Rashtreeya Sikshana Samithi Trust R.V. COLLEGE OF ENGINEERING

(Autonomous Institution, Affiliated to VTU, Belagavi)

R.V. Vidyaniketan Post, Mysuru Road,

Bengaluru - 560 059



Master of Computer Applications (M.C.A)

Scheme and Syllabus

Scheme 2016

R.V. College of Engineering, Bengaluru – 59

(Autonomous Institution Affiliated to VTU, Belagavi)

Department of Master of Computer Applications

Vision

Pioneering in ICT Enabled Quality Education and Research with a focus on Sustainable and Inclusive Applications

Mission

- To adapt novel methodologies for quality education through experiential learning
- To empower students with continuous, holistic education, emphasizing on discipline, ethics and social commitment
- To become a vibrant knowledge center for research and software development
- To continuously build capacity steering towards industry- institute collaborative research and entrepreneurial competencies
- To utilize and develop free and open source software tools for sustainable and inclusive growth

Program Educational Objectives (PEO)

MCA graduates will be able to

- **PEO1:** Practice software engineering principles and standards to develop software to meet customer requirements across verticals
- **PEO2:** Contribute to build sustainable and inclusive applications using mathematical, simulation and meta-heuristic models
- PEO3: Demonstrate entrepreneurial qualities through individual competence and teamwork
- **PEO4:** Achieve successful professional career with integrity and societal commitments leading to lifelong learning

Program Outcomes (PO)

MCA graduates will be able to:

PO1: Computational Knowledge: Acquire in-depth computational knowledge and mathematics with an ability to abstract and conceptualise models from defined problems and

requirements.

- **PO2:** Problem Analysis: Identify, formulate, conduct literature survey and solve complex computing problems through analysis as well as provide optimal solutions.
- **PO3: Design / Development of Solutions:** Design and evaluate solutions for complex problems, components or processes that meet specified needs after considering public health and safety, cultural, societal, and environmental factors.
- **PO4:** Conduct investigations of complex Computing problems: Conduct literature survey to analyse and extract information relevant to unfamiliar problems and synthesise information to provide valid conclusions and interpret data by applying appropriate research methods, tools and design experiments.
- **PO5**: Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources and modern IT tools to complex computing system activities, with an understanding of the limitations.
- **PO6:** Professional Ethics: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.
- **PO7:** Life-long Learning: Engage in lifelong learning independently for continual development to improve knowledge and competence as a computing professional
- Project management and finance: Demonstrate knowledge and understanding of **PO8:** management principles and apply these to multidisciplinary software development as a team member and manage projects efficiently as a leader considering economical and financial factors
- **PO9:** Communication Efficacy: Understand and communicate effectively with the computing community and with society at large, regarding complex computing systems activities confidently and effectively by writing effective reports and design documentations by adhering to appropriate standards, make effective presentations and give / receive clear instructions
- Societal and Environmental Concern: Understand responsibilities and consequences **PO10:** based on societal, environmental, health, safety, legal and cultural issues within local and global contexts relevant to professional computing practices.

- **PO11:** Individual and Team Work: Function effectively as an individual, as a member or leader in diverse teams in multidisciplinary environments.
- **PO12: Innovation and Entrepreneurship:** Identify a timely opportunity for entrepreneurship and use innovation to pursue and create value addition for the betterment of the individual and society at large.

Program Specific Criteria

The MCA programme will enable the students, by the time they graduate to

- **PSC1:** Explain the principles of mathematics, computing and business foundations
- PSC2: Demonstrate the use of software tools and technologies relevant to various verticals
- **PSC3:** Design and develop software products, processes and systems for real world situations

Program Specific Outcomes (PSO)

MCA graduates will be able to:

PSO1: Solve real world computing system problems of various industries by understanding and applying the principles of mathematics, computing techniques and business concepts

PSO2: Design, test, develop and maintain desktop, web, mobile and cross platform software applications using modern tools and technologies

			Firs	t Semeste	er			
Sl.	Course	Course Title	BoS		Credit	Allocation		Total
No	Code			Lecture	Tutorial	Practical	Self study	Credits
				L	Т	Р	S	
1	16MCA11	Data Structures	MCA	4	0	1	0	5
		(Theory and Practice)						
2	16MCA12	Operating Systems (Theory and Practice)	MCA	4	0	1	0	5
3	16MCA13	Web Technologies	MCA	3	0	1	1*	5
		(Theory and Practice)			_			_
4	16MCA14	Computer	MCA	4	0	0	1*	5
		Organization and						
5	16MAT15	Architecture Discrete Mathematics	МАТ	4	1	0	0	5
5	101/17113	Total	WIAT	4 10	1	3	2	25
		Contact (Una/ weak)		10	1	5	0	25
		Contact (Hrs/ week)		19	1	0	0	20
		Non-Contact(Hrs/week)*		0	1	0	8	09
			C		4			
			Secor	ia Semes	ter			
Sl.	Course	Course Title	BoS	a Semes	ter Credit	Allocation		Total
Sl. No	Course Code	Course Title	BoS	Lecture	ter Credit Tutorial	Allocation Practical	Self study	Total Credits
Sl. No	Course Code	Course Title	BoS	Lecture	ter Credit Tutorial T	Allocation Practical P	Self study S	Total Credits
Sl. No	Course Code 16MCA21	Course Title Database Systems (Theory and Practice)	BoS MCA	Lecture L 4	ter Credit Tutorial T 0	Allocation Practical P 1	Self study S 0	Total Credits 5
Sl. No 1	Course Code 16MCA21 16MCA22	Course Title Database Systems (Theory and Practice) Object Oriented Programming (Theory and Practice)	BoS MCA MCA	Lecture L 4 4	ter Credit Tutorial T 0 0	Allocation Practical P 1 1 1	Self study S 0 0	Total Credits 5 5
Sl. No 1 2 3	Course Code 16MCA21 16MCA22 16MCA23	Course Title Database Systems (Theory and Practice) Object Oriented Programming (Theory and Practice) Analysis and Design of Algorithms (Theory and Practice)	Secon BoS MCA MCA MCA	Lecture L 4 4 4	ter Credit Tutorial T 0 0	Allocation Practical P 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Self study S 0 0 0	Total Credits 5 5 5
Sl. No 1 2 3 4	Course Code 16MCA21 16MCA22 16MCA23	Course Title Database Systems (Theory and Practice) Object Oriented Programming (Theory and Practice) Analysis and Design of Algorithms (Theory and Practice) Software Engineering	SeconBoSMCAMCAMCAMCA	Lecture L 4 4 4 3	Credit Tutorial T 0 0 0 0	Allocation Practical P 1 1 1 1 0 0	Self study S 0 0 0 0	Total Credits 5 5 5 5 5 5
Sl. No 1 2 3 4 5	Course Code 16MCA21 16MCA22 16MCA23 16MCA24 16MCA25	Course Title Database Systems (Theory and Practice) Object Oriented Programming (Theory and Practice) Analysis and Design of Algorithms (Theory and Practice) Software Engineering Management	BoS MCA MCA MCA MCA MCA	Lecture L 4 4 4 4 4 4 3 4	Credit Tutorial T 0 0 0 1 0	Allocation Practical P 1 1 1 1 0 0 0 0	Self study S 0 0 0 1* 1*	Total Credits55555555
Sl. No 1 2 3 4 5	Course Code 16MCA21 16MCA22 16MCA23 16MCA24 16MCA25	Course Title Database Systems (Theory and Practice) Object Oriented Programming (Theory and Practice) Analysis and Design of Algorithms (Theory and Practice) Software Engineering Management Information System and	SeconBoSMCAMCAMCAMCAMCA	Lecture L 4 4 4 4 4 4 4 4 3 4	Credit Tutorial T 0 0 0 1 0	Allocation Practical P 1 1 1 1 0 0 0 0	Self study S 0 0 0 1* 1*	Total Credits5555555
Sl. No 1 2 3 4 5	Course Code 16MCA21 16MCA22 16MCA23 16MCA24 16MCA25	Course Title Database Systems (Theory and Practice) Object Oriented Programming (Theory and Practice) Analysis and Design of Algorithms (Theory and Practice) Software Engineering Management Information System and E-Commerce	SeconBoSMCAMCAMCAMCA	Lecture L 4 4 4 4 4 4 4 4 4 4	Credit Tutorial T 0 0 0 0 1 0	Allocation Practical P 1 1 1 1 0 0 0 0	Self study S 0 0 0 0 1* 1*	Total Credits55555555
Sl. No 1 2 3 4 5	Course Code 16MCA21 16MCA22 16MCA23 16MCA24 16MCA25	Course Title Database Systems (Theory and Practice) Object Oriented Programming (Theory and Practice) Analysis and Design of Algorithms (Theory and Practice) Software Engineering Management Information System and E-Commerce Total	Secon BoS MCA MCA MCA MCA MCA	Lecture 4 4 4 4 4 3 4 19 19	ter Credit Tutorial T 0 0 0 1 0 1 1	Allocation Practical P 1 1 1 1 0 0 0 3	Self study S 0 0 0 0 1* 1* 2 2	Total Credits 5 5 5 5 5 5 5 25
Sl. No 1 2 3 4 5	Course Code 16MCA21 16MCA22 16MCA23 16MCA23	Course Title Database Systems (Theory and Practice) Object Oriented Programming (Theory and Practice) Analysis and Design of Algorithms (Theory and Practice) Software Engineering Management Information System and E-Commerce Total Contact (Hrs/ week)	Secon BoS MCA MCA MCA MCA MCA	Lecture L 4 4 4 4 4 4 19 19	ter Credit Tutorial T 0 0 0 1 0 1 1 1 1	Allocation Practical P 1 1 1 0	Self study S 0 0 0 1* 1* 1* 2 0	Total Credits 5 5 5 5 5 5 5 25 26

					Th	ird Sem	ester			
Sl.	Course	;	Course Title		BoS		Credi	t Allocation		Total
No	Code					Lecture	Tutorial	Practical	Self study	Credits
						L	Т	Р	S	
1	16MCA3	1	Computer		MCA	4	0	1	0	5
			Networks							
			(Theory and							
			Practice)							
2	16MCA32	2	Software Testin	g	MCA	4	0	1	0	5
			and Practices							
			(Theory and							
			Practice)							
3	16MCA33	3X	Elective-1		MCA	4	0	1	0	5
			(Theory and							
			Practice)							
4	16MCA34	4X	Elective-2		MCA	4	0	0	1*	5
5	16MCA3	5	Research		MCA	3	0	0	1*	4
			Methodology							
			Total			19	0	3	2	24
			Contact			19	0	6	0	25
			(Hrs/ wee	ek)						
			Non-Cont	act		0	0	0	8	
			(Hrs/weel	()*						
						Elective	1			
					The	eory + Pr	actice			
Cou	rse Code	Co	ourse Title	Co	urse	Cou	rse Title	Course Co	de Course 7	ſitle
				Co	de					
16M	CA331	Co	ontent	161	MCA332	Advanc	ed Object	16MCA333	Model vi	ew
		M	anagement			Oriente	d		controlle	r
		Sy	stem			Program	nming		Program	ning
						Elective	2			
Cou	rse Code	Co	ourse Title	Co	urse	Cou	rse Title	Course Co	de Course 7	ſitle
				Co	de					
16M	CA341	Sy	stem	161	MCA342	Advanc	ed	16MCA343	Operation	ns Research
		Pr	ogramming			Databas	se Systems			

					Four	rth Semes	ster				
SI.	Cou	ırse	Course Title	e	BoS		Credit	Allocation			Total
No	Co	ode				Lecture	Tutorial	Practical	Self	study	Credits
						L	Т	Р		S	
1	16MC	A41	Enterprise		MCA	4	0	1		0	5
		Application									
			Programming								
			(Theory and								
2	16MC	A 42X	Floctive 3		MCA	4	0	1		0	5
2	TOMC	A42A	(Theory and		MCA	4	0	1		0	5
			Practice)								
3	16MC	A43X	Elective-4		MCA	4	0	0		1*	5
4	16MC	A44	Software Project	t	MCA	3	1	0		1*	5
			Management								
5	16MC	A45	Business		MCA	3	0	0		0	3
	1010		Communication	l		0	0	-		0	
6	16MC	A46	Minor Project-1		MCA	0	0	5		0	5
			T	otal		18	1	7		2*	28
			Contact(Hrs/we	ek)		18	1	9		0	28
			Non-Cor	ntact		0	1	5		8	13
			(Hrs/wee	ек)*							
					1	Elective 3					
					Theo	ory + Prac	tice				
Cour	se	Cours	se Title	Cou	rse	Cou	rse Title	Course		Course	Title
Code				Cod	e			Code			
16MC	CA421	Advar	nced Computer	16M	ICA422	Mobile A	pplication	16MCA4	423	Compute	er
		Netwo	orks			Developm	nent			Graphic	8
		~		~]	Elective 4		-		~	
Cour	se	Cours	se Title	Cou	irse	Cou	rse Title	Course		Course	Title
	7 4 4 2 1	Netre	ante Cooperitor		le 1C \ 422	Informati	Dataina 1		122	Madal	and
101/10	LA431	inetwo	ork security	101	ICA432	informatio	n Ketrieval	TONICA	433	Simulati	g and
		I		1				Sinuidu	011		

	Fifth Semester										
SI.	Course	Course Title	BoS		Credit	Allocation		Total			
No	Code			Lecture	Lecture Tutorial Practical Self study						
				L	Т	Р	S				
1	16MCA51	Data Analytics	MCA	4	0	1	0	5			
		(Theory and									
		Practice)									
2	16MCA52X	Elective - 5	MCA	4	0	1	0	5			
		(Theory and									
		Practice)									
3	16MCA53X	Elective – 6	MCA	4	0	0	0	4			
4	16MCA54X	Elective – 7	MCA	4	0	0	0	4			
5	16MCA55	Minor Project II	MCA	0	0	5	0	5			
		Total		16	0	7	0	23			
		Contact(Hrs /		16	0	9	0	25			
		week)									

Elective 5										
Theory + Practice										
Course Code	Course Title	Course Code	Course Title	Course Code	Course Title					
16MCA521	Cloud Computing	16MCA522	Virtual Reality	16MCA523	Internet of Things					
Elective 6										
Course Code	Course Title	Course Code	Course Title	Course Code	Course Title					
16MCA531	Distributed and Parallel Computing	16MCA532	Service Oriented Architecture	16MCA533	Data warehousing & Data Mining					
	- ·	Electiv	ve 7							
Course Code	Course Title	Course Code	Course Title	Course Code	Course Title					
16MCA541	Wireless and Mobile Networks	16MCA542	Principles of UI / UX Design	16MCA543	Soft Computing					

	Sixth Semester									
Sl.	Course	Course Title	BoS		Credit Allocation					
No	Code			Lecture	Tutorial	Practical	Self study	Credits		
				L	Т	Р	S			
1	16MCA61	Major Project	MCA	-	-	23	-	23		
2	16MCA62	Seminar	MCA	-	-	02	-	02		
		Total		0	0	25	0	25		

Total number of credits required to be earned by students

Program	Normal Duration	Total No. of credits to be			
	Years (Semesters)	Earned			
		(Average/Semester=25)			
PG Degree MCA	Three (3) Years or Six Semesters	150			
PG Degree MCA	Two(2) Years or Four Semesters	100			
(Lateral Entry)					

Credit distribution in the MCA program

Category	Min Credits	Max Credits	Credits to be earned
			for 2016 Scheme
Core (incl.soft core)	40	70	82
Elective	20	35	33
Seminar	02	10	02
Industrial Internship & Project Work	20	35	33
Total			150

I Semester

Data Structures (Theory & Practice)											
Course Code	:	16MCA11	CIE Marks	:	100+50						
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks	:	100+50						
Credits	:	5	SEE Duration	:	3 Hrs						
Course Learning Objectives (CLO) Graduates shall be able to 1. Understand the fundamental techniques of Abstract Data Types 2. Implement different data structures like stacks, queues, linked lists, trees and graphs 3. Recognize different data structures and its applications 4. Solve problems by using data structures for different applications											
		Unit – I			10 Hrs						
Introduction to Data Structures Data Structures and Arrays in C, Implementing Structures and Union, Pointers, Scope of Variables Pointers and Dynamic Memory Allocation, Algorithm Specification, Data Abstraction Unit – II 10 Hrs Arrays and Stacks Dynamically Allocated Arrays, Sparse Matrices, Representation of Multidimensional Arrays, Stacks, Stacks using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks											
		Unit – III			09 Hrs						
Queues and L Queues, Circu Chains, Repres	inl lar sen	xed lists Queues, Single- and Double-Ended Priori ting Chains in C, Linked Stacks and Queues	ity Queues, Singly Linl , Doubly Linked Lists	ked	l lists and						
		Unit – IV			09 Hrs						
Trees Binary Trees, Selection Trees	Bi s, F	nary Tree Traversals, Threaded Binary T Forests, Counting Binary Trees	Frees, Heaps, Binary S	ear	ch Trees,						
		Unit – V			10 Hrs						
Graphs and S The Graph Ab graphs, Bubble	ort str sc	ing act Data Type, Graphs: Definitions, Applic ort, Selection Sort, Merge sort, Tree sorting:	cations of graphs, Repr Binary Tree sort, Heap	ese Soi	ntation of						
Unit – VI (Lab Component)											
Implement th 1. Implement a. Lin	e fo a r ear	Part – A bllowing programs using C Language. nenu driven program to search using - Search b. Binary Search									

- 2. Write a menu driven program to sort the given number of elements (using random number generation) using
 - a. Bubble Sort b. Selection sort
- 3. Write a program to implement operations for a String based Stack
- 4. Write a program to implement basic queue operations
- 5. Simulate the working of circular queue providing the following operations a. Insert b. Delete c. Display
- 6. Simulate the working of a singly linked list providing the following operations
 - a. Insert at the beginning
 - b. Insert at the end
 - c. Insert at the position
 - d. Display
- 7. Simulate working of a singly circular linked list providing the following operations
 - a. Delete from the beginning
 - b. Delete every alternate element
 - c. Display and Insert is Mandatory
- 8. Create a binary search tree and implement tree traversal

Part – B

- 1. Demonstrate a program to implement Recursion
- 2. Parse Infix arithmetic expressions to postfix arithmetic expressions.
- 3. Demonstrate how a computer system evaluates an Expression.
- 4. Demonstrate a program to print the jobs waiting in a queue assigning priority to the jobs.
- 5. Write a program to generate the rank list of a student using dynamic memory allocation.
- 6. Simulate an undo operation using doubly linked list.
- 7. Perform Depth Wise Traversal of a graph.

Note: Students are required to implement all the programs in Part-A and Part-B

Course Outcomes

After going through this course the student will be able to

CO1: Discuss data abstraction and data structures such as stacks, queues, lists, trees and graphs

CO2: Identify relevant data structures to develop solutions for a problem

CO3: Examine the use of data structures in relevant applications

CO4: Evaluate different data structures to solve real world problem

Refere	ence Books
1	Horowitz, Sahni and Anderson-Freed, "Fundamentals of Data Structures in C", 2 nd Edition, University Press, 2007, ISBN: 0-929306-40-6. ISBN: 978-0-929306-40-7
2	Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tannenbaum, "Data Structures Using C and C++", 2006, PHI, ISBN 10: 0130369977, ISBN 13: 9780130369970
3	Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures, A Pseudocode Approach with C", 2005, Thomson, ISBN-13: 978-0-534-39080-8
4	Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language", 2 nd Edition, PHI Publications, ISBN-10: 0131103628 ISBN-13: 978-0131103627

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment. Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students must answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

SEE for the practical will be based on writing proper program, execution and proper results for 40 marks and 10 marks for viva-voce. The total marks for SEE (Practical) will be 50 marks.

Part A weightage will be 70% and Part B weightage will be 30% of 40 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Mapping of Course Outcome to Program Outcome													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	Н	Μ	Μ	L	Μ	-	L	-	-	-	L	-	
CO2	Н	Η	Μ	Μ	Μ	-	L	-	L	-	-	-	
CO3	Н	Η	Н	Μ	Η	-	L	L	-	-	-	-	
CO4	Н	Η	Η	Η	Η	-	L	-	-	-	-	-	
Mappi	ing of	Course	Outcon	ne to P	rogram	ı Spec	ific Out	come					
	P	SO1				P	SO2						
CO1	М	-				L	L						
CO2	Η					Η	Н						
CO3	Н					Η	Н						
CO4	Η	Н						Н					
H-Hig	h, M-1	Mediun	ı, L-Lo	W									

I Semester

Operating Systems										
(Incory & Practice) Course Code : 16MCA12 CIF Marks : 100±50										
Ling/Wools	•	10WCA12	CIE Marks	•	100+50					
Hrs/ week	:	L: 1: P: 5 4:0:2:0	SEE Marks	:	100+50 2 IIma					
Creans L	·	S Objections (CLO)	SEE DUration	•	5 1115					
Course Learni	ng b	cobjectives (CLO)								
1 Identify the	D	e able to	austom							
1. Identify the	th	a operating system functionalities managing	system with hardwara							
2. Onderstand	ui s a	e operating system functionanties managing	the implementation of t	n	operating					
System	5 2	structure and design decisions involved in	the implementation of a	an	operating					
4. Explore var	io	us operating system utility commands to main	nage operating system							
5. Implement	va	rious operating system algorithms								
1		Unit – I			10 Hrs					
Introduction t	D	Duerating Systems								
Operating system objectives and functions evolution of operating systems Unix – architecture										
features, file sy	ste	em; Basic file attributes, filters – head, tail, c	eut, paste, tr, grep		,					
		Unit – II			10 Hrs					
Process Manag	ge	ment								
Process, Proces	s :	States, Process Description, Process Control,	, CPU Scheduler and Scl	heo	luling					
Algorithms										
		Unit – III			10 Hrs					
Concurrency (C 0	ntrol								
Principles of (Co	ncurrency, Semaphore, Message Passing,	Principles of Deadlock	κ,	Deadlock					
Prevention, De	ad	lock Avoidance, Deadlock Detection and I	Dining Philosopher's pre-	ob	lem using					
semaphores										
		Unit – IV			10 Hrs					
Memory Mana	ıg	ement								
Swapping, Co	nti	guous Memory Allocation, Paging, Seg	mentation, Demand Pa	agi	ng, Page					
Replacement and Allocation of Frames										
Unit – V 08 Hrs										
File and Disk	M	anagement								
File Sharing,	I	Protection, Directory Implementation, A	Allocation Methods,	Fre	ee Space					
Management, I	Dis	k Structure, Disk Scheduling and Disk Mana	agement							
		Unit – VI (Lab Componer	nt)							

Part – A

- 1. a) Create a file under a three-level file hierarchy structure and change file into read only file and display the username, size of the file and modification date.
 - b) Convert the last or first 4 lines of a file into uppercase and store in another file.
 - c) Display the row in the calendar which contains the date in which a specified file was created and convert the date value to *.
- 2. a) Display corresponding home directory of a login name or current login.
- b) Display the users in the current working directory along with user and group identifiersc) Display all the System information operating system, kernel etc.
- 3. Write a C program to mimic grep command to search pattern, and its occurrence
- 4. Write a C program to mimic cp command.
- 5. Given the list of processes, their CPU burst times and priority, compute and display the average waiting time and average turnaround time using Priority Scheduling.
- 6. Write a C program to simulate the MFT (Multiprogramming with Fixed number of tasks) memory management technique.
- 7. Write a C program to implement FCFS disk scheduling algorithm.

Part – B

- 1. Write a shell script to display the current user/any other user details with CPU and Memory utilization.
- 2. Write a shell script to implement Secured Terminal Login.
- 3. Write a script to search for file details in a directory (including subdirectory) which is having maximum and minimum memory size.
- 4. Write a Script to list the users who have logged in and logged out on a specified date and check for users currently logged in from the list.

Course Outcomes

After going through this course the student will be able to

- **CO1:** Illustrate the fundamentals of operating system components and demonstrate its functionalities using UNIX commands
- **CO2:** Summarize the operating system resources and its management techniques
- **CO3:** Apply the different management techniques to handle the basic operating system resources
- **CO4:** Analyze upon the different algorithms in managing the computer resources

Reference Books

1	William Stallings, "Operating Systems – Internals and Design Principles", Pearson, 7th
	Edition, 2012, ISBN:978-93-325-1880-3
2	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts",
	John Wiley, 8th Edition, 2010, ISBN :978-81-265-205-0
3	Sumitabha Das, "Unix Concepts and Applications", Mc Graw Hill, 4 th Edition, 2012,
	ISBN:978-0-07-063546-3
4	P. Chakraborty, "Operating Systems", Jaico Publishing House, 1st Edition, 2011, ISBN
	9788179929766

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Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment.

Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed.

Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students must answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

SEE for the practical will be based on writing proper program, execution and proper results for 40 marks and 10 marks for viva-voce. The total marks for SEE (Practical) will be 50 marks.

Part A weightage will be 70% and Part B weightage will be 30% of 40 marks. One question from Part A and one from Part B need to be executed.

Change of program is not permitted.

Mapping of	Course	Outcome	to	Program	Outcome
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	М	М	L	L	М	L	L	L	-	L	-	L
CO2	М	М	L	L	L	-	М	-	-	L	-	-
CO3	Н	М	-	L	М	L	-	-	-	-	-	-
CO4	Н	Н	-	L	М	L	-	-	-	-	-	-

Mapping of Course Outcome to Program Specific Outcome

F F	8	
	PSO1	PSO2
CO1	М	L
CO2	М	L
CO3	Н	М
CO4	Н	М
H-High	, M-Medium, L-Low	

		I Semester						
Web Technologies								
		(Theory and Practic	e)					
Course Code	:	16MCA13	CIE Marks	:	100+50			
Hrs/Week	:	L: T: P: S 3:0:2:4	SEE Marks	:	100+50			
Credits	:	5	SEE Duration	:	3 Hrs			
Course Learni	ng	g Objectives (CLO)						
Graduates shall	b	e able to						
1. Explain the t	ec	hnologies used in web applications.						
2. Demonstrate	н ive	TML5, CSS, JavaScript coding for web ap	cents					
4 Analyze dyn	an	ic HTML and XML integration with DOM	Л					
	un				07 Hrs			
Introduction 4	~ 1	Wah Tashralasing			07 1115			
Internet W/W/	U V	Web Browsers and Web Servers LID	I & MIME HTTD Sequeit	N	the Web			
Programmers 7	ν, Γο	olbox Multi-tier Application Architectur	e Client-Side Scripting ve	y, rsi	is Server-			
Side Scripting.	ŀ	TML and HTML5. Markup Language	(HTML5): HTML5 tags -	Fe	ormatting.			
Commenting,	Со	de, Anchors, Backgrounds, Images, Hyp	per-links, Lists, Tables, Fra	m	es HTML			
Forms.								
		Unit – II			07 Hrs			
Front End Des	sig	n						
Cascading Styl	e	Sheet (CSS): Introduction to CSS - Bas	sic syntax and structure, In	-li	ne Styles,			
Embedding Sty	le	Sheets, Linking External Style Sheets, B	ackgrounds, manipulating to	ext	, Margins			
and Padding, F	2 09	sitioning using CSS. XML: Introduction,	syntax, Document structure	۶, ۱	Document			
Type Definition	ns,	, Namespaces, XML schema, displaying i	raw XML documents, Disp.	lay	ing XML			
	IC	Unit – III			08 Hrs			
Basics of Iava	50	rint			00 111 5			
Overview of I	sc av	aScript Object orientation and IavaScrip	ot Syntactic characteristics	F	Primitives			
operations, and	e	xpressions. Screen output and keyboard in	put. Control statements. Ob	, iec	t creation			
and modification	on,	Arrays, Functions, Constructors, Pattern r	natching using regular expre	ssi	ions.			
		Unit – IV	* * * *		08 Hrs			
JavaScript and	d I	HTML Documents						
The JavaScript	E	Execution Environment, The Document C	Object Model, Elements Ac	ces	ss in Java			
Script, Events	an	d Event Handling, Handling Events from	Body Elements, Handling	Ev	rents from			
Text Box and p	as	sword Elements, Dom Tree Traversal and	Modification.		00 11			
D					Uð Hrs			
Introduction	m ک	itioning Elements Moving Elements El	ement Visibility Changing	C	alors and			
Fonts Dynami	US C	Content Stacking Elements Locating th	e Mouse Cursor Reacting	to	a Mouse			
Click. Slow Me	~)Ve	ement of Elements.	e mouse cursor, reaching	.0	a 1110000			
JavaScript Obj	ec	ts: Introduction Math Object, String Ol	bject, Fundamentals of Ch	ara	acters and			
Strings, Metho	ds	of the String Object, Character-Process	ing Methods Searching Me	eth	ods, Date			
Object, Boolean	n a	and Number Objects Document Object						

 PART – A 1. Create an HTML5 page to demonstrate the usage of a. Text Formatting tags, b. Links c. Images d. Tables 2. Create a web page with all types of Cascading style sheets. 3. Develop and demonstrate a HTML5 file that includes JavaScript script for the following a. Input: A number n obtained using prompt Output: The first n Fibonacci numbers b. Input: A number n obtained using prompt Output: A table of numbers from 1 to n and their squares using alert 4. Develop and demonstrate, using JavaScript script, a HTML5 document that collects the USN (the
 Create an HTML5 page to demonstrate the usage of Text Formatting tags, Links Images Tables Create a web page with all types of Cascading style sheets. Develop and demonstrate a HTML5 file that includes JavaScript script for the following Input: A number n obtained using prompt Output: The first n Fibonacci numbers Input: A number n obtained using prompt Output: A table of numbers from 1 to n and their squares using alert Develop and demonstrate, using JavaScript script, a HTML5 document that collects the USN (the
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 d. Tables 2. Create a web page with all types of Cascading style sheets. 3. Develop and demonstrate a HTML5 file that includes JavaScript script for the following a. Input: A number n obtained using prompt Output: The first n Fibonacci numbers b. Input: A number n obtained using prompt Output: A table of numbers from 1 to n and their squares using alert 4. Develop and demonstrate, using JavaScript script, a HTML5 document that collects the USN (the
 Create a web page with all types of Cascading style sheets. Develop and demonstrate a HTML5 file that includes JavaScript script for the following a. Input: A number n obtained using prompt Output: The first n Fibonacci numbers b. Input: A number n obtained using prompt Output: A table of numbers from 1 to n and their squares using alert Develop and demonstrate, using JavaScript script, a HTML5 document that collects the USN (the
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Output: The first n Fibonacci numbers b. Input: A number n obtained using prompt Output: A table of numbers from 1 to n and their squares using alert 4. Develop and demonstrate, using JavaScript script, a HTML5 document that collects the USN (the
 b. Input: A number n obtained using prompt Output: A table of numbers from 1 to n and their squares using alert 4. Develop and demonstrate, using JavaScript script, a HTML5 document that collects the USN (the
4. Develop and demonstrate, using JavaScript script, a HTML5 document that collects the USN (the
4. Develop and demonstrate, using JavaScript script, a HTML5 document that collects the USN (the
valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits
followed by two upper-case characters followed by two upper case characters followed by two upper-case allowed) of
the user. Event handler must be included for the form element that collects this information to
validate the input. Messages in the alert windows must be produced when errors are detected.
5. Design an XML document to store information about a student in an engineering college
affiliated to VTU. The information must include USN, Name, Name of the College, Branch,
Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and
use it to display the document.
PART – B
1. Create WebPages using HTML5 and CSS for Employee Management Portal. The pages should
have the following, but not limited to:
a. Proper headings
b. Links for more details
c. Images where ever appropriate
d. Provision to take feedback from the user
2. Design the static web pages required for an on-line book store web site.
a. Home Page
b. The static home page must contain three frames
c. Top frame: Logo and the college name and links to Home page, Login page, Registration
page,
d. Left frame: At least four links for navigation, which will display the catalog of respective links
e. For e.g.: When you click the link "MCA" the catalog for MCA
f. Books should be displayed in the Right frame.
g. Right frame: The pages to the links in the left frame must be loaded here. Initially this page
contains description of the web site
contains description of the web site

- 3. Demonstrate a HTML5 and JavaScript functions for the following problems:
 - a) Parameter: A string
 - Output: The position in the string of the left-most vowel
 - b) Parameter: A number
 - Output: The number with its digits in the reverse order
- 4. Demonstrate Java Script for different dialog box options.
- 5. Demonstrate a login page using HTML5 and validate the username and password using JavaScript.

Self-Study Component

Topics on latest / emerging technologies will be assigned. Students are required to read white papers, publications, patents and prepare a report, give a seminar on the study undertaken. The self study will be reviewed and evaluated by a expert panel in two phases appointed by the Director, MCA.

Course Outcomes

After going through this course the student will be able to:

CO1: Interpret mark-up and scripting language concepts and demonstrate their applications

CO2: Apply the concepts of dynamic documents using DOM and JavaScript

CO3: Examine appropriate content layout design and event handling techniques

CO4: Implement web documents using HTML5, CSS, JavaScript and XML

Reference Books

- 1 Robert W. Sebesta," Programming the World Wide Web", Pearson Education, 4th Edition, 2012. ISBN: 9788131724170
- 2 M. Srinivasan, "Web Technology Theory and Practice", Pearson Education, 1st Edition, 2012, ISBN: 9788131774199
- 3 Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web How to Program", Pearson Education, 5th Edition, 2011, ISBN: 9780132151009
- 4 Chris Bates, "Web Programming Building Internet Applications", Wiley India, 3rd Edition, 2006, ISBN: 9780470017753

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment.

Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed.

Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students must answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

SEE for the practical will be based on writing proper program, execution and proper results for 40 marks and 10 marks for viva-voce. The total marks for SEE (Practical) will be 50 marks.

