M.Sc. Computer Science Syllabus AFFILIATED COLLEGES Program Code: 32K 2023 – 2024 onwards **BHARATHIAR UNIVERSITY**

(A State University, Accredited with "A++" Grade by NAAC, Ranked 21st among Indian Universities by MHRD-NIRF)

Coimbatore - 641 046, Tamil Nadu, India

Program Educational Objectives (PEOs)									
The M.Sc. CS program describe accomplishments that graduates are expected to attain within									
five to set	ven years after graduation								
DEO1	To enrich the students with the clear picture of the course objectives and to map								
I LOI	their requirements.								
PEO2	To enable the students, to understand the core concepts, visualize and to apply								
TLO2	them in the real time scenarios.								
DEO3	To impart the need for consistent learning, importance of research & development								
FLO3	for the welfare of the society and to the nation at large.								



Program Specific Outcomes (PSOs)								
After the	After the successful completion of M.Sc. CS program, the students are expected to							
PSO1	Able to analyze, design and develop problem solving skills in the discipline of computer science.							
PSO2	Acquire evaluation of potential benefits of alternative solution in designing software and/or hardware systems in broad range of open source programming languages to withstand technological changes.							
PSO3	Able to pursue careers in IT industry/ consultancy/ research and development, teaching and allied areas related to computer science.							
PSO4	Adapt to the continuous technological change in computational science and update themselves to meet the industry requirements and standards.							
PSO5	Apply the practices and strategies of computer science for software project development to deliver a quality software product and contribute to research in the chosen field and perform effectively.							



Program	Program Outcomes (POs)								
On succe	On successful completion of the M.Sc. CS program								
PO1	Develop creativity and problem solving skills with the knowledge of computing and mathematics.								
PO2	Ability to develop and carry out experiments, interpret and infer data.								
PO3	Design algorithms and develop software to aid solutions to industry and governments.								
PO4	Review the latest technology and tool handling mechanism.								
PO5	Analyze the outcome to solve global environment related issues.								
PO6	Apply the knowledge in lifelong learning journey to equip themselves.								
PO7	Identify the perspective of business practices, risks and limitations.								
PO8	Work with professional and ethical values.								
PO9	Formulate the responsibilities of human rights and entrepreneurial spirit.								
PO10	Understand the methods to communicate effectively and work collectively.								



BHARATHIAR UNIVERSITY :: COIMBATORE 641 046

M. Sc. Computer Science (*Affiliated Colleges*) (*Effective For the candidates admitted during the academic year -2023 – 2024 & onwards*)

REVISED SCHEME OF EXAMINATIONS – CBCS PATTERN

Course	Course CodeTitle of the CourseCreditsHoursTheoryPractical		ours	Ma	ximum]	Marks				
Code			Theory	Practical	CIA	ESE	Total			
FIRST SEMESTER										
13A	Paper I : Analysis & Design of Algorithms	4	5		25	75	100			
13B	Paper II : Object Oriented Analysis and Design & C++	4	5		25	75	100			
13C	Paper III : Python Programming	4	5		25	75	100			
13D	Paper IV : Advanced Software Engineering	4	5		25	75	100			
13P	Practical I : Algorithm and OOPS Lab	4		5	40	60	100			
13Q	Practical II : Python Programming Lab	தலைக்கழக 4	.9.	5	40	60	100			
	SECC	ND SEMI	ESTER							
23A	Paper V : Data Mining and Warehousing	4	4		25	75	100			
23B	Paper VI Advanced Operating Systems		Ver4	^{ar} G _i 6	25	75	100			
23C	Paper VII Advanced Java Programming	Coimbatore 4 இந்தப்பாரை இ	-winit - Ball		25	75	100			
23D	Paper VIII : Artificial Intelligence & Machine Learning	4	4		25	75	100			
2EA/2EB /2EC/2E D	Elective – I Multimedia and Its Applications / Embedded Systems / Internet of Things / Critical Thinking, Design Thinking and Problem Solving	4	4		25	75	100			
23P	Practical III: Data Mining Lab using R	4		5	40	60	100			
23Q	Practical IV: Advanced Java Programming Lab	4		5	40	60	100			
	Total	28	20	10						

	THI	RD SEME	STER					
33A	Paper IX : Digital Image Processing	4	4		25	75	100	
33B	Paper X: Cloud Computing	4	4		25	75	100	
33C	Paper XI: Network Security and Cryptography	4	4		25	75	100	
33D	Paper XII : Data Science & Analytics	4	4		25	75	100	
3EA / 3EB / 3EC / 3ED	Elective – II Mobile Computing / Block Chain Technology / Web Services / Robotic Process Automation for Business	4	4		25	75	100	
33P	Practical V: Digital Image Processing Lab using MATLAB	4		4	40	60	100	
33Q	Practical VI : Cloud Computing Lab	4		4	40	60	100	
33R	Practical VII : Web Application development & hosting	2 		2	20	30	50	
	Total	30	20	10				
473.1	FOUR	RTH SEM	ESTER		50	150%	200	
4/V	Project work and Viva-voce	8	15		50	150*	200	
	Grand Total 90 2250							
	ONL	INE COU	RSES	JOL J	1	1	Γ	
1.	#SWAYAM / MOOC	2 imbatore	in the Col					
2.	#Job oriented Certificate course	^இ ந்தட்2ாரை இ EDUCATE TO ELEN						

* Project Evaluation – 100 marks & Viva Voce – 50 marks in ESE

During II or III Semester (Optional)

ELECTIVE – I

- 1.1. Multimedia and its Applications
- 1.2. Embedded Systems
- 1.3. Internet of Things
- 1.4. Critical Thinking, Design Thinking and Problem Solving

ELECTIVE-II

- 2.1. Mobile Computing
- 2.2. Block Chain Technology
- 2.3. Web Services
- 2.4. Robotic Process Automation for Business



Course code		ANALYSIS & DE	SIGN OF	L	Т	Р	C			
		ALGORITH	MS		-	-				
Core/Elective/Su	ipportive	Core		4			4			
Pre-requisite	2	Basic Data Structures & Al	gorithms	Syllat Versi	ous ion	2021	-22			
Course Objectives:										
The main object	tives of thi	course are to:								
 Enable the students to learn the Elementary Data Structures and algorithms. Presents an introduction to the algorithms, their analysis and design Discuss various methods like Basic Traversal And SearchTechniques, divide and conquer method, Dynamic programming, backtracking Understood the various design and analysis of the algorithms. 										
Expected Cour	se Outcon	25:								
On the succes	ssful comp	tion of the course, student wi	ll be able to:							
Get know 1 Demonst technique	wledge ab trate speci e.	out algorithms and determi c search and sort algorithm	nes their time co is using divide and	omplex d conq	ity. Juer	K1,ŀ	٢2			
2 Gain goo	d understa	ling of Greedy method and it	s algorithm.			K2,ł	٢3			
3 Able to d	escribe abo	it graphs using dynamic prog	ramming technique.			K3,ł	ζ4			
4 Demonst	trate the co	cept of bac <mark>ktracking & branc</mark> l	h and bound technic	que.		K5,K6				
5 Explore t	he traversa	and searching technique and	apply it for trees an	d grapl	ıs.	ŀ	ζ6			
K1 - Rememb	ber; K2 - U	iderstand; K3 - Apply; K4 - A	Analyze; K5 - Evalu	ate; K	6 - Cr	eate				
TT:4-1		INTRODUCTIO	N		1	5 ha				
Introduction: - Asymptotic Nor Search Tree - H	Algorithm tations - E eap – Heaj	Definition and Specification ementary Data Structure: Sta sort- Graph.	- Space complexin cks and Queues - 1	ty-Tim Binary	e Coi Tree	nplex - Bin	ity- ary			
Unit:2	TI	AVERSAL AND SEARCH	TECHNIQUES		1	5 ho	urs			
Basic Traversal Divide and Con	And Sear quer: - Ger	h Techniques: Techniques fo eral Method – Binary Search -	r Binary Trees-Tec – Merge Sort – Qui	hnique ek Sort	s for	Grapl	15 -			
Unit:3		GREEDY METHO	D		1	5 ho	urs			
The Greedy Method: - General Method – Knapsack Problem – Minimum Cost Spanning Tree – Single Source Shortest Path.										
Unit:4		DYNAMIC PROGRAM	MING		1	5 ho	urs			
Dynamic Progra Binary Search T	Unit:4DYNAMIC PROGRAMMING15 hoursDynamic Programming - General Method – Multistage Graphs – All Pair Shortest Path – Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.									

