M.C.A. – MASTER OF COMPUTER APPLICATIONS

CURRICULUM & SYLLABI

Regulations 2020

(Applicable to candidates admitted in the academic year 2020-2021 onwards)

K.S.R. College of Engineering (Autonomous)

(Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University)

K.S.R. Kalvi Nagar, Tiruchengode – 637 215

Namakkal (Dt), Tamilnadu, India

Email : info@ksrce.ac.in   **Website : www.ksrce.ac.in**

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215

(Autonomous)

DEPARTMENT OF COMPUTER APPLICATIONS

(REGULATIO 2020)

Vision of the Institution

IV	We envision to achieve status as an excellent Educational Institution in the global knowledge hub, making self-learners, experts, ethical and responsible engineers, technologists, scientists, managers, administrators and entrepreneurs who will significantly contribute to research and environment friendly sustainable growth of the nation and the world.

Mission of the Institution

IM 1	To inculcate in the students self-learning abilities that enable them to become competitive and considerate engineers, technologists, scientists, managers, administrators and entrepreneurs by diligently imparting the best of education, nurturing environmental and social needs.
IM 2	To foster and maintain mutually beneficial partnership with global industries and Institutions through knowledge sharing, collaborative research and innovation.

Vision of the Department / Programme: MCA / Master of Computer Applications

DV	To develop professionals having good knowledge, skills and attitude in the field of computer applications for the betterment of industry and society

Mission of the Department / Programme: MCA / Master of Computer Applications

DM 1	To provide high quality education in the field of computer applications and there by create computer professionals with proper leadership skills, commitment and moral values
DM 2	To educate students to be successful, ethical, and effective problem-solvers and life-long learners who will contribute positively to the economic well-being of our region and nation.

Programme Educational Objectives (PEOs): MCA / Master of Computer Applications

The graduates of the programme will be able to	
PEO 1	Demonstrate high quality fundamental knowledge in varied sectors and have the ability to develop innovative software on emerging technologies and provide access to higher degree by research programs.
PEO 2	Work as teams on multi-disciplinary projects with effective communication skills, critical thinking, individual, team work and leadership qualities necessary to function productively and professionally.
PEO 3	Understand the social and ethical professionalism, public policy and aesthetics that

allows them to develop sufficient awareness of the societal impact of technology and the life-long learning needed for a successful professional career as a scientist / technocrat / an entrepreneur.

Programme Outcomes (POs) of MCA / Master of Computer Applications

Program Outcomes (POs)	
PO1	Master Graduates will be able to: Ability to apply fundamental knowledge of computing, mathematics and business studies in practice.
PO2	Ability to identify, articulate, examine, interpret data/information and develop computing solutions in the appropriate domain.
PO3	Ability to appreciate cultural, environmental, health, safety and sustainability issues for complex computing problems.
PO4	Ability to use research based knowledge and methodologies to provide valid solutions relevant to Computer Application research issues.
PO5	Ability to select and use the modern computing tools and use them with agility.
PO6	Ability to discharge their duties with Professional and Ethical responsibilities.
PO7	Ability to possess a desire for and lifelong learning based on the evolving trends.
PO8	Ability to work effectively as members of a team composed of individuals from different disciplines and also understands the management principles.
PO9	Ability to communicate effectively.
PO10	Ability to troubleshoot and provide solutions to operational problems with social and Environment / public policy.
PO11	Ability to work effectively as a team member as well as a leader while working in multidisciplinary projects.
PO12	Ability to identify right opportunity to become an entrepreneurship and will create wealth for the betterment of the individual / society at large.

Programme Specific Outcomes (PSOs) of MCA / Master of Computer Applications

Program Specific Outcomes (PSOs)	
PSO1	**Technical competency:** Apply their knowledge and skills to develop and Implement computer solutions that accomplish goals important to the industry, government or research area in which they are working. They will explore and integrate new technologies.
PSO2	**Professional awareness:** Grow intellectually and professionally in their chosen field.

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Department	Computer Applications
Programme	Master of Computer Applications

SEMESTER – I

Sl. No.	Course Code	Course Name	L	T	P	C	CA	ES	Total
			Hours/ Week			Credit	Maximum Marks		
THEORY									
1.	MA20116	Mathematical Foundation for Computer Applications	3	1	0	4	30	70	100
2.	CA20111	Data Structures Using 'C'	3	0	0	3	30	70	100
3.	CA20112	Computer Organization and Architecture	3	1	0	4	30	70	100
4.	CA20113	Database Management Systems	3	0	0	3	30	70	100
5.	CA20114	Python Programming	3	0	0	3	30	70	100
PRACTICAL									
7.	CA20121	Data Structures Lab	0	0	3	2	50	50	100
8.	CA20122	Database Management Systems Lab	0	0	3	2	50	50	100
9.	CA20123	Python Programming Lab	0	0	3	2	50	50	100
		Total	15	2	9	23		800	

SEMESTER – II

Sl. No.	Course Code	Course Name	L	T	P	C	CA	ES	Total
			Hours/ Week			Credit	Maximum Marks		
THEORY									
1.	CA20211	Data Communication and Networks	3	0	0	3	30	70	100
2.	CA20212	Java Programming	3	0	0	3	30	70	100
3.	CA20213	Operating Systems	3	1	0	4	30	70	100
4.		Elective I	3	0	0	3	30	70	100
5.		Elective II	3	0	0	3	30	70	100
PRACTICAL									
7.	CA20221	Networks Lab	0	0	3	2	50	50	100
8.	CA20222	Java Programming Lab	0	0	3	2	50	50	100
9.	CA20223	Application Development Lab	0	0	3	2	50	50	100
10..	HR20021	Career Building Skills I	0	2	0	0	50	50	100
		Total	15	3	9	22		900	

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	SEMESTER – III								
SI. No.	**Course Code**	**Course Name**	**Hours/ Week**			**Credit**	**Maximum Marks**		
			L	T	P	C	CA	ES	Total
THEORY									
1.	CA20311	Web Technology	3	0	0	3	30	70	100
2.	CA20312	Object Oriented Analysis and Design	3	1	0	4	30	70	100
3.	CA20313	Software Testing & Quality Assurance	3	0	0	3	30	70	100
4.	CA20314	Big Data Analytics	3	0	0	3	30	70	100
5.		Elective III	3	0	0	3	30	70	100
PRACTICAL									
6.	CA20321	Web Technology Lab	0	0	3	2	50	50	100
7.	CA20322	Big Data Analytics Lab	0	0	3	2	50	50	100
8.	CA20323	Software Testing Lab	0	0	3	2	50	50	100
9.	HR20031	Career Building Skills II	0	2	0	0	50	50	100
	Total		**15**	**3**	**9**	**22**		**900**	

		SEMESTER – IV							
			Hours/ Week			**Credit**	**Maximum Marks**		
SI. No.	**Course Code**	**Course Name**	L	T	P	C	CA	ES	Total
PRACTICAL									
01.	CA20421	Project work	0	0	24	12	50	50	100
	Total		**0**	**0**	**24**	**12**			100

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ELECTIVE – I (SEMESTER – II)

SI. No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
THEORY									
1.	MA20261	Operations Research	3	0	0	3	30	70	100
2.	CA20261	TCP/IP	3	0	0	3	30	70	100
3.	CA20262	Unix and Network Programming	3	0	0	3	30	70	100
4.	CA20263	Cloud Computing	3	0	0	3	30	70	100
5.	CA20264	Middleware Technology	3	0	0	3	30	70	100
6.	CA20265	Internet of Things	3	0	0	3	30	70	100
7.	BA20261	Health Care Information Systems	3	0	0	3	30	70	100
8.	CA20271	Devops	3	0	0	3	30	70	100

ELECTIVE – II (SEMESTER – II)

SI.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
01	MA20262	Probability And Statistics	3	0	0	3	30	70	100
02	CA20266	Software Project Management	3	0	0	3	30	70	100
03	CA20267	Advanced Operating Systems	3	0	0	3	30	70	100
04	CA20268	E-Learning Techniques	3	0	0	3	30	70	100
05	CA20269	Soft Computing	3	0	0	3	30	70	100
06	CA20270	Digital Image Processing	3	0	0	3	30	70	100
07	BA20262	Organizational Behavior	3	0	0	3	30	70	100
08	CA20272	Full Stack Development	3	0	0	3	30	70	100

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		ELECTIVE - III (SEMESTER - III)							
SI.No.	**Course Code**	**Course Name**	**Hours/ Week**			**Credit**	**Maximum Marks**		
			L	T	P	C	CA	ES	Total
01	CA20361	Linguistic Computing	3	0	0	3	30	70	100
02	CA20362	Block chain Technology	3	0	0	3	30	70	100
03	CA20363	Bio-Informatics	3	0	0	3	30	70	100
04	CA20364	Artificial intelligence	3	0	0	3	30	70	100
05	CA20365	Information and Network security	3	0	0	3	30	70	100
06	CA20366	Deep Learning	3	0	0	3	30	70	100
07	CA20367	Mobile Computing	3	0	0	3	30	70	100

BRIDGE COURSES

		BRIDGE COURSES (SEMESTER - I)				
SI.No.	**Course Code**	**Course Name**	**Hours/ Week**			**Credit**
			L	T	P	C
01	BC5001	Computer Basic Fundamentals	2	0	0	0
02	BC5002	Problem Solving And Programming In C	2	0	0	0
		BRIDGE COURSES (SEMESTER -II)				
04	BC5003	Core Java Programming	2	0	0	0
05	BC5004	Software Engineering	2	0	0	0

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SEMESTER – I

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			Hours/ Week			Credit	Maximum Marks		
THEORY									
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2.	CA20111	Data Structures Using 'C'	3	0	0	3	40	60	100
3.	CA20112	Computer Organization and Architecture	3	1	0	4	40	60	100
4.	CA20113	Database Management Systems	3	0	0	3	40	60	100
5.	CA20114	Python Programming	3	0	0	3	40	60	100
PRACTICAL									
7.	CA20121	Data Structures Lab	0	0	3	2	60	40	100
8.	CA20122	Database Management Systems Lab	0	0	3	2	60	40	100
9.	CA20123	Python Programming Lab	0	0	3	2	60	40	100
		Total	**15**	**2**	**9**	**23**		**800**	

SEMESTER – II

SI. No.	Course Code	Course Name	L	T	P	C	CA	ES	Total
			Hours/ Week			Credit	Maximum Marks		
THEORY									
1.	CA20211	Data Communication and Networks	3	0	0	3	40	60	100
2.	CA20212	Java Programming	3	0	0	3	40	60	100
3.	CA20213	Operating Systems	3	1	0	4	40	60	100
4.		Elective I	3	0	0	3	40	60	100
5.		Elective II	3	0	0	3	40	60	100
PRACTICAL									
7.	CA20221	Networks Lab	0	0	3	2	60	40	100
8.	CA20222	Java Programming Lab	0	0	3	2	60	40	100
9.	CA20223	Application Development Lab	0	0	3	2	60	40	100
10..	HR20021	Career Building Skills I	0	2	0	0	60	40	100
		Total	**15**	**3**	**9**	**22**		**900**	

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SEMESTER – III									
SI. No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
THEORY									
1.	CA20311	Web Technology	3	0	0	3	40	60	100
2.	CA20312	Object Oriented Analysis and Design	3	1	0	4	40	60	100
3.	CA20313	Software Testing & Quality Assurance	3	0	0	3	40	60	100
4.	CA20314	Big Data Analytics	3	0	0	3	40	60	100
5.		Elective III	3	0	0	3	40	60	100
PRACTICAL									
6.	CA20321	Web Technology Lab	0	0	3	2	60	40	100
7.	CA20322	Big Data Analytics Lab	0	0	3	2	60	40	100
8.	CA20323	Software Testing Lab	0	0	3	2	60	40	100
9.	HR20031	Career Building Skills II	0	2	0	0	60	40	100
		Total	**15**	**3**	**9**	**22**		**900**	

SEMESTER – IV									
			Hours/ Week			Credit	Maximum Marks		
SI. No.	Course Code	Course Name	L	T	P	C	CA	ES	Total
PRACTICAL									
01.	CA20421	Project work	0	0	24	12	60	40	100
		Total	**0**	**0**	**24**	**12**			100

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ELECTIVE – I (SEMESTER – II)

SI. No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
THEORY									
1.	MA20261	Operations Research	3	0	0	3	40	60	100
2.	CA20261	TCP/IP	3	0	0	3	40	60	100
3.	CA20262	Unix and Network Programming	3	0	0	3	40	60	100
4.	CA20263	Cloud Computing	3	0	0	3	40	60	100
5.	CA20264	Middleware Technology	3	0	0	3	40	60	100
6.	CA20265	Internet of Things	3	0	0	3	40	60	100
7.	BA20261	Health Care Information Systems	3	0	0	3	40	60	100
8.	CA20271	Devops	3	0	0	3	40	60	100

ELECTIVE – II (SEMESTER – II)

SI.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
01	MA20262	Probability And Statistics	3	0	0	3	40	60	100
02	CA20266	Software Project Management	3	0	0	3	40	60	100
03	CA20267	Advanced Operating Systems	3	0	0	3	40	60	100
04	CA20268	E-Learning Techniques	3	0	0	3	40	60	100
05	CA20269	Soft Computing	3	0	0	3	40	60	100
06	CA20270	Digital Image Processing	3	0	0	3	40	60	100
07	BA20262	Organizational Behavior	3	0	0	3	40	60	100
08	CA20272	Full Stack Development	3	0	0	3	40	60	100

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			L	T	P	C	CA	ES	Total
		ELECTIVE - III (SEMESTER - III)							
01	CA20361	Linguistic Computing	3	0	0	3	40	60	100
02	CA20362	Block chain Technology	3	0	0	3	40	60	100
03	CA20363	Bio-Informatics	3	0	0	3	40	60	100
04	CA20364	Artificial intelligence	3	0	0	3	40	60	100
05	CA20365	Information and Network security	3	0	0	3	40	60	100
06	CA20366	Deep Learning	3	0	0	3	40	60	100
07	CA20367	Mobile Computing	3	0	0	3	40	60	100

BRIDGE COURSES

SI.No.	Course Code	Course Name	Hours/ Week			Credit
			L	T	P	C
		BRIDGE COURSES (SEMESTER - I)				
01	BC5001	Computer Basic Fundamentals	2	0	0	0
02	BC5002	Problem Solving And Programming In C	2	0	0	0
		BRIDGE COURSES (SEMESTER -II)				
04	BC5003	Core Java Programming	2	0	0	0
05	BC5004	Software Engineering	2	0	0	0

K.S.R. COLLEGE OF ENGINEERING (Autonomous)   **R 2020**

<u>SEMESTER - I</u>

MA20116	MATHEMATICAL FOUNDATION FOR COMPUTER APPLICATIONS (Master of Computer Applications)	L 3	T 1	P 0	C 4

Prerequisite: Programming Abstractions

Course Outcomes : On Completion of this course, the student will be able to   **Cognitive Level**

CO1	*Apply the propositional calculus.*	*Remember*
CO2	*Explain the suitable predicates for the statements.*	*Apply*
CO3	*Develop the Linear Programming problems and finding the solutions to uncertain situations.*	*Create*
CO4	*Construction of networks and finding the solution by using PERT/CPM methods.*	*Understand*
CO5	*Find the solutions to equations using numerical techniques in computer applications.*	*Apply*

UNIT - I   PROPOSITIONAL CALCULUS   [12]

Propositions – Logical connectives – Compound propositions - Conditional and biconditional propositions - Truth tables- Tautologies and contradictions - Contra positive - Logical equivalences and implications - Normal forms - Principal conjunctive and disjunctive normal forms - Rules of inference Theory.

UNIT -II   PREDICATE CALCULUS   [12]

Predicates - Statement functions – Variables - Free and bound variables – Quantifiers - Universe of discourse - Logical equivalences and implications for quantified statements - Theory of inference - The rules of universal specification and generalization

UNIT - III   LINEAR PROGRAMMING   [12]

Formation of Linear Programming Problems - Graphical method - Simplex method – Big M Method - Dual Simplex Method.

UNIT - IV   NETWORK ANALYSIS - PERT/CPM   [12]

Network Construction - Critical Path Method - Computation of earliest start time, latest start time, Total, free and independent float time -PERT - Computation of optimistic, most likely Pessimistic and expected time – Probabilistic estimation for completion of project.

UNIT - V   NUMERICAL ANALYSIS   [12]

Solution of algebraic and transcendental equation – Newton Raphson's method – Regula falsi method – Interpolation and approximation – Newton's forward and backward interpolation method- Lagrange's and Newton's divided difference interpolation.

Total (L: 45 T:15) = 60 Periods

Text Books :

1   J.P. Tremblay and R. Manoharan,Discrete Mathematical Structures with Applications to computer science, McGraw-Hill, International Edition, Fifth edition, 2016.

2   Bernard Kolman, Robert Busby and Sharon Cutler Ross, Discrete Mathematical Structures for Computer Science, PHI Learning , Sixth Edition, 2013.

Reference Books :

1   P.K.Gupta& Man Mohan,Operations Research, Sultan Chand & Sons Publications, New Delhi, Twelfth Edition, 2013.

2   Dr. M.K. Venkataraman,Numerical Methods in Science and Engineering, The National Publishing Company, Fifth Edition, 2016.

3   Eric Lehman, F.Thomson Leighton, Albert R. Meyer, Mathematics for Computer Science, MIT Press, Seventh Edition, 2014.

4   Grimaldi, R.P and Ramana, B.V. Discrete and Combinatorial Mathematics, Pearson Education, New Delhi, Fifth Edition, 2006.

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CO PO MAPPING

1: Slight (Low)2: Moderate (Medium)   3: Substantial (High)

CO	Course Outcomes	Programme Outcomes													
		PO1	P02	PO3	P04	P05	PO6	P07	P08	P09	PO10	PO11	P012	PSO1	PS02
CO1	*Apply the propositional calculus.*	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO2	*Explain the suitable predicates for the statements.*	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO3	*Develop the Linear Programming problems and finding the solutions to uncertain situations.*	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	*Construction of networks and finding the solution by using PERT/CPM methods.*	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO5	*Find the solutions to equations using numerical techniques in computer applications.*	3	3	3	2	-	-	-	-	-	-	-	-	-	-
Average		3	3	3	2		-	-	-	-	-	-	-	-	-

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SEMESTER -I

		L	T	P	C
CA20111	**DATA STRUCTURES USING 'C'**	3	0	0	3

Prerequisite: C

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1:	*Recognize the introduction about the Data Structures.*	*Understand*
CO2:	*Summaraize the fundamentals of Arrays Concept.*	*Understand*
CO3:	*Discuss the concept of Stacks.*	*Analyze*
CO4:	*Discover the concept of Queues.*	*Analyze*
CO5:	*Utilize the concept of binary, binary search and binary tree traversals.*	*Apply*

UNIT - I   INTRODUCTION   [09]

Introduction: Basic Terminology, Data type, Data object, Need of Data Structure, Types of Data Structure, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off.

UNIT - II   ARRAYS   [09]

Arrays - Single and Multidimensional Arrays - address calculation - application of arrays - Character String in C - Sparse Matrices - Vectors - Searching: Sequential search - binary search - Sorting algorithms with efficiency - Bubble sort - Insertion sort - Merge sort - Quick Sort .

UNIT - III   STACKS   [09]

Stacks: Representation and Implementation of stack - Operations on Stacks: Push & Pop - Linked Representation of Stack - Operations Associated with Stacks. Applications of stack: Conversion of Infix to Prefix and Postfix Expressions - Evaluation of the postfix expression using stack. Recursion: Recursive definition and processes - recursion in C - example of recursion - recursive algorithms - principles of recursion - removal of recursion.

UNIT - IV   QUEUES   [09]

Queues: Array and linked representation and implementation of queues - Operations on Queue: Create - Add - Delete - Full and Empty. Circular queue - DeQue, and Priority Queue. Linked list: Representation and Implementation of Singly Linked Lists - Header List - Traversing and Searching of Linked List - Overflow and Underflow - Insertion and deletion to/from Linked Lists - Insertion and deletion Algorithms - Doubly linked list - Polynomial representation. Garbage Collection and Compaction.