Part A weightage will be 70% and Part B weightage will be 30% of 40 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Mapping of Course Outcome to Program Outcome

	1 .											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
COL												
COI	Η	М	М	М	Н	М	М	М	Н	М	М	М
CO2	М	Н	Н	Н	М	L	L	L	L	L	М	L
CO3	М	Н	Н	Н	L	L	М	М	L	L	М	L
CO4	L	Н	Н	Н	L	L	L	L	L	L	Μ	L
Mappi	ng of C	ourse O	utcome	to Prog	ram Sp	ecific O	utcome					
	PSO1						PSO2					
CO1	М						Н					
CO2	L						Н					
CO3	М											
CO4	4 L H											
H-Hig	gh, M-N	Iedium	, L-Lov	W								

I	Semester
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		Computer Organization and A	rchitecture						
Course Code	:	16MCA14	CIE Marks	:	100				
Hrs/Week	:	L: T: P: S 4:0:0:4	SEE Marks	:	100				
Credits	:	5	SEE Duration	:	3 Hrs				
Course Learning Objectives (CLO)									
Graduates shall	be	able to							
1. Describe va	rio	us data representations and explain how ar	ithmetic and logical ope	erati	ons are				
performed b	y c	computers	11.00	•					
2. Explain the	bas	sic operation and relationship between the	different components of	CO	mputer.				
3. Understand	the	e advanced architecture of microprocessors							
4. Write assem		y programs for 8086 microprocessors			0.0 11				
		Unit – I			09 Hrs				
Number System	ns	and Boolean Algebra		-					
Number system	s, l	Logic gates: The AND Gate, The OR gate	, the inverter and Buffe	er, 'l	The NAND				
gate, the NOR	Ga	ite, the exclusive OR gate, The Exclusive	e NOR Gates, The NA	ND	Gate as a				
Universal Gate,	U O	ates with More than two inputs, Using I	nverters to convert gat	es.	Axiomatic Reclean				
Eurotions Can	000 mi	cal and Standard Forms Other Logic Oper	etions	eura	a, Dooleali				
	711	Unit – II			10 Hrs				
Combinational	T	agic and Sequential Logic			10 1115				
Map, Product o Adders, Subtractors subtractors and the sequential log	f S toi gic	Summer Simplification, NAND and NOR Imp rs, Binary Parallel Adder, Decimal Adder, Flip – Flops, Triggering of Flip- Flops	plementation, Don't Ca Decoders, Multiplexer	ur – re (s. Ir	Conditions.				
	-	Unit – III			09 Hrs				
Basic Structur	e o	f Computer and Machine Instructions							
Computer Type Memory Locati Instructions & Microprocessor	es, on 5	Functional Units, Basic Operational Con and Addresses Machine Instruction an Instruction Sequencing, Basic Input/o sed computer system	ncepts, Bus structures, d Programmers, Memo utput Operations. In	Pe ry (trod	rformance, Dperations, luction to				
		Unit – IV			10 Hrs				
8086 Architect Introduction, A operation	ure rch	e itecture of 8086 Microprocessor, Pin func	tions, Minimum / Maxi	mu	m mode of				
· ·		Unit – V			10 Hrs				
8086 Program	niı	ng			1				
8086 instruction	ı se	ets, addressing modes, Assembler directive	s, Programming examp	les					
Self-Study Cor Topics on lates required to read study undertake appointed by th	npo t / d w en. e D	onent emerging technologies relevant to the co white papers, publications, patents and pre The self study will be reviewed and evalue Director, MCA.	purse will be assigned. spare a report, give a s nated by a expert panel	St emi in t	udents are nar on the wo phases				

Course Outcomes													
After going through this course the student will be able to:													
CC	CO1: Illustrate the concepts of Digital system, its organization and architecture.												
CO2: Apply the basic concepts of Digital system and Assembly language in solving problems.													
CO3: Analyze the working of Digital Logic circuits and Assembly language programs.													
CO4: Justify the solutions selected for a problem.													
Re	Reference Books												
1	M. Morris	Mano, "Digital Logic and Computer Design", Pearson Education Limited, 2016,											
	ISBN-139	978933	789332542525.										
2	Carl Ham	acher,	Z Va	arnesic	and	S Zaky	, "Cor	mputer	Orga	nizatio	n", Tat	a McGı	aw Hill
	Publishing	g Co.Lt	td, 5 th	Edition	n, 2002	2 ISBN-	13 978	12590	05275.				
3	Yu-Cheng	, Liu	& Glei	ın A G	ibson,	"Micro	compu	ter syst	tems 8	086/80	88 fami	ly, Arch	itecture,
	Programm	ing a	nd	Desig	n", P	earson	Educa	tion L	imited	l, 2 nd	Edition	i, 2003,	, ISBN-
	97881203	04093.											
4	Douglas V	' Hall,	"Micro	oproce	ssors a	nd Inter	facing	", McG	iraw H	ill, 2 nd	Edition	, 2010, 1	ISBN-13
	97800706	01673.											
Scl	heme of Co	ontinu	ous In	ternal	Exam	ination	(CIE)						
CI	E will cons	sist of	Two T	'ests, T	'wo Qi	uizzes a	nd Self	f study	. The t	est wi	ll be for	· 30 mar	ks each,
qui	iz and self	study f	or 20 r	narks.	The to	tal mark	ts for C	CIE (Th	eory)	will be	100 ma	ırks.	
Scl	heme of Se	emeste	r End	Exami	inatior	n (SEE)							
Th	e question	paper v	will be	for 10	0 mark	and sl	nall con	nsist of	f 10 qu	estions	s from fi	ve units	with 20
ma	rks each. (Out of	the 1	0 ques	tions s	tudents	must	answer	five c	questio	ns from	each u	nit. The
que	estions will	have	Interna	l Choi	ce with	n maxim	um 3 s	sub div	isions.	Both	the ques	stions sh	all be of
the	same com	plexity	in ter	ms of (COs an	d Bloor	n's tax	onomy	level.				
Ma	apping of (Course	e Outc	ome to	Prog	ram Ou	tcome						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CC	01	Н	L	Μ	-	L	-	Μ	М	L	-	L	-
CC)2	Н	М	Μ	-	М	-	L	L	L	-	L	-
CC)3	Μ	L	Μ	L	L	-	L	L	L	-	-	-
CC)4	L	-	Μ	L	L	-	L	L	L	-	-	-
Ma	pping of C	Course	Outco	ome to	Progr	am Spe	cific (Outcon	ıe				
		PSO1	-					PSO2					
CO	1	М						Μ					
CO	2	Μ						Μ					
CO	3	L						М					
CO	94	L						L					
H-l	H-High, M-Medium, L-Low												

Discrete Mathematics									
Course Code	:	16MAT15	CIE Marks	:	100				
Hrs/Week	:	L-T-P-S: 4-2-0-0	SEE Marks	:	100				
Credits	:	5	SEE Duration	:	3 Hrs				
Course Learning	Objec	tives (CLO)			•				
Graduates shall be	able to	0							
1. Identify and ex	xplain	the basic concepts of set t	heory, counting techni	ques a	and induction to				
perform computational operations.									
2. Illustrate formal methods of symbolic logic and proof techniques used to solve traditional									
computing problem.									
A Demonstrate t	he pro	poper use of function notation	on and Identify the m	applic ost an	propriate model				
hased both on t	techno	logy and the context of the	situation.	usi ap					
5. Use graph theo	oretic r	nodels to solve some basic	problems in informatics	5.					
		Unit – I			10 Hrs				
Set Theory and C	ounti	ησ							
Sets and subsets. s	et oper	rations and the laws of set t	heory. Venn diagrams.	Princi	ple of inclusion-				
exclusion, The ru	iles o	f sum and product, Perr	nutations and Combir	ations	, Mathematical				
induction.		I /			,				
		Unit – II			10 Hrs				
Logic					10 1115				
Propositional logic	c: Cor	mectives. Truth table. Tau	tology. Contradiction.	Logic	cal equivalence.				
Logical implication	ns, La	ws of Logic, Rules of Infere	ence, Quantifiers, Metho	ods of	Proof.				
		Unit – III	-		09 Hrs				
Relations									
Cartesian product	and r	elations, Computer recogni	tion: zero-one matrice	s and	directed graphs				
Properties of relati	ons, E	quivalence relations, Posets	and Hasse diagrams.		01				
		Unit – IV			09 Hrs				
Functions									
Functions: plain	and	one-to-one, onto function	s, Stirling numbers	of the	e second kind,				
Composition and i	nverse	functions, Special function	S.						
		Unit – V			10 Hrs				
Graphs									
Definition of grap	n, basi	c concepts in graph theory,	vertex degree, Sub gra	phs, C	Complement and				
graph isomorphism	n, Eul	er trails and circuits, Ham	lton paths and cycles,	Plana	r graphs, Graph				
coloring and chron	natic p	olynomials.							
Course Outcomes	5								
After going throug	h this	course the student shall be a	able to						
COI: Identify and	interp	ret the fundamental concept	ts of discrete structures.	•	an of				
Computation	iowiec	ige and skills obtained to ex	annue and solve differ	ent typ	es of				
CON: Analyza mot	iai pro	ical concents like sets roos	oning relational algebr	a and a	oranh				
theory to sol	ve the	problems and optimize the	solution	a anu ş	graph				
	ve me	problems and optimize the	solution.						

CO4: Distinguish the overall	mathematical kr	nowledge g	gained to	demonstrate	and an	alyze
the problems arising in	practical situation	ons.				

Referen	ice Books												
1	Ralph P	Grimal	di, B.V	.Raman	a, "Disc	crete	and	Combi	natoria	al Math	nematics	s", An a	pplied
	introduct	tion, 5^{tl}	¹ Editio	n, Pears	on Edu	catio	n, 20	007, ISI	BN-10	: 81775	584243,		
	ISBN-13	:97881	775842	240							41-		
2	Kenneth	H Ro	sen, "D	iscrete	Mathen	natic	s &	its Ap	plicati	ons", 7	th Editi	on, Mc	Graw-
	Hill, 201	<u>0, ISB</u>	<u>N-10: 0</u>	073383	<u>090, ISI</u>	BN-1	<u>13:9</u>	780073	338309) 5			
3	D.S. Ma	lik & N	1.K Sen	1, "Disc	rete Mat	them		al Struc	tures:	Theory	<i>v</i> & App	olication	s",
4	Course I	Itse Technology, 2004, ISBN 10: 0019212855, ISBN 15: 9780019212858											
4	Algorith	narssoi	$1 \propto Ka$	iymona Educativ	Greeni	aw,	UI DNI	apn 1n	eory-1		ng, App	oncation	is and
	Algorith	IIIS , FO			511, 2000	o, 151	DIN -	970-0.	1-31/-	1/20-0			
Scheme	e of Conti	nuous	Interna	al Eval	uation (CIE): Cl	E will	consis	st of Tv	vo tests	, Two q	uizzes
and Tw	o assignm	ents. T	he test v	will be f	for 30 m	arks	each	n, quiz	and as	signme	ent for 1	0 marks	s each.
The tota	al marks fo	or CIE	(Theory	y) will b	e 100 n	narks							
Scheme	e of Seme	ster E	nd Exa	minatio	on (SEF	E): T	he q	uestior	n pape	r will t	be for 1	00 marl	s and
shall co	nsist of 1() quest	ions fro	m five	units wi	th 20	0 ma	rks eac	h. Ou	t of the	10 que	stions s	tudent
must a	nswer 11ve	e ques	tions II	rom ea	ch unit.	. In	e qu	lestions	S W1II	have	internal	choice	+ with
maximu and Pla	in of 5 su	D = 0 + 1	ions. Bo	oth the	question	is sna	all De	e of the	same	compl	exity in	terms c	I COS
Monnir	on staxo	$\frac{101119}{1000000000000000000000000000000$	tcomo f	Drog	rom Oi	iteor	no						
марри			PO3	PO 4			<u>ne</u> 16	P07	PO8	POO	PO10	PO11	PO12
C01	<u>н</u>	M	105	104 I	105 I	-	0	I 07		I	-	-	1012
CO1 CO2	H	M	L	M	-	_		L	_	-	_	_	-
CO3	M	H	L	M	-	_		L	-	-	_	_	_
CO4	H	H		M	L	-		L	-	-	-	-	-
Mappir	ng of Cou	rse Ou	tcome t	to Prog	ram Sp	ecifi	c Ou	itcome					1
	PSO	1		0	•		PS	02					
CO1	М						L						
CO2	L						L						
CO3	Μ						Η						
CO4	L						Μ						
H-High	, M-Medi	um, L	-Low										

II Semester

Database Systems												
		(Theory & Practice)		<u> </u>	100.50							
Course Code	:		CIE Marks	:	100+50							
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks	:	100+50							
Credits	:	5	SEE Duration	:	3 Hrs							
Course Learning Objectives (CLO)												
Graduates shall be able to												
1. Explain da	1. Explain database concepts and structures and terms related to database design, transactions											
2 Demonstra		data modeling, normalization and developm	ant of the database									
2. Demonstra	sc	I statements for data definition modificati	on and retrieval of data									
4 Analyze ho	л Т	databases are affected by real-world transac	ctions									
5. Design and	b	uild a simple database system										
		Unit – I			08 Hrs							
Basic Concent	c											
Introduction to	.э \ (lata information databases database mat	nagement system. Char	act	eristics of							
database appro	ac	h Actors on the Scene Advantages of usin	g DBMS approach Cla	issi	fication of							
Database App	lic	ations. Data models. Schema and instan	ces. Three schema arcl	hite	ecture and							
independence.	D	BMS Environment. Client/ Server Archite	ctures of DBMS. E-R	Mc	odel – E-R							
Diagrams		·····	,									
		Unit – II			08 Hrs							
Data Models a	n	l Basic SOL										
Introduction to)]	Data Models, Relational Model Concepts	, Relational Model Co	nst	raints and							
Relational Dat	ab	ase Schemas, Keys, Dealing with Const	raint Violations, E-R	to	Relational							
Mapping, Adva	ant	ages of SQL, Data Definition Language and	d Data Types									
		Unit – III			09 Hrs							
Structured Qu	ıeı	ry Language										
Data Manipula	ati	on language, Data Control Language, Da	ta Query Language an	d :	all related							
commands. Q	ue	ries using Group by and Order by cla	use & Join, Operators	5, .	Aggregate							
Functions, Cor	nn	nit, Rollback, Save point. Views: Introduction	on									
		Unit – IV			09 Hrs							
Database Desi	gn	Theory and Normalization										
Informal Desig	gn	Guidelines for Relation Schemas, Funct	ional Dependencies, No	orn	nal Forms							
Based on Prim	ar	y Keys, General Definitions of Second and	d Third Normal Forms,	Bo	oyce-Codd							
Normal Form,	M	ulti-valued Dependency and Fourth Norma	l Form, Join Dependence	cies	and Fifth							
Normal Form												
Unit – V 10 Hrs												
Transaction P	ro	cessing and Concurrency Control		_								
Introduction-P	op	perties of Transaction, Serializability,	Concurrency Contro	ol,	Locking							
Mechanisms, T	W	o Phase Commit Protocol, Dead lock										

1. Consider the scenario of a hospital system.

Patients are treated in a single ward by the doctors assigned to them. Usually each patient will be assigned a single doctor, but in rare cases they will have two. Health care assistants also attend to the patients; a few these are associated with each ward. Initially the system will be concerned solely with drug treatment. Each patient is required to take a variety of drugs a certain number of times per day and for varying lengths of time. The system must record details concerning patient treatment and staff payment. Some staff is paid part time and doctors and care assistants work varying amounts of overtime at varying rates (subject to grade). The system will also need to track what treatments are required for which patients and when and it should calculate the cost of treatment per week for each patient.

- a. Identify super key, candidate keys, primary keys, Referential Integrity
- b. Explain the cardinality and participation between entities in the problem
- c. Create an ER diagram and the schema relationship for the above scenario Create the relations
- d. Design and execute queries for listing out
 - The patients examined by a doctor
 - Healthcare assistants of a ward
 - Cost of treatment per week by a patient
 - Availability of doctors based on specialization during emergency
- 2. Design and develop a database for Employee management system and perform the following task.
 - a. Retrieve the names of all employees who do not have supervisors
 - b. Retrieve the names of all employees whose surname is same as their supervisors
 - c. Retrieve the name of each employee who has a dependent with the same first name as the employee
 - d. Retrieve the name of each employee who works on all the projects controlled by department number 5
 - e. Retrieve the names of employees who have no dependents
- 3. Design and develop a database for order processing system in a company. Perform the following queries
 - a. Retrieve custname, No. of orders, Avg_order_amount, where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.
 - b. List the order no for orders that were shipped from all the warehouses that the company has in a specific city.
 - c. Retrieve the details of customers who have placed maximum number of orders.
 - d. Retrieve the customer name and city that have placed least order amount.
 - e. Demonstrate the deletion of an item from the database and demonstrate a method of handling the rows in the table that contains the order placed on the deleted item

- 4. Design and develop a University database which tracks information about Departments, Professors, Students, Project Assistants and Projects. Perform the following Queries and ensure to grant permissions for specified users to view the contents (create views and grant permission over the view)
 - a. Retrieve the names of all professors who do not have an ongoing project of more than 1 lakhs
 - b. Retrieve the names of all graduate students along with their senor graduate student and the professors under whom they work
 - c. List the professors and the sum of their total budgeted projects

PART-B

- 1. Create a GUI for each of the above scenarios and demonstrate CRUD operations
- 2. Backup and Restore Databases and tables
- 3. Using ODBC/JDBC, connect to the RDBMS and demonstrate CRUD operations

Course Outcomes

After going through this course the student will be able to:

- **CO1:** Explain the basic concepts of data models, database design for transaction processing and Query Language
- **CO2**: Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram
- **CO3**: Transform high-level conceptual model to relational data model, populate database and formulate queries based on principles of normalization
- CO4: Design and Implement a Database for any given problem

Reference Books

- 1Ramez Elmasri,Shamkant B. Navathe, "Fundamentals of Database Systems", PearsonAddison Wesley,6th Edition, 2011, ISBN 13: 978-0-136-08620-8
- 2 Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database Systems Concepts", McGraw-Hill Education, 6th Edition, 2010, ISBN 0-07-352332-1
- 3 Raghu Ramakrishnan, Johannes Gehrke, "Database Management System", Mc Graw-Hill, 3rd Edition, 2003, ISBN-10: 0072465638

4 Jeffrey A. Hoffer, Mary B. Prescott, Fred R. McFadden, "Modern Database Management", Prentice Hall, 8th Edition, ISBN-13: 978-0-13-033969-0

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment. Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. In test, the Part B can be executed for the data set created during execution of Part A.

Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students must answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

SEE for the practical will be based on writing proper program, execution and proper results for 40 marks and 10 marks for viva-voce. The total marks for SEE (Practical) will be 50 marks.

Part A weightage will be 70% and Part B weightage will be 30% of 40 marks. One question from Part A and one from Part B need to be executed. The Part B can be executed for the data set created during execution of Part A.

Change of program is not permitted.

Mapping of Course Outcome to Program Outcome													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	Н	М	М	М	М	L	М	М	L	L	L	L	
CO2	Η	Н	М	М	L	-	М	Μ	L	-	-	-	
CO3	Η	Н	М	М	L	L	L	L	L	-	-	-	
CO4	Η	Н	М	L	L	-	М	Μ	М	-	L	L	
Mapping of Course Outcome to Program Specific Outcome													
	PSO1						PSO2						
CO1	Η						M						
CO2	Μ						М						
CO3	Η						Н						
CO4	Н						Н						
H-High, M-M	Iediun	n, L-L	ow				•						

II Semester

Object Oriented Programming											
		(Theory & Practice)									
Course Code	:	16MCA22	CIE Marks	:	100+50						
Hrs/Week	:	L: T: P: S 4:0:2:0	SEE Marks	:	100+50						
Credits	:	5	SEE Duration	:	3 Hrs						
Course Learning Objectives (CLO)											
Graduates shal	1 t	be able to									
1. Develop an	ı u	nderstanding of the essential principles in o	bject oriented programn	nin	g						
2. Implement	oł	pject oriented programming concepts using I	Python programming la	ngu	iage						
3. Incorporate	e d	esign patterns standards for solving a real-w	vorld problem								
4. Utilize obje	ect	t based approaches during software develop	ment								
		Unit – I			10 Hrs						
Foundations of)f	Object Oriented Concepts									
History of obje	ect	oriented languages: structured programmin	ng, procedural programm	nin	g Abstract						
data types, er	ICa	apsulation, Typed and untyped languages	S Coupling and cohesi	on	Concepts						
Encapsulation,	(Classes and objects, Class members: Da	ata members (fields)	anc	1 member						
functions (met	hc	ods), Class member visibility (private, pul	olic, protected), Class	var	iables and						
instance variab	ole	s, Class methods and instance methods, Se	ervice methods and supp	or	t methods,						
Scope Class h	ie	rarchies, Single and multiple inheritance, l	Inter-class relationships	, C	onstructor						
and Destructor	ſ,	Object initialization, Memory managemen	t, Garbage collection,	Me	thods and						
messages, Met	ho	d signatures, Method and operator overload	ing, Method overriding.		10.11						
	_	Unit – II			10 Hrs						
Design Princi	ple			1	(1						
Abstract classe	ЭS,	Dynamic (late) binding, Polymorphism,	Software reuse, Super	cla	sses (base						
classes), Subcl	as_{1a}	ses (derived classes), invocation of supercla	SS methods and construct	cto	rs, Objects						
VS variables, C	in	sses vs types, Delegation, Collection classes	, Class libraries.	<u></u>	and and						
Contendo	ш Sc	enarios Class diagrams: associations, aggre	ors, system boundary, <	≤u: 1 ir	horitanco						
Object interact	in	n diagrams object state transition diagrams	gation, dependency, and	1 11	inernance,						
	10.	I unit – III			10 Hrs						
Design Detter	<u></u>	Omt – m			10 1115						
Design pattern	пэ 115	Pattern documentation: structure partic	inants and consequence	<u>0</u> 6	Types of						
patterns. Crea	tic	n Patterns-Singleton Abstract Factory	Rehavior Patterns-Com	ma	ind State						
Structural Patterns-Adapter MVC Facade											
Structurar r att		1000000000000000000000000000000000000			09 Hrs						
Introduction t	0	Python Programming Language			07 1115						
Fundamentals	0.	f Python Programming language: Variabl	es, Operators. Function	ns.	Modules.						
Conditional S	tri	icture and Recursive functions. Iterations	s, Data types in pytho	on:	Numeric.						
Sequences (Str	in	g, List and Tuple), Sets and Mapping (Dicti	onary).								
			v /								

	Unit – V	09 Hrs							
Obje	ct oriented programming using Python								
Class	es and Objects, functions, methods, Inheritance, polymorphism and Exception hand	ling							
		-							
Unit – VI (Lab Component)									
	Part – A								
1. V	Vrite a python script to demonstrate searching technique (linear or binary)								
2. V	Vrite a python script to demonstrate sorting (Bubble or Selection or Insertion or Qui	ck)							
3. V	Vrite a python program demonstrating polymorphism (operator and function)								
4. V	Vrite a python program to demonstrate Inheritance and exception handling								
5. V	Vrite a python program demonstrating 10 operations using python datatypes (any on	e)							
a) String b) List c) Tuple d) Sets and e) Dictionary								
	Part – B								
Stude	ents will be given problem statements to implement any of the following design patt	erns							
using	Use Case Diagram and Class Diagrams								
1. F	acade (Structural Pattern)								
2. N	Iodel View Control (Structural Pattern)								
3. C	ommand (Behavior Pattern)								
4. S	tate Pattern (Behavior Pattern)								
5. A	bstract Factory (Creation Pattern)								
6. S i	ingleton (Creation Pattern)								
Cour	rse Outcomes								
After	going through this course the student will be able to:								
CO1:	Relate and recall object oriented and structured programming concepts								
CO2	Demonstrate competency in object oriented concepts								
CO3	Utilize object oriented concepts and develop solutions using python programming								
~~ .	language								
CO4:	Examine UML design patterns and analyze design solutions using python program	ming							
	language								
Kefei	rence Books								
1	Martin Fowler, "UML Distilled", Addison Wesley, 3rd Edition, 2003, ISBN: 0321	193687,							
	978-0321193681								
2	Chetan Giridhar, "Learning Python Design Patterns", Packet Publishing, 2 nd Editi	on,							
	2016, ISBN: 978-1783283378	,							
3	Allen Downey, Jeffrey Elker, Chris Meyers, "Learning with Python", Dreamte	ch press,							
	2013, ISBN 13: 978-9351198147	- /							

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment.

Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students must answer five questions from each unit. The questions will have internal choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

SEE for the practical will be based on writing proper program, execution and proper results for 40 marks and 10 marks for viva-voce. The total marks for SEE (Practical) will be 50 marks. Part A weightage will be 70% and Part B weightage will be 30% of 40 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Mapping of Course Outcome to Program Outcome

Thepping of course concome to rogram concome													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	L	L	-	-	-	L	-	-	-	-	-	-	
CO2	Н	М	L	-	М	L	L	-	-	-	-	-	
CO3	Н	М	Μ	L	Н	М	L	-	-	-	-	-	
CO4	Η	Μ	Η	L	Η	L	L	-	-	-	-	-	

Mapping of Course Outcome to Program Specific Outcome

11 8	8 1										
	PSO1	PSO2									
CO1	Μ	L									
CO2	L	Н									
CO3	Н	М									
CO4	L	Н									
H-High, M-N	H-High, M-Medium, L-Low										

Analysis and Design of Algorithms											
		(Theory & Practice))								
Course Code	:	16MCA23	CIE Marks	:	100+50						
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks	:	100+50						
Credits	:	5	SEE Duration	:	3 Hrs						
Course Learning Objectives (CLO)											
Graduates shall be able to											
1. Understand	l th	e need of different Algorithm techniques	0.1100		C						
2. Apply mathematical preliminaries to the analysis and design stages of different types of											
algorithms,	1	comithing based on time and space compl	avity								
5. Allalyze the	t al Lan	d develop a variety of techniques for des	exily	011	ini- and						
4. Understand Multi-proce	- a1	or technology		on t	ini- and						
5. Develop ne	2335 W (or re-use already existing efficient algorit	thms to solve problems								
		Unit – I			10 Hrs						
Introduction t	0 /	Algorithms & Divide and Conquer tech	nique								
Notion of Al	gor	ithm, Review of Asymptotic Notation	ns, Mathematical Ana	lysi	s of Non-						
Recursive and	Re	ecursive Algorithms, Introduction to div	vide and conquer, Mer	ge S	Sort, Quick						
Sort and its performance											
Unit – II 10 Hrs											
Decrease and Conquer & Greedy Method											
Insertion Sort,	D	epth First Search and Breadth First Se	arch, Topological Sort	ing,	Knapsack						
Problem, Job	Sec	juencing with Deadlines, Minimum-Cos	st Spanning Trees: Prir	n's	Algorithm,						
Kruskal's Algo	brit	hm; Single Source Shortest Paths			•						
		Unit – III			10 Hrs						
Dynamic Prog	gra	mming & Coping with Limitations of A	Algorithmic Power								
Warshall's Alg	gor	ithm, Floyd's Algorithm for the All-P	airs Shortest Paths Pro	oble	m, Single-						
Source, Shorte	est	Paths: 0/1 Knapsack, The Traveling Sales	sperson problem								
		Unit – IV			08 Hrs						
Space and Tin	ne	Trade Offs and Limitations of Algorith	nmic Power								
Space-Time T	rac	leoffs: Introduction, sorting by Coun	ting, Input Enhancem	lent	in String						
Matching, Lov	wei	-Bound Arguments, Decision Trees, I	P, NP, and NP-Comp	lete	Problems,						
Challenges of I	NU	merical Algorithms			10.11						
		$\frac{\text{Unit} - \text{v}}{10}$			10 Hrs						
Backtracking	an	d Branch - Bound Technique	11 01 (0 D	11	D 1						
Backtracking:	n-(Queens problem, Hamiltonian Circuit Pro	blem, Subset – Sum Pr		em, Branch						
Noorost Noight	sig	Twice Around the Tree	Toblem, Approximatio	II A	pproaches-						
	101	, I will Albund the fife Unit – VI (I ab Compor	ient)								
Design develo	on	and implement the specified algorithm	ns for the following n	roh	lems using						
C/C++ Studer	rr nts	are required to execute all the programs	s in Part-A and Part R	an	d show the						
demonstration	in 1	the lab		,							

Π	Semester
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Part – A

- 1. Implement Quick sort and analyze its time complexity using different values of n (n is the number of inputs) and represent the complexity in a graph sheet, The input should be generated randomly
- 2. Print all the nodes reachable from a given starting node in a digraph using BFS method
- 3. Check whether a given graph is connected or not using DFS method
- 4. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm,
- 5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm
- 6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm and determine the time taken to find the minimum cost
- 7. Compute the transitive closure of a given directed graph using Warshall's algorithm
- 8. Implement 0/1 Knapsack problem using Dynamic Programming
- 9. Find a subset of a given set $S = \{sl, s2, sn\}$ of n positive integers whose sum is equal to a given positive integer d, For example, if $S = \{1, 2, 5, 6, 8\}$ and d = 9 there are two solutions $\{1,2,6\}$ and $\{1,8\}$, A suitable message is to be displayed if the given problem instance doesn't have a solution
- 10. Implement N Queen's problem using Back Tracking

Part – B

- 1. The time complexity of bubble sort is O(n), Suggest the improvements to be made in the algorithm so that the efficiency of the algorithm is improved
- 2. Apply Divide and Conquer method to sort a given set of elements using Merge Sort and determine the time required to sort the elements, The elements can be read from a file or can be generated using the random number generator
- 3. Implement Dynamic programming to find solution to Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm, Determine the error in the approximation
- 4. Apply dynamic Programming to find the Shortest Path in a network among all the nodes,
- 5. Apply Decrease and Conquer Technique to topological order the vertices in a given digraph

Course Outcomes

After going through this course the student will be able to

- **CO1:** Identify paradigms and approaches used in algorithms and appreciate the impact of algorithm design in practice
- **CO2:** Classify different computational models (e.g., divide-and-conquer), order notation and various complexity measures (e.g., running time, disk space) to analyze the complexity/performance of different algorithms
- **CO3:** Implement and apply various techniques for efficient algorithm design (divide-and-conquer, greedy, and dynamic algorithms)
- **CO4:** Analyze and evaluate different algorithm techniques for a real-life application and find the optimal solution using various parameters

Reference Books

1 Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Person Education, 3rd Edition, 2016, ISBN-13: 9780321358288

- 2 Ellis Horowitz, Sanguthevar Rajasekaran, Sartaj Sahni, "Fundamentals of Computer Algorithms", Galgotia, 2nd Edition, 2004, ISBN 13: 9788175152571
- 3 Rod Stephens, "Essential Algorithms- A Practical Approach to Computer Algorithms", Wiley, 2013, ISBN: 978-1-118-61210-1
- 4 Rajesh K, Shukla, "Analysis and Design of Algorithms A Beginner's Approach", Wiley Edition: 2015, ISBN 13: 9788126554775

Scheme of Continuous Internal Evaluation (CIE) for Theory

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CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment

Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B must be executed. Change of program is not permitted

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students must answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

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Mapping of Course Outcome to Program Outcome													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	Н	М	L	-	L	-	L	М	-	-	-	-	
CO2	Н	Н	Μ	М	Н	-	-	М	-	-	L	L	
CO3	Н	L	L	L	-	-	L	-	-	-	L	-	
CO4	М	М	Η	М	-	L	-	-	-	-	-	-	
Mapp	Mapping of Course Outcome to Program Specific Outcome												
	PSO1						PSO2						
CO1	Н						L						
CO2	L						Н						
CO3	М						Н						
CO4	Н М												
H-Hig	h, M-Med	lium, L-l	Low										

II Semester

Software Engineering								
Course Code	:	16MCA24	CIE Marks	:	100			
Hrs/Week	:	L: T: P: S 3:2:0:4	SEE Marks	:	100			
Credits	:	5	SEE Duration	:	3 Hrs			
Course Learni	ng	Objectives (CLO)						
Graduates shall be able to								
1. Demonstrate the basic concepts of Software Engineering, phases of software development Life								
cycle, Conc	ep	t of professional ethics using varie	ous system models					
2. Illustrate various testing techniques and Software advancement methods to build Quality								
Software pr	od	ucts	aning for offective Software De	1.				
5. Discover ad		menagement strategies to meet al	ering for effective Software Dev	ven	opment			
4. Assess Project management strategies to meet change in customer requirements								
T 4 1 4 ² 6) (Cint – 1			00 111 5			
Introduction &		forcional Software Davalonment	Software engineering and th	~ 1	Nob IEEE/			
ACM code of	10	ftware engineering ethics. Case	studies: Software Process mo	dola	web, IEEE/			
incremental de		allonment Process activities: C	oping with change Plan-driv	ven	and agile			
Development I	2 V C 7 V 1	reme Programming Scrum	oping with change, Than-unv	ven	and agrie			
Unit II								
System Modeling: Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering; Architectural Design: Architectural design decisions, Architectural views, Architectural patterns								
Unit – III								
Software Testing & Evolution Software Testing: Development testing, Test driven development, Release testing, User testing; Software Evolution: Evolution processes, Legacy systems, Software maintenance								
		Unit – IV			07 Hrs			
Advanced Software Engineering Component-based Software Engineering: Components and component models, CBSE processes, Component composition; Distributed Software Engineering: Distributed systems, Client–server computing, Software as a service								
		Unit – V			07 Hrs			
Software Management								
Project management: Risk management, managing people, Teamwork; Project planning: Plan driven development, Project scheduling, Estimation techniques								
Self Study Component								
Topics on latest / emerging technologies will be assigned, Students are required to read white papers, publications, patents and prepare a report, give a seminar on the study undertaken, The self study will be reviewed and evaluated by an expert panel in two phases appointed by the Director, MCA,								

Tutorial Component

customer, Analyst, Developer, tester & Manager) and exhibit different stages of various software life cycle models **Expected Course Outcomes** After going through this course the student will be able to **CO1:** Interpret the basic concepts of Software Engineering, professional ethics and Demonstrate the phases of software development Life cycle using various system models. **CO2:** Compare various testing techniques and relate Software advancement methods to build **Ouality Software products. CO3:** Analyze and Apply emerging software engineering concepts and methods for construction of Software systems. **CO4:** Evaluate project management strategies for effective software development. **Reference Books** Ian Sommerville, "Software Engineering", Pearson Education Ltd, 10th Edition, 2015, ISBN: 1 9780133943030 Roger S Pressman, "Software Engineering- A Practitioner's Approach", McGraw-Hill, 8th 2 Edition, 2015, ISBN: 978-0078022128