U	13 hours										
Bac Har	Backtracking: - General Method – 8-Queens Problem – Sum Of Subsets – Graph Coloring – Hamiltonian Cycles – Branch And Bound: - The Method – Traveling Salesperson.										
	nit:6	Contemporary Issues	2 hours								
E	xpert lectur	res, online seminars – webinars									
		Total Lecture hours	75 hours								
Т	'ext Books										
1	Ellis Hore	owitz,"Computer Algorithms", Galgotia Publications.									
2	Alfred V.	Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algo	orithms".								
R	eference B	ooks									
1	Goodrich	, "Data Structures & Algorithms in Java", Wiley 3rd edition.									
2	Skiena,"7	The Algorithm Design Manual", SecondEdition, Springer, 2008									
3	AnanyLe Asia, 200	vith,"Introduction to the Design and Analysis of algorithm", Per 3.	arson Education								
4	Robert S Addison-	edgewick,Phillipe Flajolet,"An Introduction to the Analysis of Wesley Publishing Company,1996.	of Algorithms",								
R	elated Onl	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://np	tel.ac.in/courses/106/106/106106131/									
2	https://ww	ww.tutorialspoint.com/design and analysis of algorithms/index.h	<u>tm</u>								
3	https://ww	ww.javatpoint.com/daa-tutorial									
		HIAR UN									
C	ourse Desig	gned By:									
		EDUCATE TO ELEVATE									

2571	1010		T 22-	
	1115	10.5	I EV R	

Mapping with Programming Outcomes											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	М	S	М	S	L	М	L	S	М	
CO2	S	S	S	S	S	М	S	М	S	М	
CO3	S	S	S	S	S	М	S	М	S	М	
CO4	S	S	S	S	S	М	S	М	S	М	
CO5	S	S	S	S	S	М	S	М	S	М	

Course code		OBJECT ORIENTED ANALYSIS AND DESIGN & C++	L	Т	Р	С			
Core/Elective/S	Supportive	Core	4			4			
Pre-requisi	te	Basics of C++ and Object Oriented Concepts	Syllal Versi	ous on	2021-	-22			
Course Objec	tives:								
The main obje	ctives of thi	s course are to:							
 Present the object model, classes and objects, object orientation, machine view and model management view. Enables the students to learn the basic functions, principles and concepts of object oriented analysis and design. Enable the students to understand C++ language with respect to OOAD 									
Expected Cou	rse Outcor	nes:							
On the succe	essful comp	letion of the course, student will be able to:			1				
1 Underst techniqu	and the cues	concept of Object-Oriented development and	mode	ling	K1,I	Κ2			
2 Gain kn	lowledge ab	out the various steps performed during object des	ign		K2,I	K3			
3 Abstrac	t object-bas	ed views for generic software systems			ŀ	ζ3			
4 Link O	OAD with O	C++ language			K4,I	Κ5			
5 Apply t	he basic con	ncept of O <mark>OPs and familiarize to writ</mark> e C++ progra	ım		K5,I	K6			
K1 - Remen	nber; K2 - U	Inderstand <mark>; K3</mark> - Apply; K4 - Analyze; K5 - Evalu	iate; K	6 - C1	reate				
T T •4 4	1								
Unit:1					15 no	urs			
The Object M Applying the O Objects.	lodel: The Dbject Mod	Evolution of the Object Model – Elements of el. Classes and Objects: The Nature of an Object -	the O – Relat	bject ionsh	Mode ip am	ıl − ong			
Unit:2		CLASSES AND OBJECTS			15 ho	urs			
Classes and Ol Objects. Class –Key Abstract	bject: Natur ification: Thi ions and Mo	e of Class – Relationship Among classes – The In he importance of Proper Classification –identifyir echanism.	terplay	of cl ses ar	asses id obje	and ects			
Unit:3		C++ INTRODUCTION		-	15 ho	urs			
Introduction to Functions in C	Introduction to C++ - Input and output statements in C++ - Declarations -control structures – Functions in C++.								
Unit:4]	INHERITANCE AND OVERLOADING		-	13 ho	urs			
Classes and O Inheritance – F	bjects –Cor Pointers and	nstructors and Destructors –operators overloading Arrays.	g –Typ	e Co	nversi	on-			

٦

U	nit:5	POLYMORPHISM AND FILES	15 hours								
Memory Management Operators- Polymorphism – Virtual functions – Files – Exception Handling – String Handling - Templates.											
U	Unit:6 Contemporary Issues 2 hours										
E	xpert lectur	res, online seminars – webinars									
I		Total Lecture hours	75 hours								
Т	ext Books										
1	"Object (Pearson I	Driented Analysis and Design with Applications", Grady Booch, S Education.	Second Edition,								
2	"Object Indian Pr	-Oriented Programming with ANSI & Turbo C++", Ashok N.k int -2003, Pearson Education.	Kamthane, First								
Re	eference B	ooks									
1	Balaguru	samy "Object Oriented Programming with C++", TMH, Second Ed	ition, 2003.								
R	elated On	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://on	linecourses.nptel.ac.in/noc19_cs48/preview									
2	https://np	tel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/									
3	https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis_htm										
		a and a hard									
C	ourse Desi	gned By:									
		Saving Combatore Co									

Mapping with Programming Outcomes											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	М	S	М	S	М	S	S	
CO2	S	S	S	М	S	М	S	М	S	S	
CO3	S	S	S	М	S	М	S	М	S	S	
CO4	S	S	S	М	S	М	S	М	S	S	
CO5	S	S	S	М	S	М	S	М	S	S	

Course code PYTHON PROGRAMMING L T											
Core/Elective/Su	ipportive	Core	4			4					
Pre-requisite	;	Basics of any OO Programming Language	Syllal	ous	2021-2	22					
Course Objectives:											
The main objectives of this course are to:											
 Presents an introduction to Python, creation of web applications, network applications and working in the clouds Use functions for structuring Python programs Understand different Data Structures of Python Represent compound data using Python lists, tuples and dictionaries 											
Expected Cour	se Outcon	nes:									
On the succes	sful compl	letion of the course, student will be able to:									
1 Underst	and the ba	sic concepts of Python Programming			K1,	K2					
2 Underst	and File of	perations, Classes and Objects			K2,1	K3					
3 Acquire	Object Or	riented Skills in Python			K3,1	K4					
4 Develop	web appl	ications using Python			I	K5					
5 Develop	Client Serv	ver Networking applications			K5,1	K6					
K1 - Rememb	ber; K2 - U	Inderstand; K3 - Apply; K4 - Analyze; K5 - Evalu	iate; K	6 - C	reate						
Unit:1		INTRODUCTION ?			15 ho	ours					
Python: Introdu Comparison.	uction – N	umbers – <mark>Strings – Variables – List</mark> s – Tuples –	Dictio	onario	es – So	ets–					
Unit:2		CODE STRUCTURES			15 ho	ours					
Code Structures: IS hours Code Structures: if, elseif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.											
Unit:3	Μ	IODULES, PACKAGES AND CLASSES			15 ho	ours					
Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. Objects and Classes: Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.											
Unit:4		DATA TYPES AND WEB			13 ho	ours					
Unit:4DATA TYPES AND WEB13 hoursData Types: Text Strings – Binary Data. Storing and Retrieving Data: File Input/Output – Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores.13 hours											
Web: Web Clients – Web Servers – Web Services and Automation											

