certification Courses:

1	https://www.tutorialspoint.com
2	https://www.javatpoint.com
3	onlinecourses.nptel.ac.in
4	https://www.programiz.com

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications				Branch/Spec.	Master of Computer Applications	
Semester	IV				Version	1.0.0.0	
Effective from Academic Year			2022-23		Effective for the batch Admitted in		2022
Subject code	MCACC-41		Subject Name		Web Technology		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

✓ The objective of this course is to provide the basic web technology concepts that are required for developing web applications. The key technology components are descriptive languages, server side program elements and client side program elements. In addition the course gives specific contents that are beneficial for developing web-based solutions, like relational data-base communication basics and information security principles and approaches *to inculcate skill, provide employability & entrepreneurship skill.*

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: History and development of the World Wide Web and associated technologies *for skill development and employability.*

CO2: The client-server architecture of the World Wide Web and its communication protocol HTTP/HTTPS *for skill development and employability.*

CO3: Formats and languages used in modern web-pages: HTML, XHTML, CSS, XML, XSLT, JavaScript, DOM *for skill development and employability for skill development, employability and entrepreneurship development.*

CO4: Programming web pages with JavaScript/DOM (client) *for skill development and employability.*

CO5: Good design, universal design, multi platform web applications *for skill development, employability and entrepreneurship development.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)						3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	2	1	2	2	1	2	1	2
CO2	1	2	2	1	2	2	1	2	1	2	2	1
CO3	2	2	2	3	2	1	2	1	1	2	1	2
CO4	1	1	1	2	1	1	1	2	1	1	1	1
CO5	2	3	1	1	2	1	1	2	2	2	2	2

Content:

UNIT- I: (8 Session)

Introduction: Introduction to Internet, www, Internet browsers, what is web, Introduction to Client Server Concepts, History of the web, Growth of the web, protocols governing the web, web development strategies, Web applications, web project, web team *for skill development and employability.*

UNIT- II: (8 Session)

Web Page Designing: HTML: list, table, images, frames, forms, Cascading Style Sheet (CSS); XML: Introduction to XML, DTD, XML schemes, presenting and using XML *for skill development and employability.*

UNIT- III: (8 Session)

Scripting: Introduction to Java script, variables, control structures, looping structures ,documents, forms, statements, functions, objects, event and event handling, Arrays; Introduction to VB Script, Fundamental of

AJAX *for skill development and employability*.

UNIT- IV: (8 Session)

Server Site Programming: Introduction to java server pages (JSP), JSP application design, tomcat server, JSP Life Cycle, JSP Implicit objects, JSP Scripting Elements, Declaring variables, and methods, debugging, sharing data between JSP pages, Session, Database with JSP, Introduction to active server pages (ASP), ASP.NET *for skill development, employability and entrepreneurship development*.

UNIT- V: (8 Session)

PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form mail, file upload, session, error, exception, filter, PHP-ODBC *for skill development, employability and entrepreneurship development*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	2	3	2
CO3	3	3	3
CO4	3	3	3
CO5	2	3	2

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

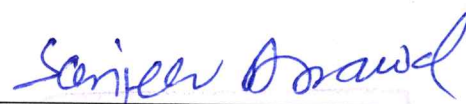| 1	Xavier, C, " Web Technology and Design" , New Age International
2	Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.
3	Ramesh Bangia, "Internet and Web Design" , New Age International
4	Bhave, "Programming with Java", Pearson Education
5	Ullman, "PHP for the Web: Visual QuickStart Guide", Pearson Education
6	Deitel, "Java for programmers", Pearson Education
7	Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.
8	Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH

MOOC/ Certification Courses:

1	https://www.tutorialspoint.com
2	https://www.javatpoint.com
3	onlinecourses.nptel.ac.in
4	https://www.programiz.com

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	IV		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-04(1)	Subject Name	Cryptography and Network Security		

Teaching scheme						Examination scheme (Marks)				
(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total	
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory	30	70	100	
Hours	3	1	-	-	4	Practical	-	-	-	

Objective(s):