3 Pankaj Jalote, "Software Engineering", Wiley India Pvt, Ltd, 3rd Edition, 2011, ISBN: 9788126523115

Students are required to make the team of 4 to 5 members, Each team has to do role play (For Eg:

4 Bernd Bruegge & Allen H, Dutoit, "Object-oriented Software Engineering: Using UML, Patterns and Java", Pearson Education Ltd, 3rd Edition, 2010, ISBN: 9780136066811

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two tests, Two quizzes and self study. The test will be for 30 marks each, quiz for 10 marks each and self study for 20 marks. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students must answer five questions by selecting one from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Mapping of Course Outcome to Program Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	М	Μ	Μ	Μ	Μ	Η	М	L	Н	Μ	Μ	-
CO2	Μ	Μ	Μ	Μ	Μ	L	М	Μ	Μ	L	Μ	М
CO3	Μ	Н	М	М	М	L	М	Μ	Μ	Μ	М	L
CO4	Μ	Μ	L	Μ	L	Μ	Μ	Η	Μ	L	М	М
Mapping of Course Outcome to Program Specific Outcome												
	PSO1						PSO2					
CO1	М						М					
CO2	Μ						Н					
CO3	Μ						Н					
CO4	Н						М					
H-High, M-Medium, L-Low												

Management Information Systems & E-Commerce												
Course Code	:	16MCA25 CIE Marks		:	100							
Hrs/Week	:	L: T: P: S 4:0:0:4	SEE Marks	:	100							
Credits	:	5	SEE Duration	:	3 Hrs							
Course Learn	ing	Objectives (CLO)										
Graduates shal	l be	able to										
1. Demonstrate the basic working principles of information systems and enterprises												
2. Make use of preliminaries of technologies and apply in business information systems and												
Decision su	Decision support systems											
3. Appraise st	ude	ents with the Business applications and eC	ommerce initiatives									
4. Elaborate the importance of management challenges in IT sector												
		Unit – I			10 Hrs							
Introduction t	o I	nformation Systems in Business										
The Real Wor	rld	of Information Systems, The Fundame	ntal Roles of Information	ion	Systems,							
Internet and	B	siness, Globalization and Informatio	n Technology, Busin	ess	Process							
Reengineering,	, F	undamentals of Information Systems -	- Introduction, Compo	ne	nts of an							
Information Sy	/ste	m, Types of Information Systems, Recog	nizing Information System	em	s (2 Case							
studies)												
		Unit – II			10 Hrs							
Computer Hardware and Software												
Computer Hare	dwa	ure – Trends in Computer Systems, Storag	ge Trends and Trade Of	fs;	Computer							
Software – Software Suites and Integrated Packages, Programming Packages; Business												
Telecommunication - Networking the Enterprise, Managing Organizational Change, Global												
Business and IT Strategies, Business Use of Internet; Database Management - Managerial												
Considerations for Data Resource Management (2 Case studies)												
Unit – III												
Information Systems for Business, eCommerce and Enterprise Collaboration												
Information Systems in Business, Enterprise Resource Planning: The Business Backbone;												
Foundations of eCommerce, Business-to-Consumer eCommerce, Business-to-Business												
eCommerce, Online Transaction Processing, Enterprise Collaboration, Groupware for Enterprise												
Let W												
T.C.		$\frac{\text{Umt} - \text{IV}}{\text{C} + \text{C} + \frac{1}{2}}$			09 Hrs							
Information Systems for Decision Support, Strategic Advantages												
Competitive Strategy Concepts Strategic roles of Information Systems Challenges of Strategic												
Information systems, Sustaining strategic success (2 Case studies)												
information sy	ster	Ins, Sustaining strategic success (2 case st	uuics)		09 Hrs							
Management Security Challenges & Controls												
Organization and Information Technology, Security and Ethical Challenges: Information systems												
controls its n	eed	Audit information systems Ethical dir	nensions. Computer Cri	ime	e. Societal							
solutions, you	and	ethical responsibility (2 Case studies)	intersions, computer en		, sooretur							
Self-Study Component												
--	--	-----------	-------------	-----------	-----------	-----------	-----------	------------	---------	---------------	-----------------------	----------
Topics on latest / emerging technologies will be assigned, Students are required to read white												
papers	apers, publications, patents and prepare a report, give a seminar on the study undertaken, Self- tudy is reviewed and evaluated in two phases by an expert panel, appointed by Director MCA											
study	study is reviewed and evaluated in two phases by an expert panel, appointed by Director, MCA,											
Cours	Course Outcomes											
After going through this course the student will be able to												
CO1:	CO1: Illustrate the fundamentals of a computer based information systems and enterprises											
CO2 :	CO2: Distinguish the preliminaries of technologies and Experiment with business information											
	systems	and De	cision s	upport s	systems							
CO3:	Apply I	E-Comr	nerce in	itiatives	s in vari	ous Bu	siness a	pplicati	ons			
CO4:	Perceiv	e the sig	gnifican	ce of M	lanageri	al strate	egies an	d challe	enges i	n IT sect	tor	
Refer	ence Bo	oks										
1 J	ames A	O'Brier	n and Ge	eorge M	[Marak	as, "Ma	nagem	ent Info	rmatio	n Systen	ns", Tata	
N	AcGraw	Hill, 10	th Editi	on, 200	8, ISBN	V -13: 9	78-1-25	5-90267	1-3, IS	BN-10:	1-25-902	2671-X
2 K	Kenneth	C, Lau	don, Ja	ine P, 1	Laudon	, "Man	agemen	t of In	format	ion Syst	tems", P	earson,
I	Dorling F	Kindersl	ey(Indi	a) Pvt, l	_td, 12t	h editio	n, 2013	, ISBN	97801	3214285	4	
3 V	Vaman S	5 Jhawa	dekar, '	'Manag	ement I	nforma	tion Sys	stems",	Tata N	IcGraw	Hill, 4 th	Edition
E	Edition, 2	2009, IS	BN : 97	7800701	46624							
4 F	Ienry Ch	nan, Ray	ymond I	Lee, The	aram Di	illon, El	izabeth	Chang.	, "E-Co	ommerce	e: Funda	mentals
a	nd Appl	ications	", John	Wiley a	& Sons,	2003, 1	ISBN: 9	780471	49303	7		
Scher	ne of Co	ontinuo	us Inte	rnal Ev	aluatio	n (CIE) for Tl	neory				
CIE v	vill cons	sist of T	wo test	s, two (Quizzes	and Se	elf study	y. The t	est wil	l be for	30 mark	ts each,
quiz f	for 10 m	arks ea	ch and	self stu	dy for 2	20 marl	ks. The	total m	arks fo	or CIE (Theory)	will be
100 n	narks.											
Scher	ne of Se	mester	End Ex	kamina	tion (Sl	EE) for	Theor	y Q 1 Q		2		
The q	uestion	paper w	/ill be for	or 100 i	narks a	nd shal	l consis	t of 10	questi	ons from	1 five un	its with
20 m	arks eac	h. Out	of the I	10 ques	tions st	udents	must ar	iswer fi	ve que	estions t	y select	ing one
from	each uni	t. The c	luestion	s will h	ave inte	ernal ch	oice wi	th maxi	mum 3	sub div	1sions. E	soth the
quest	ions shal		the same	e compl	exity in	terms of	of COs	and BIC	om s t	axonom	y level.	
Mapp	Ding of C	DO2	Dutcon	he to Pr	ogram	Outcol	ne DO7	DOO	DOA	DO10	DO11	DO12
<u>CO1</u>	POI	PO2	PUS	P04	PU5	PU0	PO/	PUð	P09	POIU	POII	POI2
	M	M	M	M	M		M	H	M	M	M	M
CO_2	M	M	M	П	M	IVI I	M	Н	M	M	M	IVI
$\frac{CO3}{CO4}$		M	M	Н	IVI		M	Н		M	M	
CO4	H				L		M	Н	Η	IVI	M	M
Mapp	Ding of C	Jourse	Outcon	ie to Pr	ogram	Specifi		ome				
001	PSOI						PSO	02				
	M											
CO2	<u>2 M</u> H											
<u>CO3</u>	<u>M</u> <u>M</u>											
<u>CO4</u>	<u> M</u>	ar 74					Μ					
H-Hi	gh, M-M	ledium	, L-Lov	V								

		III Semester			
		Computer Networ (Theory and Practic	rks re)		
Course Code	:	16MCA31	CIE Marks	:	100+50
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks	:	100+50
Credits	:	5	SEE Duration	:	3 Hrs
Course Learn	ing	Objectives (CLO)			
Graduates shal	l be	able to			
1. Understand	l th	e fundamental concepts of computer network	works		
2. Familiarize	e w	ith the design issues and protocols of var	ious layers		
3. Recognize	the	application of different algorithms to so	lve design issues		
4. Analyze va	rio	us layering protocols in computer netwo	rks		
		Unit – I			10 Hrs
Introduction-	Int	roduction, Uses of Computer Networks,	Network Hardware, Network	etwork	Software,
Reference Mod	lels	, Example Networks			
Physical Laye	r-C	uided Transmission Media, Digital Mod	ulation and Multiplexin	ng	
		Unit – II			10 Hrs
Data Link L	ave	r -Data link Laver Design issues, Err	or Detection and Co	rrectio	n. Sliding
Window Proto	col	8			,
Medium Acce	ss (Control-The Channel Allocation Problem	m, Multiple Access Pro	otocols	, Ethernet,
Broadband Wi	rele	ess, Bluetooth, Data Link Layer Switchin	g		
		Unit – III			10 Hrs
The Network	L	ayer- Network Layer Design issues,	Routing algorithms-	The	Optimality
Principal, Sho	rtes	t Path Algorithm, Flooding, Distance	Vector Routing, Link	c State	e Routing,
Hierarchical r	out	ing, Routing for Mobile Host, Conge	stion Control Algorit	hms, (Quality of
Service, Intern	etw	orking, The Network Layer in the Intern	et		
				1 (10 Hrs
The Transpor	rt .	Layer-The Transport Service, Element	ts of Transport Proto	cols, C	Congestion
Control, Intern	ett	ransport protocols- ICP, UDP, Performa	ince issues		
		Unit – V			08 Hrs
The Applicati	on	Layer-The Domain Name System, El	lectronic Mail, The W	'orld-V	Vide-Web,
Streaming Aud	io i	and Video			
		Unit – VI (Lab Compo	nent)		
1.0	NT	Part – A			11
1. Create a LA	IN V	vith five nodes implementing star topolog	gy in it. Demonstrate cl	lass fu	11
2 Create a bri	m I doe	and demonstrate tunneling using open V	/PN		
2. Create a off 3. Demonstrate	uge	uting with NAT and intables	/ 1 1 1.		
c. Demonstratt	10	and the the theorem.			

- 4. Compare file transfer with wired and wireless networks.
- 5. Build a DNS and DHCP server using dns-masq.

Part – B

- 1. Write a program to demonstrate TCP echo server and client (using C / Python)
- 2. Create a IPV6 network with the help of dns-masq.
- 3. Build a firewall using iptable to drop private network on public interface, to block / allow ICMP request.
- 4. Create a LAN using Virtual Machine and install FTP server to demonstrate file transfer.
- 5. Consider a network with two computers (PC1, PC2) connected to ISP through a gateway. A DHCP server also has to be configured as part of the network to assign IP address dynamically. Perform the following tasks on the network.
 - a) Establish the physical connection among the host
 - b) Assign IP Address dynamically
 - c) Check TCP/IP configuration
 - d) Test the connectivity
 - e) ping the loopback IP address
 - f) Display the ARP table

Expected Course Outcomes

After going through this course the students will be able to

- CO1:Identify the design issues, services, interfaces, protocols and flow of data in computer networks
- **CO2**: Analyze the elements and protocols for peer peer and communication between layers
- CO3: Implement the protocols and services designed for physical, data link, network and transport layers

CO4: Evaluate the principles and protocols in computer networking

Reference Books

- 1 Andrew S. Tanenbaum, David J Wetherall, "Computer Networks", Pearson Education, Pearson Publication, 5th Edition, 2012, ISBN-1978-81-317-8757-1
- 2 Behrouz A Forouzan, Firouz Mosharraf, "Computer Networks A Top-Down Approach", Tata McGraw-Hill Education Pvt. Ltd, 2011, ISBN 13: 9781259001567

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment. Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage of Part A is 70% and Part B weightage is 30%. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	Н	L	М	L	-	-	-	L				
CO2	M H		L	L	-	-	L	-	Μ	-	Μ	-
CO3	М	L	Η	L	-	L	-	L	L	L	-	L
CO4	Н	Μ	L	L	-	-	-	Μ	L	Μ	L	-
Mapping	g of Cou	ırse Out	comes(C	CO) to	Progr	am Sp	ecific	Outco	mes(P	SO)		
CO1			ľ	H						<u>Р502</u> М		
CO2				М						М		
CO3	СОЗ Н L											
CO4		M H										
H-High,	M-Med	lium, L-	Low									

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

		Software Testing and Dre	ations	
		Software Testing and Fra (Theory and Practice)	icuces	
Course Code	:	16MCA32	CIE Marks :	100+50
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks :	100+50
Credits	:	5	SEE Duration :	3 Hrs
Course Learn Graduates shall 1. Understand 2. Recognize 3. Analyze va 4. Explore sof	ing l be l the var riou ftwa	Objectives (CLO) e able to e basics of Software Testing ious types of Software Testing Techniques us levels of software testing are test automation process	;	
		Unit – I		09 Hrs
Basics of soft Identifying To Pseudocode, T SATM System	wa est 'he	re testing - Basic Definitions, Test Cas Cases, Fault Taxonomies, Levels of Triangle Problem, The NextDate Funct	es, Insights from a Venn Testing; Examples: Ge ion,The Commission Prob	Diagram, meralized lem, The
		Unit – II		10 Hrs
Boundary val	ue	testing, Equivalence class testing, De	cision table based testing	-Normal,
Robust and Wo Traditional and problem, Nex Techniques, Do	orst d li tDa ecis	-case Boundary value testing, special value mproved Equivalence class testing, Equi- te function and commission problem, ion Table Test cases for triangle problem	e testing, Examples, Randor valence class test cases for Decision tables, Decisio	n testing, r triangle on Table
		Unit – III		10Hrs
Path Testing, coverage metri Tools, Traditio Model–Driven	Da cs, ona De	ta flow testing, Life Cycle–Based Testin Basis path testing, Define/Use Testing, S I Waterfall Testing, Testing in Iterative velopment	ng- Program Graphs, DD Pa lice-Based Testing, Program Life Cycles, Agile Testir	aths, Test n Slicing ng, Agile
		Unit – IV		09 Hrs
Integration To ,Example: inte Model-Based Nonfunctional	esti egra Thi Svs	ng, System testing- Decomposition-Based ation NextDate; Threads, Basis Concep reads, Use Case–Based Threads, Cove stem Testing Atomic System Function Test	l Integration, Path-Based In its for Requirements Spec- rage Metrics for System sting Example	itegration rification, Testing,
- comunectional	~] !	Unit – V		10 Hrs
Test Manager Approach, Sett	nen ting	t and Automation- Preparing a Test Plan up Criteria for testing; Test Automation	, Scope Management, Decion and terms used, Skills no	ding Test eeded for

Automation, Scope of Automation, Process Model for Automation, Selecting a Test tool,

Introduction to Selenium- Overview and working with Selenium IDE, Selenium Web Driver **Unit – VI (Lab Component)**

III Semester

Challenges in Automation

Part – A

Design and write a program using Python to implement the following

- 1. Solve Triangle problem and analyze it from the perspective of decision table-based testing. Develop various test cases, execute them and discuss the test result
- 2. Solve Next date problem and analyze it from the perspective of boundary value testing. Generate test cases to test the method that increment the date, the method that increments the month and the method that increments the year. Execute the test cases and discuss test results
- 3. Write and execute test cases from the perspective of equivalence class testing for the application whose input box accepts numbers between 1-100. Valid range 1-100, Invalid range 0 or less and 101 or more. Also ensure that text field permits only numeric characters
- 4. Solve the commission problem to compute the commission based on the sales of total number of locks, stocks and barrels sold for the following criteria:
 - i) if (sales>=1800), commission=20%
 - ii) if (sales is between 1000 and 1800), commission=15%
 - iii) and if (sales<=1000), commission=10%

Analyze it from the perspective of dataflow testing, derive different test cases, execute these test cases and discuss the test results

5. Implement the Binary search Algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results

Part – B

Testing Case / Suite Implementation

Pre-requisite: Students are required to design and develop a sample webpage in order to learn test automation process using Selenium

- 1. Write and execute test cases to test sign in page of a specific web Page
- 2. Write and execute test cases to identify the objects like combo box, text boxes, radio buttons in a webpage and display the count
- 3. Write and execute test cases to verify the passing criteria (Pass percentage 50% of total marks, 60%-69% for first class & 70 % -100% for distinction, Fail for 0%-49%) by importing 5 students' subjects' marks from Excel file and update the same in Excel file.
- 4. Develop and execute a test suite containing minimum 2 test cases for any web site
- 5. Write and execute test cases to read and validate the employee master data from a webpage which contains fields of types numeric, character and date and copy the same data and display on another webpage

Note :Students are required to implement all the programs in Part-A and Part B

Course Outcomes

After going through this course the students will be able to

CO1:Demonstrate the fundamentals of software testing using real world examples

CO2: Identify and apply relevant testing techniques suitable for a real world scenario

CO3:Investigate the different levels in testing

CO4: Implement Test Automation process and experiment with testing tools like Selenium or other open source tools

Reference Books

1	Paul C. Jorgensen, "Software Testing, A Craftsman's Approach", Auerbach Publications, 4 th
	Edition, First Indian Reprint, 2014, ISBN-13:9781466560680
2	Srinivasan Desikan Gopalaswamy, "Software Testing Principles and Practices", Pearson

Education, 5th Edition, 2008, ISBN: 9788177581218

3 Unmesh Gunecha, "Learning Selenium Testing Tools with Python", PACKT Publishing, 2014,ISBN: ISBN 9781783983506

Scheme of Continuous Internal Evaluation (CIE) for Theory

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Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage of Part A is 70% and Part B weightage is 30%. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	М	L	-	Μ	Μ	Н	М	Н	-
CO2	Μ	Η	L	Н	L	-	Μ	Н	М	Н	Μ	L
CO3	Μ	L	-	-	-	-	L	-	М	L	Μ	-
CO4 L L - M H - M L L										Μ	L	L
Mapping of (Mapping of Course Outcomes(CO) to Program Specific Outcomes(PSO)											
]	PSO1						PSO2		
CO1				М						L		
CO2				Η						Μ		
CO3	CO3 L L											
CO4		M										
H-High, M-M	Iediu	n, L-L	ow									

III Semester										
Elective – I										
Content Management System										
(The	ory	and Practice)								
Course Code	:	16MCA331	CIE Marks	:	100+50					
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks	:	100+50					
Credits	:	5	SEE Duration	:	3 Hrs					
Course Learning Objectives (CLO)										
Graduates shall be able to										
1. Distinguish between various content n	nan	agement systems cap	oabilities							
2. Create and customize contents for web	o pa	ages								
3. Create lists, views in drupal		1.1 0 1								
4. Identify appropriate plugins, modules	anc	themes for an appli	cation							
5. Create websites using Wordpress and I	$\frac{Dru}{\cdot}$			-	00.11					
Un	nt -	-1			08 Hrs					
What Content Management is (and isn'	t)?,	, Points of Compa	rison, Acquiring a	CI	MS, The					
Content Management Team, CMS Feature	A	nalysis, Content Moc	leling, Content Aggr	eg	ation					
Un	it –	- 11			10 Hrs					
First Post-What Is WordPress? Popular	itv	of WordPress Cont	ent and Conversatio	nn	Getting					
Started Finishing Un	ity	01 001011035, 0010	ent and conversation	<i>,</i>	Octung					
Code Overview- downloading. directory a	and	file structure, wordr	press configuration.	wr	-content					
user playground		ine subcourt, worop		۳r	•••••••					
Working With Wordpress Locally-Be	ene	fits of Working Lo	ocally, Tools for (Co	mponent					
Administration, Configuration Details, De	plo	oving Local Changes			1					
Tour of Core- What is in the Core?, Using	g tł	ne core as a Referenc	e							
	-									
Uni	t –	III			10 Hrs					
The Loop- Understanding the Loop, Tem	pla	te Tags, Customizing	g the loop, Global va	ari	ables					
Data Management- Database Schema, Ta	able	e Details, Word Press	Database Class, Di	rec	et					
Database Manipulation										
Custom Post Types, Custom Taxonomie	s a	nd Meta data-Unde	rstanding Data in W	or	d Press,					
Word Press Taxonomy, Building your owr	ı ta	xonomy, Meta data								
Theme Development-Why use a Theme?	In	stalling a Theme, Wh	nat is a Theme?							
Unit – IV 10 Hrs										
Introduction to Drupal-Content Management Systems, Creating Content										
Creating and Managing Content-Understanding the Basics, Creating Content in Drupal,										
Editing Content, Other Content Options, Deleting Content, Finding Content										
Creating and Managing Users- Users, Roles, and Permissions, User Accounts, Configuring										
User Account Settings, Creating Roles, Assigning Permissions, Creating User Accounts, User										
Generated Accounts										
Taxonomy-Taxonomy Overview, Creating	g V	ocabularies, Assignir	ng a Taxonomy Voca	ibu	lary to					
a Content Type, Selecting a Taxonomy Ter	rm	when Creating Conte	ent, Creating Humar	1- 8	and					

Search-Engine-Friendly Lists, Assigning More Than One Vocabulary							
Creating Menus- Ordering From the Menu, Adding an Item to a Menu, Creating a New Menu							
Installing Themes- How a Drupal Theme Works, Finding a New Theme, Installing a Theme,							
The Administration Theme, Configuration Options							
Drupal Blocks-Blocks, Blocks, and More Blocks, Making Blocks Appear on Pages, Finding the							
List of Available Blocks, Reassigning and Deactivating Blocks, Configuring Blocks, Using							
Blocks from Contributed Modules, Creating Custom Blocks							
Unit – V 10 Hrs							
Drupal Modules-Contributed Modules, How to Download, Install, and Configure a Module,							
Configuring Modules and Setting Permissions, Enabling Other Modules, The Top Eleven							
Modules							
Enabling Interactive Capabilities- Blogging, Forums, Polls							
Content Types- The Basic Page and Article Content Types, Defining a Custom Content Type,							
Creating a Custom Content Type, Other Field Types							
Views: Installing the Views Module, Creating Your First View							
Panels-Available Layouts, Creating a Panel Page, Using the Flexible Layout Option, Adding							
Other Things to Panel Panes							
Administering Your Drupal Site- Backing Up Your Site, Checking the Log Files, Status							
Report, Checking for Updates							
Unit – VI (Lab Component)							
Part –A							
1.a. Demonstrate extending drupal functionality by using and configuring ckeditor and imce							
contributed modules for rich text formatting, file and image uploading in Drupal							
1.b. Create a basic page for the template shown below							
Logo Header Name							
Home Content							
About Us							
Products							
Contact us							
Footer							
2. Create a new content type with the following fields usn, student_name, semester(integer),							
branch, program, date of birth(date type), sex(radio button), hobbies(check boxes),							
height(float), resume(file), ug_studied(term reference) with a suitable title for the content in							
drupal.							
3. Create a news slider showing fields like program, date and venue using views. Also create a							
photo slider for showcasing photos of the past events in Drupal. Attach the news slider to the							
first side bar block and photo slider to the footer of the theme installed.							
4. Create a navigation menu having titles About Us, Authorities, Administration, Academics,							
Examination and Departments in Word Press. The sub-menu are as follows:							
About Us – Objectives, Students Enrolment, MoU and Rules, Infrastructure							
Authorities – Principal, Vice Principal, Dean Academics, Dean Student affairs, Dean							
Infrastructure							
Administration – Registrar, Controller of Examination, Finance Office, Heads of Department							
Academics – Programs offered, Softskills							

Examination – Results, Time table, syllabus copy Departments – Architecture, Biotech, Civil, Computer Science, Electronics

- 5 .a. Demonstrate a user creation, assigning a role and give permission to certain content in Drupal
 - b. Create main menu with titles for the following:

HOME ABOUT US DEPARTMENTS |--DEPARTMENTS NAMES |- CSE |- About the departments |- Achivements |-Faculty

-Placements

|-ISE |-MCA

KEY EXECUTIVES CONTACT US

Part – B

- 1. Install and configure Webform module in Drupal. Create a form for collecting faculty information with fields like Name, education Qualification, date of joining, email id and research publications(National and International) and demonstrate report generation.
- 2. a. Demonstrate backup update and restore of drupal websites.
 - b. Install drush and demonstrate drush commands to enable, disable, download modules and clearing caches
- 3. Enable and configure the following core module: Demonstrate its working with appropriate contents
 - a. Poll
 - b. Blog
 - c. Forum
- 4. Build a website using Wordpress for a Product Based Company. The pages should contain the following
 - a. Proper headings, Links for more details
 - b. Images where ever appropriate
 - c. Displaying types of products and their prices
 - d. Provision to take feedback from the user and Validate important fields
- 5. Build a website using drupal for a school. The pages should contain the following
 - a. Proper headings, Links for more details
 - b. Images where ever appropriate
 - c. Displaying the school curriculum
 - d. Provision to take feedback from the users and Validate important fields

Expected Course Outcomes

After going through this course the students will be able to

- **CO1** : Compare and contrast between various content management systems
- CO2 : Enable and configure interactive capabilities
- CO3 : Demonstrate critical thinking skills to design and create different contents
- **CO4** : Design and create content management system based websites

Reference Books

- 1Deane Barker, "Web Content Management: Systems, Features, and Best Practices",
O'Reilly Media, Inc., 1st Edition, 2016, ISBN 978-1-4919-0812-9
- 2 Todd Tomlinson," Beginning Drupal 7",1st Edition, Apress Publishing Company, ISBN-13 (pbk): 978-1-4302-2859-2
- 3 Brad Williams, David Damstra, Hai Stern," Professional WordPress: Design and Development", 3rd Edition, 2015, Wrox Publications, ISBN: 978-1-118-98724-7

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment.

Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage of Part A is 70% and Part B weightage is 30%. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Ma	Mapping of Course Outcomes (CO) to Program Outcomes (PO)												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C	CO1	Μ	Μ	Η	L	Μ	-	L	L	L	-	-	М
C	CO2	Μ	Μ	Μ	L	Μ	-	L	L	L	-	-	L
C	CO3	Μ	Μ	Η	L	Η	L	L	L	L	-	-	М
C	CO4	Н	Н	Н	L	Η	L	Μ	L	L	_	L	Н

Mapping of Course Outcomes(CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	L	L
CO2	М	М
CO3	М	Н
CO4	Н	Н
H-High	M-Medium I-Low	

	Elecuve – I										
		Advanced Object Oriented	Programming								
~ ~ ~		(Theory and Pract	ice)	r –	400 70						
Course Code	:	16MCA332	CIE Marks	:	100+50						
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks	:	100+50						
Credits	:	5	SEE Duration	:	3 Hrs						
Course Learning Objectives (CLO)											
Graduates shall	be	able to									
1.Explore the ac	lva	inced concepts Decorators, Context manage	gers and Generators								
2.Illustrate Mag	ic	methods, Metaclasses, class factories and	Abstract classes								
3.Develop GUI	ar	nd Web Programming including advanced	OOP concepts								
4.Theme standa	rd	features of frameworks while developing	desktop and web applie	catio	ons						
		Unit – I			10 Hrs						
Introduction -	De	ecorators- Understanding Decorators, Dec	corator Syntax, Where I	Deco	prators are used?						
Why you should	d w	write Decorators? When you should write	Decorators? Writing De	ecor	ators, decorating						
classes, Contex	t	Managers- Context manager syntax, w	hen you should write	coi	ntext managers?						
Generators- Une	der	standing what a Generator is, Understand	ing Generators syntax,	com	munication with						
generators, itera	ble	e vs iterators, generators in the standard li	brary								
		Unit – II			10 Hrs						
Magic Methods	s -	Magic method syntax, Available Methods	5								
Metaclasses-Cl	ass	ses and Objects, Writing Metaclasses, Wh	en to use Metaclasses								
Class Factories	5-]	Understanding a Class Factory Function,	Determining when yo	u sh	ould write class						
factories											
Abstract Base	cla	asses- Declaring a Virtual Subclasses, D	eclaring a Protocol, Bu	ilt-i	n Abstract Base						
Classes											
Reading and V	Vri	iting Files- What Kinds of Files are there	e?, Opening a File, Tec	hnic	ues for Reading						
Files, Writing F	ile	s, Notes to File Away									
		Unit – III			8 Hrs						
GUI Programm	nir	ng: Tkinter - Introduction, About Tcl, Tk	k, and Tkinter, Getting	Γkir	ter Installed and						
Working, Clien	t/S	erver Architecture –Tkinter and Python	Programming, Tkinter	Exa	mples – Labels,						
Button widgets,	Sc	cale widgets, Partial Function Application									
		Unit – IV			10Hrs						
Database Prog	gra	mming - Introduction, Persistent Stora	age, Basic database op	pera	tions and SQL,						
Databases and F	y t	hon, Python DB API – Module Attributes	, Connection Objects, C	Curs	or Objects, Type						
Objects and Constructors, Relational Databases, Databases and Python- Adapters, Examples of using											
Database Adapters, Non-Relational Databases											
Unit – V 10 Hrs											
Web Development- Web Frameworks:Django- Introduction, Web Frameworks, Introduction to											
Django, Projects and Apps, "Your Hello World" Application (A Blog), Creating a model to add											
database service	database service, Python Application Shell, Creating the Blog's User Interface										
		Unit – VI (Lab Comp	onent)								

Part – A

- 1. Write a program to create Fibonacci series using generators and stack the same with a decorator to find the time taken by the generator.
- 2. Demonstrate the following magic methods usage: i)__getattr__ ii) __setattr__ Example: Create a menu driven program for setting the attributes and getting the attributes from the class employee with attributes empno, name, designation, working status and display the same on screen. An appropriate message should be displayed if attribute is not present.
- 3. Write a Python program to demonstrate the Abstract Base Classes. Example: Create Animal class as abstract class and implement concrete sub classes cat, dog and cow from Animal class and demonstrate set, get and display methods.
- 4. Write a GUI application with username and password and a two buttons OK and Cancel. When the button is clicked, display appropriate message.
- 5. Write a python program to demonstrate connection to database and retrieve the information. Example: create menu driven program which will demonstrate add, display, modify and delete the record of an employee table created using database MYSQL with attributes slno, name, address, empcode, dateofbirth, age, mobile, status, designation
- 6. Write a python program to create a registration page for alumni meet for college and display the same in the next page using Django framework

Part – B

- 1. Write a program to create a back up of a given file. The program should prompt the user for the name of the file to copy and then write to a new file with the same content but with .bak as the file extension.
- 2. Demonstrate operator overloading using magic methods (addition, subtraction, multiplication and division)
- 3. Define meta classes to create new classes by re-implementing __init__ and __new__ Example: Create a class using __init__ and __new__ Also __init__ method should display the memory allocation details and __new__ method should display initialization of a class.
- 4. Demonstrate Conversion table with a Tkinter GUI
 - a) Metric Conversion (gram to ounce / kilo to pounds/ tonne to stone)
 - b) Temperature Conversion (Celsius to Fahrenheit)

Expected Course Outcomes

After going through this course the students will be able to

CO1: Compare functions with decorators , context managers and generators

CO2: Demonstrate magic methods and meta classes for registering classes at creation time

CO3: Apply advanced Object Oriented Programming GUI development for Desktop and Web

CO4: Analyze the standard way of developing applications using a framework

Reference Books

- Luke Sneeringer, "Professional Python", Wrox, Wiley India Pvt ltd, 2016, ISBN:978-81-265-5895 7
- 2 Wesley J. Chun, "Core Python Application Programming", 3rd Edition, Pearson, 2016 ISBN:978-93-325-5536-5
- 3 Paul Gries, Jennifer Campbell, Jason Montojo, Edited by Lynn Beighley, "Practical Programming",2nd Edition Reprint, The Pragmatic BookShelf, 2014, ISBN: 9781937785451, 1937785459

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment. Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage of Part A is 70% and Part B weightage is 30%. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12			
CO1	L	L	L	-	Μ	-	L	-	-	-	-	-			
CO2	-	L	М	Μ	Μ	-	L								
CO3	-	Μ	М	М	Н	-	М	М	-	-	М	М			
CO4	-	Η	М	-	Н	М	М	-	Μ	-	М	М			
Mapping	Mapping of Course Outcomes(CO) to Program Specific Outcomes (PSO)														
			PSC)1						PSO	2				
CO1			L							Μ					
CO2			L							Н					
CO3			М							Н					
CO4	M H														
H-High, N	H-High, M-Medium, L-Low														

]	III Semester					
	Elective – I							
		Model View	Controller Prog	gramming				
(Theory and Practice)								
Course Code	:	16MCA333		CIE Marks	:	100+50		
Hrs/Week	:	L:T:P:S 4:0:2:0		SEE Marks	: 100+50			
Credits	:	5		SEE Duration	:	3 Hrs		
Course Learning	g Ol	bjectives (CLO)						
Graduates shal	l be	able to						
1. Understand	an	d use different Model	View Controller	design pattern tech	hniq	ues in various		
application a	irea	S		0 1	1			
2. Apply know	led	ge of frameworks in the d	evelopment of We	b application				
3. Analyze the	per	formance of Web framew	vorks	11				
4. Develop MV	۲ C ۱	based applications using I	MEAN					
1		Ŭ	nit – I			09 Hrs		
Introduction to	M	EAN (MongoDB, Expre	ssJS, AngularJS, 1	NodeJS)		I.		
Three-tier web a	ppli	cation development, Intro	oduction to JavaSc	ript and MEAN,Intro	duct	tion to Node.js,		
JavaScript event-	dri	ven programming		1		5		
Node.js - event-o	driv	en programming, JavaSc	ript closures Node	modules, Common J	S m	odules, Node.js		
core modules, No	ode	.js third-party modules,N	ode.js file modules	,		· 5		
Introduction to	A	ngularJS-Key concepts of	of AngularJS, the c	core module of Angu	ılarJ	S, The angular		
global object, A	ngu	larJS modules Two-way	data binding	C C				
		Ŭı	nit – II			10 Hrs		
Building Expre	ss V	Web Application - Intro	duction to Express	s, Installing Express,	Cre	ating your first		
Express applica	tior	n, The application, req	uest and respons	e objects- The appl	icat	ion object, The		
request object, T	he	response object, External	middleware,			·		
Implementing	the	MVC pattern-Applicat	tion folder structur	re, Horizontal folder	str	ucture, Vertical		
folder structure,	Fil	e-naming, conventions, Ir	nplementing the ho	orizontal folder struct	ure,			
Configuring an	E	xpress application-Envi	ronment configurat	tion files Rendering	viev	vs, Configuring		
the view system			_					
Rendering EJS	vie	ws-Configuring the view	system 71, Render	ring EJS views				
		Un	nit – III			10 Hrs		
Creating a ME	AN	CRUD Module				·		
Implementing t	he	AngularJS MVC modu	le-Creating the An	ngularJS module ser	vice	Setting up the		
AngularJS modu	le	controller, Implementing	the AngularJS mo	dule views, The cre	ate()) method of the		
AngularJS contr	olle	er, The find() and find	One() methods of	the AngularJS contraction of the AngularJS contraction of the second sec	rolle	r, The update()		
method of the Ar	ngu	larJS controller, The dele	te() method of the	AngularJS controller		▲ ∨		
Implementing t	he 4	AngularJS module view	s- The create-articl	le view, The view-art	ticle	view, The edit-		
article view, The	list	t-articles view						
		Un	nit – IV			09 Hrs		
Introduction to	N	IongoDB - Introduction	to NoSQL, Introd	lucing MongoDB, M	/long	goDB sharding,		
MongoDB CRU	JD	operations-Creating a ne	ew document, Crea	ting a document using	ng ii	sert(), Creating		
a document usin	g u	pdate(), Creating a docun	nent using save()					

Unit – V

10 Hrs

Introduction to Mongoose-Introducing Mongoose ,Connecting to MongoDB, Understanding Mongoose schemas, Creating the user schema and model, Registering the User model, Creating new users using save(), Finding multiple user documents using find(), Reading a single user document using find One(), Updating an existing user document Deleting an existing user document, **Extending your Mongoose schema-** Defining default values, Using schema modifiers, Predefined modifiers, Custom setter modifiers, Custom getter modifiers

Unit – vi (Lab Component)	Unit –	VI (L	ab Co	omponent)
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Part – A

- 1. Create a model for a student information system with fields as USN, Name, sex, semester, branch, college, Aadhar card, passport number and bank acc no using Mongodb
- 2. Write a viewfor the above program with validations using JavaScript for blank fields, USN format, and name should contain only characters etc.
- 3. Write a Controller using AngularJS for the student information in Question number one and Two for Inserting, editing, deleting and updating the student information.
- 4. Create a model using mongodb with mongoose for employee information with fields as Empid, EmpName, Dept, designation, mobile number, email id using Aggregate model for sorting on Dept ID.
- 5. Create a view for the above program with validations using JavaScript for blank fields, USN format, name should contain only characters etc.
- 6. Create a Controller using ExpressJS for the employee information for the model in Question number four and view five for Inserting, editing, deleting and updating the employee information system.