U	nit:5	SYSTEMS AND NETWORKS	15 hours								
Sys	Systems: Files –Directories – Programs and Processes – Calendars and Clocks.										
Cor	ncurrency:	Queues - Processes - Threads - Green Threads and gevent - twist	ed – Redis.								
Net	works: Pa	tterns - The Publish-Subscribe Model - TCP/IP - Sockets - Ze	roMQ –Internet								
Serv	vices – We	eb Services and APIs – Remote Processing – Big Fat Data and	d MapReduce –								
Woi	rking in the	Clouds.									
	nit:6	Contemporary Issues	2 nours								
E	xpert lectu	es, onine seminars – weomars									
		Total Lecture hours	75 hours								
Т	'ext Books										
1	Bill Luba	movic, "Introducing Python", O'Reilly, First Edition-Second Relea	ise, 2014.								
2	Mark Lut	z, "Learning Python", O'Reilly, Fifth Edition, 2013.									
R	eference B	ooks									
1	David Edition,2	M. Beazley, "Python Essential Reference", Developer's L 009.	ibrary, Fourth								
2	SheetalT Approac	aneja,Naveen Kumar, "Python Programming-A n",PearsonPublications.	Modular								
R	elated On	line Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://w	ww.programiz.com/python-programming/									
2	2 <u>https://www.tutorialspoint.com/python/index.htm</u>										
3 <u>https://onlinecourses.swayam2.ac.in/aic20_sp33/preview</u>											
	A HIAR UNITED &										
C	ourse Desi	gned By:									
		EDUCATE TO ELEVATE									

Mapping with Programming Outcomes												
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	S	М	S	S	S	М	Μ	S	М		
CO2	S	S	S	S	S	S	S	Μ	S	М		
CO3	S	S	S	S	S	S	S	М	S	М		
CO4	S	S	S	S	S	S	S	М	S	М		
CO5	S	S	S	S	S	S	S	М	S	М		

Course codeADVANCED SOFTWARE ENCINEEDINCLT											
Core/Elective/S	Supportive	ENGI	Core		4			4			
Pre-requisit	te	Basics of Software	Engineering & S	PM S	yllab	us	2021-	22			
Course Objec	Course Objectives:										
The main objectives of this course are to:											
1. Introduce	to Software	Engineering, Design,	Testing and Mair	itenance.							
2. Enable the	e students to	learn the concepts of Project Management	Software Enginee	ering. & Testing							
J. Learn abo		r toject Wanagement,	Software Design	& resting.							
Expected Cou	rse Outcon	es:									
On the succe	essful comp	etion of the course, stu	dent will be able	to:							
1 Unders	tand about S	oftware Engineering p	process				K1,ł	K2			
2 Unders manage	tand about Sement	oftware project manag	gement skills, des	sign and qua	lity		K2,ł	Χ3			
3 Analyz	e on Softwa	e Requirements and S	pecification				K3,I	K4			
4 Analyz	e on Softwa	re Testing, Maintenand	e and Software F	Re-Engineeri	ng		K4,I	K5			
5 Design project	and conduc	various types and lev	els of software qu	ality for a so	oftwa	ire	K5,I	K6			
K1 - Remen	nber; K2 - U	nderstand; <mark>K3</mark> - Apply	y; K4 - Anal yze; l	K5 - Evaluat	e; K	5 - C	reate				
I		INTROD					15 ha				
						-	<u>15 no</u>	urs			
Introduction: I Approach – S Software Deve	oftware Problem oftware Pro lopment Pro	cesses: Software Proc cess Models – Other s	Engineering Cha cess – Character oftware processe	llenges - Sol istics of a S s.	ftwar Softw	e En are	igineei Proces	s –			
	•	No. 10 AND	mbatore								
Unit:2		SOFTWARE RE	QUIREMENTS				15 ho	urs			
Software Requirements Analysis and Specification : Requirement engineering – Type of Requirements – Feasibility Studies – Requirements Elicitation – Requirement Analysis – Requirement Documentation – Requirement Validation – Requirement Management – SRS - Formal System Specification – Axiomatic Specification – Algebraic Specification - Case study: Student Result management system. Software Quality Management – Software Quality, Software Quality Management System, ISO 9000, SEI CMM.											
Unit:3		PROJECT MAN	NAGEMENT				15 ho	urs			
Software Project Management: Responsibilities of a software project manager – Project planning – Metrics for Project size estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Halstead"s software science – Staffing level estimation – Scheduling – Organization and Team Structures – Staffing – Risk management – Software Configuration Management – Miscellaneous Plan.											
Unit:4		SOFTWARE	DESIGN				15 ho	urs			

Software Design: Outcome of a Design process – Characteristics of a good software design – Cohesion and coupling - Strategy of Design – Function Oriented Design – Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.

Unit:5

SOFTWARE TESTING

13 hours

Software Testing: A Strategic approach to software testing – Terminologies – Functional testing – Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging – Testing tools - Metrics-Reliability Estimation. Software Maintenance - Maintenance Process - Reverse Engineering – Software Re-engineering - Configuration Management Activities.

Unit:6	Unit:6 Contemporary Issues		
Expert lectur			

Total Lecture hours

75 hours

Т	Text Books									
1	An Integrated Approach to Software Engineering – Pankaj Jalote, Narosa Publishing House, Delhi, 3rd Edition.									
2	Fundamentals of Software Engineering – Rajib Mall, PHI Publication, 3rd Edition.									
Re	eference Books									
1	Software Engineering – K.K. Aggarwal and Yogesh Singh, New Age International Publishers, 3 rd edition.									
2	A Practitioners Approach- Software Engineering, - R. S. Pressman, McGraw Hill.									
3	Fundamentals of Software Engineering - Carlo Ghezzi, M. Jarayeri, D. Manodrioli, PHIPublication.									
	Coimbature Co									
R	elated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://www.javatpoint.com/software-engineering-tutorial									
2	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview_									
3	https://onlinecourses.nptel.ac.in/noc19_cs69/preview_									
C	Design 1 Des									

Course Designed By:

Mapping with Programming Outcomes												
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	S	М	S	S	S	М	М	М	М		
CO2	S	S	S	S	S	S	S	М	S	S		
CO3	S	S	S	S	S	S	S	М	S	S		
CO4	S	S	S	S	S	S	S	М	S	S		
CO5	S	S	S	S	S	S	S	М	S	S		