UNIT - V   TREES   [09]

Trees: Basic terminology - Binary Trees - Binary tree representation - algebraic Expressions - Complete Binary Tree - Extended Binary Trees - BST - Traversing Binary trees - operations on binary trees Create -Insert - Delete.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1. A. M. Tanenbaum, Y. Langsam, M. J. Augustein, Data Structures using C, Prentice Hall of India, ew Delhi. Revised Edition 2013.
2. Yedidyah Langsam Moshe J. Augenstein, Aaron M. Tenenbaum, "Data Structures using C & C++", PHI Publications, New Delhi, Second Edition 2017

Reference Books :

1. Mark Allen Weiss, Data structures and Algorithm Analysis in C++, Pearson Education. Ltd., Third Edition, 2016.
2. Michael T.Goodrich, R.Tamassia and D.Mount, Wiley, Data structures and Algorithms in C++, John Wiley and Son, Seventh Edition 2016.
3. S.Sahan, Data structures, Algorithms and Applications in C, Universities Press India Private Limited.,Second Edition, 2015.
4. A. M. Tanenbaum, Y. Langsam, M. J. Augustein, Data Structures using C, Prentice Hall of India, New Delhi., Revised Edition 2013.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Recognize the introduction about the Data Structures.*	3	3	2	3	-	1	-	-	-	-	-	-	2	2
CO2	*Summaraize the fundamentals of Arrays Concept.*	3	3	3	2	-	2	-	-	-	2	-	-	2	3
CO3	*Discuss the concept of Stacks.*	3	3	2	3	-	2	-	-	-	2	-	-	2	2
CO4	*Discover the concept of Queues.*	3	3	3	2	-	2	-	-	-	2	-	-	3	2
CO5	*Utilize the concept of binary, binary search and binary tree traversals.*	3	3	2	3	-	1	-	-	-	-	-	-	2	3
	Average	3	3	2	3	-	2	-	-	-	2	-	-	2	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)　　　　　　　　　　**R 2020**

<u>SEMESTER - I</u>

		L	T	P	C
CA20112	**COMPUTER ORGANIZATION AND ARCHITECTURE**	3	1	0	4

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to　　　***Cognitive Level***

CO1　*Explain Digital Fundamentals.*　　　　　　　　　　　　　　　　　　　*Understanding*

CO2:　*Identify the Digital Components and Data Representation.*　　　　　　　*Applying*

CO3:　*Classify the Micro Operations.*　　　　　　　　　　　　　　　　　　*Analyzing*

CO4:　*Outline the basics of Computer Organization..*　　　　　　　　　　　*Understanding*

CO5:　*Illustrate Memory Organization.*　　　　　　　　　　　　　　　　　*Understanding*

UNIT - I　　　DIGITAL LOGIC CIRCUITS　　　　　　　　　　　　　　　　**[12]**

Digital Computers – Logic Gates – Boolean Algebra – Map Simplification –Combinational Circuits – Flip Flops – SR Flip Flop – D Flip Flop – JK Flip Flop – T Flip Flop- Edge Triggered flip flops – Sequential Circuits - Flip flop Input Equations – State Table – State Diagram – Design Example – Design Procedure.

UNIT - II　　　DIGITAL COMPONENTS AND DATA REPRESENTATION　　　　　**[12]**

Integrated Circuits – Decoders – Multiplexers – Memory unit – Random Access Memory – Read Only Memory – Types of ROMs – Data types – Complements- (r-1)'s Complement – (r's) Complement – Fixed Point Representation – Integer Representation – Arithmetic Addition - Arithmetic Subraction.

UNIT - III　　　REGISTER TRANSFER AND MICRO OPERATIOS　　　　　　**[12]**

Register Transfer Language - Register Transfer - Bus and Memory Transfers – Arithmetic micro operations – Binary Adder - Binary Adder Subtractor – Binary Incrementer —Logic Micro operations – list of Logic Micro operations – Hardware Implementation - Shift Micro operations.

UNIT - IV　　　BASIC COMPUTER ORGANIZATION AND DESIGN　　　　　　**[12]**

Instruction Codes – Computer Registers - Common Bus System – Computer Instructions-Instruction Set Completeness – Timing and Control – Instruction Cycle – Memory reference Instructions – AND to AC – ADD to AC – LDA :Load to AC – STA: Store AC – Input Output Interrupt.

UNIT - V　　　MEMORY ORGANIZATION　　　　　　　　　　　　　　**[12]**

Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Associative mapping – Direct Mapping, Writing into Cache – Cache Initialization– Virtual Memory – Memory Management Hardware – Segmented Page Mapping – Memory Protection.

Total (L= 45, T = 15) = 60 Periods

Text Books :

1　Morris Mano M , Computer System Architecture, PHI, New Delhi, Third Edition, 2012.

2　Thomas Floyd R.P. Jain, Digital fundamentals, Pearson Education, New Delhi, Second Edition, 2015.

Reference Books :

1　William Stallings, Computer Organization and Architecture, Pearson Education, New Delhi, Sixth Edition, 2014

2　MorrisMano M, DigitalLogic& ComputerDesign ,Pearson Education, New Delhi, 2012.

3　MorrisMano M, DigitalLogic& ComputerDesign ,Pearson Education, New Delhi, 2017.

4　David E. Culler, Jaswinder Paul Singh, AnoopGupta:Parallel Computer Architecture: Hardware / Software Approach, Elsevier Science, Second Edition, 2016.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain Digital Fundamentals.*	3	2	2	3	-	-	-	-	2	-	-	3	3	2
CO2	*Identify the Digital Components and Data Representation.*	3	3	2	3	-	-	-	-	2	-	-	2	3	2
CO3	*Classify the Micro Operations.*	3	3	2	2	-	-	-	-	2	-	-	2	1	2
CO4	*Outline the basics of Computer Organization..*	3	2	2	2	-	-	-	-	2	-	-	2	3	2
CO5	*Illustrate Memory Organization.*	3	2	2	3	-	-	-	-	2	-	-	2	3	2
	Average	3	3	2	3	-	-	-	-	2	-	-	2	3	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER - I

CA20113	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On Completion of this course, the student will be able to	*Cognitive Level*
CO1: *Describe the need, role, importance and uses of databases.*	*Remembering*
CO2: *Explain about storage and file structure.*	*Understanding*
CO3: *Utilize the functions of Relational Model.*	Applying
CO4: *Write the query to perform the basic file operations.*	Creating
CO5: *Summarize the PL/SQL operations.*	*Understanding*

UNIT - I   INTRODUCTION   [09]

Database System Applications – Purpose of Database System. View of Data: Data Abstraction – Instances and Schemas – Data Models – Relational Database – Database Design –The Entity Relationship model.

UNIT - II   STORAGE AND FILE STRUCTURE   [09]

Overview of physical storage media – Magnetic Disks – Tertiary Storage – Storage Access. File Organization: Fixed Length Records – Variable Length Records. Organization of Records in Files: Sequential File Organization – Multi table Clustering File Organization – Data Dictionary Storage.

UNIT - III   RELATIONAL MODEL   [09]

Structure of Relational Databases –Fundamental Relational Algebra Operation. Transactions: Transaction Concept – Transaction State – Implementation of Atomicity and Durability – Concurrent Execution-Serializability.

UNIT - IV   SQL   [09]

Background – Data Definition- Basic Structure of SQL Queries – Set Operations – Aggregate Functions –Nested sub queries – Views – Joined Relations. Relational Database Design: Atomic Domain and First Normal Forms. Decom Position using Functional Dependencies: Keys and Functional Dependencies – Third Normal Form
Boyce Codd Normal Form.

UNIT - V   INTRODUCTION OF PL/SQL   [09]

Advantages of PL/SQL –The Generic PL/ SQL Block. PL/SQL: Data types –Variables – Constants – Control Structures Cursors – Exception Handling –Procedures and Functions –Packages – Triggers.

Total (L: 45, T:0) = 45 Hours

Text Book :

1   Abraham Silberschatz ,Henry F.Korth ,S.Sudarshan ,Database System Concepts, Tata McGraw –Hill, Singapore, New Delhi, Fifth Edition, 2012.

2   Ivan Bayross, The Programming Languages of Oracle, BPB Publications, New Delhi, Third Edition, 2012.

Reference Books :

1   C.J Date An Introduction to Database System, Pearson Education, New Delhi, First Edition, 2015.

2   P.S.Deshpande, SQL & PL/SQL for Oracle 10g, Dream Tech Press, New Delhi, Third Edition, 2007.

3   Abraham Silberschatz, Hentry F.Korth and S.Sudharssan,"Database System Concepts, Tata McGraw Hill, New Delhi , Fourth Edition, 2008.

4   Raghu Ramakrishnan & Johannesgerhrke, Data Base Management Systems, Mc Graw Hill International Edition, New Delhi, First Edition, 2009.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the need, role, importance and uses of databases.*	3	3	2	2	-	-	-	-	2	-	-	2	1	3
CO2	*Explain about storage and file structure.*	3	3	2	2	-	-	-	-	2-	-	-	2	2	2
CO3	*Utilize the functions of Relational Model.*	3	3	2	2	-	-	-	-	3	-	-	2	3	3
CO4	*Write the query to perform the basic file operations.*	3	3	2	2	-	-	-	-	3	-	-	2	2	2
CO5	*Summarize the PL/SQL operations.*	3	3	2	2	-	-	-	-	3	-	-	2	2	3
	Average	3	3	2	2	-	-	-	-	3	-	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER - I

		L	T	P	C
CA20114	PYTHON PROGRAMMING	3	0	0	3

Prerequisite: C Programming

Course Outcomes : On successful completion of the course, the student will be able to   **Cognitive Level**

CO1:	Explain basic principles of Python programming language.	Understanding
CO2:	Outline Language Components.	Understanding
CO3:	Utilize the Strings, Lists and TupleConcepts.	Applying
CO4:	Develop Dictionaries and Functions in Python.	Applying
CO5:	Make use of Files and Modules.	Applying

UNIT - I   INTRODUCTION TO PYTHON   [09]

Introduction – Features – Downloading and Installing python - Executing a Python program – Flavors of Python – Memory Management in python – Garbage Collection – Comparisons between C and Python – Comparisons between Java and Python – Data types in Python: Comments –Built-in Datatype – bool Data type – Sequences – Sets – literals – Identifiers and Reserved words – Naming Conventions.

UNIT - II   LANGUAGE COMPONENTS   [09]

Condition Statements: if , if-else statement. Looping Statement: While – for-Infinite loop – Nested loop - Break – Continue-Pass- Assert – Return. Operators – Input and Output Statements – Array: Creating – Importing the Array Module – Processing the Array – Types of Array – Operations on Arrays – Attributes of an Array- Case studies.

UNIT - III   STRINGS, LISTS AND TUPLES   [09]

Strings: Creating – Functions – Indexing - Slicing – Concatenation- Repetition – Membership – Comparing string – Testing Strings – Searching for substrings – Converting Strings – Stripping Whitespace Characters from a string – Formatting strings. Lists: Creating Lists – Updating -Concatenation - Repetition - Methods – Sorting- Nested Lists. Tuples: Creating - Accessing – Operations – Functions - Nested Tuples - Inserting Elements, Modifying Elements, Deleting Elements from a Tuple – Case studies.

UNIT - IV   DICTIONARIES AND FUNCTIONS   [09]

Dictionaries: Operations – Methods - Using for Loop with Dictionaries – Sorting the Elements of a Dictionary using Lambdas - Converting Lists and Strings into Dictionary - Passing Dictionaries to Functions - Ordered Dictionaries. Functions: Function Vs. Method - Defining – Calling – Returning - Pass by Object Reference –Arguments : Formal, Actual, Positional, Keyword, Default & Variable Length Arguments. Local and Global Variables - Recursive Functions - Lambdas - Function Decorators – Case studies.

UNIT - V   FILES AND MODULES   [09]

Files - Types of Files - Opening & Closing a File - Working with Text Files Containing Strings - Working with Binary Files - with Statement - seek() and tell() Methods - Random Accessing of Binary Files - Random Accessing of Binary Files using mmap - Zipping and Unzipping Files - Working with Directories. - Modules: Namespaces - Importing Modules – Module Built- in-functions- Standard Modules: math and dir function – Case studies.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 NageswaraRao, R., Core Python Programming, Dreamtech Press, New Delhi, First Edition, 2017.

2 Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., New Delhi, First Edition, 2016.

Reference Books :

1 Daniel Liang Y., Introduction to Programming using Python, Pearson Education, New Delhi, Second Edition, 2017.

2 Wesley J. Chun, Core Python Programming, Pearson Education, New Delhi , Second Edition, 2010.

3 Kenneth A. Lambert, Fundamentals of Python: First Programs, Cengage Learning, New Delhi , 2016.

4 Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., New Delhi, 2011.

CO PO MAPPING

CO	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
		Programme Outcomes													
CO1	*Explain basic principles of Python programming language.*	3	3	2	2	-	-	-	1	-	2	-	3	3	2
CO2	*Outline Language Components.*	3	2	3	2	-	-	-	2	-	2	-	2	3	2
CO3	*Utilize the Strings, Lists and TupleConcepts.*	3	3	3	2	-	-	-	2	-	2	-	2	2	2
CO4	*Develop Dictionaries and Functions in Python.*	3	2	3	2	-	-	-	2	-	2	-	3	3	2
CO5	*Make use of Files and Modules.*	3	3	2	2	-	-	-	2	-	2	-	3	3	2
	Average	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**3**	**3**	**2**

1: Slight (Low)　　2: Moderate (Medium)　　3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)   **R 2020**

<u>**SEMESTER - I**</u>

		L	T	P	C
CA20121	**DATA STRUCTURES LAB**	0	0	3	2

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1:	*Develop the programming skills in design and implementation of data structures and their applications*	*Applying*
CO2:	*Write and execute write programs in C to implement various sorting and searching methods*	*Applying*
CO3:	*Distinguish the conceptual differences in trees, binary trees, and binary search trees.*	*Analyzing*
CO4:	*Write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues.*	*Analyzing*
CO5:	*Exemplify and implement how abstract data types such as stack, queue and linked list.*	*Analyzing*

LIST OF EXPERIMENTS
1. Write a C program for implementation of stack using array
2. Write a C program for implementation of queue using array
3. Write a C program for implementation of circular queue using array
4. Design, develop and execute a program in C to evaluate a valid postfix expression using a stack. Assume that the postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The operators are +(add), -(subtract), *(multiply), /(divide)
5. Design, develop and execute a program in C to read a sparse matrix of integer values and make a transpose of it. Use the triple to represent an element in sparse matrix.
6. Design, develop and execute a program in C to implement singly linked list where each node consist of integers. The program should support following functions. a. Create a singly linked list b. Insert a new node c. Delete a node if it is found, otherwise display appropriate message d. Display the nodes of singly linked list
7. Design, develop and execute a program in C to implement doubly linked list where each node consist of integers. The program should support following functions. a. Create a doubly linked list b. Insert a new node c. Delete a node if it is found, otherwise display appropriate message d. Display the nodes of doubly linked list
8. Using array representation for a polynomial, design, develop and execute a program in C to add two polynomials and then print the resulting polynomial.
9. Write a program in C to construct binary tree and binary tree traversal
10. Design, develop and execute a program in C to create a max heap of integers by accepting one element at a time and by inserting it immediately in to heap. Use the array representation of heap. Display the array at the end of insertion phase.

Total (L= 45, T = 0) = 45 Periods

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Develop the programming skills in design and implementation of data structures and their applications	2	2	3	2	-	-	-	-	-	2	-	2	1	2
CO2	Write and execute write programs in C to implement various sorting and searching methods	3	2	3	2	-	-	-	-	-	2	-	3	2	3
CO3	Distinguish the conceptual differences in trees, binary trees, and binary search trees.	3	2	2	2	-	-	-	-	-	2	-	2	3	2
CO4	Write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues.	3	2	3	2	-	-	-	-	-	2	-	3	2	3
CO5	Exemplify and implement how abstract data types such as stack, queue and linked list.	3	2	3	2	-	-	-	-	-	2	-	2	1	2
	Average	2	2	3	3	-	-	-	-	-	2	-	2	2	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)   *R2020*

<u>**SEMESTER – I**</u>

CA20122	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
		0	0	3	2

Prerequisite: SQL

Course Outcomes : On Completion of this course, the student will be able to	*Cognitive Level*
CO1:	*Explain basic database concepts, applications, data models, schemas and instances.*	*Understand*
CO2:	*Demonstrate the use of constraints and relational algebra operations.*	*Understand*
CO3:	*Emphasize the importance of normalization in databases.*	*Analyzing*
CO4:	*Describe the basics of SQL and construct queries using SQL.*	*Analyzing*
CO5:	*Explain the familiarize issues of concurrency control and transaction management.*	*Analyzing*

LIST OF EXPERIMENTS

01. DDL, DML and DCL Queries
02. Aggregate Functions and Set Operations
03. Normalization
04. Joins
05. Nested Sub Queries and Correlated Sub Queries
06. Views

   PL/SQL

07. Cursors
08. Procedures
09. Functions
10. Packages
11. Triggers
12. Exception Handling

Total (L= 45, T = 0) = 45 Periods

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain basic database concepts, applications, data models, schemas and instances.*	2	3	2	2	-	-	-	-	-	2	-	3	1	2
CO2	*Demonstrate the use of constraints and relational algebra operations.*	2	3	3	2	-	-	-	-	-	2	-	2	3	2
CO3	*Emphasize the importance of normalization in databases.*	2	3	2	2	-	-	-	-	-	2	-	-	2	3
CO4	*Describe the basics of SQL and construct queries using SQL.*	2	3	2	2	-	-	-	-	-	2	-	2	3	2
CO5	*Explain the familiarize issues of concurrency control and transaction management.*	2	3	3	2	-	-	-	-	-	2	-	2	1	3
	Average	**2**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

<u>SEMESTER – I</u>

CA20123	PYTHON PROGRAMMING LAB	L	T	P	C
		0	0	3	2

Prerequisite: C Programming

Course Outcomes : On Completion of this course, the student will be able to	*Cognitive Level*
CO1: *Describe the Python language syntax including control statements, loops and functions..*	*Understand*
CO2: *write programs for a wide variety problem in mathematics, science, and games.*	*Applying*
CO3: *Write Test and Debug Python Programs*	*Applying*
CO4: *Implement Conditionals and Loops for Python Programs.*	*Applying*
CO5: *Ilustrate the Use functions and represent Compound data using Lists, Tuples and Dictionaries.*	*Analyzing*

LIST OF EXPERIMENTS

1. Program using Operators
2. Program using Conditional Statements
3. Program using Looping
4. Program using Strings
5. Program using Lists
6. Program using Dictionaries
7. Program using Tuples
8. Program using Functions
9. Program using File handling
10. Program using Modules
11. Develop the simple project

Total (L= 45, T = 0) = 45 Periods

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the Python language syntax including control statements, loops and functions..*	2	3	2	3	-	-	-	-	-	2	-	3	1	2
CO2	*write programs for a wide variety problem in mathematics, science, and games.*	2	2	2	2	-	-	-	-	-	2	-	2	3	2
CO3	*Write, Test and Debug Python Programs*	2	3	2	2	-	-	-	-	-	2	-	2	3	3
CO4	*Implement Conditionals and Loops for Python Programs.*	2	3	2	2	-	-	-	-	-	2	-	2	2	1
CO5	*Ilustrate the Use functions and represent Compound data using Lists, Tuples and Dictionaries.*	2	2	2	2	-	-	-	-	-	2	-	2	1	3
	Average	**2**	**3**	**2**	**2**	**-**	**-**		**-**	**-**	**2**	**-**	**2**	**3**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER - II

		L	T	P	C
CA20211	DATA COMMUNICATION AND NETWORKS	3	0	0	3

*Prerequisite:*Computer Networks

Course Outcomes : On Completion of this course, the student will be able to	*Cognitive Level*
CO1: Explain the concept of Data Computations.	*Understand*
CO2: Describe the concept of Data Link Layer.	*Understand*
CO3: Compare the concept of Network Layer.	*Applying*
CO4: Explain the concept of Transport Layer..	*Analyzing*
CO5: Identify the purpose of Application Layer..	*Applying*

UNIT - I   DATA COMMUNICATIONS [09]

Components – Direction of Data Flow – Networks – Components and Categories– Types of Connections – Topologies – Protocols and Standards – ISO/OSI Model –Transmission Media – Coaxial Cable – Fiber Optics.

UNIT - II   DATA LINK LAYER [09]

Error – Detection and Correction – Parity – LRC – CRC – Flow Control and Error Control – Stop and Wait – Go Back - N ARQ – Selective Repeat ARQ – Sliding Window – HDLC – LAN – Ethernet IEEE 802.3 – IEEE 802.4 – IEEE 802.5 – IEEE 802.11 – FDDI – Bridges.

UNIT - III   NETWORK LAYER [09]

Internet works – Packet Switching and Datagram Approach – IP Addressing Methods – Sub Netting – Routing – Distance Vector Routing – Link State Routing – Routers.

UNIT - IV   TRANSPORT LAYER [09]

Duties of Transport Layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol(UDP) –Transmission Control Protocol (TCP) – Congestion Control – Quality of Services(QOS) – Integrated Services.

UNIT - V   APPLICATION LAYER [09]

Domain Name Space (DNS) – SMTP – FTP – HTTP - WWW – Security – Cryptography.

Total (L= 45, T = 0) = 45 Periods

Text Book :

1 Behrouz A.Forouzan, Data Communication and Networking ,Tata McGraw-Hill, New Delhi, Fifth Edition, 2018.

2 Godbole Achyut, Data Communication and Networks , Tata McGraw Hill, New Delhi, Fourth Edition, 2011.

Reference Books :

1 James F.Kurose & Keith W.Ross, Computer Networking A Top – Down Approach Featuring The Internet, Pearson Education, New Delhi, 2015.