Part – B

- 1. Create an Inventory Management system using Mean Stack Framework for tracking inventory levels, orders, sales and deliveries.
- 2. Create an Insurance Management system using Mean Stack Framework for handling all the key insurance functions like including product definition, handling of policies, and claims.
- 3. Develop and demonstrate online book carting system Mean Stack Framework provisions to create item list and customer to add items to the cart, alter the quantities of an item and remove items from the cart.
- 4. Create an Attendance management system using Mean Stack Framework for creating student's database and tracking student's attendance subject-wise and subject wise Attendance Report.

Note : Students are required to implement all the programs in Part-A and Part B

Course Outcomes

After going through this course the student will be able to

CO1: Understand the concepts of Model, view and controller

CO2: Apply Model, view and controller for developing applications using MEAN

CO3: Design Web entities for developing web applications using MEAN Frameworks

CO4: Implement MVC Framework for enterprise application

Reference Books

1 Amos Q. Haviv, "MEAN Web Development", PACKT Publication, 2014, ISBN 978-1-78398-328-5.

2 Simon Holmes, "Getting MEAN with Mongo, Express, Angular, and Node", MEAP Edition November 2015, ISBN 9781617292033.

Scheme of Continuous Internal Evaluation (CIE) for Theory

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Mapping	g of Cou	ırse Ou	tcomes	(CO) t	to Prog	ram Ou	ıtcome	s (PO)				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	М	-	L	-	Н	L	М	L	М	L	-	-
CO2	М	-	L	-	Н	L	М	L	М	L	-	-
CO3	Н	Н	М	М	Н	М	L	М	Н	М	L	-
CO4	Н	-	L	L	Н	-	L	М	L	-	L	-

Mapping of Course Outcomes(CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2		
CO1	М	М		
CO2	М	М		
CO3	Н	Н		
CO4	Н	Н		
H-High, M-Medium, L-Low				

		Electiv	e – II	
Course Code		System Prog		. 100
Course Coue	•	10141CA341 L.T.D.S. 4.0.0.4		· 100
Hrs/ week		L:1:P:5 4:0:0:4	SEE Marks SEE Duration	: 100
Creans Commo Logaria			SEE DUFATION	
Graduates shall 1. Explain the no 2. Understand th	be ab eed o e dif	le to f system software in executing a ferent phases and data structure	application software s used in assembly process by an as	sembler
 Describe how Analyze the r Summarize th 	the role of	nacros defined in assembly lang Floaders and linkers in executin acepts of system programming f	guage will be processed g the programs with external refere for Linux	nces
		Unit – I		09 Hrs
and system pro Processing Activ	gram vities	ming, Components of system Fundamentals of Language Pro	software, Views of system software, Syst	are, Language
		Unit – II		10 Hrs
of an assembler Family processo Macro processo Macro Facilities	r, Des or ors-N s, des	sign of single and two pass as Unit – III Iacro Definition and call, Ma sign of Macro Preprocessor	acro expansion, Nested Macro C	for Intel X-86 09 Hrs Calls, Advanced
Linkers and L	oada	Unit – IV	and linking concepts. Design of	10 Hrs
Relocating Prog Software Develo	rams,	Static and dynamic linking, Lo nt tools: Software tools for prog	paders. gram development	a Linker, Sen
		Unit – V		10 Hrs
Essential conce essential conce standards, Progr libraries (shared Comparison wit	epts pts cam l ob h Win	of Systems programming for of LINUX system program segments/sections; The ELF ojects), Multitasking and p ndows	r Linux as Open Source OS-Int ming: System Programming, AF Format, Linking and loading, L baging, Address translation, Mem	roduction and PIs and ABIs Linux dynamic ory Protection,
assigned. Stude seminar on the s two phases appo	nts and tudy inted	re required to read white papers, undertaken. The self study will by the Director, MCA.	, publications, patents and prepare a be reviewed and evaluated by an ex	a report, give a spert panel in

Expected Course Outcomes

After going through this course the students will be able to

- **CO1**: Understand the role of system software, Processor components & API standards in Software Execution
- CO2: Apply the system software concepts and programming standards in software development
- CO3: Analyse the importance of various data structures, algorithms and

CO4: Evaluate design options for structuring system software features

Reference Books

- 1 D. M. Dhamdhere, "Systems Programming", Tata McGraw Hill Publications, 2011, ISBN-13 978-0-07-133311-5
- 2 Robert Love, "Linux System Programming", O'Reilly Publications, 2nd Edition, 2013 ISBN 978-1-449-33953-1
- 3 Leland L. Beck, "System Software An Introduction to Systems Programming", Pearson Education Asia, 3rd Edition, 2000

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The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level

Mapping	of Cou	rse Ou	tcomes	(CO) to	Progr	am Out	comes (PO)				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	-	М	L	-	Μ	-	L	-	Μ	L
CO2	L L - L L -				-	L	-	L	-	Μ	L	
CO3	L M L L L - L - L - L					L	L					
CO4	L	L	L	М	L	-	Μ	-	L	-	Μ	L
Mapping	of Cou	rse Ou	tcomes	s (CO) to	Progr	am Spee	cific Ou	tcomes	s (PSO)			
			PS	601					Р	SO2		
CO1			1	М			L					
CO2	М						L					
CO3	М									L		
CO4	L						L					
H-High,	I-High, M-Medium, L-Low											

		Elective – II				
Advanced Database Systems						
Course Code	:	16MCA342	CIE Marks	:	100	
Hrs/Week	:	L:T:P:S 4:0:0:4	SEE Marks	:	100	
Credits	:	5	SEE Duration	••	3 Hrs	
Course Learning	O	ojectives (CLO)				
Graduates shall be	ab	le to				
1. Interface and in	tera	act with NoSQL				
2. Understand diff	ere	nt storage architecture of NoSQL databases				
3. Perform Create,	Re	ead, Update, Delete (CRUD) operations				
4. Gain proficienc	y ir	n NoSQL				
		Unit – I			10 Hrs	
Introduction and	Ex	ploring NOSQL- NOSQL – Definition an	d Introduction, Sorted or	rde	red	
Column – Oriente	d st	tores, Key/Value stores, Document database	s, Graph Databases			
Interfacing and I	nte	racting with NOSQL – If No SQL, then w	hat?, Language Binding	fo	r NoSQL	
data stores						
		Unit – II			10 Hrs	
Understanding th	ne s	torage architecture - Working with colum	nn- oriented databases, I	Doc	cument	
store internals, Un	dei	standing Key/Value stores				
Performing CRU	D	Operations – Creating Records, Accessing	Data, Updating and Dele	etir	ng Data	
Querying NOSQ	L s	tores – Similarities between SQL and Mong	goDB query features, Ac	ce	ssing data	
from Column-Orie	ente	ed Database				
		Unit – III			10 Hrs	
Modifying Data s	stor	res and Managing Evolution – changing do	ocument databases, sche	ma		
evolution in colum	nn (priented database				
Indexing and Or	der	ing Datasets - Essential concepts behind a	database index, indexing	g a	nd	
ordering in Mongo	D	B, creating and using indexes in MongoDB				
Managing Trans	acti	ions - RDBMS and ACID, Distributed AC	ID, Upholding CAP, Co	nsi	stency	
implementation						
-		Unit – IV			10 Hrs	
Gaining proficier	icy	with NOSQL				
Using NOSQL in	the	CLOUD, Scalable Parallel Processing with	Map Reduce, Analyzing	g B	ig Data	
with HIVE, Surveying Database Internals – MongoDB internals						
		Unit – V			08 Hrs	
Developing and A	١dr	ninistration-PHP and MongoDB, Python a	nd MongoDB, Creating	Blo	og	
application with P	HP	Driver, Database Administration	- 0			
-						

III	Semester

Self-Study Component

Topics on latest / emerging technologies relevant to the course will be assigned. Students are required to read white papers, publications, patents and prepare a report, give a seminar on the study undertaken. The self study will be reviewed and evaluated by an expert panel in two phases appointed by the Director, MCA.

Expected Course Outcomes

After going through this course the students will be able to

CO1 : Understand different types of NoSQL databases

CO2: Illustrate the different operations to manage data

CO3: Apply CRUD operations with MongoDB, Cassandra, CouchDB and Redis

CO4: Justify the need of NOSQL and choose appropriate NOSQL for a problem dealing with principles of CAP theory

Reference Books:

- 1 Shashank Tiwari, "Professional NOSQL", Wiley India Private Limited, 2011, ISBN: 9978-8126-533-268
- 2 Membrey Peter, Plugge Eelco, Hawkins Tim, "The Definitive guide to MongoDB, The NOSQL Database for Cloud and Desktop Computing", Apress2010, ISBN 978-1-4302-3052-6

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Manning of	f Course Oi	itcomes(CO) to Program	Outcomes	PO)
mapping u) to i rogram	Outcomes	10)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	Н	I H M L H H							-	L	-	L
CO2	Н	Н	L	Н	L	L	М	-	L	-	L	
CO3	Н	Н	М	L	Н	L	М	М	-	L	-	L
CO4	М	М	L	L	L	L	-	М	-	L	-	L
Mapping of Course Outcomes(CO) to Program Specific Outcomes (PSO)												
				PSO1					PS	02		
CO1				Η					Н	[
CO2				Η				Н				
CO3		Н						М				
CO4		М						L				
H-High	H –High, M-Medium, L-Low											

		Flootivo II				
Operations Research						
Course Code	:	16MCA343	CIE Marks	:	100	
Hrs/Week	:	L:T:P:S 4:0:0:4	SEE Marks	:	100	
Credits	:	5	SEE Duration	:	3 Hrs	
Course Learn	ing	Objectives (CLO)	I			
Graduates shall	l be	e able to				
1. Understand the importance and applications of operations research in different domains						
2. Formulate	he	real world problems using mathematical m	odels			
3. Identify dif	fer	ent techniques to obtain optimal solution us	sing OR models			
4. Explore and	d o	ptimize Linear Programming Problem, Tra	nsportation problem, Ass	sigi	nment	
problems, r	netv	work models, game theory and metaheuristi	cs	-		
5. Explore practices to obtain good feasible solution using heuristic approach						
Unit – I 10 Hrs					10 Hrs	
Introduction to Operations Research & LPP-Introduction, Operations Research models,					els,	
Solving the OR models, Phases of an OR study, Two variable LP Model, Graphical LP Solution,						
The Simplex Method and Sensitivity Analysis- LP Model in equation form, Simplex Method,						
Artificial Starting Solution – M Method, Special cases in Simplex Method						
Unit – II 10Hrs						
Transportation and Assignment Problems- Definition of Transportation Model, Transportation						
Algorithm - No	orth	-West Corner method, Least Cost Method,	Vogel's Approximation	М	ethod,	
Iterative Comp	uta	tions of the Transportation Algorithm, Ass	ignment Model - Hunga	ria	n	
Method, Simpl	ex	explanation of the Hungarian Method.				
		Unit – III			10 Hrs	
Network Mod	els	- Scope and Definition of Network Models,	CPM and PERT – Netw	vor	k	
representation,	CF	PM computations, Construction of the Time	schedule, PERT Netwo	rks		
		Unit – IV			10 Hrs	
Duality and G	an	e Theory -Definition of the Dual Problem,	Primal dual relationship), E	Economic	
Interpretation of	of I	Duality, Dual Simplex Algorithm, Game Th	eory, Optimal Solution of	of 7	Гwo	
person Zero Su	m	games, Solution of Mixed Strategy Games				
	Unit – V 8 Hrs					
Non-Linear P	rog	ramming – Metaheuristics				
The Nature of	Me	etaheuristics: Non-linear programming Prol	blem, Traveling Salesma	an	Problem -	
Sub Tour reversal algorithm, Tabu Search: Minimum spanning tree, Simulated Annealing:						
Traveling Sale	sm	an Problem, Genetic Algorithms: basic co	oncept, Integer version	of	nonlinear	
programming e	xa	mple and Traveling Salesman Problem exa	mple			
-						

III	Semester
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Self-Study Component

Topics on latest / emerging technologies relevant to the course will be assigned. Students are required to read white papers, publications, patents and prepare a report, give a seminar on the study undertaken. The self study will be reviewed and evaluated by an expert panel in two phases appointed by the Director, MCA.

Expected Course Outcomes

After going through this course the student will be able to

CO1: Understand the importance of decision making for optimal utilization of resources

CO2: Design and formulate real world problem by applying relevant mathematical models

CO3: Apply and Analyze various operations research techniques for obtaining solutions

CO4: Evaluate the solutions for obtaining optimal solution for the real world problems

Reference Books

- Hamdy A Taha, "Operations Research An Introduction", Pearson, 9th Edition, 2014, ISBN: 978-93-325-1822-3, First Impression
- Frederick S. Hillier & Gerald J. Lieberman, "Introduction to Operations Research", Tata McGraw Hill, 8th Edition, 2007, ISBN-10: 0070600929, ISBN-13: 978-0070600928

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and One Self-study. The test will be for 30 marks each, quiz for 10 marks each and self-study for 20 marks. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students must answer five questions by selecting one from each unit. The questions will have internal choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Mapping	Mapping of Course Outcomes(CO) to Program Outcomes(PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO1	Η	М	L	-	-	-	-	L	L	М	Μ	М		
CO2	М	М	-	-	Μ	-	-	-	Μ	1				
CO3	М	М	М	Μ	L	-	Μ	Μ	L	Μ	Μ	М		
CO4	L	Н	L	Н	-	-	L	Μ	Μ	Μ	L	-		
Mapping of Course Outcomes(CO) to Program Specific Outcomes(PSO)														
			PSO1				PSO2							
CO1			Н				М							
CO2			Н				М							
CO3		М							М					
CO4			L				М							
H –High,	M-Me	dium, L	-Low				•							

Course Code:16MCA35CIE Marks:100Hrs/Week:L:T:P:S 3:0:0:4SEE Marks:100Credits:4SEE Duration:3 HrsCourse Learning Objectives (CLO)Graduates shall be able to1.Understand and explain the underlying principles of quantitative and qualitative research2.Perform gap analysis and identify the overall process for designing a research study3.Choose the most appropriate research methodology to address a particular research problem4.Prepare a technical report, proposal to analyze data and suggest possible solutionsUnit - I7 HrIntroduction - Meaning of research, Types of research, Research and scientific methodDefining the research problemResearch Design – Meaning of research design, Need and features of a good Design, Differentresearch designUnit – II7 HrMethods of Data Collection-Experiment and Surveys, Collection of Primary data, CollectionSecondary Data, Selection of Appropriate Method for Data CollectionUnit – IIOf TDesign of Sample Surveys-Sample Design, Sampling and Non sampling Errors, Sample survey, 's Census Survey, Types of Sampling Design, Sampling and Non sampling Errors, Sample survey, 's Census Survey, Types of Sampling Design, Sampling numerical problemsUnit – IV08 FUnit – IV08 F <th></th> <th></th> <th>Research Meth</th> <th>odology</th> <th></th> <th></th>			Research Meth	odology		
Hrs/Week : L:T:P:S 3:0:0:4 SEE Marks : 100 Credits : 4 SEE Duration : 3 Hrs Course Learning Objectives (CLO) Graduates shall be able to : 3 Hrs Course Learning Objectives (CLO) Graduates shall be able to : 1. Understand and explain the underlying principles of quantitative and qualitative research 2. Perform gap analysis and identify the overall process for designing a research study : 3. 3. Choose the most appropriate research methodology to address a particular research problem 4. Prepare a technical report, proposal to analyze data and suggest possible solutions * Unit - I 7 Hr 7 Hr Introduction - Meaning of research, Types of research, Research and scientific method Defining the research problem. Techniques involved in defining the problem Research Design – Meaning of research design, Need and features of a good Design, Different research designs T Hr Methods of Data Collection-Experiment and Surveys, Collection of Primary data, Collection Secondary Data, Selection of Appropriate Method for Data Collection Vor Hr Method sof Sample Surveys-Sample Design, Sampling and Non sampling Errors, Sample survey's Census Survey, Types of Sampling Designs, Simple numerical problems Vala numerical proble	Course Code	:	16MCA35	CIE Marks	:	100
Credits : 4 SEE Duration : 3 Hrs Course Learning Objectives (CLO) Graduates shall be able to 1. Understand and explain the underlying principles of quantitative and qualitative research 1. Understand and explain the underlying principles of quantitative and qualitative research 2. 2. Perform gap analysis and identify the overall process for designing a research study 3. 3. Choose the most appropriate research methodology to address a particular research problem 4. 4. Prepare a technical report, proposal to analyze data and suggest possible solutions 7 4. Prepare a technical report, proposal to analyze data and suggest possible solutions 7 1. Unit - I 7 7 Introduction - Meaning of research, Types of research, Research and scientific method 0 0 Defining the research problem Selecting the problem research designs - Research Design – Meaning of research design, Need and features of a good Design, Different research designs - 7 11 Methods of Data Collection-Experiment and Surveys, Collection of Primary data, Collection Secondary Data, Selection of Appropriate Method for Data Collection - 07 H Design of Sample Surve	Hrs/Week	:	L:T:P:S 3:0:0:4	SEE Marks	:	100
Course Learning Objectives (CLO) Graduates shall be able to 1. 1. Understand and explain the underlying principles of quantitative and qualitative research 2. Perform gap analysis and identify the overall process for designing a research study 3. Choose the most appropriate research methodology to address a particular research problem 4. Prepare a technical report, proposal to analyze data and suggest possible solutions Unit - I 7 Hr Introduction - Meaning of research, Types of research, Research and scientific method Defining the research problem- Selecting the problem, necessity of defining the problem, techniques involved in defining the problem Research Design – Meaning of research design, Need and features of a good Design, Different research designs 7 Hr Methods of Data Collection-Experiment and Surveys, Collection of Primary data, Collection Secondary Data, Selection of Appropriate Method for Data Collection 07 Hr Design of Sample Surveys-Sample Design, Sampling and Non sampling Errors, Sample survey, Types of Sampling Designs, Simple numerical problems 08 E Data Preparation - Data Preparation Process, Problems in Preparation Process, Missing Valuand Outliers, Types of Analysis, Statistics in Research, 08 E Data Preparation - Data Preparation Process, Problems in Preparation Process, Missing Valuand Outliers, Types of Analysis, Statistics in Research, 08 E	Credits	:	4	SEE Duration	:	3 Hrs
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3. Choose the most appropriate research methodology to address a particular research problem 4. Prepare a technical report, proposal to analyze data and suggest possible solutions Unit – I 7 Hr Introduction - Meaning of research, Types of research, Research and scientific method Defining the research problem. Selecting the problem, necessity of defining the problem, techniques involved in defining the problem Research Design – Meaning of research design, Need and features of a good Design, Different research designs 7 Hr Methods of Data Collection-Experiment and Surveys, Collection of Primary data, Collection Secondary Data, Selection of Appropriate Method for Data Collection 07 H Design of Sample Surveys-Sample Design, Sampling and Non sampling Errors, Sample surveys v/s Census Survey, Types of Sampling Designs, Simple numerical problems 08 H Data Preparation - Data Preparation Process, Problems in Preparation Process, Missing Valuand Outliers, Types of Analysis, Statistics in Research, Measures of Dispersion, Hypothesis 07 Hr Basic concepts of hypothesis, Testing of Hypothesis 7 Hr Lunit – V 7 Hr Essential Report Writing- Significance of Report Writing, Different Steps in Writing Report Surveys of Writing 17 Hr	2. Perform ga	p a	nalysis and identify the overall proc	ess for designing a research	study	
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III Semester

Expected Course Outcomes

After going through this course the students will be able to

CO1: Discuss various principles and concepts of quantitative and qualitative research

CO2: Identify appropriate method for data collection and processing for real world problem

CO3:Examine the research outputs in a structured manner and prepare report

CO4:Formulate research methodology for real world problems

- 1. Kothari CR, "Research Methodology Methods and Techniques ", New Age International, 2014, 3rd Edition, ISBN : 978-81-224-3623-5
- 2. Krishnaswami KN, Sivakuma AI and Mathiarajan, "Management Research Methodology", Pearson Education, 2009, ISBN : 9788177585636
- 3. Levin RI and Rubin, "Statistics for Management ", 7th Edition, Pearson Education, New Delhi, ISBN : 9788177585841

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and two self study components. The test will be for 30 marks each, quiz and self study for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	M	L	Μ	Μ	L	L	Μ	-	L	-	-
CO2	L	Н	Н	Н	Μ	-	-	-	-	L	L	-
CO3	-	-	-	-	Μ	Μ	L	-	L	-	L	-
CO4	Μ	Н	Н	Н	Н	L	Μ	-	-	Μ	-	-

Mapping of Course Outcomes(CO) to Program Specific Outcomes(PSO)

	PSO1	PSO2
CO1	М	М
CO2	Н	L
CO3	L	М
CO4	Н	М
H-High, M-Mediu	ım, L-Low	

Enterprise Application Programming (Theory and Practice)											
Course Code	:	16MCA41	<i>y unu i ruccico)</i>	CIE Marks	:	100+50					
Hrs/Week	:	L:T:P:S 4:0:2:0		SEE Marks	:	100+50					
Credits	:	5		SEE Duration	:	3 Hrs					
Course Learning	Ob	jectives (CLO)	I		1						
Graduates shall be	abl	e to									
1. To understand	and	use different enterpri	se design patterr	n techniques							
2. Apply the knowledge of frameworks and Enterprise Application Development Tools											
3. Design a Java p	orog	ram efficiently using	Inheritance, Inte	erfaces and Package	S						
4. Develop Enterp	orise	Application solution	s using Design I	Patterns							
		Unit	– I			09 Hrs					
Introduction- Cha	aller	iges of Enterprise Ap	plication Develo	pment, Programmir	ng P	roductivity					
Response to Dema	nd	Integration with Exist	sting Systems Fr	reedom to Choose J	2EE	Application					
Scenarios , Mult	itie	r Application Scena	ario ,Stand-Alo	ne Client Scenari	0,	Web-Centric					
Application Scenar	rio	Business-to-Business	Scenario, A No	ote on the MVC Arc	chite	cture					
Introduction to 3	Java	a Programming- Th	ne Java Langua	ge, The Key Attril	oute	s of Object-					
Oriented Programming, The Java Development Kit, A First Simple Program, Java Keywords											
		Unit	- II			09Hrs					
Classes and Met	tho	Is-The Java Class	Libraries. Java's	s Primitive Types,	Li	terals, Class					
Fundamentals, Ho	W	Objects are Created	, Reference Va	riables and Assign	imer	nt, Methods,					
Returning from a	I M	ethod, Returning V	alue, Using Pa	rameters, Construc	tors	, Recursion,					
Understanding Sta	atic,	Introducing nested	and inner cla	asses Inheritance H	Basio	cs, Interface					
Fundamentals, Cr	eati	ng an Interface, Im	plementing an	Interface, Package	e Fi	undamentals,					
Packages and Men	ıbeı	Access, Importing P	ackages, Static			I					
		Unit -	– III			12 Hrs					
Servlets- Servlet	Stru	icture, Servlet packa	aging, HTML b	ouilding utilities, I	lifec	ycle, Single					
Thread model inte	rfac	e, Handling Client R	equest: Form Da	ata, Handling Client	Re	quest: HTTP					
Request Headers.	G	enerating server Re	esponse: HTTP	Status codes, Ge	ener	ating server					
Response: HTTP F	Resp	onse Headers, Handl	ing Cookies, Ses	ssion Tracking		_					
Introduction to I	EJB	- The Enterprise Jav	vaBeans Tier-B	usiness Logic, Ente	erpri	se Beans as					
J2EE Business Objects Enterprise Beans and EJB Containers, Session Beans											
Unit – IV 08 Hrs											
Implementing JSP tag extensions- Overview of JSP Technology, Need of JSP, Benefits of											
JSP, Advantages of JSP, Basic syntax, Invoking java code with JSP scripting elements, creating											
Template Text, Inv	/OK1	ng java code from JS	P, Limiting java	code in JSP, using	JSP	expressions,					
comparing services	s an	a JSP, writing script	iets. For exampl	ie Using Scriptlets	to n	lake parts of					
JSP conditional, us	sing	declarations, declara	tion example								

	Unit – V 10 Hrs									
Pe	rsistence Management and Design Patterns- Implementing java persistence using									
hil	pernate. Introducing hibernate, exploring the architecture of hibernate, exploring HOL.									
111	derstanding hibernate O/R mapping working with hibernate. Implementing O/R mapping									
wi	th hibernate									
	Unit – VI (Lab Component)									
	Part – A									
1	Write a Java program to \mathbf{r}									
1.	Create a package named shape									
	a. Create classes in the package representing common shapes like Square. Triangle, and									
	Circle									
	c. Import and compile these classes in other program									
2.	Write a Java Servlet Program to implement a dynamic HTML for following scenarios									
	a. User name and password should be accepted in HTML									
	b. Verify the username and password using a ServletConfig initparam and display the									
	appropriate message on another Servlet									
3.	Write a Java Servlet Program to implement sessions (Using HTTP Session Interface)									
4.	Write a Java Servlet Program to implement a JSTL to enter the customer details in HTML									
	page and display the same in another HTML page									
5.	Write a Java Servlet Program to count the number of hits to a website using Filters									
6.	Write a Java Servlet Program to enter the login credentials and verify the same using									
	hibernate frame work									
	Part – B									
6.	Write a JAVA Servlet Program to implement and demonstrate get() and post()									
	methods (Using HTTP Servlet Class)									
7.	Write a JAVA Servlet Program using cookies to remember user preferences.									
8.	Write a Java Servlet program to display all the methods which are present in									
	ServletConfig and ServletContext									
9.	Write an EJB application to demonstrate Session Beans (with business logic)									
Co	ourse Outcomes									
Af	ter going through this course the student will be able to									
C	O1: Understand the challenges of enterprise applications									
C	D2: Apply JAVA support and API skills for Enterprise Application Development									
C	D3: Analyze the enterprise requirement to implement real world application									
C	D4: Manage deployment configurations according to the enterprise application need									
Re	eference Books									
1.	Inderjeet Singh, Beth Stearns, Mark Johnson and the Enterprise Team "Designing									
	Enterprise Applications" with the Java TM 2 Platform, Enterprise Edition, 2 nd Edition									
	ISBN-10: 0201787903									
2.	Herbert Schildt, Dale Skrien, "Java Fundamentals, A Comprehensive Introduction", Tata									
	McGraw Hill Edition, 2013, Mc Graw Hill Publication, ISBN-13:9781249006593									

1

3.	Marty H	Iall, La	arry B	rown, '	"Core Se	ervlets an	nd Java	Server P	ages. Vo	olume 1	Core	
,	Technol	ogies.	2 nd Ec	dition"	Pearson	Hall, IS	BN-13:	978862	78043.			
4.	Prof. N	1. T.	Sava	liya, "	Advanc	ed Java	", Drea	amtech	Press, V	Wiley 1	India, I	SBN-13:
	978935	119934	12.									
Sch	Scheme of Continuous Internal Evaluation (CIE) for Theory											
CIE	CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30											
mar	ks each,	, quiz a	and as	ssignm	ent for 1	0 marks	each.	The total	marks f	or CIE	(Theory) will be
100	marks.											
Sch	eme of	Contir	nuous	Interr	nal Eval	uation (CIE) fo	r Practi	cal			
CIE	for the	practi	cal w	ill be ł	based or	n the per	forman	ce of the	student	in the	laborato	ry every
wee	k for 1	l0 ma	rks fo	or even	ry expe	riment.	Finally,	, the wo	eekly ev	valuated	marks	will be
cons	solidate	d for 4	0 mar	ks. Or	ne test w	vill be co	nducted	l at the e	nd of the	e semes	ter for 1	0 marks.
The	total m	arks fo	or CII	E (Prac	ctical) w	vill be fo	or 50 ma	arks. On	e questio	on from	Part A	and one
fron	n Part B	need t	o be e	execute	d. Chan	ge of pro	ogram is	s not peri	nitted.			
Sch	eme of	Semes	ter Ei	nd Exa	minatio	on(SEE)	for Th	eory				
The	questio	n pape	r will	be for	100 ma	rks and s	shall co	nsist of 1	l0 questi	ons from	n five u	nits with
20 r	narks ea	ach. Oi	ut of t	he 10	question	is studen	ts have	to answ	er five q	uestions	s from e	ach unit.
The	questio	ons wil	l have	e Inter	nal Cho	ice with	maxim	um 3 su	b divisio	ons. Bo	oth the c	uestions
shal	l be of t	he sam	ne con	nplexit	y in tern	ns of CO	s and B	loom's t	axonomy	y level.		
Sch	eme of	Semes	ter Eı	nd Exa	minatio	on(SEE)	for Pra	nctical				
The	total m	arks fo	or SEI	E (Prac	tical) w	ill be 50	marks.	Evaluat	ion of S	EE for	the prace	tical will
be b	ased on	writin	ig proj	per pro	gram, ez	xecution	, proper	results a	and viva	voce. W	Veightag	e of Part
A is	70% ai	nd Part	B we	eightag	e is 30%	6. One qu	uestion	from Pa	rt A and	one from	m Part E	B need to
be e	xecuted	. Chan	ge of	progra	m is not	permitte	ed.					
Maj	pping o	f Cour	rse Ou	itcome	es(CO) t	o Progra	am Out	tcomes(I	PO)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	1 M	-	L	-	Н	L	Μ	L	М	L	-	-
CO	2 M	-	L	-	Н	L	Μ	L	М	L	-	-
CO	3 H	Н	М	Μ	Н	М	L	М	Н	М	L	-
CO	4 H	-	L	L	Н	-	L	Μ	L	-	L	-

Mapping of Course Outcomes(CO) to Program Specific Outcomes(PSO)

	PSO1	PSO2							
CO1	L	L							
CO2	М	М							
CO3	Н	М							
CO4	Н	Н							
H –High, M-Medium, L-Low									

		IV Seme	ster								
		Elective -	- III								
		Advanced Comput	ter Networks								
(Theory and Practice)											
Course Code	:	16MCA421	CIE Marks	:	100+50						
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks	:	100+50						
Credits	:	5	SEE Duration	:	3 Hrs						
Course Learn	ing	Objectives (CLO)									
Graduates shall	be	able to									
1. Familiarize	e th	e working of the various protocols	in TCP/IP stack								
2. Understand	l th	e working and performance of con	nnection oriented networks such	as	ATM						
3. Get a pract	ica	l approach on multitude of algorith	ims related to Advanced routing								
4. Acquaint w	vith	the real-time application of netwo	rking								
		Unit – I			10Hrs						
Concepts of St	or	age Network- Data Storage and Da	ta Access Problem. The Battle for	or {	Size and						
Access. Decour	olii	ig the Storage Component- Putting	Storage on the Network. Creating	ig a	Network						
for Storage.	r	-8 2		0							
8											
		Unit – II			10 Hrs						
Internet Proto	co	- Error and Control Messages (IC	MP), The Internet Control Mess	age	e Protocol,						
ICMP Message	e E	Delivery, ICMP Message Format,	Testing Destination Reachabilit	yг	and status,						
Echo Request	an	d Reply Message Format, Classle	ss and Subnet Address Extension	on	(CIDR) –						
Review of Re	elev	vant Facts, Proxy ARP, Subnet	Addressing, Subnet Mask Re	pre	esentation,						
Broadcasting th	ne S	Subnets, A Classless Addressing ex	ample								
		Unit – III			10 Hrs						
Mobile IP - Int	tro	luction, Mobility, Routing and Add	dressing, Mobile IP Characteristi	cs,	Overview						
of Mobile IP	(Depretions, Mobile Addressing	Details, Foreign Agent Disco	vei	ry, Agent						
Registration, r	egi	stration message format, comm	unication with a foreign agen	nt,	datagram						
transmission ar	nd	reception, two- crossing problem,	communication with computers	on	the home						
network											
Private Netwo	rk	Interconnection- NAT, VPN- Interconnection	oduction, Private and hybrid net	WC	orks, VPN,						
VPN addressin	lg a	and routing, VPN with private ad	dress, NAT, NAT translation ta	ıble	e creation,						
multi address N	١A	Γ, Port mapped NAT, interaction b	between NAT and ICMP, Interac	tio	n between						
NAT and appli	cat	ions. Conceptual address domains									
		Unit – IV			10 Hrs						
Wireless Com	mu	nication- Introduction – Fundamen	ntals of Wireless Communication	1							
Technologies,	The	Electromagnetic Spectrum, Chara	cteristics of the Wireless Channe	:I, V	Wireless						
LANS and PA	NS	- Fundamentals of WLAN's, HIPI	ERLAN Standard, Bluetooth, Wi	rel	ess						
WANS and MA	٩N	8 – The Cellular Concept, Wireless	SAIM		0.0 77						
		Unit – V			08 Hrs						

Ad-hoc Networking- Introduction, Issues in Designing a Routing Protocol for AdHoc Wireless Networks, Classification of Routing Protocols, Table-Driven Routing Protocol- Destination Sequenced Distance Vector Routing Protocol, Wireless Routing Protocol, On-Demand Routing Protocol- Dynamic Source Routing Protocol, Ad Hoc On-demand Distance Vector Routing Protocol, Hybrid Routing Protocol - Zone Routing Protocol.