After completing the subject, students should be able to:
- ✓ The concepts of classical encryption techniques and concepts of finite fields and number theory.
- ✓ And explore the working principles and utilities of various cryptographic algorithms including
- ✓ secret key cryptography, hashes and message digests, and public key algorithms.
- ✓ And explore the design issues and working principles of various authentication protocols, PKI Standards *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Classify the symmetric encryption techniques *for skill development and employability*.
CO2: Illustrate various Public key cryptographic techniques *for skill development and employability*.
CO3: Evaluate the authentication and hash algorithms *for skill development and employability*.
CO4: Discuss authentication applications *for skill development, employability and entrepreneurship development*.
CO5: Summarize the intrusion detection and its solutions to overcome the attacks and Basic concepts of system level security *for skill development, employability and entrepreneurship development*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak				
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	2	1	2	2	1	2	1	3
CO2	1	2	2	2	2	2	1	2	1	2	2	2
CO3	3	1	1	2	1	2	1	1	2	2	1	1
CO4	3	2	2	1	1	2	1	1	1	1	1	1
CO5	2	1	1	1	1	1	2	2	1	2	1	1

Content:

UNIT-I :   (8 Session)

Introduction: to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation *for skill development and employability*.

UNIT-II :   (8 Session)

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key

exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption *for skill development and employability*.

UNIT-III: (8 Session)

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm *for skill development and employability*.

UNIT-IV: (8 Session)

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME *for skill development, employability and entrepreneurship development*.

UNIT-V: (8 Session)

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems *for skill development, employability and entrepreneurship development*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	2	2	1
CO2	3	2	2
CO3	3	3	2
CO4	3	3	3
CO5	3	3	3

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2	Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw
3	C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security, Wiley
4	Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5	V.K. Jain, Cryptography and Network Security, Khanna Publishing House
6	Bernard Menezes," Network Security and Cryptography", Cengage Learning
7	AtulKahate, "Cryptography and Network Security", Tata McGraw Hill

MOOC/ Certification Courses:

1	http://vssut.ac.in/lecture_notes/lecture1428550736.pdf
2	http://www.sasurieengg.com/e-course-material/It-MCA/III-IT/3.IT2352Cryptography%20and%20Network%20Security.pdf
3	https://www.uptunotes.com/aktu-notescryptographic-network-security-nit701-notes/
4	http://www.cse.iitd.ac.in/~shweta/notes/Lec1.pdf

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications				Branch/Spec.	Master of Computer Applications		
Semester	IV				Version	1.0.0.0		
Effective from Academic Year		2022-23			Effective for the batch Admitted in			2022
Subject code	MDSET-04(2)		Subject Name		Blockchain Architecture			

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	-	-	4	Theory	30	70	100
Hours	3	1	-	-	4	Practical	-	-	-

Objective(s):

✓ The aim of this course is to provide students the concept and applications of Blockchain have now spread from cryptocurrencies to various other domains, including business process management, smart contracts, IoT and so on *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Understand the structure of a blockchain and why/when it is better than a simple distributed database *for skill development and employability.*

CO2: Analyze the incentive structure in a blockchain based system and critically assess its functions, benefits and vulnerabilities *for skill development, employability and entrepreneurship development.*

CO3: Evaluate the setting where a blockchain based structure may be applied, its potential and its limitations, Understand what constitutes a "smart" contract, what are its legal implications and what it can and cannot do, now and in the near future *for skill development and employability.*

CO4: Analyze to what extent smart and self-executing contracts can benefit automation, governance, transparency and the Internet of Things (IOT) *for skill development, employability and entrepreneurship development.*

CO5: To analysis the public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain *for skill development, employability and entrepreneurship development.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	2	1	2	2	1	2	1
CO2	2	2	3	1	3	3	2	2	1	2	3	2
CO3	2	3	2	2	2	2	1	2	1	1	2	2
CO4	3	3	2	2	2	2	1	1	2	2	3	3
CO5	3	3	3	2	1	2	1	1	2	2	2	2

Content:

UNIT--I: (8 Session)

Introduction to Blockchain: Digital Money to Distributed Ledgers , Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature,) Hashchain to Blockchain, Basic consensus mechanisms *for skill development and employability.*

UNIT--II: (8 Session)

Consensus: Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Blockchain consensus protocols Permissioned Blockchains:Design goals, Consensus protocols for Permissioned Blockchains *for skill*

development, employability and entrepreneurship development.