2 Andrew S.Tanenbaum, Computer Networks, PHI, New Delhi, Fourth Edition, 2010.

3 William Stallings, Data and Computer Communication, Pearson Education, New Delhi, Sixth Edition, 2010.

4 Forouzan Behrouz A. , Data communications and networking, Tata McGraw Hill, New Delhi, Fifth Edition, 2010.

MCA (MASTER OF COMPUTER APPLICATIONS)

<u>CO PO MAPPING</u>

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the concept of Data Computations.	3	2	3	2	-	-	-	-	-	3	-	2	2	2
CO2	Describe the concept of Data Link Layer.	3	2	3	2	-	-	-	-	-	3	-	2	2	3
CO3	Compare the concept of Network Layer.	3	2	3	2	-	-	-	-	-	3	-	2	2	3
CO4	Explain the concept of Transport Layer..	3	2	3	2	-	-	-	-	-	3	-	2	3	2
CO5	Identify the purpose of Application Layer..	3	2	3	2	-	-	-	-	-	3	-	2	2	2
	Average	3	2	3	2	-	-	-	-	-	3	-	2	2	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER - II

		L	T	P	C
CA20212	**JAVA PROGRAMMING**	3	0	0	3

Prerequisite: C,C++

Course Outcomes : On successful completion of the course, the student will be able to	*Cognitive Level*
CO1: *Explain the basic programming concepts of java.*	*Understand*
CO2: *Defined package, to create thread program and string methods.*	*Understand*
CO3: *Examine the input/output and networking package classes and methods.*	*Understand*
CO4: *Explore the abstract Applications in Distributed Environment.*	*Understand*
CO5: *Illustrate the Even – Driven Programming.*	*Understand*

UNIT - I   OVERVIEW OFJAVA   [09]

Introduction-Java-Object Oriented Programming Concepts- Data Types- Variables and Arrays – Control Statements–Method Overriding.

UNIT - II   PACKAGES   [09]

Packages – Importing Packages- I/O Package – Interfaces – Exception Handling – Multithreaded Programming- String Operations. The Java I/O Classes– File – Byte Streams – The Character Streams – Serialization. AWT Package: AWT Classes – Window Fundamentals – Working with Graphics– Working with Color – Working withFonts – Applet Package: Applet Basics – Applet Architecture – Reading and Writing in Console – Print Writer class.

UNIT - III   NETWORK PROGRAMMING IN JAVA   [09]

Sockets – secure sockets – custom sockets – UDP data grams – multicast sockets –URL classes – Reading Data from the server – writing data – configuring the connection – Reading the header – telnet application – Java Messaging services.

UNIT - IV   APPLICATIONS IN DISTRIBUTED ENVIRONMENT   [09]

Remote method Invocation – activation models – RMI custom sockets – Object Serialization – RMI – IIOP implementation – CORBA – IDL technology – Naming Services – CORBA programming Models - JAR file creation

UNIT - V   EVENT-DRIVEN PROGRAMMING   [09]

Graphics programming – Frame – Components – working with 2D shapes – Using color, fonts, and images - Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View- Controller design pattern – buttons – layout management – Swing Components.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1   Herbert Schildt, The Complete Reference JAVA, Tata McGraw Hill , Noida, Tenth Edition , 2017.

2   Gavin King, Java Persistence with Hibernate, Manning Publications, United States, Second Edition , 2016.

Reference Books :

1   Herbert Schildt, The Complete Reference, Tata McGraw Hill, Noida, Eighth Edition, 2011.

2   Kogent, Java 6 Programming Black Book, Kogent Learning Solutions, New Delhi, 2011.

3   Steven Holzner, Java2(JDK 5 Edition) Programming, Dreamtech Press India Pvt. Ltd, New Delhi, 2015.

4   Herbert Schildt, Java the Complete Reference, Tata McGraw Hill, Noida, Ninth Edition, 2014.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the basic programming concepts of java.*	2	3	2	2	-	-	-	-	-	2	-	2	1	2
CO2	*Defined package, to create thread program and string methods.*	3	3	2	2	-	-	-	-	-	2	-	2	2	3
CO3	*Examine the input/output and networking package classes and methods.*	3	2	2	2	-	-	-	-	-	2	-	2	3	2
CO4	*Explore the abstract Applications in Distributed Environment.*	3	3	2	2	-	-	-	-	-	2	-	2	2	3
CO5	*Illustrate the Even – Driven Programming.*	3	3	2	2	-	-	-	-	-	2	-	2	2	3
	Average	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER - II

CA20213	OPERATING SYSTEMS	L 3	T 1	P 0	C 4

Prerequisite: **Unix**

Course Outcomes : On Completion of this course, the student will be able to   *Cognitive Level*

CO1:	*Identify with the basics of operating systems and its components*	*Understand*
CO2:	*Examine the scheduling algorithms, know about the critical section problem*	*Understand*
CO3:	*Describe classical synchronization problem and semaphores.*	*Understand*
CO4:	*Classify the storage management, paging and segmentation*	*Understand*
CO5:	*Explain the disk structure and disk scheduling algorithms and analyze the concept of allocation methods*	*Understand*

UNIT - I   INTRODUCTION   [12]

Definition of OS - Mainframe System - Desktop Systems - Multi Processor System – Distributed - Clustered - Real Time Systems - Handheld Systems - Operating System Structure – System Components - Services - System Calls - System Programs - System Design and Implementation.

UNIT - II   PROCESS MANAGEMENT   [12]

Concepts - Process Scheduling - Operations on Processes - Co-Operating Processes – Inter Process Communication - CPU Scheduling - Scheduling Concepts - Criteria – Scheduling Algorithms - Multiprocessor Scheduling - Real Time Scheduling.

UNIT - III   PROCESS SYNCHRONIZATION   [12]

Critical Section - Synchronization Hardware – Semaphores - Problems of Synchronization - Critical Regions – Monitors – Deadlocks – Characterization - Handling Deadlocks – Deadlock Prevention – Avoidance – Detection - Deadlock Recovery.

UNIT - IV   MEMORY MANAGEMENT   [12]

Storage Hierarchy - Storage Management Strategies – Contiguous - Non Contiguous Storage Allocation - Single User - Fixed Partition - Variable Partition – Swapping - Virtual Memory – Basic Concepts - Multilevel Organization - Block Mapping – Paging – Segmentation – Page Replacement Methods – Locality - Working Sets.

UNIT - V   I/O AND FILE SYSTEMS   [12]

Disk Scheduling - File Concepts - File System Structure - Access Methods - Directory Structure – Protection – Directory Implementation - Allocation Methods - Free Space Management – Case Study: Linux System, Windows,.

Total (L: 45 T:15) = 60 Hours

Text Book :

1 Silberschatz and Galvin, Operating System Concepts, John Wiley & Sons Inc, New Delhi, Sixth Edition, 2018.

2 Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating Systems Concepts, John Wiley & Sons, New Delhi, Ninth Edition, 2013.

Reference Books :

1 Milankovic M., Operating System Concepts and Design, Tata McGraw Hill, Noida, Second Edition, 2017.

2 P.C.Bhatt, An Introduction to Operating Systems Concepts and Practice, Prentice Hall of India, New Delhi, Fourth Edition, 2014.

3 H.M.Deitel, An Introduction to Operating Systems, Pearson Education, Noida, Second Edition, 2012.

4 William Stallings, Operating Systems Internals and Design Principles, Prentice Hall, New Delhi, Seventh Edition, 2020.

MCA (MASTER OF COMPUTER APPLICATIONS)

<div align="center"><u>**CO PO MAPPING**</u></div>

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify with the basics of operating systems and its components*	2	3	2	3	-	-	-	2	-	2	-	3	2	2
CO2	*Examine the scheduling algorithms, know about the critical section problem*	2	3	2	3	-	-	-	3	-	2	-	3	3	2
CO3	*Describe classical synchronization problem and semaphores.*	2	3	2	3	-	-	-	3	-	2	-	3	3	2
CO4	*Classify the storage management, paging and segmentation*	2	3	2	3	-	-	-	2	-	2	-	3	3	3
CO5	*Explain the disk structure and disk scheduling algorithms and analyze the concept of allocation methods*	2	3	2	3	-	-	-	2	-	2	-	3	2	2
	Average	**2**	**3**	**2**	**3**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**3**	**3**	**2**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER – II

CA20221	NETWORKS LAB	L	T	P	C
		0	0	3	2

*Prerequisite:*Computer Networks

Course Outcomes : On Completion of this course, the student will be able to	*Cognitive Level*
CO1: Demonstrate the applications using TCP sockets like echo client, echo server and file transfer.	*Understand*
CO2: Illustrate the applications using raw sockets like ping, trace route.	*Understand*
CO3: Experiments using shortest path routing protocols.	*Understand*
CO4: Develop an application such as HTTP and E-Mail.	*Understand*
CO5: Perform the concept of multiuser chat application.	*Understand*

LIST OF EXPERIMENTS

01. Applications using TCP Sockets

    A. Echo Client and Echo Server.

    B. File Transfer.

02. Applications using UDP Sockets

    A. DNS.

03. Applications using Raw Sockets

    A. Ping.

04. RPC

05. Shortest Path Routing Protocols

06. Sliding Window Protocol

07. Implementation of ARP

08. Implementation of RARP

09. Development of Applications Multiuser Chat

10. Development of Applications URL Web Page Downloading

Total (L= 45, T = 0) = 45 Periods

MCA (MASTER OF COMPUTER APPLICATIONS)

<u>CO PO MAPPING</u>

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Demonstrate the applications using TCP sockets like echo client, echo server and file transfer.	2	3	2	3	-	-	-	2	-	2	-	3	2	2
CO2	Illustrate the applications using raw sockets like ping, trace route.	2	3	2	3	-	-	-	3	-	2	-	3	3	2
CO3	Experiments using shortest path routing protocols.	2	3	2	3	-	-	-	3	-	2	-	3	3	2
CO4	Develop an application such as HTTP and E-Mail.	2	3	2	3	-	-	-	2	-	2	-	3	3	3
CO5	Perform the concept of multiuser chat application.	2	3	2	3	-	-	-	2	-	2	-	3	2	2
	Average	2	3	2	3	-	-	-	2	-	2	-	3	3	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER - II

			L	T	P	C
CA20222	JAVA PROGRAMMING LAB		0	0	3	2

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1:	Demonstrate the concepts of Object Oriented Programming.	*Understand*
CO2:	Implement the concepts of overriding.	*Understand*
CO3:	Perform the concept of Handling.	*Analyzing*
CO4:	Develop a Program using Packages.	*Analyzing*
CO5:	Perform the program using Applet.	*Analyzing*

LIST OF EXPERIMENTS

1. Write a Java Program to Illustrate the use of Object Oriented Programming Concepts

2. Write a java Program to represent Array List class.

3. Write a Java Program to Illustrate the use of Overriding.

4. Write a Java Program to Implement String Handling Functions.

5. Write a Java Program to Implement any 4 File Operations.

6. Create a Calculator Using AWT Controls and use Event Handling for Calculations.

7. Write a java program to Implement Action Listener.

8. Create a Java Application using Packages.

9. Create a Java Application using RMI

10. To Develop an Applet Program using Sockets.

Total (L= 45, T = 0) = 45 Periods

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	O5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Demonstrate the concepts of overriding.	2	3	2	3	-	-	-	2	-	2	-	3	2	2
CO2	Implement the exception handling concept.	2	3	2	3	-	-	-	3	-	2	-	3	3	2
CO3	Perform the concept of downloading web pages.	2	3	2	3	-	-	-	3	-	2	-	3	3	2
CO4	Perform the programs using applet.	2	3	2	3	-	-	-	2	-	2	-	3	3	3
CO5	Develop a program using Servlet.	2	3	2	3	-	-	-	2	-	2	-	3	2	2
	Average	**2**	**3**	**2**	**3**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**3**	**3**	**2**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER - II

		L	T	P	C
CA20223	**APPLICATION DEVELOPMENT LAB**	0	0	3	2

Prerequisite: Mini Project

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1:	Understand the basic technologies used by the android platform.	*Understand*
CO2:	Become familiar with creating graphical elements, handling different screen resolutions, and how graphical elements in an android app are displayed.	*Understand*
CO3:	Create GUI along with functionality for android apps.	*Analyzing*
CO4:	Learn how the android platform uses Intents.	*Analyzing*
CO5:	Understand what is necessary to publish and distribute Android apps.	*Analyzing*

LIST OF EXPERIMENTS

Create an App to Display Hello World.

1. Create an Application with two edit Text and a Button. When the Button is Clicked, the Text Inputted in Edit Text1 Should be Retrieved and Displayed in EditText2.

2. Creating a Simple Login Application using Android.

3. Creating Calculator Application Using Android.

4. Creating Simple Home Screen Widget in Android.

5. Creating Android Chat App.

6. Create a Camera Application, where You can click a Picture and then Save it as the Wallpaper using Android.

7. Create an Audio Recorder which Will Record the Sound using Android.

8. Create an App using Web Link Application. (E.g. Face Book, Gmail Link In Same Page)

9. Create an SMS Application Using Android.

Total (L= 45, T = 0) = 45 Periods

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Understand the basic technologies used by the android platform.	2	3	2	3	-	-	-	2	-	2	-	3	2	2
CO2	Become familiar with creating graphical elements, handling different screen resolutions, and how graphical elements in an android app are displayed.	2	3	2	3	-	-	-	3	-	2	-	3	3	2
CO3	Create GUI along with functionality for android apps.	2	3	2	3	-	-	-	3	-	2	-	3	3	2
CO4	Learn how the android platform uses Intents.	2	3	2	3	-	-	-	2	-	2	-	3	3	3
CO5	Understand what is necessary to publish and distribute Android apps.	2	3	2	3	-	-	-	2	-	2	-	3	2	2
	Average	2	3	2	3	-	-	-	2	-	2	-	3	3	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER – II

		L	T	P	C
HR20021	**CAREER BUILDING SKILLS I**	0	2	0	0

Prerequisite: Basic Communication Skills

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1	*Explore the competitive exams and improve the communication skills.*	*Understand*
CO2:	*Explore the Be job-ready and able to face interviews confidently.*	*Understand*
CO3:	*Illustrate the Sensitive use of non-verbal language suitable to different situations in professional life.*	*Understand*
CO4:	*Learn and use keys words, phrases and sentence structures making a mark in interviews and presentation skills.*	*Understand*
CO5:	*Effective writing skills with the ability to use different styles for different situations.*	*Understand*

UNIT - I   EFFECTIVE ENGLISH – WRITTEN AND SPOKEN ENGLISH   [08]

Basic Rules of Grammar – Parts of Speech – Tenses – Verbs. Sentence Construction – Vocabulary – Idioms & Phrases – Synonyms – Antonyms. Dialogues and Conversations – Essay writing.Exercises to Practice and Improve these Skills.

UNIT - II   ART OF COMMUNICATION & THE HIDDEN DATA INVOLVED   [04]

Verbal Communication – Effective Communication – Active listening and reproducing – NonVerbal Communication – Body Language of Self and Others,Communication in global society – Using tehnology of communication.

UNIT - III   WORLD OF TEAMS   [04]

Self Enhancement – Importance of Developing Assertive Skills – Developing Self Confidence – Developing Emotional Intelligence,Importance of Teamwork – Team vs.Group – Attributes of a Successful Team – Barriers Involved, Working with Groups–Dealing with People – Group DecisionMaking.

UNIT - IV   QUANTITATIVE APTITUDE I   [07]

Speed Math – HCF & LCM – Ratio & Proportions – Profit & Loss – Number System – Simple Interest & Compound Interest.

UNIT - V   REASONING I   [07]

Odd Man Out – Coding and Decoding – Mathematical Operations – Arithmetic Reasoning – Seating Arrangement

Total (L= 30, T = 0) = 30 Periods

Text Books :

1   JeffButterfield, SoftSkillsforEveryone, CengageLearningIndiaPvtLtd, NewDelhi, 2011.

2   Suresh E,Srihari P &Savithri J, Communication Skillsand Soft Skills: AnIntegrated Approach, Pearson, New Delhi, 2011

Reference Books :

1   Bhatnagar Nitin, Communicative Englishfor Engineers and Professionals, Pearson Publications, NewDelhi, 2010.

2   Sasikumar V, KiranmaiDutt P & Geetha Rajeevan, Listening & Speaking, Pearson Education, NewDelhi, Reprint 2017.

3   Praveen R.V ,Quantitative Aptitude and Reasoning, PHI Publications, 2010.

4   Agarwal R.S,QuantitativeAptitude, Thirdedition, TMH Publications, 2010

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explore the competitive exams and improve the communication skills.*	2	3	2	3	-	-	-	2	-	2	-	3	2	2
CO2	*Explore the Be job-ready and able to face interviews confidently.*	2	3	2	3	-	-	-	3	-	2	-	3	3	2
CO3	*Illustrate the Sensitive use of non-verbal language suitable to different situations in professional life.*	2	3	2	3	-	-	-	3	-	2	-	3	3	2
CO4	*Learn and use keys words, phrases and sentence structures making a mark in interviews and presentation skills.*	2	3	2	3	-	-	-	2	-	2	-	3	3	3
CO5	*Effective writing skills with the ability to use different styles for different situations.*	2	3	2	3	-	-	-	2	-	2	-	3	2	2
	Average	**2**	**3**	**2**	**3**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**3**	**3**	**2**

The header row spans "Programme Outcomes" over PO1–PSO2.

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

		L	T	P	C
CA20311	**WEB TECHNOLOGY**	3	0	0	3

Prerequisite: HTML,XML

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1:	*Explain the basics of web designing.*	*Analyzing*
CO2:	*Examine about dynamic webpage creation.*	*Applying*
CO3:	*Write Real time bean programming.*	*Understanding*
CO4:	*Expertise in server side programming.*	*Understanding*
CO5:	*Create static, dynamic and active pages using web technology.*	*Create*

UNIT - I   INTRODUCTION   [09]

HTML - Forms, Frames, Tables, Simple Web Page Design, Introduction to XML - XML Versus HTML, Electronic Data Interchange (EDI), XML Terminology, Introduction to Document Type Declaration (DTD), Element Type Declaration Attribute Declaration, Limitation of DTDs, Introduction to Schema, Complex Types, Extensible Style Sheet Language Transformations.

UNIT - II   DYNAMIC HTML   [09]

Dynamic HTML – Cascading Style Sheet, Java Script – Introduction, Control Structure, Functions, Arrays, Standard
Objects, Event Model, Simple Web Page Design.

UNIT - III   BEAN PROGRAMMING   [09]

Java Bean - Introduction, Advantages of Java Beans, Introspection, Bound and Constrained Properties, Persistence, Customizers, The Java Bean API, A Bean Example.

UNIT - IV   SERVER SIDE PROGRAMMING

Introduction to Java Servlet and JSP, Creating and Testing Servlets, Servlet Examples, Session Management.

UNIT - V   JAVA WEB SERVICES   [09]

Introduction to JSP, JSP and JDBC, Apache Struts, Java Server Faces (JSF), Enterprise Java Bean (EJB), EJB Architecture - Overview, Types of EJB, Session Bean, JNDI Lookup.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Achyut S G & Atul K, WebTechnologies-TCP/IP, Web/JavaProgramming & Cloud Computing, Third Edition,
   2013.

2 Herbert Schildt, JavaTM: The Complete Reference, Oracle Press, Tata McGraw Hill, Eleventh Edition, 2014

Reference Books :

1 Deital & Deital, Internet and World Wide Web – How to program, Pearson, 2011

2 Margaret Levine Young and Doug Muder, Internet:The Complete Reference, Tata Mcgraw hill, New Delhi, First Edition, 2011.

3 Kogent, Java 6 Programming Black Book, Kogent Learning Solution, Second Edition, 2011

4 Jeffrey C.Jackson, Web Technologies-A Computer Science Perspective, Pearson Education, Noida, Seventh Edition, 2016.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	O10	PO11	PO12	PSO1	PSO2
CO1	*Explain the basics of web designing.*	3	2	2	2	-	-	-	-	-	3	-	2	3	2
CO2	*Examine about dynamic webpage creation.*	2	3	2	2	-	-	-	-	-	3	-	2	2	3
CO3	*Write Real time bean programming.*	3	2	2	3	-	-	-	-	-	3	-	2	3	2
CO4	*Expertise in server side programming.*	3	2	2	2	-	-	-	-	-	3	-	2	2	3
CO5	*Create static, dynamic and active pages using web technology.*	2	2	2	2	-	-	-	-	-	3	-	2	2	2
	Average	3	2	2	2	-	-	-	-	-	3	-	2	2	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)   **R 2020**

CA20312	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
		3	1	0	4

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to	*Cognitive Level*
CO1: *Summarize the Conceptes of unified process and use case Diagrams.*	*Understanding*
CO2: *Explain about the Static UML Diagrams.*	*Understanding*
CO3: *Illustrate the Dynamic and implementation UML Diagrams..*	*Applying*
CO4: *Summarize the Design Patterns.*	*Understanding*
CO5: *Explain the concepts of Testing in OOAD.*	*Understanding*

UNIT - I   UNIFIED PROCESS AND USE CASE DIAGRAMS   [12]

Introduction to OOAD with OO Basics - Unified Process – UML diagrams – Use Case –Case study - the Next Gen POS system, Inception -Use case Modeling – Relating Use cases – include, extend and generalization – When to use Use-cases.