Unit – VI (Lab Component)

Implement the following programs using NS2

Part – A

- 1. Simulate a gateway implementation of a LAN consisting of 8 nodes.
- 2. Simulate client server communication between two nodes A and B. Measure the packet delivery rate at the client. Create a dumbbell topology with 8 nodes using TCP and UDP connection
- 3. Simulate a star topology with 10 nodes n0 ... n9 where node n4 is acting as router.
- 4. Write a script to wired network with star topology and demonstrate QoS monitoring.
- 5. Consider a small network with four nodes n0, n1, n2 and n3 forming point to point connection with each other. Implement IEEE 802.3 standard offering CSMA. Display packet delivery count and ratio between TCP source (n0) and TCP sink (n3)

Part – B

- 1. Write a script to define Software Defined Network to facilitate accessing any one sensor data remotely.
- 2. Write a script to define a wireless network with star topology and demonstrate QoS monitoring
- 3. Simulate a wireless network and demonstrate DSR protocol.
- 4. Simulate the wireless network under 802.11 standards and demonstrate AODV protocol
- 5. Simulate the wired distance vector routing algorithm

Expected Course Outcomes

At the end of the course the student will be able to

- **CO1:** Understand the advanced networking concepts and its applications
- CO2: Apply various networking classifications in day to day computing
- **CO3:** Analyze the importance of routing and congestion control principles
- **CO4:** Access the different routing protocol methods in the networking support layers

Reference Books

- 1 Robert Spalding, "The Complete Reference-Storage Networks", McGraw Hill Education, Indian Edition 2003, ISBN -13: 978-0-07-053292-2,
- 2 C. Siva Ram Murthy, B. S. Manoj, "Ad Hoc Wireless Networks Architecture and Protocols", Pearson Publication, 2011, ISBN 978–81-317-5905-9
- 3 Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols, and Architectures", Volume 1, 4th Edition, Pearson Education, 2001, ISBN 81-7808-444-9

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks. **Scheme of Continuous Internal Evaluation (CIE) for Practical**

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment.

Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage of Part A is 70% and Part B weightage is 30%. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Mapping	of Cou	rse Out	comes (C	CO) to	Progr	am Ou	itcome	es (PO)	
	DO1	DOI	DO1		DO5	DOC	DO7	DOO	D

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	Н	Μ	L	-	-	-	-	Μ	Μ	L	Н	М
CO2	Н	L	Μ	Η	L	-	-	L	Μ	Μ	-	-
CO3	Μ	-	Н	Μ	-	-	-	М	Μ	Μ	Μ	L
CO4	Н	М	L	Н	-	L	-	L	Н	Μ	L	Μ

Mapping of Course Outcomes(CO) to Program Specific Outcomes(PSO)

mapping of oot		
	PSO1	PSO2
CO1	М	Н
CO2	Н	М
CO3	М	М
CO4	Н	Н
H –High, M-Me	edium, L-Low	

		IV Semest	ter		
		Elective –	III		
		Mobile Application 1	Development		
		(Theory and Pr	actice)		
Course Code	:	16MCA422	CIE Marks	:	100+50
Hrs/Week	••	L:T:P:S 4:0:2:0	SEE Marks	:	100+50
Credits	••	5	SEE Duration	:	3 Hrs
Course Learn	ing	Objectives (CLO)			
Graduates shall	l be	able to			
1. Understand	an	d compare different mobile applica	tion models, architectures and J	patt	terns
2. Interpret the	e co	omponents and structure of a mobile	e development framework		
3. Apply suita	ble	framework for the development of	a mobile application		
4. Develop a r	noł	bile application for a real world scen	nario		
		Unit – I			10 Hrs
Introduction t	o N	Iobile Application Development	Ecosystems- History of Mobile	: A	pplication
Development,	Un	derstanding Ecosystems, Hybrid	Application Frameworks, Ch	ıall	enges by
Mobile Applica	atio	n Layers, System Software, Mobile	e Application Testing		
		Unit – II			10 Hrs
Getting Starte	ed y	with Android Programming & A	Android User Interface-What	is	Android?
Obtaining the 1	equ	ired tools, Creating your First An	droid Application, Anatomy of	f ar	1 Android
Application, V	iew	Groups, Basic views, Fragments			
		Unit – III			10 Hrs
SMS Messagir	ng a	nd Networking-Sending SMS Me	essages programmatically, Getti	ng	Feedback
after Sending	the	Message, Sending SMS Message	s Using Intent, Receiving SM	S I	Messages,
Caveats and W	arn	ing,Sending E-Mail			
Networking-	Dov	vnloading Binary Data, Downloa	ding Text Files, Accessing W	/eb	Services
Using the GET	M	ethod, Performance Asynchronous	Calls		
		Unit – IV			10 Hrs
Creating Loca	tio	n Based Services Applications- D	isplaying Maps, Creating the Pr	:oje	ect,
Obtaining the N	Лар	s API Key, Displaying the Map, D	isplaying the Zoom Control, Cl	nan	ging
Views, Navigat	ting	to a specific Location, Adding Ma	rkers, Geocoding and Reverse	Ge	ocoding,
Getting Location	on I	Data			
		Unit – V			08 Hrs
Publishing An	dro	oid Applications-Versioning, Digit	ally Signing your Android App	lica	ations
Deploying AP	ΚI	Tiles- Using the adb.exe Tool, Usin	g a Web Server, Publishing on	th	e Android
Market					
		•••••	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
		Unit – VI (Lab Co	mponent)		

PART – A

- 1. Create "Hello World" application that will display "Hello World" in the middle of the screen
- 2. Devise sample application with login module to check username and password and proceed to next screen and on failing login, alert user using Toast Message
- 3. Develop an application that will change color of the screen, based on selected options from the menu
- 4. Read phonebook contacts using content providers and display in list
- 5. Build a screen containing menu and submenus displaying different types of automobiles and models
- 6. Implement an application that will create database with a table of User credentials and create login portal system

PART – B

- 1. Develop a program that provides various text and color effects to the text entered by the user
- 2. Write a program to display toast message on specific interval of time on successful login and navigating to the RVCE portal at the end of the Timer
- 3. Build a program that will navigate to the specific URLs deployed in the menu to the browser from the app
- 4. Create an application to send SMS to a particular contact from the Phonebook
- 5. Build an application to perform CRUD (create, read, update and delete) operations on the information of automobiles on the database and email the details to the provided email address
- 6. Develop a mobile application to save GPS location information of a particular phone on a database upon successful login

Note : Students are required to implement all the programs in Part-A and Part B

Course Outcomes

After going through this course the student will be able to

- **CO1:** Understand the architectures, user interfaces that leverage evolving mobile device capabilities
- **CO2:** Demonstrate mobile applications using software development kits (SDKs), frameworks and toolkits

CO3: Identify various methods to integrate frameworks, database and system-side technologies

CO4: Develop mobile applications and implement competent mobile applications as Digital World solutions

Reference Books

- 1. Mahesh Panhale, "Beginning Hybrid Mobile Application Development", Apres 2016, ISBN 978-1-4842-1314-8, DOI 10.1007/978-1-4842-1314-8
- 2. Wei-Meng Lee, "Beginning Android Application Development", Wiley 2011, ISBN-13: 978-1118017111

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Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment. Finally, the weekly evaluated marks will be

Scheme of Semester End Evaluation (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Evaluation (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage of Part A is 70% and Part B weightage is 30%. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Mapping of (Course	Outco	omes (CO) to	Prog	ram O	utcom	es (PO)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	Μ	L	-	Μ	Μ	Н	М	Н	-
CO2	L	Н	L	Н	L	-	Μ	Н	Μ	Н	Μ	L
CO3	L	L	-	-	-	-	L	-	Μ	L	Μ	-
CO4	L	L	-	Μ	Н	-	Μ	L	L	М	L	L
Mapping of (Course	Outco	omes(C	CO) to	Prog	ram Sp	oecific	Outco	mes(P	SO)		
]	PSO1						PSO2		
CO1				Μ						L		
CO2				Η						М		
CO3				L						L		
CO4				Μ						Н		
H-High, M-M	lediun	ı, L-L	DW									

Elective – III Computer Graphics (Theory & Practice) Course Code : 16MCA423 CIE Marks : 100+50 Irs/Week : L:T:P:S 4:0:2:0 SEE Marks : 100+50 Credits : 5 SEE Duration : 3 Hrs Course Learning Objectives (CLO) SEE Duration : 3 Hrs Course Learning Objectives (CLO) SEE Duration : 100+50 Graduates shall be able to Understand the basics underlying concepts in Analytical geometry and Computer Graphics .
Computer Graphics (Theory & Practice) Course Code : 16MCA423 CIE Marks : 100+50 Irs/Week : L:T:P:S 4:0:2:0 SEE Marks : 100+50 Credits : 5 SEE Duration : 3 Hrs Course Learning Objectives (CLO) SEE Duration : 3 Hrs Course Learning Objectives (CLO) See on the basics underlying concepts in Analytical geometry and Computer Graphics . . Identify various graphical algorithms to construct graphical primitives Use and Evaluate various geometric transformations and viewing techniques Develop graphical programs for multidisciplinary environment 10 Hrs . Introduction-Computer Graphics Hardware- Video display devices, Input devices, Graphics on nternet, Computer Graphics Software- Introduction to OpenGL, Coordinate Reference Frames, pecifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point unctions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
(Theory & Practice) Course Code : 16MCA423 CIE Marks : 100+50 Hrs/Week : L:T:P:S 4:0:2:0 SEE Marks : 100+50 Credits : 5 SEE Duration : 3 Hrs Course Learning Objectives (CLO) SEE Duration : 3 Hrs Course Learning Objectives (CLO) Generation : 3 Hrs Course Learning objectives (CLO) Generation : : 3 Hrs Course Learning Objectives (CLO) Generation : : : Generation : Understand the basics underlying concepts in Analytical geometry and Computer Graphics : : . Understand the basics underlying concepts in Analytical geometry and Computer Graphics : : : . Understand the basics underlying concepts in Analytical geometry and Computer Graphics : : : . Understand the basics underlying concepts in Analytical geometry and Computer Graphics : : : : : : : : : : : : : : : :
Course Code : 16MCA423 CIE Marks : 100+50 Irs/Week : L:T:P:S 4:0:2:0 SEE Marks : 100+50 Credits : 5 SEE Duration : 3 Hrs Course Learning Objectives (CLO) Generation : 3 Hrs Cudets shall be able to . . Understand the basics underlying concepts in Analytical geometry and Computer Graphics
Hrs/Week : L:T:P:S 4:0:2:0 SEE Marks : 100+50 Credits : 5 SEE Duration : 3 Hrs Course Learning Objectives (CLO) See Duration : 3 Hrs Graduates shall be able to . Understand the basics underlying concepts in Analytical geometry and Computer Graphics . . Identify various graphical algorithms to construct graphical primitives . . . Use and Evaluate various geometric transformations and viewing techniques . . Explore advanced OpenGL built in functions for Animation and Illumination techniques . Develop graphical programs for multidisciplinary environment Image: the function of the programs for multidisciplinary environment 10 Hrs ntroduction-Computer Graphics Hardware- Video display devices, Input devices, Graphics on nternet, Computer Graphics Software- Introduction to OpenGL, Coordinate Reference Frames, pecifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point unctions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
Credits : 5 SEE Duration : 3 Hrs Course Learning Objectives (CLO) Graduates shall be able to . <t< th=""></t<>
Course Learning Objectives (CLO) Graduates shall be able to . Understand the basics underlying concepts in Analytical geometry and Computer Graphics . Identify various graphical algorithms to construct graphical primitives . Use and Evaluate various geometric transformations and viewing techniques . Explore advanced OpenGL built in functions for Animation and Illumination techniques . Develop graphical programs for multidisciplinary environment Image: Computer Graphics Hardware-Video display devices, Input devices, Graphics on nternet, Computer Graphics Software- Introduction to OpenGL, Coordinate Reference Frames, pecifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point Unctions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
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 Identify various graphical algorithms to construct graphical primitives Use and Evaluate various geometric transformations and viewing techniques Explore advanced OpenGL built in functions for Animation and Illumination techniques Develop graphical programs for multidisciplinary environment Unit – I 10 Hrs ntroduction- Computer Graphics Hardware- Video display devices, Input devices, Graphics on nternet, Computer Graphics Software- Introduction to OpenGL, Coordinate Reference Frames, pecifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point Punctions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
 Explore advanced OpenGL built in functions for Animation and Illumination techniques Develop graphical programs for multidisciplinary environment Unit – I 10 Hrs ntroduction-Computer Graphics Hardware- Video display devices, Input devices, Graphics on nternet, Computer Graphics Software- Introduction to OpenGL, Coordinate Reference Frames, Specifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point Punctions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
Unit – I 10 Hrs Introduction-Computer Graphics Hardware- Video display devices, Input devices, Graphics on nternet, Computer Graphics Software- Introduction to OpenGL, Coordinate Reference Frames, Opecifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point Ounctions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation Igorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
Unit – I 10 Hrs ntroduction-Computer Graphics Hardware- Video display devices, Input devices, Graphics on nternet, Computer Graphics Software- Introduction to OpenGL, Coordinate Reference Frames, Specifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point Punctions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
Unit – I10 Hrsntroduction-Computer Graphics Hardware- Video display devices, Input devices, Graphics on nternet, Computer Graphics Software- Introduction to OpenGL, Coordinate Reference Frames, bpecifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point Pounctions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
ntroduction- Computer Graphics Hardware- Video display devices, Input devices, Graphics on nternet, Computer Graphics Software- Introduction to OpenGL, Coordinate Reference Frames, pecifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point Functions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
nternet, Computer Graphics Software- Introduction to OpenGL, Coordinate Reference Frames, Specifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point Functions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation Igorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
Specifying a Two Dimensional World Coordinate Reference frame in Open GL, OpenGL Point Functions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
Functions, OpenGL Line Functions, OpenGL Polygon Fill Area functions, Line generation lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
lgorithms–DDA, Bresenham's Line Generation, Mid-point Circle Generation algorithm
Unit – II 10Hrs
wo Dimensional Geometric Transformations-Two Dimensional Translation, Rotation,
caling, Reflection and Shear Geometric Transformation, Matrix Representations and
Iomogeneous Coordinates, Inverse Transformations, Other Two Dimensional Geometric
ransformation, Open GL Geometric Transformation Functions
Unit – III 10Hrs
wo Dimensional Viewing-The two dimensional viewing pipeline, Clipping window,
Iormalization and viewport transformations, Clipping algorithms, Two dimensional point
lipping, Two dimensional line clipping algorithms- Polygon fill area clipping, Text clipping
Unit – IV 09Hrs
Three Dimensional Geometric Transformations, Viewing and Curves-Three Dimensional
ranslation, Rotation, Scaling, The three dimensional viewing concepts, Three dimensional
iewing pipeline, Orthogonal Projection, Oblique Parallel Projection, Perspective Projection,
Bezier spline curves
Unit – V 09Hrs
Computer Animation, Illumination Models- Raster methods for computer animation, Design of
nimation sequences, Traditional animation techniques, General computer animation functions,
DenGL illumination and Surface rendering functions

Part - A

- 1. Write a program to implement Bresenham's line drawing algorithm with slope |m| < 1
- 2. Write a program to implement mid-point circle generation algorithm
- 3. Write a program to implement scaling transformation in X-Y Plane for the object square without using built-in function
- 4. Write a program to implement reflection transformation in X- axis and Y axis for the object triangle without using built-in function
- 5. Write a program to implement cavalier and cabinet projection with angle 45⁰ for the object cube without using built in function

Part - B

- 1. Write a program to implement rotation of a triangle with animation effect
- 2. Develop a screen saver using points displaying at random position
- 3. Write a program to display sun with animated rays using mouse events
- 4. Develop a 3D cube color model with color animation
- 5. Write a program to apply illumination effects to an object
- 6. Write a program to develop Bezier surface with shading effect

Note :

- 1. Part-B programs can be executed using Open GL built-in functions
- 2. During examination, each student picks one question from the lot of 5 questions from Part A and one question from the lot of 6 questions from Part B. Both need to be executed
- 3. No change of programs is permitted

Expected Course Outcomes

After going through this course the student will be able to

CO1: Illustrate the fundamentals of computer graphics hardware and software concepts

CO2: Demonstrate computer graphics algorithms with data and its specifications

CO3: Apply algorithms on different graphical models

CO4: Analyze different algorithms to manage graphical objects and resources

Reference Books

- Donald D. Hearn, M. Pauline Baker, Warren Carithers, "Computer Graphics with OpenGL", Pearson Education, 4th Edition, 2014, Second Impression, ISBN 978-93-325-1871-1
- 2 Edward Angel, Dave Shreiner, "Interactive Computer Graphics A Top down Approach using OpenGL", Addison-Wesley, 6th Edition, 2012, ISBN-13: 978-0-13-254523-5

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be evaluated for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment.

Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed.
Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage of Part A is 70% and Part B weightage is 30%. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Μ	-	Μ	L	Μ	-	L	-	L	-	-	-
CO2	Μ	L	М	L	Μ	-	L	-	L	-	L	I
CO3	L	L	М	-	Μ	-	L	-	L	L	L	I
CO4	L	М	L	-	-	-	Μ	-	L	L	-	-
Mapping of Course Outcomes(CO) to Program Specific Outcomes(PSO)												
			PSO)1					PS	502		
CO1			Μ							L		
CO2			М						I	М		
CO3			М]	М		
CO4		L L										
H –High,	M-Me	dium, L·	Low									

	Floctivo _ IV									
Network Security										
Course Code	:	16MCA431 CIE Marks	:	100						
Hrs/Week	:	L :T :P: S 4:0:0:4 SEE Marks	:	100						
Credits	:	5 SEE Duration	:	3 Hrs						
Course Learning	g C	Objectives (CLO)								
Graduates shall b	e a	ble to								
1. Explain security concepts involving OSI security architecture and a model for security										
involving attacks, services and mechanisms										
2. Introduce th	ie	working of classical, symmetric and asymmetric techniqu	es,	hashes and						
message dige	est	s, and public key algorithms								
3. Familiarize (des	ign issues and working principles of various secure communi-	cati	on standards						
4 Indicate the	rbe	ros, certificate & standards, iPSec & SSL/TLS								
4. Indicate the	sig.	numerate of Email and web security concepts		inciples and						
J. Elinance the	i K. Ion	nowledge on implementation of different intrusion detection	гр	incipies and						
Pre-requisite St	nd	ent must know the concepts of computer networks (16MCA31)								
Pre-requisite: Student must know the concepts of computer networks (16MCA31)										
Unit – 1 08 Hrs										
Introduction-Co	nıp C	ourity Machanisma A Model for Network Security	ty F	Attacks,						
Symmetric From	, o wn	tion and massage confidentiality. Symmetric Encryption Prin	oinl	A C						
Symmetric Block	ур · Fı	accuption Algorithms, Random and Pseudorandom Numbers, S	tre	co, Cinhora						
and RC4	Symmetric Block Encryption Algorithms, Random and Pseudorandom Numbers, Stream Ciphers									
and RC4										
		Unit – II		10 Hrs						
Public-Kev Crvr	oto	Unit – II graphy and Message Authentication- Approaches to Messag	e	10 Hrs						
Public-Key Cryp Authentication, S		Unit – II graphy and Message Authentication- Approaches to Messag ure Hash Functions, Message Authentication Codes, Public Key	e v C	10 Hrs						
Public-Key Cryp Authentication, S Principles, Public	pto ecu	Unit – II graphy and Message Authentication- Approaches to Messag ure Hash Functions, Message Authentication Codes, Public Key ev Cryptography Algorithms (RSA Algorithm and Diffie-Hellr	e y C	10 Hrs ryptography Key						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita	pto ecu x K al S	Unit – II graphy and Message Authentication- Approaches to Messag ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures	e y C nan	10 Hrs ryptography Key						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution	pto ecu k K al S n a	Unit – II graphy and Message Authentication- Approaches to Messag ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures nd User Authentication- Kerberos (Version 4 & 5), X.509 Ce	e y C nan	ryptography Key icates,						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras	pto ecu k K al S n au stru	Unit – II graphy and Message Authentication- Approaches to Message ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures nd User Authentication- Kerberos (Version 4 & 5), X.509 Ce cture	e y C nan ertif	ryptography Key Ticates,						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras	pto ecu k al S n a stru	Unit – II graphy and Message Authentication- Approaches to Message ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures nd User Authentication- Kerberos (Version 4 & 5), X.509 Ce cture Unit – III	e y C nan ertif	10 Hrs ryptography Key icates, 10 Hrs						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras	pto eci k al S n ai stru	Unit – II graphy and Message Authentication- Approaches to Message ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures and User Authentication- Kerberos (Version 4 & 5), X.509 Ce cture Unit – III ontrol and Cloud Security- Network Access Control, Extensib	e y C man ertif	10 Hrs ryptography Key ïcates, 10 Hrs						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras Network Access Authentication Pr	pto ecu k al S n a stru Co	Unit – II graphy and Message Authentication- Approaches to Message ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures and User Authentication- Kerberos (Version 4 & 5), X.509 Ce acture Unit – III ontrol and Cloud Security- Network Access Control, Extensib cool, IEEE 802.1X Port-Based Network Access Control, Cloud	e y C man ertif	10 Hrs ryptography Key ïcates, 10 Hrs omputing,						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras Network Access Authentication Pr Cloud Security R	oto ecu ecu ecu ecu al S n a stru Co coto isk	Unit – II graphy and Message Authentication- Approaches to Message ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures and User Authentication- Kerberos (Version 4 & 5), X.509 Ce acture Unit – III ontrol and Cloud Security- Network Access Control, Extensib pool, IEEE 802.1X Port-Based Network Access Control, Cloud s and Countermeasures, Data Protection in the Cloud, Cloud Sec	e y C man ertif	10 Hrs ryptography Key Ticates, 10 Hrs omputing, rity as a						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras Network Access Authentication Pr Cloud Security R Service	ecu c K al S al S tru Co coto isk	Unit – II graphy and Message Authentication- Approaches to Message ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures and User Authentication- Kerberos (Version 4 & 5), X.509 Ce acture Unit – III Introl and Cloud Security- Network Access Control, Extensib pool, IEEE 802.1X Port-Based Network Access Control, Cloud s and Countermeasures, Data Protection in the Cloud, Cloud Sec	e y C man ertif ble . Cc	10 Hrs ryptography Key ïcates, 10 Hrs omputing, rity as a						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras Network Access Authentication Pr Cloud Security R Service	ecu ecu ecu ecu ecu ecu al S n an stru Co coto isk	Unit – II graphy and Message Authentication- Approaches to Message ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures and User Authentication- Kerberos (Version 4 & 5), X.509 Ce acture Unit – III Introl and Cloud Security- Network Access Control, Extensib cool, IEEE 802.1X Port-Based Network Access Control, Cloud s and Countermeasures, Data Protection in the Cloud, Cloud Sec Unit – IV	e y C nan ertif ble . Co	10 Hrs ryptography Key ïcates, 10 Hrs omputing, rity as a 10 Hrs						
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Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras Network Access Authentication Pr Cloud Security R Service Transport-Level Security (TLS), H	oto ecu s K al S tru Co coto isk	Unit – II graphy and Message Authentication- Approaches to Messag are Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures and User Authentication- Kerberos (Version 4 & 5), X.509 Ce acture Unit – III ontrol and Cloud Security- Network Access Control, Extensib cool, IEEE 802.1X Port-Based Network Access Control, Cloud s and Countermeasures, Data Protection in the Cloud, Cloud Sec Unit – IV ecurity- Web Security Issues, Secure Sockets Layer (SSL), Tra IPS Secure Shell (SSH)	e y C nan ertif	10 Hrs ryptography Key ïcates, 10 Hrs omputing, rity as a 10 Hrs oort Layer						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras Network Access Authentication Pr Cloud Security R Service Transport-Level Security (TLS), F	oto ecr al S al S tru Co coto isk	Unit – II graphy and Message Authentication- Approaches to Message ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures nd User Authentication- Kerberos (Version 4 & 5), X.509 Ce cture Unit – III ontrol and Cloud Security- Network Access Control, Extensite bcol, IEEE 802.1X Port-Based Network Access Control, Cloud s and Countermeasures, Data Protection in the Cloud, Cloud Se Unit – IV ecurity- Web Security Issues, Secure Sockets Layer (SSL), Tra TPS Secure Shell (SSH) Security-Wireless Security, Mobile Device Security, IEEE 802	e y C man ertif ole cc ecu	10 Hrs ryptography Key ïcates, 10 Hrs omputing, rity as a 10 Hrs oort Layer Wireless						
Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras Network Access Authentication Pr Cloud Security R Service Transport-Level Security (TLS), H Wireless Networ LAN Overview, I	Contone control of the control of th	Unit – II graphy and Message Authentication- Approaches to Message ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures nd User Authentication- Kerberos (Version 4 & 5), X.509 Cecture Unit – III ontrol and Cloud Security- Network Access Control, Extensite bcol, IEEE 802.1X Port-Based Network Access Control, Cloud s and Countermeasures, Data Protection in the Cloud, Cloud Security- Web Security Issues, Secure Sockets Layer (SSL), Tra TPS Secure Shell (SSH) Security-Wireless Security, Mobile Device Security, IEEE 802 E 802.11i Wireless LAN Security	e y C man ertif ole ccu	10 Hrs ryptography Key ïcates, 10 Hrs omputing, rity as a 10 Hrs ownputing, vity as a Vireless						
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Public-Key Cryp Authentication, S Principles, Public Exchange), Digita Key Distribution Public Key Infras Network Access Authentication Pr Cloud Security R Service Transport-Level Security (TLS), H Wireless Networ LAN Overview, I Electronic Mail S (DKIM)	Contonisk	Unit – II graphy and Message Authentication- Approaches to Message ure Hash Functions, Message Authentication Codes, Public Key ey Cryptography Algorithms (RSA Algorithm and Diffie-Hellr Signatures and User Authentication- Kerberos (Version 4 & 5), X.509 Ce- cture Unit – III ontrol and Cloud Security- Network Access Control, Extensite ocol, IEEE 802.1X Port-Based Network Access Control, Cloud s and Countermeasures, Data Protection in the Cloud, Cloud Se- Unit – IV ecurity- Web Security Issues, Secure Sockets Layer (SSL), Tra TPS Secure Shell (SSH) Security-Wireless Security, Mobile Device Security, IEEE 802 E 802.11i Wireless LAN Security curity-Pretty Good Privacy (PGP), S/MIME, Domain Keys Ide in Omerica D for the D f	e y C man ole Co ecu	10 Hrs ryptography Key ïcates, 10 Hrs omputing, rity as a 10 Hrs ownputing, vireless ïed Mail						

IV SEMESTER

Combining Security Associations, Internet Key Exchange								
Unit – V 10 1	Hrs							
Malicious Software-Types of Malicious Software, Propagation – Infected Content – Viruses,								
Propagation – Vulnerability Exploit – Worms, Propagation – Social Engineering – SPAM,								
Trojans, Payload – System Corruption, Payload – Attack Agent – Zombie, Bots, Payload –								
Information Theft – Key loggers, Phishing, Spyware, Payload – Stealthing – Backdoors, Root								
kits, Countermeasures, Distributed Denial of Service Attacks.								
Intruders - Intruders, Intrusion Detection, Password Management								
Firewalls-The Need for Firewalls, Firewall characteristics, Types of Firewalls, Firewall Basing	5.							
Firewall Location and Configurations	,,							
Self-Study Component -								
Students are required to read white papers, publications, patents and prepare a report, give a								
seminar on the study undertaken. The self study will be reviewed and evaluated by a expert pan	el							
in two phases appointed by the Director. MCA								
Topics								
Topics on Network security will be assigned. Students are required to work on the tools specific	ed							
in phase I and Phase II.								
Phase 1: Nessus (vulnerability scanners), Wireshark (packet sniffers- previously known as								
Ethereal), Snort (IDS - intrusion detection system)								
Phase 2: Netcat (Netcat), Metasploit Framework (vulnerability exploitation tools), TCPDu	ump							
(packet sniffers)	1							
Course Outcomes								
After going through this course the students will be able to								
CO1: Define and illustrate network security concepts and principles								
CO2: Analyze the working of security principles to system design								
CO3 : Apply appropriate techniques to solve network security threats								
CO4: Evaluate system security using network security controls								
Reference Books								
1. William Stallings "Network Security Essentials Applications and Standards", 5 th Edition,								
2014, Pearson, ISBN-13 9780133370522.								
2. William Stallings, "Cryptography and Network Security: Principles and Practice", 6 th								
Edition, 2014, Pearson, ISBN-13 9780133354690.								
3. Charles P Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, "Security in computing	s",							
5 th Edition, 2015 Prentice Hall, ISBN-13 9780134085043.								