Core/Elective/Supportive Core 4 4 Pre-requisite Basic Programming of C++ language Syllabus 2021-22 Course Objectives:							
Pre-requisiteBasic Programming of C++ languageSyllabus2021-22Course Objectives:The main objectives of this course are to:1. This course covers the basic data structures like Stack, Queue, Tree , List.2. This course enables the students to learn the applications of the data structures using various techniques3. It also enable the students to understand C++ language with respect to OOAD concepts4. Application of OOPS concepts.Expected Course Outcomes:On the successful completion of the course, student will be able to:1Understand the concepts of object oriented with respect to C++K1,K22Able to understand and implement OOPS conceptsK3,K43Implementation of data structures like Stack, Queue, Tree , List using C++K4,K54Application of the data structures for Sorting, Searching using different techniques.K5,K6LIST OF PROGRAMS75 hours1)Write a program to solve the tower of Hanoi using recursion.2)2)Write a program to perform various operation on stack using linked list.4)Write a program to solve number of elements using quick sort.6)Write a program to solve the knapsack problem using greedy method8)Write a program to solve the knapsack problem using greedy method8)Write a program to solve the knapsack problem using divide & conquer strategy.9)Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack.10)Write a C++ pro							
Course Objectives: The main objectives of this course are to: 1. This course covers the basic data structures like Stack, Queue, Tree , List. 2. This course enables the students to learn the applications of the data structures using various techniques 3. It also enable the students to understand C++ language with respect to OOAD concepts 4. Application of OOPS concepts. Expected Course Outcomes: On the successful completion of the course, student will be able to: 1 Understand the concepts of object oriented with respect to C++ 2 Able to understand and implement OOPS concepts 4 Application of the data structures for Sorting, Searching using different techniques. 4 Implementation of the data structures for Sorting, Searching using different techniques. 1) Write a program to solve the tower of Hanoi using recursion. K5,K6 2) Write a program to perform various operations on stack using linked list. Write a program to perform various operations on stack using linked list. 4) Write a program to solve the knapsack problem using greedy method Write a program to solve the knapsack problem using greedy method 8) Write a program to solve the knapsack problem using greedy method Write a program to perform Virtual Function							
The main objectives of this course are to: 1. This course covers the basic data structures like Stack, Queue, Tree , List. 2. This course enables the students to learn the applications of the data structures using various techniques 3. It also enable the students to understand C++ language with respect to OOAD concepts 4. Application of OOPS concepts. Expected Course Outcomes: On the successful completion of the course, student will be able to: 1 Understand the concepts of object oriented with respect to C++ K1,K2 2 Able to understand and implement OOPS concepts 4. Application of the data structures like Stack, Queue, Tree , List using C++ K4,K5 2 Able to understand and implement OOPS concepts 4. K3,K4 3 Implementation of data structures like Stack, Queue, Tree , List using C++ K4,K5 4 Application of the data structures for Sorting, Searching using different techniques. K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROCRAMS 1 Write a program to solve the tower of Hanoi using recursion. 2 Write a program to perform various operations on stack using linked list. 4 Write a program to solve the knapsack problem using quick sort. 5 Write a program to solve number of elements in ascending order using heap sort. 7 Write a program to solve the knapsack problem using greedy method 8 Write a program to solve the knapsack problem using greedy method 8 Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function							
 1. This course covers the basic data structures like Stack, Queue, Tree , List. 2. This course enables the students to learn the applications of the data structures using various techniques 3. It also enable the students to understand C++ language with respect to OOAD concepts 4. Application of OOPS concepts. Expected Course Outcomes: On the successful completion of the course, student will be able to: 1 Understand the concepts of object oriented with respect to C++ K1,K2 Able to understand and implement OOPS concepts K3,K4 3 Implementation of data structures like Stack, Queue, Tree , List using C++ K4,K5 4 Application of the data structures for Sorting, Searching using K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create 1) Write a program to solve the tower of Hanoi using recursion. 2) Write a program to perform various operations on stack using linked list. 4) Write a program to perform various operation in circular queue. 5) Write a program to solve number of elements using quick sort. 6) Write a program to solve the knapsack problem using greedy method 8) Write a program to solve the knapsack problem using greedy method 8) Write a program to solve the knapsack problem using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function 							
Expected Course Outcomes: On the successful completion of the course, student will be able to: 1 Understand the concepts of object oriented with respect to C++ K1,K2 2 Able to understand and implement OOPS concepts K3,K4 3 Implementation of data structures like Stack, Queue, Tree , List using C++ K4,K5 4 Application of the data structures for Sorting, Searching using different techniques. K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create IIST OF PROGRAMS 75 hours 1) Write a program to solve the tower of Hanoi using recursion. 2) Write a program to perform various operations on stack using linked list. 4) Write a program to solve number of elements using quick sort. 6) Write a program to solve the knapsack problem using greedy method 8) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function 10							
On the successful completion of the course, student will be able to: 1 Understand the concepts of object oriented with respect to C++ K1,K2 2 Able to understand and implement OOPS concepts K3,K4 3 Implementation of data structures like Stack, Queue, Tree , List using C++ K4,K5 4 Application of the data structures for Sorting, Searching using different techniques. K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROGRAMS 75 hours 1) Write a program to solve the tower of Hanoi using recursion. 2) Write a program to perform various operations on stack using linked list. 4) Write a program to perform various operation in circular queue. 5) Write a program to solve number of elements using quick sort. 6) Write a program to solve the knapsack problem using greedy method 8) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function							
1 Understand the concepts of object oriented with respect to C+++ K1,K2 2 Able to understand and implement OOPS concepts K3,K4 3 Implementation of data structures like Stack, Queue, Tree , List using C++ K4,K5 4 Application of the data structures for Sorting, Searching using different techniques. K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create Volume LIST OF PROGRAMS 75 hours 1) Write a program to solve the tower of Hanoi using recursion. 2) Write a program to traverse through binary search tree using traversals. 3) Write a program to perform various operations on stack using linked list. 4) Write a program to sort an array of an elements using quick sort. 6) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function							
2 Able to understand and implement OOPS concepts K3,K4 3 Implementation of data structures like Stack, Queue, Tree , List using C++ K4,K5 4 Application of the data structures for Sorting, Searching using different techniques. K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create Top PROGRAMS 75 hours 1) Write a program to solve the tower of Hanoi using recursion. 2) Write a program to traverse through binary search tree using traversals. 3) Write a program to perform various operations on stack using linked list. 4) Write a program to sort an array of an elements using quick sort. 6) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function							
3 Implementation of data structures like Stack, Queue, Tree , List using C++ K4,K5 4 Application of the data structures for Sorting, Searching using different techniques. K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create 10 IIST OF PROCRAMS 75 hours 1) Write a program to solve the tower of Hanoi using recursion. 2) Write a program to traverse through binary search tree using traversals. 3) Write a program to perform various operations on stack using linked list. 4) Write a program to perform various operation in circular queue. 5) Write a program to solve number of elements using quick sort. 6) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function							
4 Apprication of the data structures for softing, searching using different techniques. K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROGRAMS 75 hours 1) Write a program to solve the tower of Hanoi using recursion. 2) Write a program to traverse through binary search tree using traversals. 3) Write a program to perform various operations on stack using linked list. 4) Write a program to perform various operation in circular queue. 5) Write a program to solve number of elements using quick sort. 6) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function							
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROGRAMS 75 hours 1) Write a program to solve the tower of Hanoi using recursion. 2) Write a program to traverse through binary search tree using traversals. 3) Write a program to perform various operations on stack using linked list. 4) Write a program to perform various operation in circular queue. 5) Write a program to solve number of elements using quick sort. 6) Write a program to solve number of elements in ascending order using heap sort. 7) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function							
LIST OF PROGRAMS75 hours1) Write a program to solve the tower of Hanoi using recursion.2) Write a program to traverse through binary search tree using traversals.3) Write a program to perform various operations on stack using linked list.4) Write a program to perform various operation in circular queue.5) Write a program to sort an array of an elements using quick sort.6) Write a program to solve number of elements in ascending order using heap sort.7) Write a program to solve the knapsack problem using greedy method8) Write a program to search for an element in a tree using divide & conquer strategy.9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack.10) Write a C++ program to perform Virtual Function							
 Write a program to solve the tower of Hanoi using recursion. Write a program to traverse through binary search tree using traversals. Write a program to perform various operations on stack using linked list. Write a program to perform various operation in circular queue. Write a program to sort an array of an elements using quick sort. Write a program to solve the knapsack problem using greedy method Write a program to search for an element in a tree using divide & conquer strategy. Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. Write a C++ program to perform Virtual Function 							
 Write a program to traverse through binary search tree using traversals. Write a program to perform various operations on stack using linked list. Write a program to perform various operation in circular queue. Write a program to sort an array of an elements using quick sort. Write a program to solve number of elements in ascending order using heap sort. Write a program to solve the knapsack problem using greedy method Write a program to search for an element in a tree using divide & conquer strategy. Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. Write a C++ program to perform Virtual Function 							
 Write a program to perform various operations on stack using linked list. Write a program to perform various operation in circular queue. Write a program to sort an array of an elements using quick sort. Write a program to solve number of elements in ascending order using heap sort. Write a program to solve the knapsack problem using greedy method Write a program to search for an element in a tree using divide & conquer strategy. Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. Write a C++ program to perform Virtual Function 							
 4) Write a program to perform various operation in circular queue. 5) Write a program to sort an array of an elements using quick sort. 6) Write a program to solve number of elements in ascending order using heap sort. 7) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function 							
 5) Write a program to sort an array of an elements using quick sort. 6) Write a program to solve number of elements in ascending order using heap sort. 7) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function 							
 6) Write a program to solve number of elements in ascending order using heap sort. 7) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function 							
 7) Write a program to solve the knapsack problem using greedy method 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function 							
 8) Write a program to search for an element in a tree using divide & conquer strategy. 9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack. 10) Write a C++ program to perform Virtual Function 							
9) Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack.10) Write a C++ program to perform Virtual Function							
10) Write a C++ program to perform Virtual Function							
11) Write a C++ program to perform Parameterized constructor							
12) Write a C++ program to perform Friend Function							
13) Write a C++ program to perform Function Overloading							
14) Write a C++ program to perform Single Inheritance							
15) Write a C++ program to perform Employee Details using files.							
Expert lectures, online seminars – webinars							