UNIT - II   STATIC UML DIAGRAMS   [12]

Class Diagram— Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition - Relationship between sequence diagrams and use cases – When to use Class Diagrams.

UNIT - III   DYNAMIC AND IMPLEMENTATION UML DIAGRAMS   [12]

Dynamic Diagrams – UML interaction diagrams - System sequence diagram – Collaboration diagram – When to use Communication Diagrams - State machine diagram and Modeling –When to use State Diagrams - Activity diagram – When to use activity diagrams - Implementation Diagrams - UML package diagram - When to use package diagrams - Component and Deployment Diagrams – When to use Component and Deployment diagrams.

UNIT - IV   DESIGN PATTERNS   [12]

GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller - Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioral – Strategy – observer – Applying GoF design patterns – Mapping design to code.

UNIT - V   TESTING   [12]

Object Oriented Methodologies – Software Quality Assurance – Impact of object orientation on Testing – Develop Test Cases and Test Plans.

Total (L: 45 T:15) = 60 Periods

Text Books :

1 Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development,Pearson Education, , Third Edition, 2005.

2 Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition – Re-Print 2013.

Reference Books :

1 Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, ―Design patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley, 2015.

2 Martin Fowler, ―UML Distilled: A Brief Guide to the Standard Object Modeling Languageǁ, Addison Wesley, Third Edition, 2003.

3. Deital & Deital, Internet and World Wide Web – How to program, Pearson, 2011

4 Margaret Levine Young and Doug Muder,"Internet:The Complete Reference" McGraw Hill International Edition, First Edition, 2011.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the Conceptes of unified process and use case Diagrams.*	3	3	2	3	-	-	-	-	-	2	-	3	3	1
CO2	*Explain about the Static UML Diagrams.*	2	3	2	3	-	-	-	-	-	2	-	3	3	2
CO3	*Illustrate the Dynamic and implementation UML Diagrams..*	3	3	2	3	-	-	-	-	-	2	-	3	3	2
CO4	*Summarize the Design Patterns.*	3	3	1	3	-	-	-	-	-	2	-	2	3	1
CO5	*Explain the concepts of Testing in OOAD.*	2	3	1	3	-	-	-	-	-	2	-	2	3	2
	Average	3	3	2	3	-	-	-	-	-	2	-	3	3	2

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - III

CA20313	SOFTWARE TESTING & QUALITY ASSURANCE	L 3	T 0	P 0	C 3

Prerequisite: **Software Testing**

Course Outcomes : On Completion of this course, the student will be able to   *Cognitive Level*

CO1:	*Explain software testing and quality assurance as a fundamental component of software life cycle.*	*Understanding*
CO2:	*Efficiently testing types in sofware.*	*Analyzing*
CO3:	*Summaraize the specialized testing.*	*Applying*
CO4:	*Explain Organizational issues in tsting.*	*Understanding*
CO5:	*Explain about testing management and automation*	*Understanding*

UNIT - I   TESTING FUNDAMENTALS   **[09]**

Principles of Testing- Testing, Verification and Validation – Process Model to represent Different Phases – Software Development Life Cycle Models.

UNIT - II   TESTING TYPES   **[09]**

Types of Testing – White Box Testing – Black Box Testing – Integration Testing – System and Acceptance Testing – Performance Testing – Regression Testing - Internalization Testing – Ad Hoc Testing

UNIT - III   SPECIALIZED TESTING   **[09]**

Testing of Objects Oriented Systems – Difference In OO Testing – Tools for Testing of OO Systems – Usability and Accessibility Testing – Testing for Usability.

UNIT - IV   ORGANIZATIONAL ISSUES IN TESTING   **[09]**

Common People Issues – Comparison between Testing and Development Functions – Organization Structures for Testing Team – Testing Services Organizations.

UNIT - V   TESTING MANAGEMENT AND AUTOMATION   **[09]**

Introduction – Test Planning – Test Management – Test Execution – Software Test Automation – Scope of Automation – Test Automation Tools – Generic Requirement for Test Tool/Framework – Selecting a Test Tool – Challenges in Automation.

Total (L: 45 T:0) = 45 Periods

Text Book :

1. Gopalswamy R and Srinivasan D, Software Testing: Principles and Practices, Pearson Education, New Delhi, 2013.

2. JJ Shen, Software Testing Techniques, Principles, and Practices, Tata McGraw Hill Publishing, New Delhi, Second Edition, 2019

Reference Books :

1. Glenford J M, Corey S, Tom Badgett and Todd M Thomas, The Art of Software Testin, Wiley, USA, 2014.
2. Ilene B, Practical Software Testing, Springer – Verlag, New Delhi, 2013.
3. John D Mr and David A S, A Practical Guide to Testing Object-Oriented Software, Addison-Wesley, New Delhi,2011.
4. William E Perry, Effective Methods for Software Testing, Wiley, New York, 2010

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain software testing and quality assurance as a fundamental component of software life cycle.*	3	2	2	2	3	-	-	-	-	2	-	2	2	3
CO2	*Efficiently testing types in sofware.*	3	3	3	2	3	-	-	-	-	2	-	2	3	3
CO3	*Summaraize the specialized testing.*	3	2	3	2	3	-	-	-	-	2	-	2	3	2
CO4	*Explain Organizational issues in tsting.*	3	2	3	3	3	-	-	-	-	2	-	2	2	2
CO5	*Explain about testing management and automation*	3	2	3	3	3	-	-	-	-	2	-	2	2	3
	Average	**3**	**2**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

SEMESTER - III

CA20314	BIG DATA ANALYTICS	L 3	T 0	P 0	C 3

Prerequisite: Cloud Computing

Course Outcomes : On Completion of this course, the student will be able to

Cognitive Level

CO1:	Explain with big data platform and Understand the fundamentals of various big data analysis techniques.	Understanding
CO2:	Analyze the big data mining data streams	Analyzing
CO3:	Explain Hadoop Environment.	Applying
CO4:	Analyze the data analysis systems and visualition.	Analyzing
CO5:	Explain the frameworks and applications	Understanding

UNIT - I   **INTRODUCTION TO BIG DATA**   **[9]**

Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT - II   **MINING DATA STREAMS**   **[9]**

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP)Applications –- Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT - III   **HADOOP ENVIRONMENT**   **[9]**

History of Hadoop-The Hadoop Distributed File System – Components of Hadoop -Analyzing the Data with Hadoop-Scaling Out- Hadoop Streaming- Design of HDFS-Hadoop filesystems-Java interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling.

UNIT - IV   **DATA ANALYSIS SYTEMS AND VISUALIZATION**   **[9]**

Link Analysis – PageRank - Efficient Computation of PageRank- Topic-Sensitive PageRank – Link Spam-Recommendation Systems- A Model for Recommendation Systems- Content Based Recommendations - Collaborative Filtering- Dimensionality Reduction- Visualizations - Visual data analysis techniques-interaction techniques- Systems and applications.

UNIT - V   **FRAMEWORKS AND APPLICATIONS**   **[9]**

IBM for Big Data –Framework - Hive – Sharding – NoSQL Databases –Mango DB-Casandra Hbase – Impala – Analyzing big data with twitter – Big data for Ecommerce – Big data for blogs.

Total (L: 45 T:0) = 45 Periods

Text Book :

1. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, England, Third Edition, 2014.

2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill Publishing, United States, First Edition, 2012.

Reference Books :

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, Germany, Second revised and extended Edition, 2010.

2. Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons, Reprinted, 2012.

3. Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, Elsevier, Second Edition Reprinted 2010.

4. Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, Intelligent Data Mining, Springer, Second Edition, 2007.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain with big data platform and Understand the fundamentals of various big data analysis techniques.*	3	2	2	2	3	-	-	-	-	2	-	2	2	3
CO2	*Analyze the big data mining data streams*	3	3	3	2	3	-	-	-	-	2	-	2	3	3
CO3	*Explain Hadoop Environment.*	3	2	3	2	3	-	-	-	-	2	-	2	3	2
CO4	*Analyze the data analysis systems and visualition.*	3	2	3	3	3	-	-	-	-	2	-	2	2	2
CO5	*Explain the frameworks and applications*	3	2	3	3	3	-	-	-	-	2	-	2	2	3
	Average	3	2	3	2	3	-	-	-	-	2	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - III

	L	T	P	C
CA20321 **WEB TECHNOLOGY LAB**	0	0	3	2

Prerequisite: SQL,HTML,XML

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1:	To Design effective WebPages.	*Understand*
CO2:	To create dynamic WebPages using DHTML.	*Create*
CO3:	Create applications using advanced java tools	*Create*
CO4:	To design, interactive web pages using Scripting languages	*Analysing*
CO5:	To learn server-side programming using servlets and JSP.	*Create*

LIST OF EXPERIMENTS

1. Create a Web Page Using HTML.

2. Create an Interactive Web Page using HTML and CSS.

3. Design an XML Document to Store Information About a Student In a College. The Information Must Include Register Number. Name, Name of the College, Branch, Year of Joining and E-Mail Id. Make Up Simple Data for Three Students. Create a CSS Style Sheet and Use It To Display the Document.

4. Create an XML Document, which contains 10 user information. Implement a Program, which takes User id as an Input and Returns The user details by taking the user Information from XML Document.

5. Create a Web Page with all types of Cascading Style Sheets using our College Information.

6. Client-Side Scripts for Validating Web Form Controls Using DHTML.

7. Create a Java Bean to draw various Graphical Shapes and Display it using BDK.

8. Patient Information System: This Software can be used to keep track of the Patients' Information and Treatment Details in a Hospital or Clinic. using JSP, Servlet & JDBC.

9. Write a Program Java to Create Three-Tier Applications using JSP and Database for Conducting On- Line Examination for Displaying Student Mark List. Assume that Student Information is available in a Database which has been stored in a Database Server.

10. Write a Program to Implement Banking Operation using EJB.

Total (L= 45, T = 0) = 45 Periods

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Design effective WebPages.	3	2	2	2	3	-	-	-	-	2	-	2	2	3
CO2	Create dynamic WebPages using DHTML.	3	3	3	2	3	-	-	-	-	2	-	2	3	3
CO3	Create applications using advanced java tools.	3	2	3	2	3	-	-	-	-	2	-	2	3	2
CO4	Design, interactive web pages using Scripting languages.	3	2	3	3	3	-	-	-	-	2	-	2	2	2
CO5	Create Server Side programming using servlets and JSP.	3	2	3	3	3	-	-	-	-	2	-	2	2	3
	Average	**3**	**2**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**2**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – III

			L	T	P	C
CA20322	**BIG DATA ANALYTICS LAB**		0	0	3	2

Prerequisite: Cloud Computing

Course Outcomes : On Completion of this course, the student will be able to　　　***Cognitive Level***

CO1:	*Implement standard tools for analyzing data sets.*	*Understand*
CO2:	Explain Manipulation for handling Data Analytics..	*Understand*
CO3:	*Demonstrate Dataset using data frame techniques.*	*Analyzing*
CO4:	Design Statistical Operation techniques.	*Analyzing*
CO5:	*Demonstrate* the concepts of Data Visualization Operation.	*Analyzing*

LIST OF EXPERIMENTS

01. Implement a Variable Assignment.

02. Implement a Vector Manipulation.

03. Implement a List Manipulation.

04. Implement a Matrix Manipulation.

05. Create an array with two elements which are 3x3 matrices.

06. Visualize a Patient Dataset Using Data frame.

07. Implement a Statistical Operation.

08. Implement a Data Visualization Operation.

Total (L: 45 T:0) = 45 Periods

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Implement standard tools for analyzing data sets.*	3	2	2	2	3	-	-	-	-	2	-	2	2	3
CO2	Explain Manipulation for handling Data Analytics..	3	3	3	2	3	-	-	-	-	2	-	2	3	3
CO3	*Demonstrate Dataset using data frame techniques.*	3	2	3	2	3	-	-	-	-	2	-	2	3	2
CO4	Design Statistical Operation techniques.	3	2	3	3	3	-	-	-	-	2	-	2	2	2
CO5	*Demonstrate* the concepts of Data Visualization Operation.	3	2	3	3	3	-	-	-	-	2	-	2	2	3
	Average	**3**	**2**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – III

CA20323	SOFTWARE TESTING LAB	L	T	P	C
		0	0	3	2

Prerequisite: Selenium

Course Outcomes : On Completion of this course, the student will be able to   *Cognitive Level*

CO1:	Explain software testing techniques for online systems.	*Understand*
CO2:	Illustrate Be familiar with GUI object testing.	*Understand*
CO3:	Develop exception concept in software testing.	*Analyzing*
CO4:	Describe the Automation Testing Approach.	*Analyzing*
CO5:	Describe Selenium server and demonstrate it using a script in Java/PHP	*Analyzing*

LIST OF EXPERIMENTS

1. Understand the Automation Testing Approach (Theory Concept).

2. Manual Testing for

   a. Login Page

   b.University Result

3. Using IDE, Write a Test Suite Containing Minimum 4 Test Cases.

4. Conduct a Test Suite for any Two Web Sites.

5. Write Java Script to Develop a Web Page Which Calculates the GCD of 2 Numbers.

6. Write and Test a Program to Login a Specific Web Page.

7. Write the Test Case for any Known Application (Eg - Banking Application).

8. Write and Test a Program to Provide Total Number of Objects Present / Available on the Page.

9. Write and Test a Program to Get the Number of List Items In a List / Combo Box.

10. Write and Test a Program to Count Number of Items on a Desktop.

Total (L: 45 T:0) = 45 Periods

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain software testing techniques for online systems.	3	2	2	2	3	-	-	-	-	2	-	2	2	3
CO2	Illustrate Be familiar with GUI object testing.	3	3	3	2	3	-	-	-	-	2	-	2	3	3
CO3	Develop exception concept in software testing.	3	2	3	2	3	-	-	-	-	2	-	2	3	2
CO4	Describe the Automation Testing Approach.	3	2	3	3	3	-	-	-	-	2	-	2	2	2
CO5	Describe Selenium server and demonstrate it using a script in Java/PHP	3	2	3	3	3	-	-	-	-	2	-	2	2	3
	Average	3	2	3	2	3	-	-	-	-	2	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – III

		L	T	P	C
HR20031	**CAREER BUILDING SKILLS II**	0	2	0	0

Prerequisite: Basic Communication Skills

Course Outcomes : On successful completion of the course, the student will be able to	***Cognitive Level***
CO1　*Explain the student competes quantitative aptitude and they can manage time and*	*Understanding*
CO2:　*Become effective technical communicators*	*Understanding*
CO3:　*Effective writing skills with the ability to use different styles for different situations.*	*Understanding*
CO4:　*Sensitive use of non-verbal language suitable to different situations in professional life.*	*Understanding*
CO5:　*Be job-ready and able to face interviews confidently.*	*Understanding*

UNIT - I　　　INTERVIEW & GD　　　　　　　　　　　　　　　　　　　　　　[04]

Interview Handling Skills – Self Preparation Checklist – Grooming Tips: Do's & Don'ts – Mock Interview & Feedback, GD Skills – Understanding the Objective and Skills Tested in a GD – General types of Gds – Roles in a GD – Do's & Don'ts – Mock GD & Feedback.

UNIT - II　　　PRESENTATION SKILLS　　　　　　　　　　　　　　　　　　　[05]

Presentation Skills – Stages Involved in an Effective Presentation – Selection of Topic, Content, Aids – Engaging the Audience – Time Management – Mock Presentations & Feedback.

UNIT - III　　　BUSINESS ETHICS　　　　　　　　　　　　　　　　　　　　[07]

Grooming Etiquette–Telephone & E-Mail Etiquette–Dining Etiquette–Do's & Don'ts in a Formal Setting – How to Impress. Ethics – Importance of Ethics and Values– Choices and Dilemmas Faced – Discussions From News Headlines.

UNIT - IV　　　QUANTITATIVE APTITUDE II　　　　　　　　　　　　　　　　[07]

Areas – Volumes – Heights & Distances – Partnerships & Shares – Chain Rule – Allegation & Mixtures – Time & Work – Pipes & Cisterns, Time and Distance, Problems on Trains.

UNIT - V　　　REASONING II　　　　　　　　　　　　　　　　　　　　　　[07]

Blood Relations – Series Completion – Venn Diagrams – Direction Sense Test– Verbal Reasoning -1.

Total (L: 30 T: 0) = 30 Periods

Text Books :

1　Jeff Butterfield, Soft Skills for Everyone, Cengage Learning India Pvt Ltd, New Delhi, 2011.

2　Bhatnagar Nitin, Communicative English for Engineers and Professionals, Pearson Publication, New Delhi, 2010

Reference Books :

1　Suresh Kumar E, Srihari P & Savithri J – Communication Skills and Soft Skills: An Integrated Approach, Pearson New Delhi, 2011.

2　Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth edition, TMH 2010.

3　Sasikumar V ,Kiranmai P Dutt & Geetha Rajeevan,Listening & Speaking, Pearson Education, New Delhi, Reprint 2010.

4　Praveen R.V, Quantitative Aptitude and Reasoning, PHI, New Delhi, 2010.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the student competes quantitative aptitude and they can manage time and stress.*	3	2	2	2	3	-	-	-	-	2	-	2	2	3
CO2	*Become effective technical communicators*	3	3	3	2	3	-	-	-	-	2	-	2	3	3
CO3	*Effective writing skills with the ability to use different styles for different situations.*	3	2	3	2	3	-	-	-	-	2	-	2	3	2
CO4	*Sensitive use of non-verbal language suitable to different situations in professional life.*	3	2	3	3	3	-	-	-	-	2	-	2	2	2
CO5	*Be job-ready and able to face interviews confidently.*	3	2	3	3	3	-	-	-	-	2	-	2	2	3
	Average	3	2	3	2	3	-	-	-	-	2	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – IV

CA20421	PROJECT WORK	L	T	P	C
		0	0	24	12

Prerequisite: **Mini Project**

Course Outcomes : On Completion of this course, the student will be able to   *Cognitive Level*

CO1:	Design modules of the project.	*Understand*
CO2:	Integrate the modules and arrive the final output.	*Understand*
CO3:	Investigate the results with available solutions.	*Analyzing*
CO4:	Demonstrate the outcome of the project and verify.	*Analyzing*
CO5:	Prepare technical report.	*Creating*

Instructions for Project Work

1. Students should register the Project title at the beginning of the Semester.

2. Review meetings should be conducted periodically. (Minimum 3 Review Meeting)

3. Project work should be published either in a Conference or Journal.

4. Project Document must be prepared with Company Certificate.

5. Project Work should be presented in the viva voce at the end of the semester.

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<u>**CO PO MAPPING**</u>

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Design modules of the project.	3	2	2	2	3	-	-	-	-	2	-	2	2	3
CO2	Integrate the modules and arrive the final output.	3	3	3	2	3	-	-	-	-	2	-	2	3	3
CO3	Investigate the results with available solutions.	3	2	3	2	3	-	-	-	-	2	-	2	3	2
CO4	Demonstrate the outcome of the project and verify.	3	2	3	3	3	-	-	-	-	2	-	2	2	2
CO5	Prepare technical report.	3	2	3	3	3	-	-	-	-	2	-	2	2	3
	Average	**3**	**2**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – II

		L	T	P	C
MA20261	**OPERATIONS RESEARCH (ELECTIVE I)**	3	0	0	3

Prerequisite: -

Course Outcomes: *On Completion of this course, the student will be able to*   *Cognitive Level*

CO1:	*Explain the decision making during the uncertain situations by linear programming approach.*	*Understand*
CO2:	*Explain the transportation and assignment algorithm to find the optimal solution.*	*Understand*
CO3:	*Constructing the network techniques in project scheduling.*	*Create*
CO4:	*Analyse the importance of stock controlling to maximize the profit.*	*Understand*
CO5:	*Applying the replacement and sequencing methods to maximize the profit.*	*Apply*

UNIT - I   LINEAR PROGRAMMING PROBLEMS   [09]

Introduction – Scope and role of OR – Phases of OR – Limitations of OR – Linear Programming Problem – Formulation of Linear Programming Problem – Optimum Solution by Graphical Method – Simplex Method (Using Slack Variables).

UNIT - II   TRANSPORTATION AND ASSIGNMENT PROBLEMS   [09]

Transportation Models (Minimizing and Maximizing Cases) - Balanced and Unbalanced Cases – Initial Basic Feasible Solution by North West Corner Rule, Least Cost and Vogel's Approximation Methods. Check for Optimality by Modified Method Assignment Models.

UNIT - III   NETWORK MODELS   [09]

Network – Fulkerson's Rule – Construction of a Network – Critical Path Method (CPM) – Optimistic, Pessimistic and Most Likely Time Estimates – Project Scheduling by PERT Analysis.

UNIT - IV   INVENTORY MODEL   [09]

Types of Inventory – Deterministic Inventory Models – EOQ and EBQ Models with and without Shortages – Quantity Discount Models - Price Breaks.