Scheme of Continuous Internal Evaluation (CIE)

CIE will consist of Two Tests, Two Quizzes and self-study. The test will be for 30 marks each, quiz and self-study for 20 marks. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE)

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Н	Н	Μ	Н	Н	L	Μ	Μ	Μ	-	L	М
CO2	Н	Н	Μ	Μ	Н	-	Μ	Μ	Μ	-	-	L
CO3	Н	Н	Μ	Μ	Н	L	L	L	L	-	L	-
CO4	Η	Η	М	Η	Н	-	М	М	М	-	L	L

	PSO1	PSO2
CO1	М	L
CO2	М	L
C O 3	М	L
C O 4	М	L

Elective – IV Information Retrieval											
Course Code	:	16MCA432	CIE Marks	:	100						
Hrs/Week	:	L:T:P:S 4:0:0:4	SEE Marks	:	100						
Credits	:	5	SEE Duration	:	3 Hrs						
Course Learning	Obj	ectives (CLO)									
Graduates shall be	able	to									
1. Use different in	torm	ation retrieval technique	s in various application areas								
2. Apply IR principles to locate relevant information large collections of data											
3. Analyze periori	3. Analyze performance of retrieval systems large or unmanaged data sources										
4. Implement lett	evai	<u>IInit – I</u>	.45K5		10 Hrs						
Introduction to i	nfor	mation notrioval and a	mahitaatura of a gaarah an	aine S	angle Engines						
and Information	niur. Reti	rieval. What Is Information	ation Retrieval? The Rig Ice	gine-ð	earch Engines						
Search Engineers	nu	incvar- what is informe	aton Retreval: The Dig is,	sues, c	earen Engines,						
Search Engineers Architecture of a Search Engine- What is an Architecture? Basic Building Blocks, Breaking It											
Down											
Unit – II 10 Hrs											
Crawls and Fee	ds- I	Deciding what to search	h, Crawling the Web, Crav	vling I	Documents and						
Email, Document	Feed	s, The Conversion Probl	em, Storing the Documents,	Detect	ing Duplicates						
Processing Text -	From	n Words to Terms, Text	Statistics, Document Parsing	g, Doci	iment Structure						
and Markup, Link	Ana	lysis, Information Extra	ction, Internationalization								
		Unit – III	[10 Hrs						
Ranking with Inc	lexes	- Overview, Abstract M	Iodel of Ranking, Inverted in	dexes,	Compression,						
Auxinary Structur	es, n	idex Construction, Quer	y Processing								
		Unit – IV			08Hrs						
Queries and Inte	rface	s- Information Needs an	d Queries, Query Transform	ation a	nd Refinement,						
Showing the Resu	lts, C	Cross-Language Search									
		TT •4 T7			10 11						
		Unit – V	11 D 1 1 1	1.							
Retrieval Models - Overview of Retrieval Models , Probabilistic Models, Ranking Based on											
Ketrieval Models	- Ov	erview of Retrieval Mod	ining Friday of Web Course	anking							
Ketrieval Models Language Models	- Ov , Cor	nplex Queries and Comb	bining Evidence, Web Search	, Macł	ine Learning						
Retrieval Models Language Models and Information R	- Ov , Cor etrie	nplex Queries and Comb val	bining Evidence, Web Search	anking , Macł	ine Learning						
Retrieval Models Language Models and Information R Evaluating Searce Efficiency Metrice	- Ov , Cor etrie ch E	nplex Queries and Comb val ngines- Why Evaluate?	bining Evidence, Web Search P, The Evaluation Corpus, H	, Macł	veness Metrics,						
Retrieval Models Language Models and Information R Evaluating Searce Efficiency Metrics Self-Study Comp	- Ov , Cor letrie ch E	nplex Queries and Comb val ngines- Why Evaluate?	pining Evidence, Web Search P, The Evaluation Corpus, F	, Mach	veness Metrics,						
Ketrieval Models Language Models and Information R Evaluating Searce Efficiency Metrics Self-Study Comp Topics on latest /	- Ov , Con etrie ch E 3 onen Eme	nplex Queries and Comb val ngines- Why Evaluate?	be assigned. Students are r	, Mach	to read white						
Retrieval Models Language Models and Information R Evaluating Searce Efficiency Metrics Self-Study Comp Topics on latest / papers, publicatio	- Ov , Cor , etrie ch E s onen Eme ns, p	nplex Queries and Comb val ngines- Why Evaluate? nt erging technologies will atents and prepare a rep	be assigned. Students are r	equired	to read white ndertaken. The						
Retrieval Models Language Models and Information R Evaluating Searce Efficiency Metrics Self-Study Comp Topics on latest / papers, publicatio self study will be	- Ov , Con etrie ch E s onen Eme ns, p	atents and prepare a rep ewed and evaluated by	bining Evidence, Web Search 7, The Evaluation Corpus, H be assigned. Students are r port, give a seminar on the s an expert panel in two pha	equired tudy u	d to read white ndertaken. The						

Expe	ected	Cours	e Outc	omes									
After	goir	ig throu	igh this	course	the stu	ident w	ill be a	ble to			. –		
CO1:	Unc	lerstanc	the co	ncept c	of Infor	mation	Retriev	val, its	models	and Se	earch En	gine	
CO2:	Rec	ognize	and use	e variou	is inde	xing an	d query	ing tec	hnique	s to sto	re and re	etrieve	
docu	documents												
CO3:	CO3: Apply IR principles to extract relevant information and build retrieval models												
CO4: Analyze and evaluate the IR techniques and retrieval models													
Reference Books													
1. Trevor Strohman, Bruce Croft Donald Metzler, "Search Engines: Information Retrieval in Practice", Kindle Edition, Pearson Education Inc., 2015, ISBN-13: 978-0136072249													
2.	Chr	istophe	er D. N	Mannin	g, Prał	ohakar,	Ragha	avan a	nd Hin	rich S	chutze,	"Introdu	ction to
	Info	ormatio	n Retri	eval", C	Cambri	dge Un	iversity	Press,	2008,	ISBN 9	78-0-52	1-86571	-5
3.	Wil	liam E	B Frake	es, Ric	ardo E	Baeza-Y	l'ates, '	"Inforn	nation	Retriev	al Data	Structu	ires and
	Alg	orithm	s", Pear	rson Ed	ucation	n, 3 rd Eo	dition, 2	2009. IS	SBN13	: 97801	346383	79	
4.	Rob	oert. R.	Korfh	age, "I	nforma	tion St	orage a	& Retr	ieval",	John V	Viley &	Sons, I	nc. New
	York, NY, USA, 4 th Edition, 1997, ISBN:0-471-14338-3												
Scheme of Continuous Internal Evaluation (CIE)													
CIE will consist of Two Tests, Two Quizzes and Self study. The test will be for 30 marks each,													
quiz Saba	and s	f Some	ly lor 2	o mark	s each.	$\frac{1}{2}$ ne to	uai mar	KS IOF	_IE (11	leory)	will be I	00 mark	s.
The c	me u	ion nar	ster El	have F	HIMAU SIVE o	UII (SE	(E) swith	interna	l choic	e from	each un	it Fach	question
will a	arrv	20 mai	rks Stu	dent w	ill have	e to ans	wer on	e quest	ion fro	m each	unit Th	ie total n	arks for
SEE	(The	ory) wi	ll be 10	0 mark	as.	to uno		e quest	1011 110	in cuch			iunitio 101
Map	ping	of Cou	irse Ou	itcome	s (CO)	to Pro	gram (Outcon	nes (PO))			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	1	Н	Н	Н	М	М	L	L	Н	Μ	М	-	М
CO	2	Н	Н	Н	М	Μ	L	L	Н	Μ	L	-	М
CO	3	Н	Н	Н	L	Μ	L	L	Н	Μ	L	-	М
CO	4	Η	Η	Η	L	Μ	L	L	Н	Μ	L	-	Μ
Map	ping	of Cou	irse Ot	itcome	s (CO)	to Pro	gram S	Specifi	c Outc	omes (l	PSO)		
				PSC	D1					PSO 2	2		
CO	1			L	1					L			
CO	2			Μ	[Μ			
CO	3			Μ	[Μ			
CO	4			Н	[Н			
High	, M-	Mediu	m, L-L	ow									H –

Elective – IV										
Modeling And Simulation										
Course Code	:	16MCA433	CIE Marks	:	100					
Hrs/Week	:	L:T:P:S 4:0:0:4	SEE Marks	:	100					
Credits	:	5	SEE Duration	:	3 Hrs					
Course Learn	ing	Objectives (CLO)								
Graduates shall be able to										
1. Unders	1. Understand the basics of simulation and various simulation models									
2. Disting	uisl	n different types of random number and va	riate generation techniq	ues	for					
solving	pro	blems through statistical functions								
3. Explore	e ve	rification, validation and optimization on	simulation models							
4. Estimat	te tl	ne performance of system simulation mode	els							
		Unit – I			10 Hrs					
Introduction -	Dis	screte and continuous systems, Model of a	system, Types of Model	ls, I	Discrete-					
Event System	Sim	ulation, Steps in a Simulation Study								
Statistical Mo	del	s in Simulation -Discrete Random Varia	bles, Continuous Rando	m	Variables,					
Cumulative di	stri	bution function, Useful statistical models	s, Discrete distributions	, C	Continuous					
distributions-	Uni	form distribution, Exponential distribution	ion, Normal distributio	n,	Empirical					
distributions										
		Unit – II			10 Hrs					
Random-Num	be	r Generation - Properties of random numb	pers, Generation of pseu	do-	random					
numbers, Tech	niq	ues for generating random numbers, Tests	for random numbers							
Random-Vari	ate	Generation - Inverse transform technique	e, Acceptance-Rejection	tec	chnique					
		Unit – III			10 Hrs					
Simulation Ex	am	ples - Waiting Line Models, Simulating a	Single-Server Queue, S	imı	ulating a					
Queue with Tw	vo S	Servers, News Dealer's Problem								
General Princ	ipl	es - Concepts in Discrete-Event Simulation	n, The Event-Scheduling	ç /]	Гіте-					
Advance Algor	rith	m, Manual simulation using Event Schedu	ling							
		Unit – IV			09 Hrs					
Input Modelin	ıg ·	Parameter estimation, Goodness of Fit T	ests, Fitting a non-static	nar	ry Poisson					
process, Select	ing	Input models without data, Multivariate a	nd Time-Series input mo	ode	ls					
Verification a	ind	Validation - Model building, verificat	tion and validation, Ve	erif	ication of					
simulation mod	dels	, Calibration and validation of models								
		Unit – V			09 Hrs					
Estimation of	Ab	solute Performance								
Absolute mea	Absolute measures of performance and their estimation, Output analysis for terminating									
simulations, Output analysis for steady-state simulations- Initialization bias & Error estimation										
for steady stat	te s	simulation, Optimization via Simulation,	Case Studies - CPU	and	1 Memory					
utilization of th	ne c	omputer								

IV Semester

Self-Study Component											
Topics on latest	Topics on latest / Emerging technologies will be assigned. Students are required to read white										
papers, publications, patents and prepare a report, give a seminar on the study undertaken. The											
self study will	be reviewe	d and	evalua	ted by	an ex	pert pa	nel in	two p	hases a	ppointed	d by the
Director, MCA	Director, MCA										
Course Outcomes											
After going through this course the student will be able to											
CO1: Understand the fundamentals of Simulation and various simulation models using real world											
examples											
CO2: Design a simulation model for solving a real world Problem											
CO3: Apply diff	erent techn	iques f	or sim	ulation	mode	ls					
CO4: Evaluate	and analyze	e the re	sults o	f the S	imulati	ion mo	dels				
Reference Bool	KS										
1 Jerry Banks	John S. Ca	arson I	I, Barr	y L. Ne	elson, l	David I	M. Nic	ol, "Di	iscrete-F	Event Sy	stem
Simulation"	, Pearson E	ducation	on, 5^{th}	Editio	n, 201	3, ISBI	N: 978	-81-31	7-9699-	3 first	
impression											
2 Geoffrey G	ordon, "Sys	stem S	imulati	ion", P	earson	Educa	tion, 2	015, IS	SBN: 97	8933255	50247
Scheme of Continuous Internal Evaluation (CIE)											
CIE will consist of Two Tests, Two Quizzes and Self study. The test will be for 30 marks each.											
quiz and self stu	dy for 20 n	narks.	The to	tal mar	ks for	CIE (Ť	heory)	will b	e 100 m	arks.	,
Scheme of Sem	ester End	Evalua	ation (SEE)							
The question pa	per will be	for 10)0 mar	ks and	shall o	consist	of 10	questi	ons fron	n five ur	nits with
20 marks each.	Out of the	e 10 qu	uestion	s stude	ents ha	ive to	answei	five	question	is, select	ting one
from each unit.	The question	ons wil	ll have	Interna	al choi	ce with	n maxi	mum 3	sub div	visions. 1	Both the
questions shall	be of the sa	me cor	nplexi	ty in te	rms of	COs a	nd Blo	om's t	axonom	y level.	
Mapping of Co	urse Outco	omes (CO) to	Prog	ram O	utcom	es (PO)			
PC	1 PO	PO	PO	PO	PO	PO	PO	PO	PO10	PO11	PO12
	2	3	4	5	6	7	8	9			
CO1 H	M	L	-	-	-	-	L	L	M	M	М
CO2 M	M	-	-	M	-	-	-	L	-	-	-
CO3 M	M	M	M	L	-	M	M	L	M	M	М
CO4 L	H	L	H	-	-		M	M	M	L	-
Mapping of Co	urse Outco	omes(C	<u>.CO) to</u> 1	Prog	ram Sj	pecific	Outco	mes (I	<u>PSO)</u>		
<u> </u>		<u>PSO</u>	1					<u>PS</u>	02		
		<u>Н</u> и						<u>N</u>	/ <u>1</u> /		
CO_2											
CO4		I.						N	1		
H-High, M-Me	dium, L-L				1			10	-		

		Software Project N	lanagement						
Course Code	:	16MCA44	CIE Marks	:	100				
Hrs/Week	:	L:T:P:S 3:2:0:4	SEE Marks	:	100				
Credits	:	5	SEE Duration	:	3 Hrs				
Course Learn	ing	Objectives (CLO)			•				
Graduates shal	1 be	able to							
1. Understand	d t	he principles and components o	f software project manag	emen	t and its				
application	ns in	real life							
2. Apply project evaluation and programme management techniques									
3. Discover the processes involved in Project Planning, Project Cost and Risk Management									
4. Understand the techniques in project monitoring and control, manage people and imbibe									
Ethics									
		Unit – I			08 Hrs				
Introduction	to	Software Project Management	Introduction, Why is Se	oftwa	re Project				
Management i	mp	ortant?, What is a Project?, Softw	are Projects versus other ty	pes o	of Project,				
Contract Man	age	ment and Technical Project Man	agement, Activities covered	ed by	software				
project manag	em	ent, Plans, methods & Methodolog	gies, Some ways of category	rizing	Software				
Projects, Stake	hol	ders, Setting Objectives, The Busin	ess Case, Project Success an	d Fai	lure, What				
is Manageme	nt?	Management Control, Traditior	al versus Modern Projec	t Ma	anagement				
Practices									
Unit – II 08 Hrs									
Project Evalu	ati	on and Programme Managemen	t- Introduction, A Busines	s Cas	se, Project				
Portfolio Man	age	ment, Evaluation of individual pro	jects, Cost-Benefit Evaluati	on T	echniques,				
Risk Evaluati	on,	Programme Management, Mana	ging the allocation of re	sourc	es within				
Programmes,	Stra	tegic Programme Management, C	reating a Programme, Aids	to P	rogramme				
Management,	Son	ne reservations about Programme M	anagement, Benefits Manag	emen	t.				
		Unit – 111			08 Hrs				
An Overview	of	Project Planning-Introduction to	Step-wise Project Planning	, Step	0: Select				
Project, Step	l: I	dentify Project Scope and Objectiv	ves, Step 2: Identify Projec	t Infr	astructure,				
Step 3: Analyz	te F	roject Characteristics, Step 4: Iden	ify Project Products and Ac		es, Step 5:				
Estimate Effor	ts 1	or each activity, Step 6: Identify A	Activity Risks, Step /: Allo	cate I	Resources,				
Step 8: Review	//	<u>ublicize Plan, Step 9 & 10: Execute</u>	e Plan / Lower Levels of Plat	nning					
				• •	06 Hrs				
Activity Plan	nir	g-Introduction, The Objectives (of Activity Planning, Pro	ject :	Schedules,				
Projects and		ivities, Sequencing and Schedulin	ng Activities, Network Pla	inning Daalw	g Models,				
Formulating a	INC	tion work Model, Adding the time dim	ension, Forward Pass, The	Backy	ward Pass,				
activities Acti		an Arrow Networks	ng the Project duration, ide	nuryi	ng critical				
Bick Monage	mo	-on-Antow Indiwolks nt _ Risk Catagorian of Disk D	isk Identification Disk A	CACON	nent Diale				
Planning and L	nie Piel	Management	isk iuchunication, KISK AS	909911	iciit, KISK				
Monitoring and F	Planning and Kisk Management Monitoring and Control Introduction Creating the Example Collecting the Data Deview								
Project Termination Review Cost Monitoring Farned Value Analysis Prioritizing Monitoring									
Getting the Pro	biec	t back to Target Change Control S	oftware Configuration Man	ing ing Igeme	ent (SCM)				
	<u> </u>	Unit – V		0	06 Hrs				

• 4 3 4 C . ft-D 4

Managing People in Software Environments-Introduction, Understanding Behavior, Organizational Behavior: A Background, Selecting the right person for the job, Instructions in the Best methods, Motivation, The Oldham-Hackmann Job Characteristics Model, Stress, Health & Safety, Some Ethical and Professional Concerns

Software Quality- ISO 9126, Product and project metrics, quality plans

Course Outcomes

After going through this course the students will be able to

- CO1: Explain the practices and methods for successful software project management
- **CO2:** Identify techniques for requirement, policies and decision making for effective resource management
- CO3: Apply the evaluation techniques for estimating cost ,benefit, schedule and risk
- **CO4**: Devise a framework for planning software project management activites, risk, staffing, monitoring and control

Reference Books

- Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", Tata McGraw-Hill Education, Delhi, Special Indian Edition, 5th Edition, 2011, ISBN-13: 978-0-07-107274-8, ISBN-10: 0-07-107274-8
- 2. Harold Kerzer, "Project Management, A System approach to planning Scheduling & Controlling", John Wiley & Sons Inc., 11th Edition, 2013, ISBN 978-1-118-02227-6

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes, Tutorial and Self Study. The test will be for 30 marks each, quiz for 10 marks each and self study for 20 marks. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions, students have to answer five questions by selecting one from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO	PO10	PO11	PO12							
		2	3	4	5	6	7	8	9			
CO1	Н	Н	Н	М	М	-	Н	Μ	Μ	Μ	-	-
CO2	М	Μ	Н	Н	L	Μ	Н	Μ	-	Μ	-	-
CO3	М	Η	Μ	Н	-	L	Н	-	-	Μ	-	-
CO4	Н	L	Μ	Μ	Μ	Μ	Н	Μ	-	Н	_	_

Mapping of Course Outcomes(CO) to Program Specific Outcomes(PSO)

	PSO1	PSO2						
CO1	М	М						
CO2	М	М						
CO3	Н	Н						
CO4	Н	Н						
H-High, M-Medium, L-Low								

Scheme and Syllabi – 2016 Admission Batch

		Business Com	nunication						
Course Code	:	16MCA45	CIE Marks		:	100			
Hrs/Week	:	L:T:P:S 3:0:0:0	SEE Marks		:	100			
Credits	:	3	SEE Duration	on	:	3 Hrs			
Course Learning	Obje	ctives (CLO)							
Graduates shall be	able	to							
1. Identify the nee	ed and	l importance of Communic	ation						
2. Understand the	diffe	rent types of communication	on and apply efficiently						
3. Demonstrate Pr	resent	ations skills in an effective	manner						
4. Explore person	al and	d Interpersonal skills to imp	prove Group Communication	on					
5. Apply concise i	integr	cation of various aspects of	communication						
		Unit – I		()8 E	Irs			
Basics of Comm	unic	ation, Communication:	An Overview – Definit	itions,	N	ature and			
Attributes of Com	nunic	cation, Purpose of Commun	nication, Directions of Cor	nmuni	icati	ion, Types			
of Communication	i, Ki	nds of Communication N	etwork – Internal & Ext	ernal,	Ch	nannels of			
Communication, M	letho	ds of Communication – Ver	rbal and Non-Verbal						
Process of Comm	unica	ation- Objectives of Comm	nunication, Basic elements	of Co	omn	nunication			
process, Process of	Com	imunication, Models of Con	nmunication Process			— 22			
Effective Comm	unica	ation-Essentials of Effe	ctive Communication,	/Cs	of	Effective			
Communication, 4	ss of	Effective Communication,	IMPRESS Model	6 0					
Barriers to Con	nmui	nication–What is Miscor	nmunication? Barriers c	of Co	mm	iunication,			
Categorization of E	Sarrie	rs to Communication, Meth	nods of Overcoming Comn	nunica	ation	1 Barriers			
					08 1	Hrs			
Oral and Non-Ve	rbal	Communication- Oral P	resentation Skills – Maj	or Ar	eas	of Verbal			
Communications, I	Purpo	ose of Oral Presentation, St	ructuring the Presentation.	, Prep	arat	ion before			
Presentation, Start	ing a	Presentation, Introduction	to a Presentation, Patter	ms of	Pre	esentation,			
Types of delivery	' 1N	Oral Presentations, Organ	nizing the Presentation,	Main	boo	ly of the			
Presentation, Con		ng a Presentation, Basic	guidelines for designing	g the	Pre	esentation,			
Suggestion for Imp	rovir	g Presentation delivery		> '.cc		1 4			
Listening Skills	- De	finitions of Listening, In	portance of Listening, I	Jittere	ence	between			
Listening and Hea	aring,	Principles of good Liste	ning, Process of Listenii	ig, ba	ISIC	Listening			
modes, approaches	s to	Listening, Types of Liste	ening, Advantages of Lis	tening	g, E	sarriers to			
Creidelines for offe	, Coi	nmon faults of Listening,	Methods & Strategies to	impro	ove	Listening,			
Guidelines for elle	cuve	Listening, Ten Commandin	f Interview Essential for	tures	of	Intomiory			
Methods of Inter	ing iow	Stules of Interviewing	Tunes of Interview, Poss	ilules	01 Ioh	interview,			
Methods of Interview, Styles of Interviewing, Types of Interview, Possible Job interview									
Non-Vorbal Com	5 JOD	niterview questions	re of Non Varbal Commu	icatio	n E	Fasturas of			
Non Verbal Com	Non-Verbal Communication – Common Indicators of Non-Verbal Communication, Features of								
Paralanguage Ocu	lesics	Artifactics Tactilics / Har	ntics)	UNCIII	ics,	micsics,			
	100100	Unit – III		()7 F	Irs			

IV Semester

Wri	tten Communication – Part I						
Busi	iness Letters – Meaning of Business Letter, Essentials of a good Business Letter, Basic						
Considerations, Styles of a Letter Layout, Parts of a Business Letter,							
Тур	Types of Business Letters – Types of Business Letters, Differences between a memorandum and						
a Le	tter						
E-M	ail Writing –What makes E-mail different?, Origin, Structure of an E-Mail, Signatures,						
Туре	es of usage of E-Mail, E-Mail Abbreviations and Acronyms, Organizing E-mail messages,						
E-m	ail Etiquette, Tips for E-mail Effectiveness, Advantages and Limitations of E-mail						
Para	agraph Writing – What is a Paragraph?, Classification of a Paragraph, Building Paragraphs,						
5-Ste	ep Process to Paragraph Development, Prewriting Paragraphs, Coherence and Unity in						
Para	graph Writing						
	Unit – IV 07 Hrs						
Wri	tten Communication – Part II						
Job	Application and Resume Writing – Definition of a Job Application Letter, Features of Job						
App	lication Letter, Types of Job Application Letter, Contents of an Application Letter, Tips for						
Draf	ting an Application Letter, Checklist: Writing Job Application Letters, Resume, Resume vs.						
Curr	iculum Vitae, Types of Resumes, Potential Errors with Resume Writing, Essential Parts of a						
Resu	me, Ten Key Points in writing effective resume						
Rep	ort Writing – Definition of a report, Basic Features of a Report, Purpose of a Report,						
Requ	uirements of a Report, Characteristics of a good Report, Generally accepted Principles of						
Effe	ctive Report Writing, Types of Reports, Parts of a Report, Style of Reports, Report planning,						
Stag	es of Report Preparation, Tips on Report Preparation						
	Unit – V 06 Hrs						
App	lications						
Asse	rtiveness – Positive/Negative Thinking, Assertive Rights, Strategies for Assertive Behavior.						
India	cators of Assertive Behaviour. Success in Relationships. How to say No?. Mental Locks						
Bod	v Sport – Positive Gestures, Handshakes, The Gazes, Smiles, Hand Movements, Different						
Style	es of Walking, Voice Modulations						
Gro	up Discussions and Interviews–Group Discussions. Strategies for Group Discussions.						
Inter	views. Facing the Interview Board, Body Sport for Interviews, Negotiations						
Cou	rse Outcomes						
Afte	r going through this course the students will be able to						
COI	: Understand the need and significance of Communication						
CO2	: Comprehend the different types of communication in Organizations						
CO3	: Deliver Presentations effectively with positive group communication exchanges						
CO4	: Demonstrate Interpersonal skills proficiently and apply the concepts in Business						
	Environment						
Dofe							
Nele							
1.	Sathya Swaroop, Debasish, and Bhagaban Das, "Business Communication". PHI Learning						
2	Asha Kaul "Business Communication" PHI Learning Dut I to New Delhi 2nd Edition						
۷.	2010, ISBN: 978-81-203-3848-7						
3.	P D Chaturvedi and Mukesh Chaturvedi, "Business Communication: Concepts, Cases and						
	Applications", Pearson Education, 2 nd Edition, 2007. ISBN: 978-81-317-0172-7						
Sche	eme of Continuous Internal Evaluation (CIE) for Theory						
CIE	will consist of Two Tests. Two Ouizzes and Two assignments. The test will be for 30 marks						

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions, students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	L	М	-	Н	-	L	L
CO2	-	-	-	-	-	L	Μ	-	Н	-	-	L
CO3	-	-	-	-	-	L	Μ	Μ	Н	-	М	Μ
CO4	-	-	_	-	_	L	M	Μ	Н	-	Н	Н

Mapping of Course Outcomes(CO) to Program Specific Outcomes(PSO)						
	PSO1	PSO2				
CO1	Н	L				
CO2	М	L				
CO3	Н	L				
CO4	M	L				
H-High, M-Medium, L-Low						

MINOR PROJECT – I											
Course (Code	:	16MCA46		CIE Marks	:	100				
Hrs/Wee	ek :	:	L:T:P:S	0:0:10:0	SEE Marks	:	100				
Credits	:	:	05		SEE Duration	:	3 Hours				
Course I	Course Learning Objectives (CLO):										
Students	Students are able to										
1. Understand the method of applying computational knowledge to solve specific problems											
2. Apply	2. Apply software engineering and management principles while executing the project										
3. Denic 4 Identi	5. Demonstrate the skills for good presentation and technical report writing skills										
Identi	iry and s	30	<u>Ive complex computing</u>	UIDELINES	rolessionally preser	UCU	standards				
1. Each	project	gr	oup will consist of maxi	mum of two stud	ents						
The S	tudent s	sh	all undertake minor proj	ect- I depending	on the electives stud	ied i	n the previous				
semes	sters / R	es	search based / Industry O	Priented			-				
Each	student	/	group has to select a con	temporary topic	that will use the tech	nica	l knowledge				
of the	ir progr	ar	n of study after intensive	e literature survey	/						
2. Alloc	ation of	tł	ne guides preferably in a	ccordance with the	ne expertise of the fa	culty	/				
3. The n	umber o	of.	projects that a faculty ca	in guide would b	e limited to six						
4. The impl	amontat	0] ic	ect would be performed	in-nouse	ad out using the ras	21140	a available in				
the depar	tment/c	רר 10	lege	e preferably carri	ed out using the les	Juico	es avallable ill				
Course (Dutcom	es									
After goin	ng throu	1g	h this course the student	s will be able to							
CO1: C	Concepti	ua	lize, design and implem	ent solutions for	specific problems						
CO2: 0	Commur	nic	cate the solutions through	h presentations a	nd technical reports						
CO3: A	Apply re	sc	ource managements skill	s for projects							
CO4: S	Synthesiz	ze	e self-learning, team wor	k and ethics							
Scheme of	of Cont	in	uous Internal Examina	tion (CIE)			-				
Evaluatio	on of the	e 1	project work will be dor	he by the commi	ttee appointed by th	e dir	ector, Dept of				
MCA. If	n will b	nı	snould submit report on	hases	WOIK.						
Phase				tivity		7	Veightage				
Indse	Synop	si	s submission. Prelimina	arv seminar for	the approval of		10%				
-	selecte	d	topic and Objectives for	mulation							
II	Mid-te	err	n seminar to review	the progress o	f the work and						
	docum	e	ntation								
	•	Ι	Design and Simulation	n / Algorithm	development /		25%				
		F	Experimental Setup				2.5.01				
	•	(Conducting experiments	/ Implementation	/ Testing		25%				
III	Oral p	re	sentation				10%				
	Demor	1S	tration				20%				
Sahama	Project	ιľ	eport stor End Examination ((SFF)			10%				
The ovel	LOF Sem		ster Enu Examination (SEE) d External avom	iners. The following	T TUO	ightaga would				
The evaluation	The evaluation will be done by internal and External examiners. The following weightage would										

IV Semester

be given for the examination. Evaluation will be done in batches of 10 students.												
1.	Brief v	rief write-up about the project 05%										
2.	Presentation / Demonstration of the project 20%											
3.	3. Methodology and Experimental Results & Discussion 25%											
4.	Report	5									20%	
5.	Viva V	/oce									30%	
Mappi	ng of C	Course	Outcor	nes (CO	D) to P	rogran	1 Outco	omes (P	O)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Μ	Μ	Η	Η	Η	-	-	Μ	-	Н	Н	
CO2	-	-	-	-	Η	-	-	Н	Η	Н	-	
CO3	Η	Η	Μ	-	Μ	Μ	Н	Н	-	Μ	Н	
CO4	-	Η	-	-	-	Η	Μ	Μ	Μ	Н	-	
Mappi	ing of C	Course	Outcor	nes (CO	D) to P	rogran	1 Speci	fic Outc	omes (l	PSO)		
			PSC)1					PSO2			
CO1			Η						Μ			
CO2			-						L			
CO3			-						Μ			
CO4			М	-					М			
H-Hig	h. M-N	Iedium	L-Lo	w		•						

V Semester

DATA ANALYTICS									
	T	(Theory &	Practice)						
Course Code	:	16MCA51	CIE Marks	:	100+50				
Hrs/Week	:	L:T:P:S : 4:0:2:0	SEE Marks	:	100+50				
Credits	:	5	SEE Duration	:	3 Hrs				
Course Learning (Objeo	ctives (CLO)							
Graduates shall be a	able t	0							
1. Explore the fundamental concepts of data analytics									
2. Understand the	applı	cations using Map Reduce (Concepts						
3. Introduce progra	amm vario	ing loois PIG & HIVE in Ha	alization techniques						
+. Understand the	vario	Init – I			10 Hrs				
Hadaan Fundama	ntola	Umt – 1			10 111 5				
Data Data Analysi	and	storage Comparison with	other systems – Relational F	Jatah	ase Management				
Systems Grid Com	s and	g Volunteer Computing H	istory of Apache Hadoop	Jalau	ase management				
The Hadoon Distr	puun ibuto	g, volumeer Computing, m d Filo system	istory of Apache Hadoop						
The Design of HDE	IDUIC	DFS Concents – Blocks N	ame nodes and Data nodes. F	Rlock	Caching HDFS				
Federation HDFS I	Jigh	Availability	and houses and Data nodes, I	JIOCK	Caching, HDI 5				
The command-I ine	Inte	rface Hadoon File system –	Interfaces						
The Java Interface	– Re	ading data from Hadoon III	RL. Reading Data using File	svst	em API Writing				
Data Directories () Juerv	ing the File system Deleting	σ Data	5y5t	eni mi i, winnig				
Data Flow – Anator	nv of	a File Read. Anatomy of a	File Write, Coherency Mode	1					
Parallel Copying w	ith di	stcp – Keeping an HDFS clu	ister Balanced	•					
		Unit – II			10 Hrs				
Map Reduce – A	Weat	her Dataset – Data format, A	Analyzing the data with Unix	Too	ls, Analyzing the				
Data with Hadoop,	Scali	ng Out	, ,		, , , , ,				
Working of Map	Redu	ice – Anatomy of a Map F	Reduce Job Run, Failures, Sl	huffle	e and Sort, Task				
Execution		<i>y</i> 1	, ,		,				
Map Reduce Form	nats –	- Input Formats, Output Form	mats						
_		Unit – III			09 Hrs				
Pig Environment -	- Exe	cution types, Running Pig p	rograms, Grunt, Pig Latin Ed	litors					
An Example – Gen	erati	ng Examples, Comparison v	vith databases						
Pig Latin – Structu	Pig Latin – Structure, Statements, Expressions, Types, Schemas, Functions, Macros								
User-Defined Functions – A Filter UDF, An Eval UDF, A Load UDF									
Data Processing Operators – Loading and storing of data, Filtering data, Grouping and Joining data,									
Sorting data, Combining and splitting data									
Pig in Practice– Parallelism, Anonymous Relations, Parameter Substitution									
Unit – IV 09 Hrs									
Installing Hive – The Hive shell, An Example; Running Hive – Configuring hive, Hive services, the									

Comparison with Traditional Databases – Schema on Read Versus Schema on Write, Updates, Transactions and Indexes, SQL-on-Hadoop Alternatives

Hive QL – Data Types, operators and functions

Tables – Managed Tables and External Tables, Partitions and Buckets, Storage Formats, Importing Data, Altering Tables, Dropping Tables

Querying Data - Sorting and Aggregating, Map Reduce scripts, Joins, Sub queries, Views

Unit – V 10 Hrs

Data Visualization – I – Introduction, Techniques used for visual data representation, Types of data visualization, Applications of data visualization, visualizing big data, Tools used in data visualization, tableau products

Data Visualization with Tableau – Introduction to tableau software, tableau desktop workspace, Data analytics in tableau public, Using visual controls in tableau public

Unit – VI (Lab Component) PART A

1 --- HDFS

Review the commands available for the Hadoop Distributed File System:

- 1. Copy file foo.txt from local disk to the user's directory in HDFS
- 2. Get a directory listing of the user's home directory in HDFS
- 3. Get a directory listing of the HDFS root directory
- 4. Display the contents of the HDFS file user / fred / bar.txt
- 5. Move that file to the local disk, named as baz.txt
- 6. Create a directory called input under the user's home directory
- 7. Delete the directory input old and all its contents
- 8. Verify the copy by listing the directory contents in HDFS

2 --- Map Reduce

- 1. Create a Job and submit to cluster
- 2. Track the job information
- 3. Terminate the job
- 4. Counters in MR Jobs
- 5.Listing of Jobs

3 --- Pig

Using movie lens data

- 1. List all the movies and the number of ratings
- 2. List all the users and the number of ratings they have done for a movie
- 3. List all the Movie IDs which have been rated (Movie Id with at least one user rating it)
- 4. List all the Users who have rated the movies (Users who have rated at least one movie)
- 5. List of all the User with the max, min, average ratings against movies

4. Advanced Concepts in Pig

1. Group by movie and dump the result in a bag.

2.Write a pig script to find the sum of ratings of all movies

3.Write a pig script to find the total ratings done by all user to a movie and store the results in an output file in HDFS

5 – Extracts facts using Hive

Use movies lens data with added attributes Genere_id and Activity state column, perform the following queries using HiveQL. The Activity_State and Gener_id are as follows

Gener_id
1.ADVENTURE
2.ANIMATION
3.COMEDY
4.DRAMA
5.ACTION
6.THRILLER
7.CRIME
8.HORROR
9.MYSTERY
10.WAR

- 1.Write a query to select only those values which correspond to starting, browsing, completing, or Use a CASE statement to transform the RECOMMENDED column into integers where 'Y' is 1 and 'N' is 0. Also, ensure GENREID is not null. Only include the first 25 rows.
- 2. Write a query to select the User ID, movie ID, movie name for the activity COMPLETED_MOVIE.
- 3. Create the staging table
- 4. Load the results of the query 1 into the staging table

6. Consider the superstore data set https://community.tableau.com/docs/DOC-1236

a. Build a Bar Chart that displays total sales over four year period

b. Add totals to show the stacked bars

c. Build a bar chart view that displays a list of technology products and how much profit each has generated.