	Total Lecture hours75 hours
T	ext Books
1	Goodrich, "Data Structures & Algorithms in Java", Wiley 3rd edition.
2	Skiena,"The Algorithm Design Manual",SecondEdition,Springer, 2008
F	Reference Books
1	AnanyLevith,"Introduction to the Design and Analysis of algorithm", Pearson Education
	Asia, 2003.
2	Robert Sedgewick, Phillipe Flajolet, "An Introduction to the Analysis of Algorithms",
	Addison-westey I donsning Company,1990.
F	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3	https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_anal
5	<u>ysis.htm</u>
C	Course Designed By:

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	S	S	S	М	М	S	S
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S Tp	S	S	s S	М	S	S

Biggi Biggi and States and States

Course code		PRACTICAL II : PYTHON PROGRAMMING LAB	L	Т	Р	С					
Coro/Elective/Su	nnortivo	Coro			1	1					
	ipportive		Svlla	abus	-						
Pre-requisite	Pre-requisite Basics of any OO Programming Language 2021-22										
Course Objecti	ves:	is course are to:									
 This course To understa To Understa To develop 	 This course presents an overview of elementary data items, lists, dictionaries, sets and tuples To understand and write simple Python programs To Understand the OOPS concepts of Python To develop web applications using Python 										
Expected Cours	se Outco	mes:									
On the succes	sful comp	letion of the course, student will be able to:									
1 Able to	write prog	grams in Python using OOPS concepts			K1,K2						
2 To under	stand the	concepts of File operations and Modules in Pythe	on		K2,K3	3					
3 Implement	ntation of	lists, dictionaries, sets and tuples as programs			K3,K4	1					
4 To develo	op web ap	plications using Python	14		$\frac{K5,K6}{C}$	5					
KI - Rememb	ber; K 2 -	Understand; K3 - Apply; K4 - Analyze; K5 - Eva	luate;	K0 -	Create						
		LIST OF PROGRAMS			75 ho	ours					
Impleme	ent the fol	lowing in Python:		•							
1. Progra	ams using	elementary data items, lists, dictionaries and tupl	es								
2. Progra	ams using	conditional branches, and and good									
3. Progra	ams using	loops.									
4. Progra	ams using	functions									
5. Progra	ams using	exception handling									
6. Progra	ams using	inheritance									
7. Progra	ams using	polymorphism									
8. Progra	ams to im	plement file operations.									
9. Progra	ams using	modules.									
10. Progr	10. Programs for creating dynamic and interactive web pages using forms.										
Total Lecture hours 75 hours											
				I							
Text Books											
1 Bill Luban	novic, "In	roducing Python", O'Reilly, First Edition-Second	l Relea	ase, 2	014.						
2 Mark Lutz	, "Learnii	ng Python", O'Reilly, Fifth Edition, 2013.									
Reference Boo	oks										

1	David M. Beazley, "Python Esse Edition, 2009.	ential Reference",	Developer's	Library, Fourth
2	SheetalTaneja,Naveen Kumar,	"Python	Programming-	-A Modular
	Approach , realson rubications.			
R	Related Online Contents [MOOC, SW.	AYAM, NPTEL, W	ebsites etc.]	
1	https://www.programiz.com/python-p	rogramming/		
2	https://www.tutorialspoint.com/pythor	n/index.htm		
3	https://onlinecourses.swayam2.ac.in/a	ic20_sp33/preview		
C	Course Designed By:			

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	S	S	S	М	М	S	S
CO2	S	S	S	S	S	S	S	М	S	М
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S





Course code	DATA MINING AND WAREHOUSING	L	Т	Р	С			
Core/Elective/Supportive	Core	4			4			
Pre-requisite	Basics of RDBMS & Algorithms	Syllab	ous	2021	2021-22			
Course Objectives:								
The main objectives of the	is course are to:							
 Enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing. Develop skills of using recent data mining software for solving practical problems. Develop and apply critical thinking, problem solving, and decision making skills. 								
3. Develop and apply critical thinking, problem-solving, and decision-making skills.								
Expected Course Outco	mes:							
On the successful com	pletion of the course, student will be able to:			T				
1 Understand the b	asic data mining techniques and algorithms			K1,ł	K2			
2 Understand the A contents	ssociation rules, Clustering techniques and Data wa	irehous	sing	K2,I	Χ3			
3 Compare and ev prediction, Cluster	valuate different data mining techniques like cla rring and association rule mining	assifica	tion,	K4,ł	ζ5			
4 Design data wa operations	4 Design data warehouse with dimensional modeling and apply OLAP K5,K6							
5 Identify appropriate data mining algorithms to solve real world problems K6								
K1 - Remember: K2 -	Understand: K3 - Apply: K4 - Analyze: K5 - Evalu	ate: K	6 - C	reate	-			
,		,						
Unit:1	BASICS AND TECHNIQUES			12 ho	urs			
Basic data mining tasks	- data mining versus knowledge discovery in da	tabases	s – d	ata mi	ning			
issues - data mining me	trics – social implications of data mining – data m	nining t	from	a data	base			
perspective.	Say Combatore							
Data mining techniques	: Introduction – a statistical perspective on data	minin	1g -	simila	ritv			
measures – decision trees	s – neural networks – genetic algorithms.		8					
Unit•?	ALCORITHMS			12 ho	urs			
Classification: Introducti	on – Statistical – based algorithms - distance – base	ed algor	rithm	$\frac{12}{\text{s-dec}}$	ision			
tree - based algorithms -	neural network – based algorithms –rule - based a	lgorith	ms –	combi	ning			
techniques.	8	0			0			
•								
Unit:3	CLUSTERING AND ASSOCIATION			12 ho	urs			
Clustering: Introduction - Partitional Algorithms.	– Similarity and Distance Measures – Outliers – Hi	erarchi	cal A	lgorit	hms			
Association rules: Introduction - large item sets - basic algorithms – parallel & distributed								
algorithms – comparing approaches- incremental rules – advanced association rules techniques – measuring the quality of rules.								
Unit:4 D	ATA WAREHOUSING AND MODELING			11 ho	urs			
Data warehousing: introd	luction - characteristics of a data warehouse – data	marts	– oth	er asp	ects			

of data mart. Online analytical processing: introduction - OLTP & OLAP systems							
Datamodeling –star schema for multidimensional view –data modeling – multifactstar schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.							
Unit:5 APPLICATIONS OF DATA WAREHOUSE 11 hours							
Developing a data WAREHOUSE: why and how to build a data warehouse -data warehouse							
architectural strategies and organization issues - design consideration - data content - metadata							
distribution of data – tools for data warehousing – performance considerations – crucial decisions							
In designing a data warehouse.							
warehouses – other areas for data warehousing and data mining.							
A second se							
Unit:6 Contemporary Issues 2 hours							
Expert lectures, online seminars – webinars							
I otal Lecture hours 60 hours							
Text Books							
1 Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson education,2003.							
2 C.S.R. Prabhu, "Data Warehousing Concepts, Techniques, Productsand Applications", PHI, Second Edition.							
Reference Books							
1 Arun K.Pujari, "Data Mining Techniques", Universities Press (India) Pvt. Ltd.,2003.							
2 Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", TMCH, 2001.							
3 Jiawei Han & Micheline Kamber, "Data Mining Concepts & Techniques", 2001, Academicpress.							
a Bissiumons eving							
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1 <u>https://www.javatpoint.com/data-warehouse</u>							
2 <u>https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/</u>							
<u>https://www.btechguru.com/trainingitdatabase-management-systemsfile-structures</u>							
introduction-to-data-warehousing-and-olap-2-video-lecture1205426151.html							
Course Designed By:							

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	S	S	S	S	М	Μ	М	М
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S
CO5	S	S	S	S	S	S	S	М	S	S