UNIT - V   REPLACEMENT MODELS AND SEQUENCING   [09]

Replacement of items that Deteriorate with Time – Value of Money Changing with Time – Not Changing with Time – Optimum Replacement Policy – Individual and Group Replacement. Sequencing Problem – Assumptions – Processing of 'n' Jobs in 2 Machines 'n' Jobs with 'm' Machines.

Total (L: 45 T:0) = 45 Periods

Text Book :

1   P.K.Gupta and Man Mohan ,Problems in Operations Research, S.Chand and Co, New Delhi, Twelth Edition,2014

2   Pradeep Prabhakar Pai, Operations Research principles and Practice, Oxford University Press, Fouth Edition, 2016

Reference Books :

1   Hira and Gupta, Problems in Operations Research, S. Chand and Co, New Delhi, Second Edition, 2012.

2   Wayne.L.Winston, Operations research applications and algorithms, Thomson learning, United States, Fourth Edition 2016.

3   Taha H.A, Operation Research, Pearson Education, Noida ,Ninth Edition,2013

4   P Sankara Iyer, Operations Research, Tata McGraw-Hill, NOIDA ,Fifth Edition, 2012.

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<u>**CO PO MAPPING**</u>

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the decision making during the uncertain situations by linear programming approach.*	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO2	*Explain the transportation and assignment algorithm to find the optimal solution.*	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO3	*Constructing the network techniques in project scheduling.*	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	*Analyse the importance of stock controlling to maximize the profit.*	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO5	*Applying the replacement and sequencing methods to maximize the profit.*	3	3	3	2	-	-	-	-	-	-	-	-	-	-
	Average	3	3	3	2		-	-	-	-	-	-	-	-	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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<u>SEMESTER - II</u>

		L	T	P	C
CA20261	TCP/IP (ELECTIVE I)	3	0	0	3

Prerequisite: Computer Networks

Course Outcomes : On successful completion of the course, the student will be able to	*Cognitive Level*
CO1: *Recognize the network components, categories, topology and IP address and compare the ISO/OSI model with TCP/IP protocol suite.*	*Understanding*
CO2: *Discuss about the functionality of various internet protocols and gain the knowledge of the different routing protocols and algorithms.*	*Understanding*
CO3: *Appraise User datagram and transmission control protocols.*	*Understanding*
CO4: *Explain the knowledge of congestion control and QOS techniques and purpose of DNS and client - server model.*	*Understanding*
CO5: *Compare HTTP, HTTPs and FTP in world wide web.*	*Understanding*

UNIT - I   INTRODUCTION   [09]

History –Standards – Internet — OSI model – Protocol suite – Addressing – Transmission Media – Local Area and Wide Area Networks – Switching – Connecting devices – IP Addressing.

UNIT - II   INTERNET PROTOCOL   [09]

Subnetting – Super netting – IP Packets – Delivery and Forwarding of IP Packets –Datagram – Fragmentation – Options-Checksum – ARP –RARP-Internet Control Message Protocol – Internet Group Management Protocol.

UNIT - III   TCP & UDP   [09]

TCP Services –Features-Segmentation-TCP Connection-State Transition Diagram-Windows in TCP-Flow control – Error Control – Congestion Control –Timers-Package-User Datagram protocol – Services-Applications-Package.

UNIT - IV   APPLICATION LAYER AND CLIENT SERVER MODEL   [09]

Concurrency – BOOTP – DHCP – Domain Name System – Name Space – Distribution – Resolution – Messages – Telnet – Rlogin –Network Virtual Terminal – Character Set – Controlling the Server – Remote Login.

UNIT - V   APPLICATION PROTOCOLS   [09]

File Transfer Protocol – Connections – Communication – Simple Mail Transfer Protocol – Simple Network Management Protocol – Hyper Text Transfer Protocol – Transaction – Request and Response messages.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1   Behrouz A. Forouzan, TCP/IP Protocol Suite, Tata McGraw Hill Edition, New Delhi, Third Edition, 2015.

2   Richard Stevens W. and Gabrani G., TCP/IP Illustrated Volume I, Pearson Education, New Delhi, 2019.

Reference Books :

1   Douglas E. Comer, David L. Stevens, Internetworking with TCP/IP – Volume I,II,III, PHI Pvt. Ltd., Second Edition, 2015.

2   Tim Parker, Mark A., Sportack , TCP/IP Unleashed, Techmedia,New Delhi, Second Edition, 2016.

3   Douglas E. Comex, Internetworking with TCP/IP, Principles, protocols and architecture, PHI, New Delhi, Fifth Edition, 2016.

4   Behrouz A. Forouzan, TCP/IP Protocol Suite, Tata McGraw Hill, New Delhi, Third Edition, 2016.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Recognize the network components, categories, topology and IP address and compare the ISO/OSI model with TCP/IP protocol suite.*	3	2	3	2	3	-	-	-	-	2	-	2	2	3
CO2	*Discuss about the functionality of various internet protocols and gain the knowledge of the different routing protocols and algorithms.*	3	2	3	2	3	-	-	-	-	2	-	2	2	3
CO3	*Appraise User datagram and transmission control protocols.*	3	2	3	2	3	-	-	-	-	2	-	2	2	3
CO4	*Explain the knowledge of congestion control and QOS techniques and purpose of DNS and client - server model.*	3	2	3	2	3	-	-	-	-	2	-	2	2	3
CO5	*Compare HTTP, HTTPs and FTP in world wide web.*	3	2	3	2	3	-	-	-	-	2	-	2	2	3
	Average	**3**	**2**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)   **R 2020**

		L	T	P	C
CA20262	**UNIX AND NETWORK PROGRAMMING (ELECTIVE I)**	3	0	0	3

Prerequisite: Operating System

Course Outcomes : On successful completion of the course, the student will be able to   ***Cognitive Level***

CO1:   *Compare the system calls and library functions, different types of files and access*   *Understanding*
         permissions.

CO2:   *Creation of parent and child process and gain the knowledge of the signals and threads.*   *Analyzing*

CO3:   *Identify the purpose of inter process communication system and locking procedure.*   *Analyzing*

CO4:   *Recognizing the different multiplexing techniques*   *Understanding*

CO5:   *Appraise the TCP, UDP sockets and raw sockets.*   *Understanding*

UNIT - I   INTRODUCTION & FILE SYSTEM   [09]

Overview of UNIX OS - File I/O – File Descriptors – File Sharing - Files and Directories – File Types - File Access Permissions – File Systems – Symbolic Links - Standard I/O library – Streams and File Objects – Buffering - System Data Files and Information - Password File – Group File – Login Accounting – System Identification.

UNIT - II   PROCESSES   [09]

Environment of a UNIX Process – Process Termination – Command Line Arguments – Process Control – Process Identifiers - Process Relationships Terminal Logins – Signals –Threads.

UNIT - III   INTER PROCESS COMMUNICATION   [09]

Introduction - Message Passing (SVR4)- Pipes – FIFO – Message Queues – Synchronization (SVR4) – Mutexes – Condition Variables – Read – Write Locks – File Locking – Record Locking –Semaphores –Shared Memory(SVR4).

UNIT - IV   SOCKETS   [09]

Introduction – Transport Layer – Socket Introduction - TCP Sockets – UDP Sockets - Raw Sockets – Socket Options - I/O Multiplexing - Name and Address Conversions.

UNIT - V   APPLICATIONS   [09]

Debugging Techniques - TCP Echo Client Server - UDP Echo Client Server - Ping - Trace Route - Client Server Applications Like File Transfer and Chat.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1   W.Richard Stevens, Advanced programming in the UNIX environment, Addison Wesley, New Delhi, 2015.

2   W.Stevens, Bill Fenner, Andrew Rudoff, Unix Network Programming, Volume 1,The Sockets Networking API, Pearson education,New Delhi, Third Edition, 2013.

Reference Books :

1   W.Stevens, Bill F,A R, Unix Network Programming ,V1, TheSockets Networking API , PE,New Delhi, Third Edition, 2017.

2   Meeta G, Tilak S and Rajiv S The C Odyssey Unix –The open Boundless C , BPB Publications,New Delhi, First Edition, 2015.

3   W. Richard Stevens, Advanced Programming in The UNIX Environment, Addison Wesley, New Delhi 2015.

4   S. J. Leffler, M. K. Mckusick, M. J.Karels and J. S. Quarterman.,The Design and Implementation of the 4.3 BSD Unix Operating System, Addison Wesley,New Delhi, 2015.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Compare the system calls and library functions, different types of files and access permissions.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO2	*Creation of parent and child process and gain the knowledge of the signals and threads.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO3	*Identify the purpose of inter process communication system and locking procedure.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO4	*Recognizing the different multiplexing techniques*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO5	*Appraise the TCP, UDP sockets and raw sockets.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
	Average	3	2	3	2	-	-	-	-	-	2	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER - II

		L	T	P	C
CA20263	**CLOUD COMPUTING (ELECTIVE I)**	3	0	0	3

Prerequisite: Distributed Computing

Course Outcomes : On Completion of this course, the student will be able to — *Cognitive Level*

CO1: *Explain the characteristics of cloud computing and its types.* — *Understanding*

CO2: *Illustrate the cloud service models and cloud deployment models.* — *Analyzing*

CO3: *Explain the cloud infrastructure.* — *Understading*

CO4: *Explore the Microsoft cloud services- windows azure platform.* — *Understanding*

CO5: *Understand the mobile cloud.* — *Understanding*

UNIT - I   UNDERSTANDING CLOUD COMPUTING   [09]

Defining Cloud Computing - Cloud Types - Examining the Characteristics of Cloud Computing - Assessing the Value Proposition – Measuring the Cloud's Value - Avoiding Capital Expenditures - Understanding Cloud Architecture - Exploring the Cloud Computing Stack - Connecting to the Cloud Understanding Services - Defining Infrastructure as a Service.

UNIT - II   USING PLATFORMS   [09]

Understanding Abstraction and Virtualization – Capacity Planning – Defining Baseline and Metrics - Network Capacity – Exploring Platform as a Service – Using Google Web Services – Surveying the Google Application Portfolio – Using Amazon Web Services - Understanding Amazon Database Services

UNIT - III   EXPLORING CLOUD INFRASTRUCTURE   [09]

Managing the Cloud – Administrating the Clouds – Cloud Management Products – Emerging Cloud Management Standards – Understanding Cloud Security – Securing the Cloud – Securing Data – Establishing Identity and Presence.

UNIT - IV   UNDERSTANDING SERVIES AND APPLICATIONS   [09]

Understanding Service Oriented Architecture – Defining SOA Communications - Managing and Monitoring SOA - Moving Applications to   the Cloud - Working with Cloud-Based Storage - Exploring Cloud Backup Solutions – Working With Productivity Software.

UNIT - V   USING THE MOBILE CLOUD   [09]

Working with Mobile Devices - Defining the Mobile Market – Using Smart Phones with the Cloud – Working with Mobile Web Services – Understanding Services Types – Performing Services Discovery – Using SMS – Defining WAP and Other Protocols – Performing Synchronization.

Total (L: 45 T: 0) = 45 Periods

Text Book :
1   Barrie Sosinsky, Cloud Computing Bible, Wiley Publishing, New Delhi,Second Edition, 2015.
2   Judith Hurwitz, Marcia Kaufman, Fern Halper, Robin Bloor Cloud Computing for Dummies, Wiley Publishing House ,New Delhi, 2015.

Reference Books :
1   Michael Miller, Cloud Computing: Web-Based Applications , First Edition, Que Publishing,New Delhi, 2018.
2   Anthony T V, Toby J V, Robert E, Cloud Computing: A Practical Approach,Third Edition, Tata McGraw Hill New Delhi, 2015.
3   Rajkumar Buyya, James Broberg, Andrzej Goscinski Cloud Computing Principles and Paradigms, Wiley Publishing, New Delhi, 2016.
4   Nick Antonopoulos, Lee Gillam, Cloud Computing Principles, Systems and Applications, Springer, 2015

MCA (MASTER OF COMPUTER APPLICATIONS)

<u>CO PO MAPPING</u>

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the characteristics of cloud computing and its types.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO2	*Illustrate the cloud service models and cloud deployment models.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO3	*Explain the cloud infrastructure.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO4	*Explore the Microsoft cloud services- windows azure platform.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO5	*Understand the mobile cloud.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
	Average	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER - II

	L	T	P	C
CA20264 MIDDLEWARE TECHNOLOGY (ELECTIVE I)	3	0	0	3

Prerequisite: NETWORKING

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1:   Introduce the concepts, techniques and applications of middleware technology.   *Understanding*
CO2   Understand middleware components like COM, CORBA and EJB.   *Understanding*
CO3:   Explaing about EJP Applications.   *Understanding*
CO4:   Illustrate the overview of CORBA concepts   *Understanding*
CO5:   Illustrate the overview of COM concepts   *Understanding*

UNIT - I   INTRODUCTION CLIENT / SERVER & MIDDLEWARE TECHNOLOGY   [09]

Client / Server- Server Types- Middleware – Client, Server and Operating System-Introduction to Distributed Object Technology-Middleware – Client/Server Building Blocks – Peer-to Peer Communications–RPC-Messaging-Java RMI- Overview of CORBA and DCOM.

UNIT - II   EJB ARCHITECTURE   [09]

EJB – EJB Architecture – Overview of EJB Software Architecture – View of EJB –Conversation – Building and Deploying EJBs – Roles in EJB.

UNIT - III   EJB APPLICATIONS   [09]

Types of Enterprise beans –Lifecycle of Beans-Steps in Developing an application using EJB Framework, EJB Deployment-EJB Session Beans – EJB Entity Beans – EJB Clients – Building an Application with EJB.

UNIT - IV   CORBA   [09]

Introduction and Concepts-CORBA Components-Architectural Features-Method Invocations-Static and Dynamic CORBA-Structure of CORBA IDL-Self Describing Data types-Building an application using CORBA-Advanced CORBA- CORBA Object Service-Object Location Service-Message Service-CORBA Component Model.

UNIT - V   COM   [09]

Evolution of DCOM, COM Client and Server, COM IDL, COM Interface-COM threading Model, Marshalling, Comparision of RMI, CORBA and DCOM.Programming Examples of RMI, CORBA and DCOM.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Herbert Schildt, The Complete Reference JAVA, Tata McGraw Hill, New Delhi, Tenth Edition, 2017.

2 Gavin King, Java Persistence with Hibernate, Manning Publications,New Delhi, Second Edition,2016.

Reference Books :

1 Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, Eighth Edition, 2016.

2 Kogent, Java 6 Programming Black Book, Kogent Learning Solutions, New Delhi, Second Edition, 2015,

3 Steven Holzner, Java 2 (JDK 5) Programming,PHI,New Delhi,Second Edition, 2017.

4 Herbert Schildt, Java the Complete Reference, McGraw Hill, Nineth Edition, 2016.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO11	O1	O1	SO1	PSO2
CO1	*Introduce the concepts, techniques and applications of middleware technology.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO2	*Understand middleware components lik COM, CORBA and EJB.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO3	*Explaing about EJP Applications.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO4	*Illustrate the overview of CORBA concepts*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO5	*Illustrate the overview of COM concepts*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
	Average	3	2	3	2	-	-	-	-	-	2	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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<u>SEMESTER - II</u>

		L	T	P	C
CA20265	**INTERNET OF THINGS (ELECTIVE I)**	3	0	0	3

Prerequisite: **Cloud Storage**

Course Outcomes : On Completion of this course, the student will be able to　　　　*Cognitive Level*

CO1:	*Understand the fundamentals of Internet of Things.*	*Understanding*
CO2:	*Understand the basics of IOT Architecture.*	*Understanding*
CO3:	*Understand the basics of IOT protocols*	*Understanding*
CO4:	*Apply the concept of Internet of Things in Building Iot with Raspberry Pi & Arduino*	*Applying*
CO5:	*Develop various business models and ethics in Internet of Things*	*Analyzing*

UNIT - I　　　　INTRODUCTION TO IoT　　　　　　　　　　　　　　　　[09]

Internet of Things - Physical Design - Logical Design - IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF – YANG - IoT Platforms Design Methodology.

UNIT - II　　　　IoT ARCHITECTURE　　　　　　　　　　　　　　　　　[09]

M2M high - level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture.

UNIT - III　　　　IoT PROTOCOLS　　　　　　　　　　　　　　　　　　[09]

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security.

UNIT - IV　　　　BUILDING IoT WITH RASPBERRY PI & ARDUINO　　　　[09]

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device - Building blocks - Raspberry Pi - Board - Linux on Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT - V　　　　CASE STUDIES AND REAL - WORLD APPLICATIONS　　　[09]

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

Total (L: 45 T: 0) = 45 Periods

Text Book :

1　Arshdeep Bahga, Vijay Madisetti, Internet of Things – A hands-on approach, Universities Press,New Delhi, 2015.

2　Dieter Uckelmann, Mark Harrison, Michahelles, Florian, Architecting the Internet of Things, Springer, 2015.

Reference Books :

1　Jan Holler, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence, Elsevier, London 2014.

2　Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, New Delhi 2016.

3　Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things – Key applications and Protocols, Wiley,New Delhi, 2012.

4　Ovidiu Vermesan and Peter Friess, ―Internet of Things – From Research and Innovation to Market Deployementǁ , River Publishers,New Delhi, 2014.

MCA (MASTER OF COMPUTER APPLICATIONS)

<u>**CO PO MAPPING**</u>

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Understand the fundamentals of Internet of Things.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO2	*Understand the basics of IOT Architecture.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO3	*Understand the basics of IOT protocols*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO4	*Apply the concept of Internet of Things in Building Iot with Raspberry Pi & Arduino*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO5	*Develop various business models and ethics in Internet of Things*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
	Average	3	2	3	2	-	-	-	-	-	2	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER - II

		L	T	P	C
BA20261	**HEALTH CARE INFORMATION SYSTEMS (ELECTIVE I)**	3	0	0	3

Prerequisite: Management Information Systems

Course Outcomes : On Completion of this course, the student will be able to   *Cognitive Level*

CO1:	Understand the concept of major types of health care information.	*Understanding*
CO2:	*Explore* knowledge about the healthcare information systems.	*Understanding*
CO3:	Understand the knowledge about the concept of information technology.	*Understanding*
CO4:	*Understand* the Information Technology (IT) adaptation rates are lower in health care systems.	*Understanding*
CO5:	Understand the concept of IT initiatives.	*Understanding*

UNIT - I   **INTRODUCTION**   **[09]**

Introduction to Healthcare Information – Health Care Data Quality - Healthcare Information Regulations, Laws And Standards

UNIT - II   **HEALTHCARE INFORMATION SYSTEMS**   **[09]**

History and Evolution of Healthcare Information Systems - Current and Emerging use of Clinical Information Systems - System Acquisition - System Implementation and Support.

UNIT - III   **INFORMATION TECHNOLOGY**   **[09]**

Information Architecture and Technologies that Support Health Care Information Systems - Health Care Information Systems Standards - Security of Healthcare Information Systems.

UNIT - IV   **MANAGEMENT OF IT CHALLENGES**   **[09]**

Organizing Information Technology Services - IT Alignment and Strategic Planning - IT Governance and Management.

UNIT - V   **IT INITIATIVES**   **[09]**

Management's Role in Major IT Initiatives - Assessing and Archiving Value in Healthcare Information Systems.

Total (L: 45 T: 0) = 45 Periods

Text Book :

1. Karen A.W, France W.Lee, John P.G, Managing Healthcare Information Systems: A Practical Approach for Health CARE Executives. Jossey B/Willey, France, Fifth Edition, 2015.

2. Rudi Van De Velde and Patrice Degoulet, Clinical Information Systems A Componenet based approach, Springer, Fifth Edition, 2010.

Reference Books :

1. Rudi Van De Velde & Patrice D, Clinical Information Systems A Component Based Approach,Springer,Fifth Edition 2010.

2. Sayles, Nanette, Introduction to Computer Systems for Health Information Technology , Third edition, American Health Information Management Association,New York, Fifth Edition, 2018.

3. Velde, Rudi Van de, Hospital Information Systems The Next Generation , Springer Verlag, New Delhi, Fifth Edition 2015.

4. Goyal, R.C Handbook of Hospital Personnel Management, PHI,New Delhi, Fifth Edition ,2015.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Understand the concept of major types of health care information.	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO2	*Explore* knowledge about the healthcare information systems.	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO3	Understand the knowledge about the concept of information technology.	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO4	*Understand* the Information Technology (IT) adaptation rates are lower in health care systems.	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO5	Understand the concept of IT initiatives.	3	2	3	2	-	-	-	-	-	2	-	2	2	3
	Average	3	2	3	2	-	-	-	-	-	2	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

SEMESTER – II

CA20271	DEVOPS (Elective I)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On Completion of this course, the student will be able to	Cognitive Level
CO1	*Explain the Microservices and containers*	*Understand*
CO2	*Explain the architecture of Microservices*	*Apply*
CO3	*Describe DevOps and the common tools used in DevOps*	*Create*
CO4	*Apply Microservices in DevOps*	*Understand*
CO5	*Develop, integrate and deploy projects using DevOps*	*Apply*

UNIT I   INTRODUCTION TO MICROSERVICES   09

Definition of Microservices – Characteristics - Microservices and Containers – Interacting with Other Services – Monitoring and Securing the Services – Containerized Services – Deploying on Cloud.