UNIT--III: **(8 Session)**

Hyperledger Fabric (A): Decomposing the consensus process , Hyperledger fabric components, Chaincode Design and Implementation Hyperledger Fabric (B): Beyond Chaincode: fabric SDK and Front End (b) Hyperledger composer tool *for skill development and employability.*

UNIT--IV: **(8 Session)**

Use case 1 : Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance

Use case 2: Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc *for skill development, employability and entrepreneurship development.*

UNIT--V: **(8 Session)**

Use case 3: Block chain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain *for skill development, employability and entrepreneurship development.*

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	3
CO3	2	3	1
CO4	3	3	3
CO5	3	2	2

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	Mstering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
2	Blockchain by Melanie Swa, O'Reilly
3	Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
4	Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

MOOC/ Certification Courses:

1	https://www.upgrad.com/blog/blockchain-architecture/
2	https://www.pluralsight.com/guides/blockchain-architecture
3	https://www.edureka.co/blog/blockchain-architecture/
4	https://www.ibm.com/cloud/architecture/architectures/blockchainArchitecture/reference-architecture

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DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications			Branch/Spec.	Master of Computer Applications	
Semester	IV			Version	1.0.0.0	
Effective from Academic Year		2022-23		Effective for the batch Admitted in		2022
Subject code	MDSET-04(3)		Subject Name	Digital Marketing		

Teaching scheme

(Per week)	Lecture		Practical(Lab.)		Total	Examination scheme (Marks)		CE	SEE	Total
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory		30	70	100
Hours	3	1	-	-	4	Practical		-	-	-

Objective(s):

After completing the subject, students should be able to:

✓ Digital Marketing is an umbrella term for the targeted, measurable, and interactive marketing of products or services using digital technologies.

✓ To provide the students with the important conceptual insights, perspectives and the tools required for effective digital marketing *to inculcate skill, provide employability & entrepreneurship skill*.

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Understanding digital marketing along with technical acumen will be an added tool as a problem solver and solution provider *for skill development and employability.*

CO2: As an analyst he can assist and advice the marketer to take right decision. Will be helpful to work as a consultant for anycompany or organization *for skill development and employability.*

CO3: Understanding Building E-mail List and Signup Forms *for skill development and employability.*

CO4: To understand the digital Marketing and Introduction and Significance Google Analytics Interface *for skill development and employability.*

CO5: To understand the Facebook Advertising Account and TwitterAdvertising, TwitterCampaigns *for skill development and employability.*

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	1	3	1	1	1	2	2	2
CO2	1	1	2	2	2	2	1	2	1	1	2	1
CO3	2	3	1	2	2	2	1	1	2	1	2	2
CO4	2	2	2	1	3	2	3	1	1	2	3	2
CO5	2	3	1	2	2	2	2	1	1	1	2	2

Content:

UNIT-I :   (8 Session)

Introduction to Digital Marketing and its Significance Traditional Marketing Vs Digital Marketing Digital Marketing Process. Website Planning and Development : Types of websites Website Planning and Development , Understanding Domain and Webhosting Building Website/Blog using CMS WordPress, Using WordPress Plug-ins *for skill development and employability.*

UNIT-II   :   (8 Session)

Introduction to Search Engine Optimization Keyword P lanner Tools On Page SEO Techniques-Indexing

and Key Word Placement, On Page SEO Techniques- Content Optimization On Page SEO : Yoast, SEO Plug-in, Off –Page SEO Techniques, Email Marketing- Introduction and Significance, Designing e-mail marketing campaigns using Mail Chimp *for skill development and employability*.

UNIT-III: (8 Session)
Building E-mail List and Signup Forms, Email Marketing Strategy and Monitoring Email –Automization. Pay Per Click Advertising: Introduction Pay Per Click Advertising: Google Adword, Types of Bidding strategies Designing and Monitoring search campaigns, Designing and Monitoring Display campaigns *for skill development and employability*.

UNIT-IV: (8 Session)
Designing and Monitoring Video campaigns Designing and Monitoring Universal App Campaigns Google Analytics : Introduction and Significance Google Analytics Interface and Setup Understanding Goals and Conversions. Monitoring Traffic Behavior and preparing Reports Social Media Marketing: Introduction and Significance Facebook Marketing, Types of Various Ad Formats *for skill development and employability*.