Course code	ADVANCED OPERATING SYSTEMS	L	Т	Р	С			
Core/Elective/Supportive	Core	4			4			
Pre-requisite	Basics of OS & its functioning	Syllat	ous	2021-	22			
Course Objectives:								
The main objectives of th	is course are to:							
1. Enable the students	to learn the different types of operating systems and	l their f	unct	ioning				
2. Gain knowledge on Distributed Operating Systems								
3. Gain insight into the components and management aspects of real time and mobile operating								
systems.	Linux On anoting Systems							
4. Learn case studies in	Linux Operating Systems							
Expected Course Outco	mes:							
On the successful com	bletion of the course, student will be able to:							
1 Understand the des	ign issues associated with operating systems			K1,ł	K2			
2 Master various process management concepts including scheduling, deadlocks K3,K4								
3 Prepare Real Time Task Scheduling								
4 Analyze Operating Systems for Handheld Systems								
5 Analyze Operating Systems like LINUX and iOS								
K1 - Remember: K2 -	Understand: K3 - Apply: K4 - Analyze: K5 - Evalu	ate: K	6 - C	reate	10			
,		,	-					
Unit:1	BASIC <mark>S OF OPERATING SYST</mark> EMS			12 ho	urs			
Basics of Operating Systems – Multiprocess Systems – Handheld S Scheduling – Cooperatin Avoidance – Detection –	rems: What is an Operating System? – Main fram or Systems – Distributed Systems – Clustered ystems – Feature Migration – Computing En g Processes – Inter Process Communication- Dea Recovery.	ne System System vironm dlocks	ems 1s –F 1ents –Pre	–Desk Real-T: -Proc	ttop ime cess n –			
Unit•?	DISTRIBUTED OPERATING SYSTEMS			12 ho	urs			
Distributed Operating Sy	stems: Issues – Communication Primitives – Lam	port ^e s I	Logic	al Clo	cks			
systems – design issues –	Case studies – The Sun Network File System-Coda	lution-0	listii	buled	me			
Unit.3	DEAL TIME ODEDATING SYSTEM	[10 ha	ure			
Realtime Operating S	vstems : Introduction – Applications of Real Ti	me Sv	stem	$\frac{10}{8} = R_{2}$	<u>urs</u> asic			
Model of Real Time Systems – Characteristics – Safety and Reliability - Real Time Task Scheduling								
Unit:4	HANDHEI D CVCTEM			17 ha				
				<u>14 IIO</u>	urs			
Operating Systems for I Operating Systems – Pal	andheld Systems: Requirements – Technology mOS-Symbian Operating System- Android –Arch	Overvie	ew – e of	Handł androi	neld Id –			

Sec	uring handh	eld systems							
U	Jnit:5	CASE STUDIES	12 hours						
Cas Sch Frai	Case Studies : Linux System: Introduction – Memory Management – Process Scheduling – Scheduling Policy - Managing I/O devices – Accessing Files- iOS : Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.								
Units6 Contemporary Issues 2 hours									
E	xpert lectur	es, online seminars – webinars	2 11041 3						
	1								
		Total Lecture hours	60 hours						
Т	ext Books								
1	1Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.								
2	2 MukeshSinghal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.								
R	eference Bo	oks							
1	Rajib Ma	l, "Real-Time Systems: Theory and Practice", Pearson Education	India, 2006.						
2	Pramod C Third edit	handra P.Bhatt, An introduction to operating systems, concept an ion, 2010.	d practice, PHI,						
3	Daniel.P.	Bovet& Marco Cesati,"Understanding the Linux kernel",3 rd edition	,O"Reilly, 2005						
4	Neil Smy media, 20	th, "iPhone iOS 4 Development Essentials – Xcode", Fourth E 11.	Edition, Payload						
		B ATHIAD UNIT S							
R	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]								
1	1 <u>https://onlinecourses.nptel.ac.in/noc20_cs04/preview</u>								
2	2 <u>https://www.udacity.com/course/advanced-operating-systemsud189</u>								
3	3 <u>https://minnie.tuhs.org/CompArch/Resources/os-notes.pdf</u>								
	Course Desig	med By:							

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	S	S	S	S	М	М	М	М
CO2	S	М	S	S	S	S	S	М	S	М
CO3	S	М	S	S	S	S	S	М	S	М
CO4	S	М	S	S	S	S	S	М	S	М
CO5	S	М	S	S	S	S	S	М	S	М

Course code	ADVANCED JAVA PROGRAMMING	L	Т	Р	С			
Core/Elective/Supportive	Core	4			4			
Pre-requisite	Basics of Java & its Usage	Sylla	ous	2021	-22			
Course Objectives:	·							
The main objectives of thi	is course are to:							
 Enable the students to learn the basic functions, principles and concepts of advanced java programming. Provide knowledge on concepts needed for distributed Application Architecture. Learn JDBC, Servlet packages, JQuery, Java Server Pages and JAR file format 								
Expected Course Outcor	nes:							
On the successful comp	letion of the course, student will be able to:							
1 Understand the ad-	vanced concepts of Java Programming			K1,	K2			
2 Understand JDBC	2 Understand JDBC and RMI concepts							
3 Apply and analyze	e Java in Database			K3,	K4			
4 Handle different e and class	4 Handle different event in java using the delegation event model, event listener K5							
5 Design interactive applications using Java Servlet, JSP and JDBC								
K1 - Remember; K2 - U	Jnderstand; <mark>K3 -</mark> Apply; K4 - Analyze; K5 - Eval	ıate; K	6 - C	reate				
Unit.1	PASICS OF TAVA 9			17 ha				
Java Basics Review: Co	omponents and event handling – Threading con	ncepts	– N	etwork	king			
	HIAD UN							
Unit:2	REMOTE METHOD INVOCATION			12 ho	urs			
Remote Method Invocation Defining Remote objects-	on-Distributed Application Architecture- Creating Remote Object Activation-Object Serialization-Ja	stubs va Spa	and s	skeleta	ons-			
Unit•3	DATABASE			10 ha	mrs			
Java in Databases- JDBC multimedia databases – D	C principles – database access- Interacting- database atabase support in web applications	base se	arch	– Cre	ating			
Unit:4	SERVLETS			<u>12 ho</u>	urs			
Servlet-Readingdata from a client-Reading http request header-sending data to a client and writing the http response header-working with cookies Java Server Pages: JSP Overview-Installation-JSP tags-Components of a JSP page-Expressions- Scriptlets-Directives-Declarations-A complete example								
Scriptlets-Directives-Decl	arations-A complete example	SI pag	ge-Ex	pressi	0115			
Scriptlets-Directives-Decl	arations-A complete example			12 ho				

tech	niques								
U	nit:6	Contemporary Issues	2 hours						
E	Expert lectures, online seminars – webinars								
		Total Lecture hours	60 hours						
T	ext Books								
1	Jamie Ja	worski, "Java Unleashed", SAMS Techmedia Publications,1999.							
2	Campione, Walrath and Huml, "The Java Tutorial", AddisonWesley,1999.								
R	Reference Books								
1	Jim Keo Ltd,2010	ogh," The Complete Reference J2EE", Tata McGrawHill Publis	shing Company						
2	David S Publicat	awyer McFarland, "JavaScript And JQuery- The Missing Mons, 3rd Edition,2011.	anual", Oreilly						
3	Deitel ar	d Deitel, "Java How to Program", Third Edition, PHI/Pearson Educ	cation Asia.						
R	elated On	line Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1	https://w	ww.javatpoint.com/servlet-tutorial							
2	https://w	ww.tutorialspoint.com/java/index.htm							
3	https://or	nlinecourses.nptel.ac.in/noc19_cs84/preview							
C	Course Designed By:								

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	ந்தப்பு சல்ர 2 சல்ர A TE TO ELEV	TE S	М	М	М	S
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	Μ	S	S
CO5	S	S	S	S	S	S	S	М	S	S