UNIT II   MICROSERVICES ARCHITECTURE   09

Monolithic architecture- Microservice architectural style- Benefits - Drawbacks of Microservice architectural style - decomposing monolithic applications into Microservices.

UNIT III   BASICS OF DEVOPS   09

History of DevOps- DevOps and software development life cycle- water fall model – agile model – DevOps life cycle – DevOps tools: distributed version control tool –Git- automation testing tools – Selenium - reports generation – TestNG - User Acceptance Testing – Jenkins.

UNIT IV   MICROSERVICES IN DEVOPS ENVIRONMENT   09

Evolution of Microservices and DevOps – Benefits of combining DevOps and Microservices working of DevOps and Microservices in Cloud environment - DevOps Pipeline representation for a NodeJS based Microservices.

UNIT V   VELOCITY AND CONTINUOUS DELIVERY   09

Velocity - Delivery Pipeline- test stack - Small/Unit Test – medium /integration testing – system testing- Job of Development and DevOps - Job of Test and DevOps – Job of Op and DevopsInfrastructure and the job of Ops.

Total (L: 45 T:0) = 45 Periods

Text Books :

1   Namit Tanasseri, RahulRai, Microservices with Azure, Packt Publishing, UK, Firstst Edition, 2017.

2   Eberhard Wolff, Microservices: Flexible Software Architecture, Pearson Education, New Delhi, First Edition, 2017

Reference Books :

1   James A Scott, A Practical Guide to Microservices and Containers, Map R Data Technologies e–book

2   Joyner Joseph, Devops for Beginners, Mihails Konoplovs publisher, First Edition, 2015.

3   Gene Kim, Kevin Behr, George Spafford, The Phoenix Project, A Novel about IT, DevOps, IT Revolution Press, 5th Edition, 2018.

4   Michael Hüttermann, DevOps for Developers, APress, e-book, First Edition, 2012.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the Microservices and containers*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO2	*Explain the architecture of Microservices*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO3	*Describe DevOps and the common tools used in DevOps*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO4	*Apply Microservices in DevOps*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO5	*Develop, integrate and deploy projects using DevOps*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
	Average	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

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SEMESTER – II

MA20262	PROBABILITY AND STATISTICS (ELECTIVE II)	L	T	P	C
		3	0	0	3

Prerequisite: **-**

Course Outcomes: *On Completion of this course, the student will be able to*   *Cognitive Level*

CO1:	Illustrate the data using exploratory data analysis.	Remember
CO2:	Applying the concepts of probability distributions.	Apply
CO3:	Analyze the sampling distributions.	Create
CO4:	Explain the inferences by using testing of hypothesis.	Understand
CO5:	Analyze the variances using ANOVA techniques to find the inferences.	Apply

UNIT - I   EXPLORATORY DATA ANALYSIS   [09]

Definition of Statistics – applications - data types and measurements, graphical representation of data using histogram, line diagram, bar diagram, measures of central tendency and dispersion; coefficient of skewness and kurtosis.

UNIT - II   PROBABILITY AND RANDOM VARIABLES   [09]

Random experiment, sample space and events. Definitions of probability, addition and multiplication rules of probability, conditional probability. Random variables: pmf and pdf of random variables; Mathematical expectation: mean, variance, covariance, mgf and cgf of a random variables.

UNIT - III   SAMPLING DISTRIBUTIONS   [09]

Concepts of population, sample, parameter, statistic, and sampling distribution. Probability distributions: Binomial, Poisson and Normal distributions with their important characteristics.

UNIT - IV   TESTING OF HYPOTHESIS   [09]

Statistical hypotheses-Simple and composite, Statistical tests, Critical region, Type I and Type II errors, Testing of hypothesis – null and alternative hypothesis, level of significance,. Test of significance using z, t, F and Chi-Square distributions.

UNIT - V   ADVANCED STATISTICAL METHODS   [09]

Analysis of one-way, two-way classifications and Latin Square Design. Correlation and regression analysis.

Total (L: 45 T:0) = 45 Periods

Text Book :

1   Gupta S.C & Kapoor V.K, Fundamentals of Mathematical statistics, Sultan Chand & sons, New Delhi, Second Edition, 2015.

2   Douglas C Montgomery, George C Runger, Applied Statistics and Probability for Engineers, Wiley student edition, Chennai, 2014.

Reference Books :

1   Freund J.E, Mathematical statistics, Prentice hall, New Delhi,Third Edition, 2016.

2   Levine, David M; Berenson, L Mark; Stephen, David, Statistics for Managers Using Microsoft Excel, PHI,New Delhi, Second Edition, 2016.

3   Murray Spiegel, John Schiller, and R. Alu Srinivasan, Schaum's Outline of Probability and Statistics, Third Edition, 2016..

4   Sheldon M. Ross, Íntroduction to Probability and Statistics for Engineers and Scientists, Fourth Edition, 2016.

CO	Course Outcomes	Programme Outcomes													
		PO1	P02	PO3	P04	P05	PO6	P07	P08	P09	PO10	PO11	P012	PSO1	PS02
CO1	Illustrate the data using exploratory data analysis.	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO2	Applying the concepts of probability distributions.	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO3	Analyze the sampling distributions.	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO4	Explain the inferences by using testing of hypothesis.	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO5	Analyze the variances using ANOVA techniques to find the inferences.	3	2	3	2	-	-	-	-	-	2	-	2	2	3
Average		3	**2**	**3**	**2**	**-**	**-**	**-**	**-**	-	2	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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<u>**SEMESTER - II**</u>

CA20266	SOFTWARE PROJECT MANAGEMENT (ELECTIVE II)	L	T	P	C
		3	0	0	3

Prerequisite: **Software Metrics**

Course Outcomes : On Completion of this course, the student will be able to	*Cognitive Level*
CO1:	*Create the basic idea about the software project management and it's planning activities.*	*Understanding*
CO2:	*Understand the software metrics and SCM.*	*Understanding*
CO3:	*Understand the role of software developers in getting exposure on software quality and risk management.*	*Understanding*
CO4:	*Understand the project management process and its activities.*	*Understanding*
CO5:	*Create project reporting, defect analysis and prevention.*	*Understanding*

UNIT - I　　　　INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT　　　　[09]

Product Life Cycle: Introduction-Idea Generation -Prototype Development Phase-Alpha Phase - Beta Phase - Production Phase-Maintenance and Obsolescence Phase. Product Life Cycle Models: The Waterfall Model - The Prototyping Model - The Rapid Application Development (RAD) Model - Spiral Model and Its Variants. Process Models: The ISO-9001 Model - The Capability Maturity Model.

UNIT - II　　SOFTWARE METRICS & SOFTWARE CONFIGURATION MANAGEMENT　　[09]

Software Metrics: Introduction - The Metrics Roadmap - A Typical Metrics Strategy - What To Measure - Set Targets and Track Them - Understanding and Trying to Minimize Variability - Act on Data - People and Organizational Issues in Metrics Programs - Common Pitfalls to watch out for in Metrics Programs – Metrics Implementation Checklists and Tools. Software Configuration Management: Introduction - Definitions and Terminology - The Process and Activities of SCM - Configuration Status Accounting - Configuration Audit - Metrics in SCM - SCM Tools and Automation.

UNIT - III　　　　SOFTWARE QUALITY ASSURANCE & RISK MANAGEMENT　　　　[09]

Software Quality Assurance: Software Quality - Quality Important in Software - Quality Control and Quality Assurance - Cost and Benefits of Quality - Software Quality Analyst's Functions - Misconceptions about the SQA Role - Software Quality Assurance Tools- Organizational Structures - Profile of a Successful SQA - Measure of SQA Success - Pitfalls of SQA. Risk Management: Introduction - Risk Management and its important. Risk Management Cycle - Risk Identification - Risk Quantification - Risk Monitoring - Risk Mitigation - Practical Techniques and Metrics in Risk Management.

UNIT - IV　　　　PROJECT MANAGEMENT PROCESS AND ACTIVITIES　　　　[09]

Project Life Cycle: In-Stream Activities-Project Initiation: Activities During Project Initiation - Outputs, Quality Record and Project Initiation Phase – Interface to the Process Database. Project Planning and Tracking: Components of Project Planning and Tracking - Project Closure: Issues and Metrics for Project Closure.

UNIT - V　　　　ENGINEERING ACITIVITIES IN PROJECTS　　　　[09]

Estimation: Phases of Estimation - Estimation Methodology - Size Estimation Effort and Schedule Estimates. Project Management In Testing Phase - What Is Testing? – What are the Activities That Make Up Testing - Test Scheduling & Types of Tests - Project Management In the Maintenance Phase - Activities During the Maintenance Phase - Management Issues in the Maintenance Phase.

Total (L: 45 T: 0) = 45　Periods

Text Book :

1　Gopalaswamy Ramesh, Managing Global Software Projects, Tata McGraw Hill,New Delhi,Third Edition, 2016

2　Pankaj Jalote, Software Project Management in Practice, Pearson Education,New Delhi,Second Edition 2015

Reference Books :

1　Bob Hughes, Mikecotterell, Rajib Mall, Software Project Management, Fifth Edition,Tata McGraw Hill, 2011.

2　Walker Royce, Software Project Management, Pearson Education, New Delhi,Second Edition 2015.

3　Pankoj Jalote, Software Project Management in Practice, Pearson Education,Chennai, 2015.

4　Jim Highsmith, Agile Project Management, Pearson education, New Delhi, 2016.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Create the basic idea about the software project management and it's planning activities.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO2	*Understand the software metrics and SCM.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO3	*Understand the role of software developers in getting exposure on software quality and risk management.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO4	*Understand the project management process and its activities.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO5	*Create project reporting, defect analysis and prevention.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
	Average	3	2	3	2	-	-	-	-	-	2	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER - II

CA20267	ADVANCED OPERATING SYSTEMS (ELECTIVE II)	L	T	P	C
		3	0	0	3

Prerequisite: **Distributed and Load Sharing.**

Course Outcomes : On Completion of this course, the student will be able to   *Cognitive Level*

CO1:	*Illustrate comprehensive knowledge of the architecture of distributed systems.*	*Understanding*
CO2:	*Understand the deadlock and their solutions in distributed environments,*	*Understanding*
CO3:	*Analyze the knowledge of failure recovery and fault tolerance, to know the security issues and protection mechanisms for distributed environments,*	*Analyzing*
CO4:	*Understand the multiprocessor operating systems*	*Understanding*
CO5:	*Understand the main concepts of advanced operating systems*	*Understanding*

UNIT - I   **DISTRIBUTED OPERATING SYSTEMS**   **[09]**

Architectures of Distributed Systems - System Architecture Types - Issues in Distributed Operating Systems - Communication Networks - Communication Primitives. Distributed Dead Lock Detection - Introduction - Deadlock Handling Strategies in Distributed Systems - Issues in Deadlock Detection and Resolution - Control Organizations for Distributed Deadlock Detection.

UNIT - II   **DISTRIBUTED RESOURCE MANAGEMENT**   **[09]**

Distributed File Systems – Mechanisms for Building Distributed File Systems – Design Issues – Distributed Shared Memory – Design Issues : Distributed Scheduling – Issues in Load Distributing – Components of a Load Distributing Algorithm – Load Distributing Algorithms – Selecting a Suitable Load Sharing Algorithm – Requirements for Load Distributing.

UNIT - III   **FAILURE RECOVERY AND FAULT TOLERANCE**   **[09]**

Recovery – Basic Concepts – Classification of Failures – Backward and Forward Error Recovery – Backward-Error Recovery : Basic Approaches – Recovery in Concurrent Systems – Fault Tolerance – Issues – Atomic Actions and Committing – Commit Protocols – Non blocking Commit Protocols – Voting Protocol

UNIT - IV   **PROTECTION AND SECURITY**   **[09]**

Protection and Security - Preliminaries, The Access Matrix Model and its implementations.-Safety in Matrix Model - Advanced Models of Protection.

UNIT - V   **MULTIPROCESSOR OPERATING SYSTEMS**   **[09]**

Multiprocessor Operating Systems - Basic Multiprocessor System Architectures - Inter Connection Networks for Multiprocessor Systems - Caching - Hypercube Architecture - Structures of Multiprocessor Operating System- Operating System Design Issues.

Total (L: 45 T: 0) = 45 Periods

Text Book :

1   Mukesh Singhal, Niranjan G.Shivaratri, Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems, Tata McGraw Hill ,New Delhi,Second Edition, 2017.

2   Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, Operating System Concepts, Seventh Edition, John Wiley and Sons, New York, 2014.

Reference Books :

1   Andrew S.Tanenbaum, Modern operating system, PHI,New York, 2015

2   Pradeep K.Sinha, Distributed operating system Concepts and design, PHI,New Delhi, 2015.

3   Andrew S.Tanenbaum, Distributed operating system, Pearson education,New York, 2015.

4   S. Tanenbaum and A. S. Woodhull, Operating Systems Design and Implementation, Prentice Hall, London, Third Edition, 2016.

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<u>**CO PO MAPPING**</u>

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate comprehensive knowledge of the architecture of distributed systems.*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO2	*Understand the deadlock and their solutions in distributed environments,*	3	2	3	2	-				-	2	-	2	2	3
CO3	*Analyze the knowledge of failure recovery and fault tolerance, to know the security issues and protection mechanisms for distributed environments,*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO4	*Understand the multiprocessor operating systems*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
CO5	*Understand the main concepts of advanced operating systems*	3	2	3	2	-	-	-	-	-	2	-	2	2	3
	Average	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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<u>SEMESTER – II</u>

		L	T	P	C
CA20268	**E-LEARNING TECHNIQUES(ELECTIVE II)**	3	0	0	3

*Prerequisite:***E-Commerce**

Course Outcomes : On successful completion of the course, the student will be able to

Cognitive Level

CO1	Understand the concept of e-learning.	*Understanding*
CO2:	Understand the concept of various learning strategies.	*Understandng*
CO3:	Express the concept of delivering e-learning.	*Understanding*
CO4:	Understand the concept of web standards for designing, valuators.	*Understanding*
CO5:	Understand the knowledge about the e-learning tools.	*Understanding*

UNIT - I   INTRODUCTION   **[09]**

WhatisE-Learning – E-LearningEvolution – Advantagesand Disadvantages of E-Learning – Instructional Design Models for E-Learning – Applying User – Centered Design to E-Learning – Rapid E-Learning.

UNIT - II   KEEPINGTHEE-LEARNING STRATEGY FORWARD   **[09]**

LearningStrategy – Processfor Developingthe E-Learning Strategy – Doomed to Failure – Keeping Focuse donthe Strategy – Instructional Strategies for E-Learning.

UNIT - III   DELIVERINGE-LEARNING&E-LEARNINGEVALUATION   **[09]**

Delivering E-Learning – Instructional Game Characteristics – Educational Podcasting - Gaming at Work – Delivering E-Learning Synchronously – E-Learning Education – Four Levels of Evaluating Learning – Learning Analytics - EvaluationModels.

UNIT - IV   WEB STANDARDS   **[09]**

Resources for Guidance on Web Standards - Web Standards for Designers – Validators - W3C Keeping it Simple.

UNIT - V   E-LEARNINGTOOLS   **[09]**

E-learning Tools – E-learning Authoring Tools – Wikis and E-Learning.

Total (L: 45 T: 0) = 45 Periods

Text Books :

1 Randy Garrison D ,E-Learning in the 21st century a framework for research and practice, Second edition, Taylor and Francis, 2015.

2 Robin Mason,E-Learning : the key concepts, Routledge, 2015.

Reference Books :

1 Clark R.C and Mayer R.E, E-Learning and the science of instruction, Pfeiffer Wiley, 2015.

2 Mark J Rosenberg, E-Learning: strategies for delivering knowledge in the Digital Age, McGraw- Hill, New Delhi, 2016.

3 Kjell E. (Erik) Rudestam , Judith Schoenholtz - Read, Handbook of Online Learning, Sage Publications Inc., London,
Second Edition, 2019.

4 John Gardner, Bryn Holems, E-Learning : Concepts and practice, SAGE Publications, New Delhi 2016.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Understand the concept of e-learning.	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	Understand the concept of various learning strategies.	3	2	2	3	-	-	-	-	-	3-	-	2	2	2
CO3	Express the concept of delivering e-learning.	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	Understand the concept of web standards for designing, valuators.	3	2	2	3	-	-	-	-	1	3	-	2	2	2
CO5	Understand the knowledge about the e-learning tools.	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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<u>**SEMESTER - II**</u>

	L	T	P	C
CA20269 **SOFT COMPUTING (ELECTIVE II)**	3	0	0	3

Prerequisite: **Distributed Computing**

Course Outcomes : On successful completion of the course, the student will be able to   ***Cognitive Level***

CO1:   *Understand the concept of soft computing.*   *Understanding*

CO2:   *Understand the concept of genetic algorithm.*   *Understanding*

CO3:   *Understand the concept of neural networks basic.*   *Understanding*

CO4:   *Understand the concept of fuzzy modeling.*   *Understanding*

CO5:   *Develop the knowledge about the neuro-fuzzy modeling.*   *Understanding*

UNIT - I   **INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS**   **[09]**

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics.

UNIT - II   **GENETIC ALGORITHMS**   **[09]**

Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition.

UNIT - III   **NEURAL NETWORKS**   **[09]**

Machine Learning using Neural Network, Adaptive Networks – Feed Forward Networks Supervised Learning Neural Networks – Radial Basis Function Networks -Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural networks.

UNIT - IV   **FUZZY LOGIC**   **[09]**

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions - Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

UNIT - V   **NEURO-FUZZY MODELING**   **[09]**

Adaptive Neuro - Fuzzy Inference Systems – Coactive Neuro - Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule Base Structure Identification – Neuro - Fuzzy Control.

                                            Total (L= 45, T = 0) = 45 Periods

Text Books :

1   Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, Neuro-Fuzzy and Soft Computing, PHI, New Delhi 2015.

2   James A., Freeman & David M,Skapura, Neural Networks Algorithms Applications & Prg. Tech., PE,Chennai 2016

Reference Books :

1   Mitchell Melanie, An Introduction to Genetic Algorithm, Prentice Hall,New Delhi 2013.

2   Sivanandam, S. N., Sumathi, S., and Deepa, S.N., Introduction to Fuzzy Logic using MATLAB, Springer, 2017.

3   Sivanandam, S.N., Deepa, S.N., Introduction to Genetic Algorithms, Springer, 2017.

4   Jacek M., Zurada, Introduction to Artificial Neural Systems, PWS Publishers,New Delhi 2015.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Understand the concept of soft computing.*	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	*Understand the concept of genetic algorithm.*	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	*Understand the concept of neural networks basic.*	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	*Understand the concept of fuzzy modeling.*	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	*Develop the knowledge about the neuro-fuzzy modeling.*	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

		L	T	P	C
CA20270	**DIGITAL IMAGE PROCESSING (ELECTIVE II)**	3	0	0	3

Prerequisite: DigitalFundamentalsandComputerOrganization

Course Outcomes : On successful completion of the course, the student will be able to   **Cognitive Level**

CO1: Understand the concept of fundamentals of image processing.   *Understanding*

CO2: Explain the concept of image enhancement in spatial domain.   *Understanding*

CO3: Spot out the multi resolution and analysis the various techniques for image compression.   *Understanding*

CO4: Study the concept of image segmentation.   *Understanding*

CO5: Investigate the concept of current trends in image processing.   *Understanding*

UNIT - I   FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANSFORMS   [09]

Introduction – Stepsin Digital Image Processing – Image Sampling and Quantization – Basic Relationships Between Pixels – Color Fundamentals – File Formats – ImageTransforms:DFT,DCT,Haar, SVD and KL- Introduction to Mat Lab Toolbox.

UNIT - II   IMAGE ENHANCEMENT AND IMAGE RESTORATION   [09]

Image Enhancement in the Spatial Domain:Basic Gray Level Transformations,Histogram Processing,Enhancement Using Arithmetic / Logic Operations,Spatial Filtering– Image Enhancement in the Frequency Domain:Frequency Domain Filters - Image Restoration:Model of Image Degradation/Restoration Process,Noise Models,Restoration by Spatial and Frequency Domain Filtering.

UNIT - III   MULTI RESOLUTION ANALYSIS AND IMAGE COMPRESSION   [09]

Multi Resolution Analysis:Image Pyramids–Multi Resolution Expansion –Wavelet Transforms. Image Compression: Fundamentals – Models – Elements of InformationTheory–Error Free Compression – Lossy Compression– Compression Standards.

UNIT - IV   IMAGE SEGMENTATION AND DESCRIPTION   [09]

Image Segmentation: Detection of Discontinuities,Edge Linking and Boundary Detection,Thresholding,Region Based Segmentation,Basic Morphological Algorithms,Morphological Water Sheds-Description:Boundary Descriptors, Regional Descriptors.