PART –B

All the Programs should be executed using R

1. Build a word cloud using text mining tools.

- Read a text file
- Create a corpus from the collection of text files
- Data Processing on the text files
- Convert the text file into term document matrix and create a data frame
- Making the word cloud

2. Social Network Analysis and Visualization

- Create a graph and plot the graph
- Show the various centrality scores such as degree, between's, closeness, Transitivity
- Show Neighbourhood of graph vertices
- Find Cliques
- Display maximal connected components of a graph
- Calculate cohesive blocks

3. Sentiment Analysis for products reviews using Customer Feedback

- Load the required data set
- Perform stemming and cleaning
- Display the sentiment score for Neutral, Positive polarity and Negative Polarity

Expected Course Outcomes

After going through this course, the students will be able to

CO1: Understand the fundamentals of data analytics techniques and platforms

- CO2: Design and Apply data analytics ecosystem and visualization techniques to solve various problems
- CO3: Analyze the results of data analytics and visualization for various problems
- **CO4**: Evaluate the solutions of data analytics ecosystems

Reference Books

-	
1	Tom White, "Hadoop – The Definitive Guide; Storage and Analysis at Internet scale", O'Reilly,
	Shroff Publishers & Distributers Pvt. Ltd., 4 th Edition, 2015, ISBN – 978-93-5213-067-2.
2	DT Editorial Services "Big Data – Black Book" Dreamtech Press, Edition – 2015, ISBN - 978-93-
	511-9-757-7.
3	Dirk deRoos, Paul C. Zikopoulos, Roman B. Melnyk, Bruce Brown, Rafael Coss "Hadoop for
	Dummies", John Wiley & Sons, Inc., 2014 ISBN: 978-1-118-60755-8 (pbk); ISBN 978-1-118-
	65220-6 (ebk); ISBN 978-1-118-70503-2 (ebk).
4	Nathan Marz and James Warren,"Big Data Principles and Best Practices of Scalable Real time data
	systems", 2015, ISBN 9781617290343.

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment. Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage of Part A is 70% and Part B weightage is 30%. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Μ	Η	Μ	Μ	L	-	L	L	-	-	-	-
CO2	Η	Μ	L	Μ	Μ	-	-	-	-	-	-	-
CO3	Η	Η	L	Μ	Μ	-	-	-	-	-	-	-
CO4	Η	Μ	L	Μ	L	-	-	-	-	-	-	-

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	М	М
CO2	Н	М
CO3	М	М
CO4	Н	М

H-High, M-Medium, L-Low

		V Semester	•							
		Elective V								
		Cloud Comput	ting							
(Theory and Practice)										
Course Code	:	16MCA521	CIE Marks	:	100+50					
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks	:	100+50					
Credits	:	5	SEE Duration	:	3 Hrs					
Course Learning (Dbj	ectives (CLO)								
Graduates shall be a	able	eto								
1. Familiarize the	ba	sic concepts of Infrastructure, Plat	form and Software serv	rices	5					
2. Understand the	: W(tua	braing of various applications, mod	ud resource							
4. Explore the var	riou	is security and security risks in the	cloud environment							
<u> </u>		Unit – I			10Hrs					
Introduction to C	lon	d Computing: Defining cloud co	mputingcloud_types	Т	he NIST model					
The cloud cube me	ode	L deployment models. Service	models. Examining t	he c	characteristics of					
cloud computing, r	ara	digm shift benefits of cloud com	outing, disadvantages	of c	loud computing.					
Assessing the role of	of o	pen Standards. Assessing the valu	e proposition. measuri	ng t	he cloud's value.					
early adopters and	l n	ew applications, the laws of cl	oudonomics, cloud c	omr	outing obstacles.					
behavioural factors	rel	ating to cloud adoption, measurin	g cloud computing cos	sts.	avoiding capital					
expenditures, right	t-siz	zing computing the total cost	of ownership, speci	fvin	g service level					
agreements, definin	g li	censing models	1 / 1	5						
		 Unit – II			10 Hrs					
Cloud Infrastruct	ire	- Cloud Computing at Amazon (Tloud Computing: the	Gor	ogle Perspective					
Microsoft Window	Az	ure and Online Services. Open-So	urce Software Platforn	1 fot	Private Clouds					
Cloud Storage Div	ersi	ty and Vendor Lock-in. Cloud C	omputing Interoperabi	lity:	The Intercloud.					
Energy Use and E	col	ogical Impact of large-Scale Dat	a Center. Service- and	d C	ompliance-Level					
Agreements, Respo	nsil	collity Sharing Between User and C	loud Service Provider							
8		$\frac{\text{Unit} - \text{III}}{\text{Unit} - \text{III}}$			08 Hrs					
Cloud Computing	: A	pplications and Paradigms-Chall	lenges for cloud compu	ating	g. Existing cloud					
applications and i	new	application opportunities. Arc	hitectural styles for	clo	ud applications.					
Workflows: Coordi	nat	ion of multiple activities, Coordin	ation based on a state	mac	hine model: The					
ZooKeeper, The Ma	apR	educe programming model, A cas	e study: The <i>GrepTheV</i>	Veb	application					
1 /	1	Unit – IV	J 1		10 Hrs					
Cloud Resource	Vir	tualization- Virtualization, Lave	ring and Virtualizatio	n, '	Virtual Machine					
Monitors, Virtual	Ma	chines, Performance and Securit	y Isolation, Full Virt	uali	zation and Para					
Virtualization, Har	dwa	are Support for Virtualization, C	ase Study: Xen, a VI	MM	Based on Para					
virtualization, Opti	miz	zation of Network Virtualization	in Xen2.0, vBlades:	Pa	ra virtualization					
Targeting an x86-6	54	Itanium Processor, A Performand	ce Comparison of Vir	tual	Machines, The					
Darker Side of Virt	uali	zation			<i>`</i>					

Unit – V	10 Hrs							
Cloud Security- Cloud security risks, Security: The top concern for cloud users,	Privacy and							
privacy impact assessment, Trust, Operating system security, Virtual machine security	, Security of							
virtualization. Security risks posed by shared images. Security risks posed by a management OS.								
Xoar: Breaking the monolithic design of the TCB, A trusted virtual machine monitor								
Unit – VI (Lab Component)								
Part – A								
1) Deploy an image into cloud using manual and command prompt method.								
2) Launch multiple instances using manual and command prompt method.								
3) Deploy the virtual drive in individual Virtual Machine for storage purpose.								
4) Create multiple Virtual Machines to communicate through SSH.								
5) Create a new user and grant the privilege to assign project in the cloud environment.	•							
Part – B								
1) Demonstrate Live Migration of Virtual Machine in Cloud.								
2) Analyze the status of VMs during down time in Live Migration.								
3) Create a new instance and associate the instance with floating IP address.								
4) Deploy the network with Virtual Local Area Network in cloud.								
5) Create a multiple router to communicate with each other by deploying in two different networks.	ent							
Note: Students can use Openstack to execute the programs								
Expected Course Outcomes								
After going through this course the student will be able to								
CO1: Understand the fundamental concepts of cloud computing environment								
CO2: Identify the various key enabling technologies for cloud computing								
CO3: Apply various programming models to cloud applications								
CO4: Compare the different cloud platforms to the cloud computing scenarios								
Reference Books								
1 Derrie Sociadry "Cloud Computing" Wiley Dypliching Inc. 2011 ISBN: 079 0 47	0.00256.9							
1. Barne Sosnisky, Cloud Computing whey Publishing Inc., 2011, ISBN: 978-0-470	J-90330-8.							
2. Dan. C. Marinescu," Cloud Computing Theory and Practice", 2016, Morgan	Kaufmann							
Publication, ISBN: 978-93-5107-094-8.								

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks. **Scheme of Continuous Internal Evaluation (CIE) for Practical**

CIE for the practical will be based on the performance of the student in the laboratory every week

for 10 marks for every experiment. Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage for Part A is 70% and weightage for Part B is 30%. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Mapp	Mapping of Course Outcomes (CO) to Program Outcomes (PO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	
CO1	Н	L		L			М		Μ	М	L	М	
CO2	L	М	Μ				Н	L		L		М	
CO3	М	L		М			L	Μ	Μ		L	L	
CO4	М	Н	L			=	М	L	L	L	М		
Manning of Course Outcomes(CO) to Program Specific Outcomes(PSO)													
	8			PSC	01	8	F	PSO2					
CO1				Н				М					
CO2				М				_					
CO3				L						Н			
CO4				-	- L								
H –Hi	gh, M-N	Aedium,	, L-Low										

		V Semester									
		Elective V									
Virtual Reality											
		(Theory and Practice))								
Course Code	:	16MCA522	CIE Marks	:	100+50						
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks	:	100+50						
Credits	:	5	SEE Duration	:	3 Hours						
Course Learning Objectives (CLO)											
Graduates shall	l be	able to									
1. Explain the co	once	pts and principles of Virtual Reality									
2. Understand the	ne ni	uances of designing for VR									
3. Explore the Fu	unda	mental issues of Virtual Reality									
4. Learn how to	buil	d VR applications in real World									
		Unit – I		Τ	8 Hours						
Introduction: W	/hat	is Virtual Reality? Virtual Reality Appli	cations.								
Virtual Reality	Ha	rdware: Oculus Rift, Other High End	Head Mounted Display	/S,	Gear VR,						
Google Cardboa	rd, V	/R Input Devices.									
Birds - Eye Viev	w: C	General Hardware, software, sensation ar	nd perception.								
Objects and Sca	ale:	Getting started with Unity- Starting a ne	w Unity project, The Un	ity	editor,						
The default worl	d sp	pace. Creating a simple diorama- Adding	a cube, Adding a plane,	Ad	ding a						
sphere and some	ma	terial, Changing the scene view, Adding	a photo, Colouring the g	rot	ind plane.						
*		Unit – II		1	10 Hours						
Objects and Sca	ale:	Measurement Tools- Keeping a unit cub	e handy, Using a Grid Pr	oje	ector,						
Measuring the E	than	character. Importing from the Blender I	Experiment: An introduct	tioi	n to						
Blender- A unit of	cube	A UV Texture image, Importing into U	nity. VR device integrati	on	software-						
Unity's built-in V	/R s	upport, The device-specific SDK.	, ,								
Geometry of Vi	rtua	l Worlds: Geometric modelling, Transf	ormation models, Matrix	A	gebra and						
2D rotations, 3D	rota	ations and Yaw, pitch and roll.	,		C						
		Unit – III		8	Hours						
Physics and the	En	vironment: Unity physics, Bouncy balls		_							
J Interlude – envi	iron	ment and things: Blender, An Elevator.	Jumping.								
Gaze-based Co	ntro	l: Ethan, the walker- Artificially intelli	gent Ethan. The Navme	sh	bakerv. A						
random walker i	n th	e town, Interlude – a quick introduction	to Unity programming, '	Th	e Random						
Position script, '	'Zor	nbie-ize" Ethan. Go where I'm looking-	The Look Move To scri	ipt,	Adding a						
feedback cursor,	Ob	servations. If looks could kill- The Kill	Target script, Adding par	rtic	ele effects,						
Cleaning up.											
		Unit – IV		1	2 Hours						
Visual Renderin	ng:	Visual rendering overview, Ray Tracing	g and Shading Models, F	₹as	terization,						
VK –Specific pro	oble	ms. 2D and 2D orientation tracking with a	amara								
Fracking: Track	ıng	2D and 3D orientation, tracking with a c	zamera.								

Unit – V	10 Hours
First-person Character: Understanding the Unity characters - The Camera con	nponent, The
Rigid body component, The Character Controller component, Unity Standard	Assets- Third
Person Controller, AI Third Person Controller, First Person Controller, Rigi	d Body FPS
Controller. Making a first person, User calibrations, Maintaining a sense of self,	Locomotion
Unit – VI (Lab Component)	
Port _ A	
1. Create a 3D object and Apply different geometric Transformations using Mouse	/Kevboard
2. Create animation for a 3D object(transformation, color, texture, ect)	j
3. Bouncing ball on multiple $2D/3D$ platforms	
4. Develop First Person Controller to a Scene	
5. Create a 3D Character movement	
6. Create a menu driven interface for adding and removing objects from a Scene	
7. Build a cubic room, whose sides are made out of six planes. The room should be	15x15x15
Unity units. At the center of the roof of the room, place a point source of light. T	his light
should change color by pressing the Tab key.	8
8. Finding target using 2D Raycaster	
9. Create a loading bar (health bar, progress bar, start bar)	
10. Create and show motion effect using time scale and scripts for 2D images.	
Part – B	
1. Design and Development of Simple VR Game	
a. Action Games	
b. Racing	
2. Design and Development of Story Telling	
a. Moral Stories	
b. Fiction Stories	
3. Design and Development of Virtual Tour	
a. Forest / Zoo	
b. Solar System	
4. Design and Development of Medical Application	
a. Animate different Organs	
b. Influence of viruses on human body	
5. Design and Development of Building Structure	
Note:	
Students should complete all programs of Part – A and any one program from Part –	B using
Unity tool.	
In the examination each student will pick one question from Part –A for execution a	nd
demonstrate one program from Part –B	

After going through this course the student will be able to:

CO1 : Understand the concepts of Virtual Reality and its Applications

CO2: Discuss the Principles of Virtual Reality

CO3: Demonstrate a virtual environment to captivate its experiences

CO4: Analyze the fundamental issues of virtual reality

Reference Books:

1	Tony Parisi, "Learning Virtual Reality, Developing Immersive Experiences and Applications
	for Desktop, Web and Mobile", 1st edition, 2015, O'Reilly Media, Inc., ISBN-13: 978-93-
	5213-257-7.
2	Jonathan Linowes," Unity Virtual Reality Projects", 1 st edition, 2015, Packt Publishing Ltd.,

ISBN 978-1-78398-855-6.

3 Steven M La Velle," Virtual Reality", copy right Steven M La Valle, 2017.

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment. Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage for Part A is 70% and weightage for Part B is 30%. One question from Part A to be executed and one from Part B to be demonstrated. Change of program is not permitted.

Mapping of Course Outcome (CO) to Program Outcome (PO)												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	Η	L	L	L	Μ	L	-	-	-	-	-	-
CO2	Н	Μ	М	L	Μ	-	-	-	L	-	L	-
CO3	-	-	Н	L	Η	-	-	Μ	Μ	-	L	-
CO4	-	L	L	Н	L	-	-	-	L	-	-	-

60

Mapping of Course Outcome to Program Specific Outcome (PSO)									
	PSO1	PSO2							
CO1	L	L							
CO2	L	L							
CO3	Н	Н							
CO4	М	Н							
H –High,	M-Medium, L-Low								

V Semester

		Electiv	e V							
Internet of Things										
<u> </u>	1	(Theory and)	Practice)	<u> </u>	400 50					
Course Code	:	16MCA523	CIE Marks	:	100+50					
Hrs/Week	:	L:T:P:S 4:0:2:0	SEE Marks	:	100+50					
Credits	:	5	SEE Duration	:	3 Hrs					
Course Learn	ing	g Objectives (CLO)								
Graduates shal	l be	e able to								
1. Learn t	he	basics of Internet of Things and its	applications							
2. Unders	tan	d lol principles, design and abstra	ction of developing lol system	ns						
4 Setup I	oT	connectivity using dashboards								
1. Setup I	01	Unit I			8Hrc					
Introduction (Unit - 1			01115					
Introduction (01	Electronics and services for Internet	of This as Internet of This		A multipation.					
Fundamentals	0I	Electronics and sensors for Intern	let of Things. Internet of Thir	igs A	Applications					
and Use cases, Network and Communication, Standards related to Internet of Things, Protocols in										
Unit – 11 10 Hrs										
Programming	W	ith Arduno: Understanding the	eco system of arduino, Pinou	it co	onfiguration.					
Digital input a	nd	output, Analog input and output,	working with sensors and act	tuato	ors. Arduind					
serial commu	inic	cation. Communication interfac	es (SPI and I2C) wired	an	id wireless					
communication	1 W	ith arduino and sensor data logging	g from arduino.		10.11					
D •					10 Hrs					
Programming	W	ith Raspberry Pi: Understandir	ig the eco system of Raspbe	erry	P13, P1nou					
configuration,	Di	gital input and output, working w	ith sensors and actuators. Ras	spbe	rry Pi seria					
communication	1. (Communication interfaces (SPI and	I I2C) wired and wireless com	mun	ication with					
raspberry Pi. S	Seri	al communication from raspberry	Pi to arduino.		1					
		Unit – IV			10 Hrs					
Programming	W	vith esp8266 (nodemcu): Unders	standing the eco system of	esp8	266, pinou					
configuration,	Di	gital, Analog input and output,	working with sensors and a	actua	ators. Seria					
communication	n fi	rom raspberry Pi to nodemcu, N	etwork configuration on esp8	3266	, wired and					
wireless comm	un	ication with nodemcu								
		Unit – V			10 Hrs					
IoT Application	on	Development and Integrating ser	nsors with IoT Dashboards							
NodeJS/Djang	0	Based web application develop	ment to monitor and contro	ol Io	oT devices					
Integration of A	Ada	afruit / Thinksboard and similar too	ols with sensors and actuators.							

Unit – VI(Lab Component)

Part – A

- 1. Write a program with Arduino UNO board to calculate the distance of a obstacle based on the Ultrasonic sensor inputs. If the distance calculated is less than a certain value turn on a buzzer / beeper with a LED in ON state and display the distance in LCD / OLED.
- 2. Write a program with Arduino UNO to indicate the level of temperature using the LEDs indicating the low, medium and high values of temperature (Red, Blue and Green) or Write a program with Arduino UNO to implement the interactive traffic signal.
- 3. Write a interactive python script on Raspberry Pi3 to implement the serial communication from Raspberry Pi to Arduino and vice versa with the following components.a) LED b) Buzzer c) Temperature and humidity sensor b) four channel relay
- 4. Write a python script on Raspberry pi to control servo motor and DC Motor based on the potentiometer meter and button switch inputs. Also, indicate the angle of the servo motor and change the color of RGB Led/Bulb.
- 5. Write a micro python script with esp8266 based nodemcu board to calculate the distance of an obstacle based on the Ultrasonic sensor inputs. If the distance calculated is less than a certain. value turn on buzzer / beeper with a LED in ON state and display the distance in LCD/ OLED.
- 6. Write a micro python script with esp8266 based nodemcu board to operate a 4 channel relay demonstrating minimal home automation.

Part – B

- 1. Integrate dashboard like Blynk /Adafruit /gobot /Thingsboards to any of the experiments in PART A.
- Note : nodemcu with lua and 4 channel relay can be used instead of micropython
- 2. Integrate Blynk / gobot / Thingsboard dashboard with arduino or Raspberry pi or nodemcu and proximity and ultrasonic sensor.
- 3. Develop a django dashboard to monitor and control the sensor and actuators used in PART A.
- 4. Develop a javascript based application to monitor power and water consumption with billing.

Expected Course Outcomes

At the end of the course the student will be able to

- **CO1:** Understand the architecture of Arduino, Raspberry Pi, nodemcu, arduino IDE, frameworks.
- **CO2:** Differentiate between various development boards, sensors and actutators, install NOOBS Ubuntu IoT Operating System and setup Raspberry PI, Arduino and nodemcu.
- CO3: Interacting with Arduino, Raspberry Pi and Nodemcu using python, JavaScript.
- **CO4:** Learn and Implement various IoT solutions practically.

Reference Books

- 1. Wizardr, "Exploring Arduino: Tools and Techniques for Engineering" 1st Edition Wiley, ISBN-10: 1118549368, ISBN-13: 978-1118549360.
- Derek Molloy, "Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux" 1st Edition, Wiley ISBN-13: 978-1119188681, ISBN-10: 1119188687.
- 3. Marco Schwartz," Internet of Things with ESP8266 ", 2016, Packt.

- 4. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", 2015, Orient Blackswan Pvt Ltd, ISBN: 8173719543.
- 5.Dominique D. Guinard & Vlad M. Trifa, "Building the Web of Things", Manning, ISBN 9781617292682.

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Continuous Internal Evaluation (CIE) for Practical

CIE for the practical will be based on the performance of the student in the laboratory every week for 10 marks for every experiment. Finally, the weekly evaluated marks will be consolidated for 40 marks. One test will be conducted at the end of the semester for 10 marks. The total marks for CIE (Practical) will be for 50 marks. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Scheme of Semester End Examination (SEE) for Practical

The total marks for SEE (Practical) will be 50 marks. Evaluation of SEE for the practical will be based on writing proper program, execution, proper results and viva voce. Weightage for Part A is 70% and Part B is 30%. One question from Part A and one from Part B need to be executed. Change of program is not permitted.

Mapping	Mapping of Course Outcomes (CO) to Program Outcomes (PO)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	L	L		L	L	_	Μ	_	М	М	L	
CO2	L	М	М		L		Η	L		L		
CO3	М	М	М	Μ	Μ	_	М		_	_	-	-
CO4	М	Н	Н	Μ	Η	L	Μ	L	L	L	М	М
	Mappi	ing of Co	ourse Ou	itcome	es(CO)	to Pr	ogram	n Speci	fic Ou	tcomes	(PSO)	
		Р	SO1			PSO2						
CO1			-			-						
CO2			L			L						
CO3			М						Μ			
CO4			Н			М						
H –High,	M-Mee	lium, L-	Low		ľ							

		V Semester								
		Elective VI								
Distributed and Parallel Computing										
Course Code	:	16MCA531	CIE Marks	:	100					
Hrs/Week	••	L:T:P:S 4:0:0:0	SEE Marks	:	100					
Credits	:	4	SEE Duration	:	3 Hrs					
Course Learning Ob	jecti	ves:								
Graduates shall be abl	e to									
1. Gain basic understa	ndir	g of fundamental concepts of distr	ributed and parallel con	nputir	ng					
2. Be able to identify	and	everage common distributed and p	parallel computing patt	erns						
3. Be able to properly	asse	ss efficiency and scalability of a d	istributed and parallel							
algorithm/application	on									
4. Become proficient	in us	ing different programming technic	ques to implement basi	c distr	ibuted and					
parallel computing	para	digms			10.11					
		Unit – I			10 Hrs					
Introduction to Dist	ribu	ted Computing– Introduction, D	efinition, Goals of Di	stribu	ted systems,					
Issues to Distributed s	syste	ms, Types of Distributed Systems	, Distributed System N	Models	s, Models of					
Middle ware				-						
Introduction to Para		Computing –Introduction, Comput	ting, Parallel Architect	ure, C	lassification					
based on architectura	al so	heme, Classification based on	Memory access, Perf	orman	ice Metrics,					
Parallel Programming	moc	els, Serial and Parallel Algorithm	is, Parallelism	<u> </u>	10.11					
~		Unit – II			10 Hrs					
Communication: Int	trodu	ction, Layered protocols, Rem	note Procedure Calls	, Ren	note Object					
Invocation, Remote	Met	nod Invocation, Message Orient	ted Communications,	Strea	m Oriented					
Communications	4 - 1		Destable	F 4	Clabel					
Resource Manageme	nt: 1	Resource management in Distribut	ed system, Desirable	Featur	es of Global					
Scheduling algorithm	, SC.	reach	Load Balancing appro	ach II	1 distributed					
system, Load Sharing	Арр	Unit III			10 Hrs					
Synchronization Day	1:00	tion and Distributed File System	Distributed Commu	ting)	10 111 5					
Synchronization, Kej	JIICa	reprint tion Distributed File System	al clock Election A	ung) looritk	ma Mutual					
Exclusion Centralised	l al a	rithm Distributed Mutual Exclusion	ion	igoriu	iiiis, Mutuai					
Poplication and Dist	i aig	ad File System	1011							
Replication Managem	ent	Distributed File system Case stu	dies							
Replication Managem	Unit IV 10 Hrs									
Distributed Memory	Pro	pramming with MPI (Parallel Co	omputing)		IVIIIS					
Getting Started. Trar	ezoi	dal Rule in MPI. Dealing with	I/O. Collective Con	ımuni	cation. MPI					
Derived data types. Pe	rfor	nance Evaluation of MPI program	s. A parallel sorting a	lgorith	m					
		Unit – V	<u> </u>	0	08 Hrs					

Shared Memory programming with Open MP(Parallel Computing)												
Getting Started, Trapezoidal Rule, Scope of Variables, Reduction Clause - Parallel for directive,												
More about Loops in openMP, Scheduling loops.												
Expected Course Outcomes												
After g	After going through this course the students will be able to											
	kealize	the nee	d of dis	tributed	and pa	rallel	computi	ng syste	ms and	techniqu	les .	
CO2: S	Summa	trize the	techniq	ues to h	andle c	compo	nents of	distribu	ited and	parallel	computir	ng
COS: A	Apply of and la	distribut	manag	ement (Commu	inicat	ion, Reso	burce, N	lemory	, File) tec	cnniques	to
	anule	uisuidui	eu allu	parallel od porfo	rmance	iiisiii of th	a corial d	dictribu	tad and	norallal r	rograme	
Referen	nco Re	oks		iu perio	mance	or un	= serial, (JISUIDU		paraner	nograms	
Kelere			• • •		1			<u> </u>	- 11	(())		
1	Arun Systei	Kulkarn ns", 2 nd	1, Nupu Edition	r Prasa , Wiley	d Giri, . Publica	Nikes. ation,	hi Joshi, 2017, IS	Bhusha BN: 97	an Jadha 8-81-26	av, "Para 5-6582-5	llel and I	Distributed
2	Peter S Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann Publishers – 2014 ISBN 978-93-80931-75-3											
3	Sunit	Mahair	n and S	laama S	hah "T	Vietrih	uted Cor	nnutino	" Seco	nd Editi	on Oxfor	·d
5	Unive	rsity Pre	III allu S	$N_{-10} \cdot 0$	198093	489	ISBN-1	11puting 3. 9780	1980934	180	JII, OXIOI	u
4	A 11		<u> </u>	11 10. 0	170075	107,	<u>1501(1.</u>	10		11 1	"NC	TT'11
4	Alber	t Y. Zon	haya, Ec	11tor, "F	arallel	and D	1stribute	d Comp	outing H	landbook	"McGra	aw-Hill,
	12RN	-13:978	-00/0/3	30205,	12BIN-1	10:00	/0/3020	2.				
CIE w each, q	ill con ill con uiz an	sist of 7 d assign	Two Tes ment fo	ernal Eve sts, Two or 10 ma	valuation O Quizz Marks eac	on (C) tes and th. The EE) f	lE) for 1 d Two as e total m	Theory ssignme arks for	ents. Th CIE (T	e test wi heory) w	ll be for ill be 100	30 marks) marks.
The qu	le of S	naper v	vill be f	\mathbf{x} and \mathbf{x}	marks a	nd sh	all consi	i y st of 10	auestia	ons from	five unit	s with 20
marks	each.	Out of t	the $10 c$	uestion	is. stude	ents h	ave to a	nswer f	ive questi	stions from	om each	unit. The
questic	ons wi	ll have I	nternal	Choice	with m	axim	ım 3 sub	divisio	ns. Bo	th the qu	estions s	hall be of
the san	ne con	plexity	in term	s of CO	s and B	loom	's taxono	my lev	el.	1		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Η	М	Μ	Н	L	-	L	-	-	-	L	-
CO2	Η	Н	Μ	L	Μ	-	L	L	-	-	L	-
CO3	Μ	Μ	Н	Н	Η	-	L	-	L	-	-	-
CO4	Η	Η	Η	Η	Η	-	L	-	L	-	L	-
Mapp	ing of	Course	Outcor	ne to P	rogran	n Spec	ific Out	come				
	P	SO1				P	SO2					
CO1	H					L	1					
CO2	H					Ν	1					
CO3	N	[H	[
CO4	N					H	[
H-Hig	h, M-	Medium	n, L-Lo	W								

		V Semest	ier		
		Elective –	VI		
		Service Oriented A	Architecture		
Course Code	:	100			
Hrs/Week	:	L:T:P:S 4:0:0:0	SEE Marks	:	100
Credits	:	4	SEE Duration	:	3 Hrs
Course Learni	ing	Objectives (CLO)			
Graduates shall	l be	able to			
1. Identify all t	func	lamental concept of Service-Orienta	tion.		
2. Analyze bas	ic F	Principles of service –Composibility.			
3. Use and con	npa	re different Service Technology.			
4. Apply concu	ırre	ncy, synchronization techniques to c	levelop J2EE and .NET real worl	d	
applications	•				
		Unit – I			10 Hrs
Orientation, Ye Orientation, Tl Patterns.	ester ne l	rday and Today, Applying Service- Four Characteristics of SOA, The	Orientation, The Eight Principle Four Common Types of SOA,	s (S(of Service- OA Design
		Unit – II			10 Hrs
Down the Bus Agnostic Capa Abstraction and	ines abili 1 Ta	s Problem, Functional Decompositi ity, Utility Abstraction, Entity A sk Services	on, Service Encapsulation, Agne Abstraction, Non-Agnostic Con	ost tex	ic Context, kt, Process
		Unit – III			10 Hrs
An Overview	of	Service Technology: SOAP-Based	Web Services, REST Services,	Co	omponents.
Service Virtua	liza	tion, Cloud Computing, API Ma	inagement, Model-Driven Soft	wa	re Design.
Semantic Web), E	Business Process Management, Co	omposition and Orchestration,	Μ	aster Data
Management,	Bus	iness Rule Engines, Social Netwo	rk Technologies, Mobile Comp	uti	ng, Agent-
Driven Archite	ctur	e, Event-Driven Architecture and Co	omplex Event Processing.		
		Unit – IV		_	10 Hrs
Enterprise Ap for Enterprise Software Platfo	plic Ap	cations: Learning Objectives, Archipplications, Solution Architecture is for Enterprise Applications.	tectural Considerations, Solution for Enterprise Applications bas	ı A ed	rchitecture on SOA
		Unit – V			08 Hrs
A Case Stud Maintenance, Architecture, T	l y: The he (Systems Landscape, New Mark Billing System, Strategic Consid Customer Profile Process.	eting Strategy, Corporate Cul derations, Cloud Adoption. Ne	tur W	e, Vehicle Reference

VC 4

Expected Course Outcomes

After going through this course the students will be able to

CO1: Understand the basic concepts of Service Orientation.

CO2: Analyze the SOA Architectural style, SOA strategies, model web services

CO3: Design, implement process of SOA in web service.

CO4: Apply the SOA operational style for the web services.

Reference Books

1 Thomas Erl, "Next Generation SOA: A Concise Introduction to Service Technology & Service-Orientation ", Pearson Education, 2014, 1st Edition, ISBN-978-0133859041.

² Shankar Kambhapaty, "Service –Oriented Architecture for Enterprise and Cloud Applications", 2nd Edition, Wiley India, 2012, ISBN-978-81-265-1989-7.

Scheme of Continuous Internal Evaluation (CIE) for Theory

CIE will consist of Two Tests, Two Quizzes and Two assignments. The test will be for 30 marks each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 marks.

Scheme of Semester End Examination (SEE) for Theory

The question paper will be for 100 marks and shall consist of 10 questions from five units with 20 marks each. Out of the 10 questions, students have to answer five questions from each unit. The questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall be of the same complexity in terms of COs and Bloom's taxonomy level.

Mapping of Course Outcomes (CO) to Program Outcomes (PO)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO1	Μ	Μ	L	L	L	-	L	H	Μ	-	L	L		
CO2	Μ	Μ	Η	М	М	-	L	H	Μ	-	L	М		
CO3	L	Η	L	Н	М	-	L	L	Н	-	Μ	М		
CO4	Μ	Μ	Η	М	Н	-	L	L	Н	-	Μ	L		
Mapping	g of Course	e Outcon	nes (CO) to Pro	gram S	Specifi	c Outc	omes	(PSO)					
	PSO1						PSO2							
CO1	Н						Н							
CO2	М						L							
CO3	M						L							
CO4	L	М	Μ											
H-High, M-Medium, L-Low														

		V Semester							
		Elective VI							
Data Warehousing & Data Mining									
Course Code: 16MCA533CIE Marks:									
Hrs/Week	:	L:T:P:S 4:0:0:0	SEE Marks	:	100				
Credits	:	4	SEE Duration	:	3 Hrs				
Course Learning Objectives (C	LO)							
Graduates shall be able to									
1. Introduce the basic concept	s (of Data Warehouse and Data	Mining techniques.						
2. Examine the types of the da	ata	to be mined and apply pre-p	rocessing methods	on ra	w data.				
3. Discover interesting patter	ns	, analyze supervised and uns	supervised models	and e	stimate the				
accuracy of the algorithms.			-						
		Unit – I			10 Hrs				
Introduction to Data Wareho	DU	se and OLAP Techniques:	Data Ware house.	Basi	c Concepts.				
Data Warehouse Modelling: D)at	a Cube and OLAP, Data W	arehouse -Design	and U	Jsage, Data				
Warehouse Implementation.			U		U /				
		Unit – II			12 Hrs				
Introduction to Data Mining	: \	Vhy Data Mining. What is D	ata Mining. What	kinds	of patterns				
can be mined. Which Technol	lo	vies are used. Which kinds	of applications are	targe	eted. Major				
Issues in Data Mining.	(·FF		····, -·-·j·-				
Getting to Know Your Data	a	and Data Pre-processing:	Data Objects and	Attri	bute types,				
Measuring Data Similarity and	D	issimilarity, Data Pre-proces	sing: An Overview	, Dat	a Cleaning,				
Data Integration, Data Reducti	or	: Overview of Data Reduction	on Strategies, Prin	cipal	Component				
Analysis, Attribute subset selec	ti	on, Clustering, Sampling.			I				
Unit – III									
Classification Basic Concepts	:	Basic Concepts							
Decision Tree Induction: Dec	isi	on tree induction, Attribute S	Selection Method,	Tree I	Pruning				
Bayes Classification Methods	: I	Bayes Theorem ,Naïve Bayes	ian Classification						
Rule Based Classification Te	ch	niques: Using IF-Then Rule	s for classification	, Rule	e Extraction				
from a Decision tree, Rule Indu	ict	ion using sequential covering	g algorithm		1137 (1 1				
Nodel Evaluation and Selection: Metrics for evaluating a classifier performance, Hold Method									
and Random sampling, Cross	V 8	indation, Comparing classifie	ers based on Cost-I	Bener	it and ROC				
Curves.					08 Uma				
UIIII – IV Acconition Mining Resig concents: Market Dealect Analysis Erection Item acts									
Association Mining Dasic College	ne	epts. Market Basket Analys	is, Fiequent field	5015, 1	losed hem				
Frequent Item set Mining	м	ethods: Apriori Algorithm	Generating Assoc	iation	rule from				
frequent item sets Improving	he	Efficiency of Apriori	Seneruing 115500	iution					
Pattern Evaluation Methods	:	Strong rules are not necess	arily Interesting. A	A con	nparison of				
Pattern evaluation methods.	•			- 201	-r				
		Unit – V			08				
					Hrs				

Cluster Analysis: Basic Concepts and Methods: Cluster Analysis, Partitioning Methods, Hierarchical Methods: Agglomerative v/s Divisive Hierarchical clustering, Distance measures in Algorithmic methods, Evaluation of Clustering

Expected Course Outcomes

CO1: Understand the components of data warehouse architecture and OLAP operations

CO2: Process raw data to make it suitable for various data mining algorithms

CO3: Apply Clustering, Classification, Rule mining algorithms to find patterns

CO4: Evaluate the different data mining algorithms using various metrics

Reference Books

1	Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining – Concepts and Techniques", 3 rd Edition, Morgan Kauffmann Publications, 2012, ISBN: 978-93-80931-91-3.
2	Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Addison Wesley, 2008, ISBN:978-81-317-1472-0.
3	G K Gupta, "Introduction to Data Mining with Case Studies", 2 nd Edition, PHI Learning Private Ltd, ISBN 978-81-203-4326-9.