Course code		ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	:	L	Т	Р	С	
Core/Elective/S	Supportive	Core		4	4		4	
Pre-requisit	te	Basics of AI & an Introduction about MI	£	Syllat	ous	2021-22		
Course Objec	tives:							
The main object	ctives of thi	course are to:						
 Enable the students to learn the basic functions of AI, Heuristic Search Techniques. Provide knowledge on concepts of Representations and Mappings and Predicate Logic. Introduce Machine Learning with respect Data Mining, Big Data and Cloud. Study about Applications & Impact of ML. 								
Expected Cou	rsa Autoor	05.						
On the succe	essful comp	etion of the course, student will be able to:						
1 Demons	strate AI pro	blems and techniques				K11	<i>र</i> २	
2 Underst	2 Understand machine learning concepts						72	
Apply basis principles of A Lin solutions that require problem solving							XJ	
3 Apply basic principles of AT in solutions that require problem solving, inference, perception, knowledge representation, and learning						K3,K4		
4 Analyze the impact of machine learning on applications						K4,K5		
5Analyze and design a real world problem for implementation and understand the dynamic behavior of a systemK5,K6							K6	
K1 - Remen	nber; K2 - U	nderstand <mark>; K3</mark> - Apply; K4 - Analyze; K5 -	Evalua	ite; K	6 - C	reate		
	1	a man						
Unit:1		INTRODUCTION				12 ho	urs	
Introduction: A Search: State s Search.	AI Problem space search	- Al techniques - Criteria for success. F - Production Systems - Problem Character	roblem ristics -	ns, Pro · Issue	obler es in	n Spa desigi	ces, 1 of	
Unit.7		SEADCH TECHNIQUES				12 ha		
		SEARCH TECHNIQUES				12 110	urs	
Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.								
Unit·3		PREDICATE LOGIC				12 ho	urs	
Uning Dradies	ta lacia. D	managemente de la concentra de		~ 1	tora		Iac	
Using Predicate logic: Representing simple facts in logic - Representing Instance and Isa relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge - Logic programming - Forward Vs Backward reasoning - Matching - Control knowledge.								
IIn:4-4								
Unit:4		WACHINE LEAKNING				12 NO	urs	

Understanding Machine Learning: What Is Machine Learning?-Defining Big Data-Big Data in Context with Machine Learning-The Importance of the Hybrid Cloud-Leveraging the Power of Machine Learning-The Roles of Statistics and Data Mining with Machine Learning-Putting Machine Learning in Context-Approaches to Machine Learning.									
Unit:5		APPLICATIONS OF MACHINE LEARNING	10 hours						
Looking Inside Machine Learning: The Impact of Machine Learning on Applications - Data Preparation-The Machine Learning Cycle.									
U:4.(Contorna orony Isonos	2 h auna						
Unit:6	laatur	Contemporary Issues	2 nours						
Expert	icciui	es, omne semmars – weomars							
		Total Lecture hours	60 hours						
Text B	ooks								
1 Elair	ne R pany	ich and Kevin Knight," Artificial Intelligence", Tata McGraw Pvt Ltd, Second Edition, 1991.	Hill Publishers						
2 Geo	rge F	Luger, "Artificial Intelligence",4th Edition, Pearson Education Pul	bl,2002.						
Referer	nce B	ooks							
1 Mac Kirs	chine sch.	Learning For Dummies [®] , IBM Limited Edition by Judith H	urwitz, Daniel						
		E AND A DE							
Related	d Onl	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1 <u>https</u>	1 <u>https://www.ibm.com/downloads/cas/GB8ZMQZ3</u>								
2 <u>https</u>	s://wv	ww.javatpoint.com/artificial-intelligence-tutorial							
3 <u>https</u>	3 <u>https://nptel.ac.in/courses/106/105/106105077/</u>								
Siggiument and Signature									
Course	Desig	gned By:							

Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	S	S	S	S	Μ	М	S	
CO2	S	S	S	S	S	S	S	М	S	S	
CO3	S	S	S	S	S	S	S	М	S	S	
CO4	S	S	S	S	S	S	S	М	S	S	
CO5	S	S	S	S	S	S	S	М	S	S	

Course code		PRACTICAL III : DATA MINING USING R	L	Т	Р	С			
Core/Elective/S	Supportive	Core			4	4			
Pre-requisi	te	Basics of DM Algorithms & R Programming	Syllat Versi	ous on	2021-22				
Course Objec	tives:	<u> </u>							
The main obje	ctives of thi	s course are to:							
 To enable the students to learn the concepts of Data Mining algorithms namely classification, clustering, regression To understand & write programs using the DM algorithms To apply statistical interpretations for the solutions Able to use visualizations techniques for interpretations 									
Europeted Con									
On the succe	essful comp	letion of the course, student will be able to:							
1 Able to	write progr	ams using R for Association rules. Clustering	technique	26	K1 K2				
2 To implement data mining techniques like classification prediction									
3 Able to use different visualizations techniques using R K4 K5									
4 To appl	y different	data mining algorithms to solve real world app	olications		K5,K6				
K1 - Remen	nber; K2 - U	Inderstand; K3 - Apply; K4 - Analyze; K5 - E	Evaluate;	K6 -	Create				
		Star Cas Cas							
1 7 1		LIST OF PROGRAMS	•••		75 ho	ours			
I. Imple	ement Aprio	ri algorithm to extract association rule of data	mining.						
2. Imple	ement k-mea	ans clustering technique.							
3. Imple	ment any o	ne Hierarchal Clustering.							
4. Imple	ement Class	ification algorithm.							
5. Imple	ement Decis	ion Tree.							
6. Linea	r Regressio	n.							
7. Data	Visualizatio	n.							
		Total Lecture	e hours		75 ho	ours			
Text Books									
1 Margaret education	t H. Dunhar n,2003.	n, "Data Mining: Introductory and Advanced	l'opics",	Pears	son				
2 C.S.R. P Second E	rabhu, "Dat Edition	a Warehousing Concepts, Techniques, Produc	tsand Ap	plica	tions", l	PHI,			
Reference Books									
1 ArunK.P	ujari, "Data	Mining Techniques", Universities Press (Ind	a) Pvt. L	td.,20	003.				
2 Alex Be 2001.	rson, Steph	en J. Smith, "Data Warehousing, Data Min	ing and (OLA	Р", ТМ	CH,			
Related On	line Conter	nts IMOOC. SWAVAM. NPTEL. Websites	etc.]						

1	https://www.javatpoint.com/data-warehouse
2	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3	https://www.btechguru.com/trainingitdatabase-management-systemsfile-structures introduction-to-data-warehousing-and-olap-2-video-lecture1205426151.html
С	Course Designed By:

Mappir	Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	S	М	S	S	S	М	М	S	S		
CO2	S	S	S	S	S	S	S	М	S	М		
CO3	S	S	S	S	S	S	S	S	S	S		
CO4	S	S	S	S	S	S	S	М	S	S		



Course code		PRAC	TICAL IV : A JAVA LA	ADVANCED AB	L	Т	Р	C	
Core/Elective/S	Supportive		Co	re			4	4	
Pre-requisit	te	Basics	in Java Progra	amming	Syl	labus	2021	1-22	
Course Objec	tives:								
The main object	ctives of thi	is course a	re to:						
 1.To enable the students to implement the simple programs using JSP, JAR 2.To provide knowledge on using Servlets, Applets 3.To introduce JDBC and navigation of records 4.To understand RMI & its implementation 5.To introduce to Socket programming 									
Expected Cou	rse Outcon	mes:							
On the succe	essful comp	oletion of t	he course, stud	ent will be able to:					
1 Underst JAR	° &	K1,K2							
2 Must be		K3,K4							
3 Able to		K4,K5							
4 To Crea	te interactiv	ve web ba	sed application	s using servlets ar	ld jsp		K5,K6		
K1 - Remen	nber; K2 - U	Understand	l; K3 - Apply;	K4 - Analyze; K5	· Evaluat	te; K6	- Create		
			EPROCRAM				75 h	01116	
LIST OF PROGRAMS 75 hours 1. Display a welcome message usingServlet. 2. 2. Design a Purchase Order form using Html form andServlet. 3. 3. Develop a program for calculating the percentage of marks of a student usingJSP. 4. 4. Design a Purchase Order form using Html form andJSP. 5. 5. Prepare a Employee pay slip usingJSP. 6. 6. Write a program using JDBC for creating a table, Inserting, Deleting records and listout therecords. 7. 7. Write a program using Java servlet to handle formdata. 8. 8. Write a simple Servlet program to create a table of all the headers it receives along withtheir associatedvalues. 9. 9. Write a program in JSP by using sessionobject. 10. 10. Write a program to build a simple Client Server application usingRMI. 11. Create an applet for a calculator application. 12. Program to send a text message to another system and receive the text message from the system (use socket programming). 10.									
	ies, onnie s	5011111a15 -	webiliars						
				Total Lectu	re hour	s	75 h	ours	