UNIT - V   CURRENT TRENDS AND APPLICATIONS OF IMAGE PROCESSING   [09]

Applications: Image Classification, Object Recognition, Image Fusion, Steganography – Current Trends: Color Image Processing, Wavelets in Image Processing.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1   S.Jayaraman, S.Esakkirajanand T.Veerakumar, Digital ImageProcessing ,McGrawHillEdition,New Delhi 2015.

2   S. Sridhar, Digital Image Processing, Oxford University Press,New Delhi 2015.

Reference Books :

1   Milan S, Vaclav H & Roger B, ImageProcessing, Analysis & Machine Vision ,Thomson Learning,New York, Second Edition 2015.

2   Anil K.Jain, Fundamentals of Digital Image Processing,PHI,New Delhi, 2016.

3   Sanjit K.Mitra, & Giovanni L.Sicuranza, Non Linear Image Processing,Elsevier,New Delhi, 2017.

4   Rafael C.Gonzalez and Richard E.Woods, Digital Image Processing, Pearson Education,New Delhi, Third Edition, 2018.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	O1	O1	O1	PSO1	PSO2
CO1	Create the knowledge of effectively storing images.	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	Create interesting patterns from an image.	3	2	2	3	-	-	-	-	-	3 -	-	2	2	3
CO3	Analyze discriminate between different classes of images.	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	Understand mathematical fundamentals for image processing.	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	Understand the confidence in developing image-processingapplications.	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	2	2	2	-	-	-	-	-	3	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MCA (MASTER OF COMPUTER APPLICATIONS)

<u>SEMESTER – II</u>

		L	T	P	C
BA20262	**ORGANIZATIONAL BEHAVIOR (ELECTIVE II)**	3	0	0	3

Prerequisite: -

Course Outcomes: *On Completion of this course, the student will be able to*

		Cognitive Level
CO1:	*Explain the concepts of organizational behavior, managements and managers.*	*Understanding*
CO2:	*Analysis the concept of individual behavior like personality, attitudes.*	*Analyzing*
CO3:	*Summarize the concept of perception, motivation and Analysis the concept team work, leadership and power.*	*Understanding*
CO4:	*Implement the concept of perception and motivation and Gain the knowledge of Leadership and power*	*Understanding*
CO5:	*Illustrate the concept of dynamic of organizational behaviour*	*Understanding*

UNIT - I   INTRODUCTION   [09]

Organizational behavior: Definition – Meaning – Scope & Importance of OB – OB Model. Management and Managers: Functions – Skills – Roles – Types of Managers.

UNIT - II   INDIVIDUAL BEHAVIOUR   [09]

Personality: Theories – Types. Learning: Meaning and Definition – Theories of Learning. Attitudes: Nature – Components – Formation – Functions – Measurement. Perception: Factors Influencing Perception. Motivation: Importance – Theories (Maslow's Hierarchy Theory & Herzberg Theory) – Types – Effects on Work Behavior

UNIT - III   GROUP BEHAVIOUR   [09]

Nature – Types – Group Development – Group behavior – Structuring. Group Decision Making Techniques. Team Dynamics: Nature of Teams – Teams Vs Groups – Benefits From Teams – Types of Teams – Team Issues – Effective Team Work.

UNIT - IV   LEADERSHIP AND POWER   [09]

Leadership: Meaning – Importance – Leadership Styles – Theories. Power: Power Dynamics – Sources of Power – Effective Use of Power.

UNIT - V   DYNAMICS OF ORGANIZATIONAL BEHAVIOUR   [09]

Resistance of Change – Managing Change. Job Satisfaction: Determinants – Measurements. Stress: Prevention and Management of Stress – Balancing Work and Life.

Total (L: 45 T:0) =45 Periods

Text Book :

1 Aswathappa.K, Organizational Behaviour, Himalaya Publishing House,Chennai, Tenth Edition, 2015.

2 Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education,New Delhi, Eleventh edition, 2016.

Reference Books :

1 Stephen P Robbins, Organizational Behaviour, PHI, New York, Thirteen Edition, 2014.

2 Mohini Sukhapure & Uday N.Limaye Organizational Behaviour, Himalaya Publishing Private Limited, Pune, 2015.

3 P.Subba Rao ,Organizational Behaviour, Himalaya Publishing (P) Ltd, Pune, Fifth Edition, 2016.

4 Schermerhorn, Hunt and Osborn, Organisational behavior, John Wiley, New Delhi, Ninth Edition, 2015.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the concepts of organizational behavior, managements and managers.*	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	*Analysis the concept of individual behavior like personality, attitudes.*	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	*Summarize the concept of perception, motivation and Analysis the concept team work, leadership and power.*	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	*Implement the concept of perception and motivation and Gain the knowledge of Leadership and power*	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	*Illustrate the concept of dynamic of organizational behaviour*	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	3	2	3						3		2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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CA20272	FULL STACK DEVELOPMENT (Elective II)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On Completion of this course, the student will be able to		Cognitive Level
CO1	Explain the object oriented approach in Python.	*Understand*
CO2	Develop GUI applications with Python.	*Apply*
CO3	Describe the collaborative version control system, git.	*Create*
CO4	develop code in Linux and Windows environment package.	*Understand*
CO5	Deploy the developed web application using Flask in real time scenarios such as AWS.	*Apply*

UNIT I	OBJECT ORIENTED APPROACH IN PYTHON	09

Classes – Class Coding Basics: Instances – Behavior Methods – Operator Overloading – Customizing Behavior Methods – Constructors – Polymorphism – Inheritance.

UNIT II	USER INTERFACE APPLICATIONS IN PYTHON AND VERSION CONTROL SYSTEM	09

Wxpython Installation – Menus and Toolbars – Layout Management – Wxpython Events – Wxpython Dialogs – Widgets – Graphics – Collaborative Version Control Systems – Git Commands – Real Time Usage of Git Commands.

UNIT III	FLASK FRAMEWORK FOR WEB DEVELOPMENT	09

Flask Basics – Routes – Templates – Control Flow – Inheritance – Forms – Modules – Connection with Databases – Relational Database versus NoSQL – Modeling – Mapping Classes to Mongodb – Building Data Layer with Mongo Engine.

UNIT IV	REAL TIME DEPLOYMENT OF WEB APPLICATION	09

Deploy Web Applications with Flask and MongoDB – Example Applications – Blogs – Forums – Auto Evaluation of Student Assignments – Deployment Using AWS or Google Cloud or Heroku.

UNIT V	DEPLOYMENT OF SOFTWARE IN LINUX AND WINDOWS PLATFORM	09

Deployment in Ubuntu Distribution – Creation of .Deb Executable File – Deployment in Windows – Creation of Standalone Executable – Test Cases.

Total (L: 45 T:0) = 45 Periods

Text Books :

1	Mark Lutz, Learning Python, O' Reilly, Fifth Edition, 2013.
2	Scott Chacon and Ben Straub, Pro Git, Free e-book under Creative commons, Apress, Second Edition, 2016.

Reference Books :

1	Miguel Grinberg, Flask Web Development Developing Web Applications with Python, O Reilly, Second Edition, 2014.
2	Karl Seguin, The Little Mongo DB Book, O Reilly, First Edition, 2018.
3	Gareth Dwyer, Flask by Example, Packt Publishers, Second Edition, 2016.
4	Gene Kim, Kevin Behr, George Spafford, The Phoenix Project, A Novel about IT, DevOps, IT Revolution Press, Fifth Edition, 2018.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the object oriented approach in Python.	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	Develop GUI applications with Python.	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	Describe the collaborative version control system, git.	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	develop code in Linux and Windows environment package.	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	Deploy the developed web application using Flask in real time scenarios such as AWS.	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	3	2	3						3		2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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<u>SEMESTER - III</u>

	L	T	P	C
CA20361 **LINGUISTIC COMPUTING (ELECTIVE III)**	3	0	0	3

Prerequisite: Problem Solving Techniques

Course Outcomes : On successful completion of the course, the student will be able to   ***Cognitive Level***

CO1:	*Understand the basic concept of natural language.*	*Understanding*
CO2:	*Describe the concept of morphology and speech tagging.*	*Understanding*
CO3:	*Understad the basic concept of syntax analysis.*	*Understanding*
CO4:	*Express the concept of semantic analysis and lexical analysis.*	*Understanding*
CO5:	*Compare the concept of different statistical approaches.*	*Understanding*

UNIT - I   INTRODUCTION   [09]

Natural Language Processing tasks in Syntax, Semantics and Pragmatics Issues - Applications - The Role of Machine Learning - Probability Basics – Information Theory – Collocations - N-gram Language Models - Estimating Parameters and Smoothing - Evaluating Language Models.

UNIT - II   MORPHOLOGY AND PART OF SPEECH TAGGING   [09]

Linguistic Essentials - Lexical Syntax - Morphology and Finite State Transducers - Part of Speech Tagging – Rule - Based Part of Speech Tagging - Markov Models - Hidden Markov Models – Transformation Based Models - Maximum Entropy Models - Conditional Random Fields.

UNIT - III   SYNTAX PARSING   [09]

Syntax Parsing - Grammar Formalisms and Tree Banks - Parsing with Context Free Grammars - Features and Unification - Statistical Parsing and Probabilistic CFGs (PCFGs) - Lexicalized CFGs.

UNIT - IV   SEMANTIC ANALYSIS   [09]

Representing Meaning – Semantic Analysis - Lexical Semantics –Word - Sense Disambiguation - Supervised – Dictionary Based and Unsupervised Approaches - Compositional Semantics - Semantic Role Labeling and Semantic Parsing – Discourse Analysis.

UNIT - V   APPLICATIONS   [09]

Named Entity Recognition and Relation Extraction - IE Using Sequence Labeling - Machine Translation (MT) - Basic issues in MT - Statistical Translation - Word Alignment – Phrase - Based Translation – Question Answering.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1   Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, Neuro-Fuzzy and Soft Computing, PHI, New Delhi 2015.

2   James A. Freeman & David M. Skapura, Neural Networks Algorithms, Applications & Prg. Tech, PE, London 2018

Reference Books :

1   Mitchell Melanie, An Introduction to Genetic Algorithm, Prentice Hall, New Delhi, 2014.

2   S. N. Sivanandam, S. Sumathi and S. N. Deepa, Introduction to Fuzzy Logic using MATLAB, Springer, 2017.

3   S.N.Sivanandam , S.N.Deepa, Introduction to Genetic Algorithms,Springer, 2017.

4   Jacek M. Zurada, Introduction to Artificial Neural Systems, PWS Publishers,New York 2013.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Understand the basic concept of natural language.*	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	*Describe the concept of morphology and speech tagging.*	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	*Understad the basic concept of syntax analysis.*	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	*Express the concept of semantic analysis and lexical analysis.*	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	*Compare the concept of different statistical approaches.*	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	2	2	3						3		2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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SEMESTER – III

		L	T	P	C
CA20362	**BLOCK CHAIN TECHNOLOGY(ELECTIVE III)**	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to　　　*Cognitive Level*

CO1　*Analyze the difference between centralized, decentralized network and blockchain.*　*Understanding*

CO2:　*Explain fundamental concepts of blockchain using hashes and consensus.*　*Understanding*

CO3:　*Understand the concept of mining in blockchains.*　*Understanding*

CO4:　*Understand the working of Bitcoin and its security*　*Understanding*

CO5:　*Create the different platforms for implementing blockchain and its varied application.*　*Understanding*

UNIT - I　　INTRODUCTION TO BLOCKCHAIN TECHNOLOGY　　　　　　　[09]

Introduction to Blockchain-Trusted Third party for transactions - Difference between centralized - decentralized and distributed peer to peer networks -Types of Blockchain - Permission Blockchain vs. Permissionless Blockchain - History of Bit coins.

UNIT - II　　FUNDAMENTAL CONCEPTS OF BLOCKCHAIN　　　　　　　[09]

Concepts of Block - Transactions, Hashes - Consensus. Hashes: Hash cryptography - Encryption vs. hashing - Transactions: Recording transactions - Digital Signature - Verifying and confirming transactions - Blocks and blockchain

UNIT - III　　MINING AND SIMULATING BLOCKCHAIN　　　　　　　[09]

Mining and simulating blockchain: Game theory behind competitive mining. Incentives: mining and transaction fees, Energy expended in mining.

UNIT - IV　　BITCOIN AD SECURITY　　　　　　　　　　[09]

Bitcoin: Bitcoin creation - exchanges. Wallets – security - Protecting blockchain from attackers - Forks – soft and hard, Blockchain security - Key Management in Bitcoin - Case studies.

UNIT - V　　PLATFORMS AND APPLICATIONS　　　　　　　　[09]

Introduction to Blockchain platform: Ethereum - Hyperledger, IOTA, EOS, Multichain, Bigchain, CORDA, SOLIDITY - Designing a new blockchain - Distributed Application. Applications: E-Governance - Elections - File sharing - Micropayments Challenges and Research Issues in blockchain.

Total (L: 45 T: 0) = 45　Periods

Text Books :

1　Arshdeep Bahga,Vijay Madisetti, Blockchain Applications: A Hands-On Approach, VPT Publisher.New Delhi, First edition,2018.

2　Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, Bitcoin and Cryptocurrency technologies: a comprehensive introduction, Princeton University Press, Chennai, First edition, 2016.

Reference Books :

1　Imran Bashir, Mastering Blockchain, Packt Publishing,London, Second Edition, 2018.

2　Daniel Drescher, Blockchain Basics, Apress,Washington, 2017.

3　Alan Wright, Daniel Dresher, Blockchain, Google Books, 2017.

4　Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press,New Delhi, 2016.

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CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Analyze the difference between centralized, decentralized network and blockchain.	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	Explain fundamental concepts of blockchain using hashes and consensus.	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	Understand the concept of mining in blockchains.	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	Understand the working of Bitcoin and its security	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	Create the different platforms for implementing blockchain and its varied application.	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	3	2	3	-	-	-	-	-	3	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

		L	T	P	C
CA20363	BIO-INFORMATICS (ELECTIVE III)	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to	**Cognitive Level**
CO1: Understand the basic concept of database management.	Understanding
CO2: Understand the concept of search engines and data visualization.	Understanding
CO3: Understand the concept of statistics and data mining.	Understanding
CO4: Evaluate the fundamental concept of pattern matching.	Understanding
CO5: Analysis the concept of modelling structures and simulation.	Understanding

UNIT - I　　INTRODUCTORY CONCEPTS　　[09]

The Central Dogma – The Killer Application – Parallel Universes – Watson's Definition –Top Down Versus Bottom up – Information Flow – Convergence – Databases – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation – Networks – Geographical Scope – Communication Models – Transmissions Technology – Protocols – Bandwidth – Topology – Hardware – Contents – Security – Ownership – Implementation – Management.

UNIT - II　　SEARCH ENGINES AND DATA VISUALIZATION　　[09]

Search Engines- The Search Process – Search Engine Technology – Searching and Information Theory – Computational Methods – Search Engines and Knowledge Management – Data Visualization – Sequence Visualization – Structure Visualization – User Interface –Animation vs. Simulation – General Purpose Technologies.

UNIT - III　　STATISTICS AND DATA MINING　　[09]

Statistical Concepts – Microarrays – Imperfect Data –Basics–- Quantifying Randomness – Data Analysis – Tool Selection- Statistics of Alignment – Clustering and Classification – Data Mining – Methods – Infrastructure-Pattern Recognition and Discovery – Machine Learning – Text Mining – Tools.

UNIT - IV　　PATTERN MATCHING　　[09]

Fundamentals – Dot Matrix Analysis – Substitution Matrices –Dynamic Programming – Word Methods – Bayesian Methods – Multiple Sequence Alignment –Tools.

UNIT - V　　MODELING AND SIMULATION　　[09]

Drug Discovery – Fundamentals – Protein Structure – Systems Biology – Tools – Collaboration and Communications – Standards –Issues.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1　Bryan Bergeron, Bio Informatics Computing, Pearson Education,Washington, Second Edition, 2014.

2　Yi-Ping Phoebe Chen, Bio Informatics Technologies, Springer Verlag,Beiging, First Edition, 2017.

Reference Books :

1　Attwood T.K.,and Perry Smith D.J., Introduction to Bio Informatics, Longman Essen,New York,Second Edition, 2010.

2　Chikhale N.J., and Virendra Gomase, Bioinformatics - Theory and Practice, Himalaya Publication House, New Delhi, 2017.

3　Zoe lacroix and Terence Critchlow, Bio Informatics – Managing Scientific data, Elsevier, Washington, First Edition, 2014.

4　Arthur M Lesk, Introduction to Bioinformatics, Oxford University Press, Second Edition, 2005.

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CO PO MAPPING

CO	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Understand the basic concept of database management.*	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	*Understand the concept of search engines and data visualization.*	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	*Understand the concept of statistics and data mining.*	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	*Evaluate the fundamental concept of pattern matching.*	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	*Analysis the concept of modelling structures and simulation.*	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**2**	**3**

Programme Outcomes

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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<u>**SEMESTER - III**</u>

		L	T	P	C
CA20364	**ARTIFICIAL INTELLIGENCE (ELECTIVE III)**	3	0	0	3

Prerequisite: NETWORKING

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1:	*Explain the various AI Concepts and Methodologies.*	*Understanding*
CO2:	*Explain about searching texhniques in AI.*	*Understanding*
CO3:	*Explain regarding heuristic search, Knowledge representation and Expert systems..*	*Understanding*
CO4:	*Illustrate Learning*	*Understanding*
CO5:	*Explain the Applications of Artificial intelligence*	*Applying*

UNIT - I   INTRODUCTION   [09]

Intelligent Agents – Agents and environments – Good behavior – The nature of environments – structure of agents – Problem Solving – problem solving agents – example problems – searching for solutions – uniformed search strategies – avoiding repeated states – searching with partial information.

UNIT - II   SEARCHING TECHNIQUES   [09]

Informed search strategies – heuristic function – local search algorithms and optimistic problems – local search in continuous spaces – online search agents and unknown environments – Constraint satisfaction problems (CSP) – Backtracking search and Local search – Structure of problems – Adversarial Search – Games – Optimal decisions in games – Alpha – Beta Pruning – imperfect real-time decision – games that include an element of chance.

UNIT - III   KNOWLEDGE REPRESENTATION   [09]

First order logic - syntax and semantics – Using first order logic – Knowledge engineering – Inference – prepositional versus first order logic – unification and lifting – forward chaining – backward chaining – Resolution – Knowledge representation – Ontological Engineering – Categories and objects – Actions – Simulation and events – Mental events and mental objects.

UNIT - IV   LEARNING   [09]

Learning from observations – forms of learning – Inductive learning - Learning decision trees – Ensemble learning – Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming – Statistical learning methods – Learning with complete data – Learning with hidden variable – EM algorithm – Instance based learning – Neural networks – Reinforcement learning – Passive reinforcement learning – Active reinforcement learning – Generalization in reinforcement learning.

UNIT - V   APPLICATIONS   [09]

Communication – Communication as action – Formal grammar for a fragment of English – Syntactic analysis – Augmented grammars – Semantic interpretation – Ambiguity and disambiguation – Discourse understanding – Grammar induction – Probabilistic language processing – Probabilistic language models – Information retrieval – Information Extraction – Machine translation.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1   Stuart Russell & Peter Norvig, Artificial Intelligence a modern Approach, Third Edition Perason Education,Washington, 2015.

2   Chandra S.S.V Artificial Intelligence and Machine Learning,Second Edition,PHI,New York, 2015.

Reference Books :

1   Elaine rich and Kelvin Knight, Artificial Intelligence , Tata McGrawhill Publication,London, Third Edition, 2018.

2   George F Luger, Artificial Intelligence ,Pearsons Education,Washington, Fifth Edition, 2018.

3   Anamitra Deshmukh Nimvalkar, Artificial Intelligence, Technical Publishers, New Delhi, First Edition, 2012.

4   Mariya Yao, Adelyn Zhou, Marlene Jia, Applied Artificial Intelligence: A Handbook for Business Leaders, PHI, Washington, 2016.

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CO PO MAPPING

CO	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	O1	O1	O1	SO1	PSO2
															Programme Outcomes
CO1	*Explain the various AI Concepts and Methodologies.*	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	*Explain about searching texhniques in AI.*	3	2	2	3	-	-	-	-	-	3 -	-	2	2	3
CO3	*Explain regarding heuristic search, Knowledge representation and Expert systems..*	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	*Illustrate Learning*	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	*Explain the Applications of Artificial intelligence*	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	**3**	**2**	**2**	**3**						**3**		**2**	**2**	**3**

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

SEMESTER - III

	L	T	P	C
CA20365 INFORMATION AND NETWORK SECURITY (ELECTIVE III)	3	0	0	3

Prerequisite: Operating System

Course Outcomes : On successful completion of the course, the student will be able to   ***Cognitive Level***

CO1:	*Explain about the basis if information and network security.*	*Understanding*
CO2:	*Explain the cryptanalysis for cryptographic algorithms*	*Understanding*
CO3:	*Analysis overcome the attacks on software.*	*Understanding*
CO4:	*Summaraize the Internet security protocols*	*Understanding*
CO5:	*Develop solutions about network security.*	*Understanding*

UNIT - I   INTRODUCTION   [09]

Information Security: Introduction, Need for information security - security approaches - principles of security - Plain Text and Cipher Text - substitution and Transposition Techniques - Encryption and Decryption - Symmetric and Asymmetric Cryptography – Stenography - key range and key size - types of attacks.