Scheme of Continuous Internal Evaluation (CIE) for Theory

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Mapping of Course Outcome to Program Outcome														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO1	L	L	Н	Μ	Μ	-	L	-	-	-	L	-		
CO2	L	Μ	Μ	Μ	Н	-	L	-	-	-	М	-		
CO3	Μ	Η	Н	Η	Н	-	Μ	L	L	-	L	-		
CO4	Η	Μ	Μ	Η	Н	_	L	-	-	-	-	-		
Mapping of Course Outcome to Program Specific Outcome														
PSO1						P	PSO2							
CO1	Μ					L	L							
CO2	Μ					L								
CO3	Η					Μ	М							
CO4	L					L								
H-High, M-Medium, L-Low														
		V Se	mester											
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		Elect	ive VII											
		Wireless and I	Mobile Networks		100									
Course Code	:	16MCA541	CIE Marks	:	100									
Hrs/Week	:	4:0:0:0	SEE Marks	:	100									
Credits	:	4	SEE Duration	:	3 Hrs									
Course Learning	; Ob	jectives (CLO)												
Graduates shall be	e abl	e to												
1. Explore the de	esign	issues in wireless netwo	rks.											
2. Understand w	irele	ss and mobile network ar	d its applications in communi	cation er	ngineering									
3. Explore the va	iriou	s principles, concepts and	l design of wireless mobile con	mmunic	ations.									
4. Analyse the a	chite	ecture and protocols of w	ireless mobile networks											
		Unit – I			8 Hrs									
Fundamentals	of	Wireless Communi	cation: Digital Communi	cations,	Wireless									
Communication	Syst	em, Wireless Media,	Frequency Spectrum, Techn	ologies	in Digital									
Wireless Commu	nicat	ion, Wireless Communic	ations Channel Specifications	, Types	of Wireless									
Communication S	yste	ms.	L.											
		Unit – I	[10 Hrs									
Basics of Wirele	ss N	etworks: Wireless Netw	vorks, Wireless Switching Te	chnolog	y, Wireless									
Network Reference	e M	odel.	, C	U	5,									
Cellular Mobile	Wir	eless Networks: System	Design Fundamentals and	Propag	ation Path									
Loss Models- D	escri	ption of Cellular System	ns, Propagation Models for V	Vireless	Networks-									
Free-space Propag	gatio	n Model and Two-Ray C	round Reflection Model. Mob	ile Com	munication									
Antennas.														
		Unit – II	I		10 Hrs									
Second-Generati	on]	Mobile Networks-GSM	: Architecture and Protoc	ols-GSN	M Network									
Architecture, GSI	ΛM	ultiple Access Scheme, C	SSM Protocols and Signalling	Authen	tication and									
Security.		-												
3G-The Univer	sal	Mobile Telecommun	ication System (UMTS):	UMTS	S Network									
Architecture-Rele	ase,	UMTS Interfaces, UMT	S Networks Evolution, UM7	S FDD	and TDD,									
UMTS Channels,	UM	TS Network Protocol Are	chitecture											
		Unit – IV	7		10 Hrs									
Fundamentals o	f W	vireless Local Area N	etworks: IEEE 802.11, WI	LAN T	ransmission									
Technology, WL	AN	System Architecture, C	collision Sense Multiple Acc	ess wit	h Collision									
Detection: CSMA	/CD	, Collision Sense Multip	le Access with Collision Avoid	dance: C	CSMA/CA									
Future Trends: 1	Four	th Generation (4G) sys	tem and Beyond: Introduction	n, Desig	n Goals for									
4G and Beyond a	nd re	lated Issues - Orthogona	l Frequency Division Multipl	exing (OFDM), 4G									
Services and App	licati	ons, Challenges- Predict	ing the future of wireless Syste	ems										

					10 Hrs							
Security	Issues i	n Wire	less in `	Wirele	ess Sys	stem:	The N	leed fo	or Wir	eless Se	curity, a	attacks on
Wireless	network	s, Wired	l Equiva	lent P	rivacy	(WEP) Proto	ocol				
Drivers f	for 5G:	The 'Pe	ervasive	Conn	ected	World	d': 50	G Road	lmap,	10 Pilla	rs of 50	, The 5G
Internet	Introdu	ction, Ir	ternet o	of Thin	gs and	Conte	ext-Av	varene	ss, Net	tworkin	g Recon	figuration
and virtu		Suppor	t, MOD1	nty, Q	uanty	of Serv	vice Co	ontrol				
Expected	d of the		ines ha studa		ha ah	la tat						
At the en	d of the	course u		nt will	d at an	le lo:	ala4a d	40	-1			
		the bas	1c conce	epts an	a stand	ards r	elated	to wir	eless n	nobile n	etworks	•
CO2: EX	piore va	rious co	ncepts a	na prii	ncipies	usea	in wire	$\frac{1}{1}$	etwork	. • 1	1	
CO3: Bu	11d Know	viedge u	pon arci	ntectu	re and	protoc	2018 OF	wirele	ss mol	bile netv	works	
CO4: An	CO4: Analyze the design issues in wheless and mobile networks											
Reference Books:												
1 Dr. SunilKumar S. Manvi, Mahabaleshwar S.kakkasageri, "Wireless and Mobile Networks:												
Concepts and Protocol", Wiley India, ISBN: 978-81-265-2069-5, Reprint 2012												
2 Iti Saha Misra. Wireless Communications and Networks: 3G and Beyond. McGraw Hill												
Education (India) Pvt Ltd, ISBN – 13:978-0-07-015140-6, 2013.												
3 Georgios I. Papadimitriou, Andreas S. Pomportsis, P. Nicopolitidis, Mohammed S. Obaidat												
"Wireless Networks", Publisher-John Wiley & Sons, ISBN- 0470858028, 2003												
4 Rodriguez, Jonathan, ed. Fundamentals of 5G mobile networks. Publisher- John Wiley &												
Sons, ISBN: 9781118867525, 2015												
Scheme of	of Conti	nuous I	nternal	Evalu	ation	(CIE)	for Tl	heory				
CIE will	consist c	of Two T	Tests, Ty	vo Qui	izzes a	nd Tw	o assig	gnmen	ts. The	e test wi	ll be for	30 marks
each, qui	z and as	ssignme	nt for 1	0 mar	ks eac	h. The	e total	marks	for C	CIE (The	eory) w	ill be 100
marks.	60						TIL					
Scheme of The ques	tion nan	or will h	I Exam	ination	n (SEE	L) IOT	I neor	y stof1(tions fr	om five	unite with
20 marks	each C	but of the		o mai	KS and s stude	nts he	ve to	answe	r five	auestion	s from	each unit
The ques	tions wil	l have I	nternal (Choice	with r	naxim	100 100	sub div	visions	. Both t	the quest	tions shall
be of the	same co	mplexity	in term	ns of C	Os and	d Bloo	m's ta	xonom	y leve		1	
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	-	L	Μ	-	L	Μ	L	-	-	Μ	-	-
CO2	T.	T.	-	н	н	L	_	_	_	м	_	_
			м				тт			М		
COS	-	IVI	IVI	н	IVI	н	н	-	-	IVI	-	-
CO4	L	L	Η	H	Н	Μ	L	-	-	Μ	-	-
Mapping	g of Cou	rse Out	come to) Prog	ram S	pecifi	c Outo	come				
CO\PSO)			PSO1	l					PSC)2	
CO1				Μ						H		
<u>CO2</u>				M				M				
						H						
			T a	L						Μ		
H –High	, wi-we	uium, L	-LOW									

			V Semester			
			Elective VII			
		Princip	les of UI / UX Design			
Course Code	:	16MCA542		CIE Marks	:	100
Hrs/Week	:	L:T:P:S 4:0:0:0		SEE Marks	:	100
Credits	••	4		SEE Duration	:	3 Hrs
Course Learnin	ng O	bjectives (CLO)				
Graduates shall	be a	ble to				
1. Understand t	he ba	asics of user interface	e and user experience design	1		
2. Develop vari	ous	design skills in UI a	nd UX			
3. Evaluate qua	lity o	of service in UI desig	n / user experience process	and technical doc	ume	ntation
4. Establish ind	ividu	al and collaborative	skills in design-based probl	em solving		
		τ	J nit – I			10 Hrs
Introduction to) Use	er Interface Design I	Process:			
Usability of l	[nter	active Systems: In	troduction, Usability Goa	als and Measure	s, l	Jsability
Motivation, Uni	ivers	al Usability, Guidelir	ne, principles, and theories,	Managing Design	n Pr	ocesses:
Introduction, (Orga	nizational Design t	to support Usability, Th	ne Four Pillars	of	Design,
Development	meth	nodologies, Ethnogi	raphic Observation, Part	ticipatory Design	n, S	Scenario
Development						
		U	nit – II			10 Hrs
Evaluating Int	erfa	ce Design: Introduct	tion, Expert Reviews, Usab	ility Testing and I	Labo	ratories,
Survey Instrum	ents,	Acceptance tests, E	valuation during Active Us	se, Controlled Psy	chol	logically
Oriented Exper	rime	nts. Direct Manipu	llation and Virtual Env	ironments: Intro	duct	ion, 3D
Interfaces, Men	u S	election, Form Fillin	ng and Dialog Boxes: Intr	oduction, Task-R	elate	ed Menu
Organization, S	Singl	e Menus, Combina	tion of Multiple Menus,	Content Organi	zatio	on, Fast
Movement The	roug	h Menus, Data En	try With Menus, Form	Filling, Dialog	Box	xes and
Alternatives, Au	ıdio	Menus and Menus fo	r Small Displays			
		U	nit – III			10 Hrs
Quality of Serv	vice:	Introduction, Models	s of Response-Time Impact	ts, Expectations a	nd A	ttitudes,
User Productivi	ty, V	ariability in Respons	se time, Balancing Function	on and Fashion: 1	Intro	duction,
Error Message	s, N	Non-anthropomorphic	e Design, Display design	n, Window Desi	gn,	Colour.
Information S	earc	h: Introduction, Se	earch in Textual Docume	nts and Databas	e Q	uerying,
Multimedia doc	ume	nt searches, advanced	l filtering and Search Interfa	aces		
		U	nit – IV			08 Hrs
User Experien	ce D	esign: Introducing U	Jser Experience, From proc	luct design to use	r ex	perience
design, Designi	ng f	for experience, User	experience and the web,	Building from bo	ttom	n to top,
Elements of use	r exp	perience				
		U	$\operatorname{Init} - \mathbf{V}$			10 Hrs

Strategy Plane: Product Objectives, Business goals, Brand Identity ,Success Metrics and												
Jser Segmentation, Usability and User Research, Creating Personas												
Surface Plane: Sensory Design, Defining the Surface, Making Sense of the Senses, Contras	st and											
Uniformity, Internal and External Consistency, Color Palettes and Typography, Design Comp	s and											
Style Guides.												
Case Study: To explore the UI/UX using Wire framing /Prototyping tools												
Expected Course Outcomes												
After going through this course the student will be able to												
CO1: Understand the theoretical foundations and awareness of User Interface and User												
Experience design												
CO2: Identify and Apply various Design Skills in UI and UX for real world Applications												
CO3: Demonstrate Quality of Service in UI Design strategies / Approaches and Techn												
documentation Process												
CO4: Evaluate UI/UX design Process/ artifacts for building products												
Reference Books												
1 Ben Shneiderman, Plaisant, Cohen, Jacobs, "Designing the User Interface", Pearso												
Education, 2014, 5 th Edition, ISBN-10: 9332518734, ISBN-13: 978-9332518735												
2 Jesse James, "The Elements of User Experience: User-Centred Design for the Web",	New											
Riders Publishers, 2 nd Edition, 2011, ISBN-10: 0321683684 ISBN-13: 978-0321683687	<i>'</i> .											
3 Bill Buxton, "Sketching User Experiences: Getting the Design Right and the Right Des	ign",											
Morgan Kaufmann, 2007, ISBN-10: 0123740371 ISBN-13: 978-0123740373.	gan Kaufmann, 2007, ISBN-10: 0123740371 ISBN-13: 978-0123740373.											
4 Jeffrey Rubin, Dana Chisnell, "Handbook of Usability Testing: How to Plan, Design	ffrey Rubin, Dana Chisnell, "Handbook of Usability Testing: How to Plan, Design, and											
Conduct Effective Tests", Wiley India Private Limited, 2 nd edition, 2008 ISB	N-10:											
8126516909, ISBN-13: 978-8126516902.												
Scheme of Continuous Internal Evaluation (CIE) for Theory												
CIE will consist of Two Tests. Two Ouizzes and Two assignments. The test will be for 30 t	narks											
each, quiz and assignment for 10 marks each. The total marks for CIE (Theory) will be 100 m	arks.											
Scheme of Semester End Examination (SEE) for Theory												
The question paper will be for 100 marks and shall consist of 10 questions from five units wi	th 20											
marks each. Out of the 10 questions, students have to answer five questions from each unit	. The											
questions will have Internal Choice with maximum 3 sub divisions. Both the questions shall	be of											
the same complexity in terms of COs and Bloom's taxonomy level.												
Mapping of Course Outcomes (CO) to Program Outcomes (PO)												
PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO1	2											
CO1 M L L M M - L - L L L .												
	M L L M M - L - L L L -											
CO2 M M M L L - M - M L M												
CO2 M M M L L - M - M L M - CO3 M L M L L - L - M L M - <td></td>												
CO2 M M M L L - M - M L M	- - - -											
CO2 M M M L L - M - M L M CO3 M L M L L - L - M <td>- - -</td>	- - -											
CO2 M M M L L - M - M L M CO3 M L M L L - L - M - M CO3 M L M L L - L - M - M CO4 M M M M - M - M - M - M Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO) PSO1 PSO2	-											
CO2 M M M L L - M - M L M CO3 M L M L L - L - M - M - M CO3 M L M L L - L - M <th< td=""><td>-</td></th<>	-											
CO2 M M M L L - M - M L M CO3 M L M L L - L - M - M - M CO3 M L M L L - L - M <th< td=""><td>-</td></th<>	-											
CO2 M M M L L - M - M L M CO3 M L M L L - L - M - M - M CO3 M L M L L - L - M - N - N - N - N N - N - N - N - <th< td=""><td>-</td></th<>	-											
CO2 M M M L L - M - M L M CO3 M L M L L - L - M - M - M CO3 M L M L L - L - M - N - N - N - N - N - N - N - N <th< td=""><td></td></th<>												

H-High, M-Medium, L-Low

			V Semester			
			Elective VII			
		Se	oft Computing			
Course Code	:	16MCA543		CIE Marks	:	100
Hrs/Week	:	L:T:P:S 4:0:0:0		SEE Marks	:	100
Credits	:	4		SEE Duration	:	3 Hrs
Course Learni	ng O	bjectives (CLO)				
Graduates shall	be a	ble to				
1. Understand	the l	earning algorithms us	ing neural networks.			
2. Differentiat	e bet	ween Classical Sets a	nd Fuzzy Sets			
3. Apply fuzzy	log	ic to solve real world	problems.			
4. Apply gene	tic al	gorithm to solve optim	nization problems			
		U	nit – I			10 Hrs
Artificial Neur	al N	etwork: Fundamenta	l Concept – Artificial Neur	al Network, Biolo	gica	l Neural
Network, Brain	n Vs	Computer; Importan	t Terminologies of ANNs	- Weights, Bias	, Th	reshold.
Learning rate,	Mon	nentum Factor, Vigila	ance Parameter, Notations:	Back Propagation	on N	letwork-
Theory, Archite	ectur	e, Flow chart for Tra	ining Process, Training Al	lgorithm, Learnin	g Fa	ctors of
Back Propagat	ion	Network, Testing Al	lgorithm of Back Propaga	ation Network, H	Radia	al Basis
Function Netwo	ork, T	Fime Delay Neural Ne	etwork.	,		
		Ū.	nit – II			10 Hrs
Introduction t	o Fi	izzy Logic, Classica	l Sets and Fuzzy Sets:	Introduction to F	uzzy	/ Logic,
Classical Sets -	- Ope	erators on classical set	ts, Fuzzy Sets- Fuzzy Set O	perations, proper	ties of	of Fuzzy
Sets.	1		ý 5 5	1 /1 1		2
Classical Relat	tions	and Fuzzy Relation	s: Introduction, Cartesian	Product of Relation	on, C	Classical
Relation – Card	linali	ty of Classical Relation	on, Operations on Classical	Relations, Proper	ties	of Crisp
Relations, Com	posi	tion of Classical Rela	ations; Fuzzy Relations - C	Cardinality of Fuz	zy F	Relation,
Operations on H	Fuzzy	Relations, Properties	s of Fuzzy Relations, Fuzzy	Composition.	5	,
^	~	UI	nit – III	1		10 Hrs
Member Func	tions	: Introduction, Featur	es of the Membership Fund	ctions, Fuzzificati	on, l	Methods
of Membership	Val	ue Assignments – In	tuition, Inference, Rank O	rdering, Angular	Fuz	zy Sets,
Neural Network	ks, G	enetic Algorithms, In	duction Reasoning.			-
		U	nit – IV			08 Hrs
Defuzzification	ı: La	mbda-Cuts for Fuzzy	Sets, Lambda-Cuts for Fuz	zzy Relations, De	fuzz	ification
Methods – Max	k-Me	mbership Principle, C	Centroid Method, Weighted	Average Method	, Me	ean-Max
Membership, C	entre	of Sums, Centre of L	argest Area, First of maxin	na.		
		U	nit – V			10 Hrs

Gen Natu Opti Arti: Wor Gen Enco Basi	Genetic Algorithms: Biological Background – The Cell, Chromosomes, Genetics, Reproduction, Natural Selection; Traditional Optimization and Search Techniques – Gradient-Based Local Optimization Method, Random Search, Stochastic Hill Climbing, Simulated Annealing, Symbolic Artificial Intelligence; Genetic Algorithm and Search Space – Search Space, Genetic Algorithms World, Evolution and Optimization, Evolution and Genetic Algorithms, Basic Terminologies in Genetic Algorithm – Individuals, Genes, Fitness, Populations; Operators in Genetic Algorithm – Encoding, Selection, Crossover, Mutation; Stopping Condition for Genetic Algorithm Flow – Basic Individual, Worst Individual, Sum of Fitness, Median Fitness											roduction, sed Local Symbolic Igorithms ologies in gorithm – n Flow –	
Expected Course Outcomes													
Afte	r goin	ig throu	igh this	s course	the stu	idents v	will be	able to					
CO	1 :Und	erstand	l the fu	ındame	ntals of	f Soft c	omputi	ng app	roaches	and de	emonstra	te the b	asic
	fun	ctional	ities										
CO	2: Apj	ply the	soft co	mputin	g techn	iques t	o solve	proble	ms				
CO.	3: Ana	alyze th	ne resul	ts of so	ft com	outing	techniq	ues to l	nandle	various	problen	18	
CO4:Evaluate the solutions of soft computing algorithms for optimization													
Reference Books													
1 S. N. Sivanandam, S. N. Deepa, "Soft Computing', Wiley Publishers, 2 nd Edition, 2015, ISBN – 978-81-265-2741-0.													
2	B K	Tripa	thy J	Anura	dha "Se	oft Cor	nputing	y Adva	nces ar	d App	lications	" 2015	Cengage
-	Learning India Pyt I to ISBN-13: 978-81-315-2619-4 ISBN-10: 81-315-2619-4												
3	Farl Gose Richard Johnson Baugh Steve Jost "Pattern Recognition and Image Analysis"												
5	Pearson 2015 ISBN: 978-93-325-4979-1												
4	Iom	$\frac{301}{20}$	ndorso:	$\frac{11.7}{11.7}$	Introdu	otion t	$\frac{1}{2}$	al Nota	orko"	Drontio	o Holl o	f India	CDN 91
4	203	1251 Q	inder so	n, An	muouu			al inclw	UIKS,	Fiende		i illuia, i	SDIN-01-
Sch	203-	$\frac{1331-6}{\mathbf{f} Cont}$	inuous	Intern	al Eva	luatior		for T	JAORY				
CIE	will (n Com	of Two	Tests	Two (Juizzes	and T		ionmen	te The	test wil	1 be for	30 marks
each		and as	sionme	ont for 1	0 mark	zuizze: cs.each	The to	ntal mai	rks for	CIE (T	heory) w	ill be 10	0 marks
Sch	eme o	f Seme	ster Fi	nd Eva	minati	on (SF	(\mathbf{F}) for	Theory	w		neory) w		o marks.
The	auest	ion nar	er will	be for	100 m	on (DL arks an	d shall	consist	$\frac{1}{10}$	mestio	ns from	five uni	ts with 20
marl	ks eac	ch. Out	of the	10 que	stions.	studen	ts have	e to ans	wer fiv	ve ques	tions from	m each	unit. The
ques	stions	will ha	ve Inte	rnal Ch	oice w	ith max	ximum	3 sub c	livision	s. Bot	h the que	estions s	hall be of
the s	same o	comple	xity in	terms o	f COs	and Blo	om's t	axonor	nv leve	1	n nie qu	conono c	
Mar	oping	of Col	irse Oi	itcome	s (CO)	to Pro	gram (Outcor	nes (P())			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CC)1	М	Н	М	М	L	-	L	L	-	-	-	-
CC)2	Н	М	L	М	М	-	-	-	-	-	-	-
CC)3	Н	Н	L	М	М	_	-	-	-	-	-	-
CC)4	Н	M	L	M	L	_	_	-	-	_	_	_
	-		1	<u> </u>			1	1	1		1	1	
Map	oping	of Cou	irse Oi	itcome	s (CO)	to Pro	gram	Specifi	c Outc	omes (l	PSO)		
	PSO1 PSO2												
CC	CO1 M						М						
CC)2	Н								М			
CC)3	М								М			
CC)4	Н М											

H-High, M-Medium, L-Low

V Semester

Minor Project– II										
Course (Code	:	16MCA55		CIE Marks	:	100			
Hrs/Wee	k	:	L:T:P:S	0:0:10:0	SEE Marks	:	100			
Credits		:	05		SEE Duration	:	3 Hours			
Course I	learni	ng	Objectives (CLO):							
Students	are abl	e to	C							
1. Understand the method of applying computational knowledge to solve specific problems.										
2. Apply software engineering and management principles while executing the project.										
3. Demonstrate the skills for good presentation and technical report writing skills.										
4. Identify and solve complex computing problems using professionally prescribed standards.										
GUIDELINES										
1. Eac	h proje	ect	group will consist of ma	ximum of two stu	idents					
2. The	Stude	ent	shall undertake minor	project- II deper	nding on the elect	ives	studied in the			
prev	vious s	em	esters / Research based /	Industry Oriente	d					
3. Eac	h stud	lent	t / group has to selec	t a contemporar	ry topic that will	use	the technical			
kno	wledge	e of	f their program of study a	after intensive lite	erature survey					
4. Allo	ocation	l of	the guides preferably in	accordance with	the expertise of the	facu	lty			
5. The	numb	er o	of projects that a faculty	can guide would	be limited to six					
6. The	minor	. pr	oject would be performe	d in-house						
The impl	ementa	atic	on of the project must be	preferably carrie	ed out using the res	ource	es available in			
the Depar	rtment	/col	llege							
Course (Jutcon	nes								
After goi	ng thro	bug	h this course, the student	ts will be able to						
CO1 : Co	nceptu	aliz	ze, design and implemen	t solutions for spe	ecific problems					
CO2 : Ap	ply pro	ojeo	ct and resource managem	ents skills consic	lering the societal c	oncer	rns			
CO3: Ex	hibit tl	ne s	solutions through present	ations and techni	cal reports					
CO4: Syr	nthesiz	ze s	elf-learning, Team Work	and ethics						
Scheme of	of Con	tin	uous Internal Examina	tion (CIE)						
Evaluatio	on of th	ne j	project work will be don	e by the commit	tee appointed by th	e Dir	ector, Dept of			
MCA. Th	ne stud	ent	should submit report on	the mini project	work.					
Evaluatio	n will	be	carried out in THREE P	hases.						
Phase			Act	ivity		V	Neightage			
Ι	Syno	psis	s submission, Prelimina	ary seminar for	the approval of		10%			
	select	ed	topic and Objectives for	mulation						
II	Mid-1	err	n seminar to review	the progress of	f the work and					
	docui	ner	ntation							

	•	Design	and sir	nulation	n / algo	rithm d	levelop	ment / e	xperime	ental	250	V-	
		setup						•			25%	⁄0	
	•	Conduc	eting ex	perime	nts / 1m	plemen	tation /	testing			23%	/0	
III	Ora	l nreser	itation								100	/6	
	Den	nonstrat	tion							20%			
	Proi	lect ren	ort								109	0 /0	
Scheme	for S	emeste	r End I	Examin	nation (SEE)					107	0	
The eva	luation	n will h	e done	by Inte	ernal an	d Exte	rnal ex	aminers	The fo	llowing	weightag	e would	
be giver	n for th	ne exam	ination	. Evalu	ation w	ill be d	one in l	batches c	of 10 stu	idents.	in orginae	,e would	
1. Brie	f write	e-up abo	out the	project					05%				
2. Pres	entatio	on / Der	nonstra	tion of	the pro	iect			20%				
3. Met	hodolo	bodology and Experimental Results & Discussion 25%											
4. Rep	ort	ort 20%											
5. Viva	a Voce	•							30%				
Mappir	ng of C	Course	Outcor	nes (CO	D) to P	rogran	o Outco	omes (PO	D)				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	М	Μ	Н	Η	Μ	-	-	М	-	Н	М	L	
CO2	-	-	-	-	Μ	Μ	-	Н	Μ	Н	-	-	
CO3	М	Μ	Н	-	Μ	-	-	I	Μ	-	Μ	-	
CO4	-	Μ	-	-	-	Η	Μ	-	Μ	-	Н	-	
Mappir	ng of C	Course	Outcon	nes (CO	D) to P	rogran	ı Speci	fic Outc	omes (l	PSO)			
			PSC)1					PSO2	1			
CO1			H						Μ				
CO2			L						L				
CO3			-				M						
CO4			Μ						Μ				
H-High	High, M-Medium, L-Low												

		Ţ	VI Semester			
		Μ	lajor Project			
Course Cod	e :	16MCA61		CIE Marks	: 150)
Hrs/Week	:	L:T:P:S	0:0:46:0	SEE Marks	: 150)
Credits	:	23		SEE Duration	: 3I	Iours
Course Lea	rning	Objectives:	•			
The students	shall	be able to				
1. Understa	and the	e method of applying tec	hnical knowledg	ge to solve specific pro	blems.	
2. Apply so	oftwar	e engineering and manag	ement principle	s while executing the	project	
3. Demonst	trate g	ood verbal presentation a	and technical rep	oort writing skills		
4. Identify	and s	solve complex applicati	on / research o	priented problems usi	ing prof	essionally
prescribe	ed star	idards				
		(GUIDELINES			
1. Major pr	oject	will have to be done by c	only one student	in his / her area of inte	erest	
2. Each stu	dent h	as to select a contempor	ary topic in the	area of application or	research	n that will
use the te	echnic	al knowledge and skill s	et	inductory on on oncon	ization .	with maion
3. The proj	from	the Director Department	$\frac{1}{100} \frac{1}{100} \frac{1}$	industry of all organ	Ization v	with prior
4 The cand	lidate	must maintain and subm	it weekly projec	rt work diary duly sign	ued hv th	e internal
and exter	rnal gi	ide to verify the regular	ity of the studen	t	ica by th	
5. Internal	Evalua	ation of the project work	will be done by	the evaluation comm	littee apr	ointed by
the Direc	ctor, D	Department of MCA.	5		11	5
6. The star	ndard	duration of the project	is for 5 mont	h duration, however	if the e	evaluation
committe	ee of t	he department, after the	assessment feel	that the work is insut	fficient a	ind it has
to be ext	ended	, then the student will have	ave to continue a	as per the directions of	the com	mittee.
7. Students	are m	andatorily required to pu	blish in reputed	journals/ conferences	•	
Course Out	comes	5:				
After going	throug	this course the student	s will be able to			
CO1: Conce	eptuali	ize, design and implement	nt solutions for s	pecific problem define	ed.	
CO2: Comm	nunica	te the solutions through	presentations an	d dissertation report.		
CO3: Apply	v proje	ect and resource manager	nent skills, profe	essional ethics and soc	ietal con	cerns.
CO4: Exhib	it self	-learning, lifelong learning	ng skills towards	s sustainable solutions	<u>.</u>	
Scneme of (Jontin	uous Internal Examina	LUON (CIE)	valuation committee	will oor	nnrice of
Evaluation v	ember	e carried out in THREE	$\Delta MC\Delta$	evaluation committee	will coi	iipiise oi.
guide and m	embel	CIE Phase wise Evalua	ntion of Activiti	es for Major Project		
Phase	<u>a</u>		Activity	.1		Marks
fth 1	Synop	osis submission, Prelimin	ary seminar for	the approval of select	ed topic	10
5 th week	and of	ojectives formulation.	he program of 1	a mail and do and	ation	
10 th wool		erm seminars to review t	ne progress of the	ie work and document	ation –	40
10 week	• <u>S</u> R	s and algorithm develop	ment			40

	• Design and simulation/ experimental set up												
III	(Conduct	ting exp	perimei	nts / im	plemen	itation /	[/] testing	5			20	
15 th we	ek I	Demons	tration									20	
	Ι	Disserta	tion Re	eport								20	
In CIE,	cand	idate m	ust sco	re 50%	to take	up SE	E.						
Scheme for Semester End Evaluation (SEE): The evaluation will be done by ONE Senior faculty / Internal Guide from the department and ONE External member from Academia / Industry / Research Organization. The following weightages would be given for the examination. Evaluation will be done in batches, not exceeding SIX students. Evaluation will be done individually and marks distribution is as below a. Relevance of the project - 25													
h. Derived Standard mith menerative the method in the derive (Dereventh (and better viewed) 50													
b. Project Standard with respect to the post-graduation / Research/application oriented- 50										50			
c. Fin	al Tes	sting and	d Resul	lts with	conclu	sion					-	25	
d. Viv	a-voc	e									-	50	
Mappi	ng of	Course	Outco	omes (C	CO) to	Progra	m Out	comes	(PO)				
	P	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
	01												
CO1	Н	Н	Н	М	L	М	L	-	-	-	L	L	
CO2	-	-	-	-		Μ	-	М	Н	-	-	-	
CO3	-	-	-	-	L	Μ	Μ		-	Н	L	-	
CO4	-	-	-	-	L	Μ	Η	Μ	-	-	Н	L	
Mappi	ng of	Course	Outco	omes (C	CO) to	Progra	ım Spe	cific O	utcome	s (PSO)			
	PSO1						PSO2						
CO1	Н									Н			

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М

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CO2

CO3

CO4

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Η

				Seminar						
Course Code	:	16MCA62			CIE Marks	:	50			
Hrs/Week	:	L:T:P:S	0:0:4:0		SEE Marks	:	00			
Credits	:	2			SEE Duration					
 The students shall be able to: Understand the technological developments in the chosen field of interest Explain the scope of work and challenges in the domain area Analyze technological developments of societal concerns, project management and sustainability Demonstrate presentation and report writing skills GUIDELINES The seminar presentation shall be done by individual students. The topic for seminar should be in one of the thrust areas relevant to industry or on-going research with in-depth technical review and analysis The topic can also be an extension of the Major project The student must be able to highlight or relate the technological developments with societal relevance and sustainability The students must mandatorily address professional computing practices relevant to the topic of study Each student shall make an attempt to perform financial / cost analysis or apply project management tools as related to his/her topic of study 										
After going thr	nes	h this course	, the student	will be able to:						
CO1 . Identify t	nug oni	cs in recent	trends in cou	mouting technolog	τV					
CO2: Perform 1	ite	rature / mark	xet / product	survey and analyz	y e information in the	fiel	d of study			
CO3: Exhibit of	rea	ative thinkin	g abilities	survey and anaryz		1101	a of staay			
CO4: Demonst	trat	e presentatio	on and report	t writing skills						
 Scheme of Continuous Internal Evaluation (CIE): Evaluation would be carried out in TWO phases. The evaluation committee shall comprise of TWO senior faculty members. The evaluation criteria shall be as per the rubrics given below: Rubrics for Evaluation: Topic – Technical Relevance, Sustainability and Societal Concerns 15% 										
 Enerature R Presentation 	evi i Sl	ew cills				239 359	~ 6			
• Report						25%	6			

VI Semester

Map	pping of Course Outcomes (CO) to Program Outcomes (PO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	-	М	Μ	М	Μ	Н	Н	-	-	L	Μ	-	
CO2	L	Μ	-	-	-	-	-	-	-	Н	-	-	
CO3	-	L	Μ	-	Н	L	L	-	-	-	Μ	-	
CO4	-	-	-	-	-	L	L	Μ	Η	-	-	-	
Mappi	ng of (Course (Dutcom	es (CO)	to Prog	gram Sj	pecific	Outcon	nes (PS	O)			
			PSO1			PSO2							
CO1			Μ						L				
CO2			L						L				
CO3		L							L				
CO4		L					L						