UNIT-V: (8 Session)
Setting up Facebook Advertising Account, Understanding Facebook Audience and its Types Designing Facebook Advertising Campaigns. Working with Facebook Pixel, Twitter Marketing: Basics Designing, Twitter Advertising Campaigns. Introduction to LinkedIn Marketing Developing digital marketing strategy in Integration form *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	2
CO3	3	3	2
CO4	3	2	1
CO5	3	3	2

Practical content

List of programs specified by the subject teacher based on above mentioned topics.

Text Book:

1	William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2	Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw
3	C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security, Wiley
4	Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5	V.K. Jain, Cryptography and Network Security, Khanna Publishing House
6	Bernard Menezes," Network Security and Cryptography", Cengage Learning
7	AtulKahate, "Cryptography and Network Security", Tata McGraw Hill

MOOC/ Certification Courses:

1	http://vssut.ac.in/lecture_notes/lecture1428550736.pdf
2	http://www.sasurieengg.com/e-course-material/It-MCA/III-IT/3.IT2352Cryptography%20and%20Network%20Security.pdf
3	https://www.uptunotes.com/aktu-notescryptographic-network-security-nit701-notes/
4	http://www.cse.iitd.ac.in/~shweta/notes/Lec1.pdf

DEPARTMENT OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications		Branch/Spec.	Master of Computer Applications	
Semester	IV		Version	1.0.0.0	
Effective from Academic Year		2022-23	Effective for the batch Admitted in		2022
Subject code	MDSET-04(4)	Subject Name	Privacy & Security in Online Social-Media		

Teaching scheme

Teaching scheme (Per week)	Lecture		Practical(Lab.)		Total	Examination scheme (Marks)		CE	SEE	Total
	L	TU	P	TW						
Credit	3	1	-	-	4	Theory		30	70	100
Hours	3	1	-	-	4	Practical		-	-	-

Objective(s):

After completing the subject, students should be able to:
- ✓ To familiarize various types of cyber-attacks and cyber-crimes
- ✓ To give an overview of the cyber laws
- ✓ To study the defensive techniques against these attacks *to inculcate skill, provide employability & entrepreneurship skill.*

Pre-requisites:

Basic knowledge of programming.

Course Outcomes (COs):

After completing the subject, students should be able to:

CO1: Discuss authentication applications *for skill development and employability*.

CO2: Summarize the intrusion detection and its solutions to overcome the attacks *for skill development and employability*.

CO3: Basic concepts of system level security *for skill development and employability*.

CO4: Learning the Cyber Security and hackers or other cyber criminals *for skill development and employability*.

CO5: Discuss the Privacy Issues and privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc. *for skill development and employability*.

Mapping COs with POs:

(3,2,1- indicates the strength of correlation)							3 strong, 2 medium, 1 weak					
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	1	1	1	1	1	3
CO2	1	2	2	2	2	2	1	2	1	1	1	1
CO3	3	2	2	1	1	3	2	2	1	2	1	2
CO4	1	1	2	1	1	2	1	2	1	2	2	1
CO5	2	2	1	1	1	1	1	1	2	1	1	2

Content:

UNIT-I :   (8 Session)

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy *for skill development and employability*.

UNIT-II   :   (8 Session)

Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics

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Auditing *for skill development and employability*.

UNIT-III: (8 Session)

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops *for skill development and employability*.

UNIT-IV: (8 Session)

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals *for skill development and employability*.

UNIT-V: (8 Session)

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains-medical, financial, etc *for skill development and employability*.

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	2	1
CO3	2	2	1
CO4	2	3	2
CO5	3	3	2

Text Book:

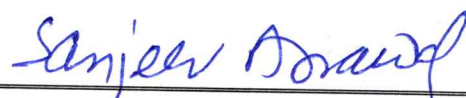| 1	Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2	B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

MOOC/ Certification Courses:

1	http://vssut.ac.in/lecture_notes/lecture1428550736.pdf
2	http://www.sasurieengg.com/e-course-material/It-MCA/III-IT/3.IT2352Cryptography%20and%20Network%20Security.pdf
3	https://www.uptunotes.com/aktu-notescryptographic-network-security-nit701-notes/
4	http://www.cse.iitd.ac.in/~shweta/notes/Lec1.pdf