UNIT - II   SYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS   [09]

Algorithm types and modes - overview of symmetric key cryptography - DES – Working principles of DES - IDEA RC5 – BLOWFISH – AES - Introduction.

UNIT - III   ASYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS   [09]

Overview of asymmetric key cryptography - RSA algorithm - symmetric and asymmetric key cryptography together - Digital signatures — Message digest - Attacks on Digital Signature - Public Key Infrastructure: Introduction - Digital certificates.

UNIT - IV   INTERNET SECURITY PROTOCOLS   [09]

Basic concepts – SSL – SHTTP – TLS – SET - SSL versus SET - 3D secure protocol - Email security - WAP security - security in GSM User Authentication Mechanisms: Introduction - Authentication basics - passwords - Authentication tokens-certificate based authentication - biometrics authentication – Kerberos - SSO approaches

UNIT - V   NETWORK SECURITY   [09]

Brief Introduction to TCP/IP – firewalls - IP security - Virtual Private Networks case studies on cryptography and security.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1   Atul Kahate, Cryptography and Network Security, Tata McGraw-Hill,New Delhi, Fourth Edition 2019.

2   William Stallings, Cryptography and Network Security: Principles and Practice, PHI,New York, Third Edition, 2016.

Reference Books :

1   Bagad V S and Dhotre I A., Cryptography and Network Security – Kindle Edition, New Delhi, First Edition, 2020.

2   Bruce Schneier, Applied Cryptography, John Wiley & Sons Inc, London, 2015.

3   Michael E., Whitman, Herbert J., Mattord, Principles of Information Security , Cengage Learning India Private Limited,London, Fourth Edition, 2015

4   Behrouz.A.Foruzan, Cryptography and Network Security, Tata McGraw Hill, New York, 2017.

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain about the basis if information and network security.*	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	*Explain the cryptanalysis for cryptographic algorithms*	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	*Analysis overcome the attacks on software.*	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	*Summaraize the Internet security protocols*	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	*Develop solutions about network security.*	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	2	2	3						3		2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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<u>SEMESTER - III</u>

	L	T	P	C
CA20366　　　　**DEEP LEARNING (ELECTIVE III)**	3	0	0	3

*Prerequisite:*Machine Learning

Course Outcomes : On Completion of this course, the student will be able to　　　　　*Cognitive Level*

CO1:	*Summarize the basics of deep learning*	*Remembering*
CO2:	*Implement various deep learning models*	*Understanding*
CO3:	*Create high dimensional data using reduction techniques*	*Understanding*
CO4:	*Analyze optimization and generalization in deep learning*	*Analyzing*
CO5:	*Explore the deep learning applications*	*Understanding*

UNIT - I　　　　INTRODUCTION ENGLISH　　　　　　　　　　　　　　　　　[9]

Introduction to machine learning - Linear models (SVMs and Perceptrons, logistic regression) - Intro to Neural Nets: What a shallow network computes - Training a network: loss functions, back propagation and stochastic gradient descent - Neural networks as universal function approximates.

UNIT - II　　　　DEEP NETWORKS　　　　　　　　　　　　　　　　　　　[09]

History of Deep Learning - A Probabilistic Theory of Deep Learning - Backpropagation and regularization, batch normalization - VC Dimension and Neural Nets - Deep Vs Shallow Networks - Convolutional Networks - Generative Adversarial Networks (GAN), Semi-supervised Learning.

UNIT - III　　　　DIMENTIONALITY REDUCTION　　　　　　　　　　　　　[09]

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.

UNIT - IV　　　　OPTIMIZATION AND GENERALIZATION　　　　　　　　　[09]

Optimization in deep learning – Non-convex optimization for deep networks - Stochastic Optimization - Generalization in neural networks - Spatial Transformer Networks - Recurrent networks, LSTM - Recurrent Neural Network Language Models – Word - Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.

UNIT - V　　　　CASE STUDY AND APPLICATIONS　　　　　　　　　　　[09]

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection- BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions.

Total (L: 45 T:0) = 45 Periods

Text Book :

1　Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View,Cambridge University Press, England, Second Edition, 2015.

2　Deng & Yu, Deep Learning Methods and Applications, Now Publishers,Netherlands, Second Edition, 2013.

Reference Books :

1　Michael Nielsen, Neural Networks and Deep Learning, Determination Press,London, Third Edition, 2015.

2　Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press, United States, 2016.

3　Aggarwal, Charu C, Neural Networks and deep learning, Springer, Germany, First Edition, 2015.

4　Michael Fullan, Joanne quinn, Joanne Mceachen, Deep Learning engage the world change the world, SAGE Publications, United States, Second Edition, 2012.

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<u>CO PO MAPPING</u>

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	O11	PO12	PSO1	PSO2
CO1	*Summarize the basics of deep learning*	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	*Implement various deep learning models*	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	*Create high dimensional data using reduction techniques*	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	*Analyze optimization and generalization in deep learning*	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	*Explore the deep learning applications*	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	2	2	3						3		2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

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<u>**SEMESTER - III**</u>

		L	T	P	C
CA20367	MOBILE COMPUTING (ELECTIVE III)	3	0	0	3

Prerequisite: **Networks**

Course Outcomes : On Completion of this course, the student will be able to   *Cognitive Level*

CO1: *Explain the Concept of fundamentals of wireless communication.*   *Understanding*
CO2: *Describe concept of Ttelecommunication System.*   *Understanding*
CO3: *Explain the concepts of wireless networks.*   *Understanding*
CO4: *Identify the requirements of network layer.*   *Understanding*
CO5: *Apply the concept in transport and application layer.*   *Applying*

UNIT - I   WIRELESS COMMUNICATION FUNDAMENTALS   **[09]**

Introduction – Wireless Transmission – Frequencies for Radio Transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread Spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless

UNIT - II   TELECOMMUNICATION SYSTEMS   **[09]**

GSM – System Architecture – Protocols – Connection Establishment – Handover – Security – GPRS, DECT.

UNIT - III   WIRELESS NETWORKS   **[09]**

Wireless LAN – IEEE 802.11 Standards – Architecture – Services – HIPERLAN – AdHoc Network – BlueTooth.

UNIT - IV   NETWORK LAYER   **[09]**

MobileIP – Dynamic Host Configuration Protocol – Routing – DSDV – DSR – AODV – ZRP – ODMR.

UNIT - V   TRANSPORT AND APPLICATION LAYERS   **[09]**

TCP Over Wireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery – Transmission / Timeout Freezing – Selective Retransmission–Transaction Oriented TCP – WAP.

Total (L: 45 T:0) = 45 Periods

Text Book :

1 Jochen Schiller, Mobile Communications, Prentice Hall of India – Pearson Education, New Delhi, Second Edition, 2011

2 Sivarammurthy C & Manoj B.S., Adhoc wireless Networks, Pearson Education, New Delhi, First Edition 2012.

Reference Books :

1 Kaveh Pahlavan, Prasanth Krishnamoorthy, Principles of Wireless Networks,Pearson Education, New Delhi, Second Edition, 2013.

2 UweH, Lothar, M.MartinS.Nicklons & Thomas S,Principles of Mobile Computing, Springer, New York, Second Edition, 2010.

3 C.K.Toh, AdHoc Mobile Wireless Networks, Prentice Hall Inc., New Delhi , Second Edition, 2012.

4 William Stallings, Wireless Communications and Networks, PHI of India / Pearson Education, New Delhi, Second Edition, 2014.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the Concept of fundamentals of wireless communication.	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	Describe concept of Ttelecommunication System.	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	Explain the concepts of wireless networks.	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	Identify the requirements of network layer.	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	Apply the concept in transport and application layer.	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	2	2	3						3		2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

<u>**SEMESTER - I**</u>

BC5001	**COMPUTER BASIC FUNDAMENTALS**	L	T	P	C
		2	0	0	0

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to	*Cognitive Level*
CO1: *Explain the concept of components, generations of computer.*	*Understanding*
CO2: *Describe the concept of memory.*	*Understanding*
CO3: *Demonstrate the concept of Operating system*	*Understanding*
CO4: *Describe the Software types*	*Understanding*
CO5: *Identify the purpose of computer Applications*	*Understanding*

UNIT - I   INTRODUCTION   [09]

Computer - Characteristics of Computers, Input, Output, Storage units, CPU, Computer System. Computer Organization Central Processing Unit - Processor Speed, Cache, Memory, RAM, ROM, Booting, Generation of Computers-Application and features of computer.

UNIT - II   MEMORY-DEVICES   [09]

Memory- Secondary Storage Devices: Floppy and Hard Disks, Optical Disks CD-ROM, DVD, Mass Storage Devices: USB thumb drive. Managing disk Partitions, File System Input. Devices - Keyboard, Mouse, joystick, Scanner, web cam, Output Devices- Monitors, Printers – Dot matrix, inkjet, laser, Multimedia- What is Multimedia, Text, Graphics, Animation, Audio, Images, Video; Multimedia Application in Education, Entertainment, Marketing.

UNIT - III   OPERATING SYSTEM   [09]

What is an operating system and basics of Windows-The User Interface Windows Setting

UNIT - IV   SOFTWARE TYPES   [09]

Names of common multimedia file formats, Computer Software- Relationship between Hardware and Software; System Software, Application Software, Compiler, names of some high level languages, free domain software.

UNIT - V   COMPUTER NETWORK   [09]

Networks-network types-web design –Applications-e-Commerce.

Total (L: 45 T:0) = 45 Periods

Text Books :

1   Anitha Goel, Computer Fundamentals, Pearson India, New Delhi, 2010.

2   Balagurusamy E, Fundamentals of computers, TMH, New Delhi, Second Edition, 2010.

Reference Books :

1   Rajaraman V, Fundamentals of Computer, Prentice Hall of India Pvt. Ltd., New Delhi, Third Edition, 2012

2   Ram B, Computers Fundamentals Architecture and Organisation, New Age International Publishers, New Delhi, Revised Edition, 2011.

3.   Dhanpat Rai and Co, Fundamentals of Computer , Sumita Arora, New Delhi, Second Edition, 2013.

4   Sinha P.K., Computer Fundamentals, BPB Publications, New Delhi. Third Edition, 2010.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the concept of components, generations of computer.	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	Describe the concept of memory.	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	Demonstrate the concept of Operating system	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	Describe the Software types	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	Identify the purpose of computer Applications	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	2	2	3	-	-	-	-	-	3	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

		L	T	P	C
BC5002	**PROBLEM SOLVING AND PROGRAMMING IN C**	2	0	0	0

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1:	Design a computational solution for a given problem.	*Understanding*
CO2:	Explain the break a problem into logical modules that can be solved (programmed).	*Understanding*
CO3:	Demonstrate transform a problem solution into programs involving programming constructs.	*Understanding*
CO4:	Illustrate programs using structures, strings, arrays, pointer and files for solving complex computational problem.	*Understanding*
CO5:	Explain introduce modularity using functions and pointers which permit ad hoc runtime polymorphism.	*Understanding*

UNIT - I   INTRODUCTION TO COMPUTER PROBLEM SOLVING   [09]

Introduction – The Problem Solving aspect – Top down design – Implementation of algorithm – Program Verification – The efficiency of algorithms – The analysis of algorithms – Fundamental Algorithms

UNIT - II   PROGRAMMING AND ALGORITHMS   [09]

Programs and Programming – building blocks for simple programs -pseudo code representation – flow charts Programming Languages - compiler –Interpreter, Loader and Linker - Program execution – Classification of Programming Language – Structured Programming Concept – Illustrated Problems: Algorithm to check whether a given number is Armstrong number or not- Find factorial of a number.

UNIT - III   BASICS OF 'C', INPUT / OUTPUT & CONTROL STATEMENTS   [09]

Introduction- Identifier – Keywords - Variables – Constants – I/O Statements - Operators - Initialization –Expressions – Expression Evaluation – L values and R values – Type Conversion in C –Formatted input and output functions - Specifying Test Condition for Selection and Iteration- Conditional Execution - and Selection – Iteration and Repetitive

Execution- go to Statement – Nested Loops- Continue and break statements. Programs to be implemented:

1. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)

2. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.

UNIT - IV   ARRAYS, STRINGS, FUNCTIONS AND POINTERS   [09]

Array – One dimensional Character Arrays- Multidimensional Arrays- Arrays of Strings – Two dimensional character array – functions - parameter passing mechanism scope – storage classes – recursion - comparing iteration and recursion- pointers – pointer operators - uses of pointers- arrays and pointers – pointers and strings - pointer indirection pointers to functions - Dynamic memory allocation.

1. Write a program in C to get the largest element of an array using the function.

2. Display all prime numbers between two intervals using functions.

3. Reverse a sentence using recursion.

4. Write a C program to concatenate two strings.

5. Find the frequency of a character in a string.

UNIT - V   USER-DEFINED DATATYPES & FILES   [09]

Structures – initialization - nested structures – structures and arrays – structures and pointers - union– type def and enumeration types - bit fields - File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

1. Write a C program to Store Student Information in Structure and Display it.

2. The annual examination is conducted for 10 students for five subjects.

3. Write a program to read the data and determine the following:

(a) Total marks obtained by each student.

(b) The highest marks in each subject and the marks of the student who secured it.

(c) The student who obtained the highest total marks.

Total (L: 45 T:0) = 45 Periods

Text Books :

1 Deitel and Deitel, C How to Program, Pearson Education, Noida, Seventh Edition, 2013.

2 Byron S Gottfried, Programming with C, Schaums Outlines, Tata McGraw-Hill, New Delhi, Second Edition, 2011.

Reference Books :

1 Brian W. Kernighan and Dennis M. Ritchie, The C programming Language, Pearson Education India, Second Edition, 2015,

2 Dromey R. G., How to solve it by Computer, Pearson Education, New Delhi, Fifth Edition, 2012.

3. Kamthane, A.N., Programming with ANSI and Turbo C, Pearson Education, New Delhi, Third Edition, 2015.

4 Venugopal R, Sudeep R Prasad, Mastering CK, McGraw Hill Education Private Limited, New Delhi, India, Second Edition 2015.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Design a computational solution for a given problem.	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	Explain the break a problem into logical modules that can be solved (programmed).	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	Demonstrate transform a problem solution into programs involving programming constructs.	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	Illustrate programs using structures, strings, arrays, pointer and files for solving complex computational problem.	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	Explain introduce modularity using functions and pointers which permit ad hoc runtime polymorphism.	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	3	2	3						3	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous)   **R 2020**

SEMESTER - II

BC5003	CORE JAVA PROGRAMMING	L	T	P	C
		2	0	0	0

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to   ***Cognitive Level***

CO1:   *Explain the basic object oriented programming concepts and know the origin of java*   *Understanding*
          programming.
CO2:   *Identify the different operations through single packages and understanding the String*   *Understanding*
          concepts.
CO3:   *Illustrate Learning the concept of java I/O packages.*   *Understanding*
CO4:   *Explain the concept of AWT package.*   *Understanding*
CO5:   *Describe the concept of swing*   *Understanding*

UNIT - I   OVERVIEW OF OBJECT ORIENTED PROGRAMMING CONCEPTS   [09]

Object Oriented Programming Concepts- Introduction- Methods –Method Overriding..

UNIT - II   INTRODUCTION   [09]

Java History-Applications-Lexical Issues- Data Types- Variables and Arrays Operators – Control Statements

UNIT - III   PACKAGES   [09]
Packages – Importing Packages- I/O Package – Interfaces – Exception Handling – Multithreaded Programming- String Operations. The Java I/O Classes– File – Byte Streams – The Character Streams – Serialization.

UNIT - IV   JAVA PACKAGES: AWT, APPLET   [09]
AWT Package: AWT Classes – Window Fundamentals – Working with Graphics– Working with Color – Working withFonts – Applet Package: Applet Basics – Applet Architecture – Reading and Writing in Console – Print Writer class.

UNIT - V   JAVA SWING   [09]
Java Swing-Applet-Icons and Labels-Text Fields-Buttons-Combo Box-Tabbed Panes-Scroll Panes-Trees-Tables-Exploring Swing.

Total (L: 45 T:0) = 45 Periods

Text Books :

1   Herbert Schildt, The Complete Reference JAVA, Tata McGraw Hill, New Delhi, Tenth Edition, 2017.

2   Joshua Bloch, Effective Java, Addison Wesley, New Delhi, Third Edition, 2016.

Reference Books :

1   Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, Eighth Edition, 2011.

2   Kogent, Java 6 Programming Black Book, Kogent Learning Solutions, New Delhi, Third Edition, 2011.

3.   Steven Holzner, Java2 (JDK 5 Edition) Programming, Tata McGraw Hill, New Delhi, Fourth Edition, 2012.

4   Balagurusamy E, Programming with Java, McGraw-Hill Education, New Delhi, Sixth Edition, 2019.

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
		Programme Outcomes													
CO1	*Explain the basic object oriented programming concepts and know the origin of java programming.*	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	*Identify the different operations through single packages and understanding the String concepts.*	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	*Illustrate Learning the concept of java I/O packages.*	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	*Explain the concept of AWT package.*	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	*Describe the concept of swing*	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	3	2	3						3	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

<u>**SEMESTER - II**</u>

BC5004	**SOFTWARE ENGINEERING**	L	T	P	C
		2	0	0	0

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to   *Cognitive Level*

CO1: Explain the problem domain to choose process models and to develop SRS   *Understanding*

CO2: Summarize the model software projects using appropriate design notations   *Understanding*

CO3: Show the measure the product and process performance using various metrics   *Understanding*

CO4: Evaluate the system with various testing techniques and strategies   *Understanding*

CO5: Analyze, design, verify, validate, implement, and maintain software systems.   *Understanding*

UNIT - I   INTRODUCTION   [09]

Software Engineering Paradigms – Waterfall Life Cycle Model – Spiral Model – Prototype Model – Agile Process Model – Unified Process Model - Planning – Software Project Scheduling – SRS - Case Study: Project Plan and SRS

UNIT - II   SOFTWARE DESIGN   [09]

Designing Concepts - Abstraction – Modularity – Software Architecture – Cohesion – Coupling – Dataflow Oriented Design - Jackson System Development - Real time and Distributed System Design – Designing for Reuse — Case Study : Design for any Application Oriented Project.

UNIT - III   SOFTWARE TESTING AND MAINTENANCE   [09]

Software Testing Fundamentals – Software Testing Strategies – Black Box Testing – White Box Testing – System Testing – Object Orientation Testing – State Based Testing – Testing Tools – Test Case Management – Types of Maintenance – Case Study: Testing Techniques

UNIT - IV   SOFTWARE METRICS   [09]

Scope – Classification of metrics – Measuring Process and Product attributes – Direct and Indirect measures – Cost Estimation - Reliability – Software Quality Assurance – Standards – Case Study for COCOMO model.

UNIT - V   SCM & WEB ENGINEERING   [09]

Need for SCM – Version Control – SCM process – Software Configuration Items – Taxonomy – Re Engineering – Reverse Engineering - Web Engineering - CASE Repository – Features.

Total (L: 45 T:0) = 45 Periods

Text Books :

1 Roger S. Pressman, Software Engineering: A Practitioner Approach, Tata McGraw – Hill International Edition, New Delhi, Seventh Edition, 2010

2 Richard Fairley, Software Engineering Concepts, Tata McGraw Hill Edition, New Delhi, Third Edition, 2012.

Reference Books :

1 Ali Behforroz, Frederick J.Hudson, Software Engineering Fundamentals, Oxford Indian Reprint, New Delhi, First Edition, 2012.

2 Sommerville, Software Engineering, Pearson, New Delhi, Tenth Edition, 2016.

3. PankajJalote, An Integrated approach to Software Engineering, Narosa Publications, New Delhi, Third Edition, 2011.

4 David Farley, Modern Software Engineering: Doing What Works to Build, Tata McGraw Hil, New Delhi, First Edition, 2021

MCA (MASTER OF COMPUTER APPLICATIONS)

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the problem domain to choose process models and to develop SRS	2	2	2	3	-	-	-	-	-	3	-	3	2	3
CO2	Summarize the model software projects using appropriate design notations	3	2	2	3	-	-	-	-	-	3-	-	2	2	3
CO3	Show the measure the product and process performance using various metrics	3	3	2	2	-	-	-	-	-	3	-	3	2	3
CO4	Evaluate the system with various testing techniques and strategies	3	2	2	3	-	-	-	-	-	3	-	2	2	2
CO5	Analyze, design, verify, validate, implement, and maintain software systems.	3	3	2	3	-	-	-	-	-	3	-	2	2	3
	Average	3	3	2	3						3	-	2	2	3

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)