Т	ext Books
1	Jamie Jaworski, "Java Unleashed", SAMS Techmedia Publications, 1999.
2	Campione, Walrath and Huml, "The Java Tutorial", AddisonWesley, 1999.
R	eference Books
1	Jim Keogh," The Complete Reference J2EE", Tata McGrawHill Publishing Company Ltd,2010.
2	David Sawyer McFarland, "JavaScript And JQuery- The Missing Manual", Oreilly Publications, 3rd Edition, 2011.
R	elated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.javatpoint.com/servlet-tutorial
2	https://www.tutorialspoint.com/java/index.htm
3	https://onlinecourses.nptel.ac.in/noc19_cs84/preview_
С	ourse Designed By:

Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	М	S	S	S	М	М	S	М	
CO2	S	S	S	S	S .	S	S	М	S	S	
CO3	S	S	S	S	S	S	S	S	S	S	
CO4	S	S	S	S	S	S	S	S	S	S	



Cou	rse code		DIGITA	L IMAGE PROC	ESSING	L	Т	Р	С	
Core	e/Elective/S	Supportive		Core		4			4	
Pr	re-requisit	te	Basics of Ima	ige Processing		Syllal	bus	2021-	22	
Cou	rse Objec	tives:								
The	main objeo	ctives of thi	course are to:							
 Learn basic image processing techniques for solving real problems. Gain knowledge in image transformation and Image enhancement techniques. Learn Image compression and Segmentation procedures. 										
Exp	ected Cou	rse Outcon	es:							
Oı	n the succe	essful comp	etion of the cour	rse, student will be	able to:			-		
1Understand the fundamentals of Digital Image ProcessingK1,K2										
2	Unders image a	tand the m cquisition, i	thematical four nage transformation	ndations for digitation, and image en	al image repro hancement	esentat	ion,	K2,1	K3	
3	Apply, problem	Design and	Implement and	get solutions for	digital image	process	sing	K3,1	K4	
4	Apply t	the concepts	of filtering and	segmentation for d	igital image re	trieval		K4,1	K5	
5	Explore an effici	e the concepient manner	ts of Multi-reso	lution process and	recognize the	object	s in	K5,1	K6	
K	1 - Remen	nber; K2 - U	nderstand; K3 -	Apply; K4 - Analy	ze; K5 - Evalu	ıate; K	6 - C	reate		
		I	1 Film	Carlo B						
U	nit:1		INT	RODUCTION				12 ho	urs	
Intro DIP Func sensi Pixe	duction: V – Fundam lamentals: ing and ac ls – Linear	What is Digitation of the second seco	al image proces in DIP – Comp Visual percept mage sampling r operations.	ssing – the origin operation of an image of an image of an image of an image of a state	f DIP – Exam e processing s e electromagne – Some Basic	ples of system. etic spe relatic	field Dig ctrun onship	ls that ital Im n – Im o betw	use lage lage veen	
U	nit:2		IMAGE	ENHANCEMEN	Т			12 ho	urs	
Image Enhancement in the spatial domain:- Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.										
Unit:3 IMAGE RESTORATION 12 hours								ours		
Unit:3IMAGE RESTORATION12 hoursImage Restoration: A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering – Constrained least squares filtering – Geometric mean filter – Geometric Transformations.										

Unit:4 IMAGE COMPRESSION		11 hours							
Image Compression: Fundamentals – Image compression m Theory – Error Free compression – Lossy compression – Imag	Image Compression: Fundamentals – Image compression models – Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.								
Unit:5 IMAGE SEGMENTATION	I	11 hours							
Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction – Thresholding – Region-Based segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation.									
Unit:6 Contomporary Issues		2 hours							
Expert lectures, online seminars – webinars		2 11001 5							
Tota	al Lecture hours	60 hours							
Text Books									
1 Rafael C. Gonzalez, Richard E. Woods, "Digital Im PHI/Pearson Education.	age Processing",	Second Edition,							
2 B. Chanda, D. Dutta Majumder, "Digital Image Processi	ng and Analysis", F	РНІ, 2003.							
Reference Books									
1 Nick Efford, "Digital Image Processing a practical Education, 2004.	introducing using	Java", Pearson							
Related Online Contents MOOC, SWAYAM, NPTEL,	Websites etc.								
1 <u>https://nptel.ac.in/courses/117/105/117105135/</u>									
2 <u>https://www.tutorialspoint.com/dip/index.htm</u>	10 A								
3 <u>https://www.javatpoint.com/digital-image-processing-tut</u>	torial								
Educate to steven									
Course Designed By:									

Mapping with Programming Outcomes											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	М	S	S	S	М	S	М	М	S	
CO2	S	S	S	S	S	М	S	М	S	S	
CO3	S	S	S	S	S	S	S	М	S	S	
CO4	S	S	S	S	S	S	S	М	S	S	
CO5	S	S	S	S	S	S	S	М	S	S	

Course code	CLOUD COMPUTING	L	Т	Р	С					
Core/Elective/Supportive	Core	4			4					
Pre-requisite	Basics of Cloud & its Applications	Syllat	ous	2021-2	22					
Course Objectives:										
The main objectives of this course are to:										
1. Gain knowledge on cloud computing, cloud services, architectures and applications.										
2. Enable the students to learn the basics of cloud computing with real time usage										
3. How to store and sha	re, in and from cloud?									
Expected Course Outcor	nes									
On the successful comp	letion of the course, student will be able to:									
1 Understand the concepts of Cloud and its services K1 K2										
2 Collaborate Cloud for Event & Project Management										
3 Analyze on clou Database	id in - Word Processing, Spread Sheets, Mail,	Calend	lar,	K4,I	Χ5					
4 Analyze cloud in social networks										
5 Explore cloud stor	rage and sharing			K	K6					
K1 - Remember; K2 - U	Jnderstand; K3 - Apply; K4 - Analyze; K5 - Evalu	late; K	6 - C	reate						
Unit:1	INTRODUCTION			12 ho	urs					
INTRODUCTION Cloud cloud computing, pros an development, discovering	Computing Introduction, From, Collaboration to ad cons, benefits, developing cloud computing se cloud services.	o cloue rvices,	d, W Clou	orking ud serv	g of vice					
Unit:2	CLOUD COMPUTING			12 ho	urs					
CLOUD COMPUTING computing for communit events, cloud computing road.	FOR EVERYONE Centralizing email corty, collaborating on schedules, collaborating or for corporation, mapping, schedules, managing p	nmunic 1 group rojects,	ation pro pres	ns, cl ojects senting	oud and ; on					
Unit:3	CLOUD SERVICES			12 ho	urs					
USING CLOUD SERVICES Collaborating on calendars, Schedules and task management, exploring on line scheduling and planning, collaborating on event management, collaborating on contact management, collaborating on project management, collaborating on word processing, spreadsheets, and databases.										
Unit:4	OUTSIDE THE CLOUD			12 ho	urs					
OUTSIDE THE CLOU Evaluating web conferen	Unit:4OUTSIDE THE CLOUD12 hoursOUTSIDE THE CLOUD Evaluating web mail services, Evaluating instant messaging, Evaluating web conference tools, creating groups on social networks, Evaluating on line									
grou	groupware, collaborating via blogs and wikis.									
---	---	--	---------------	--	--	--	--	--	--	
U	nit:5	STORING AND SHARING	10 hours							
STORING AND SHARING Understanding cloud storage, evaluating on line file storage, exploring on line book marking services, exploring on line photo editing applications, exploring photo sharing communities, controlling it with web based desktops.										
U	Unit:6 Contemporary Issues 2 hours									
E	xpert lectu	res, online seminars – webinars								
Total Lecture hours										
Т	ext Books									
1	Michael	Miller, "Cloud Computing", Pearson Education, New Delhi, 2009.								
R	eference B	Books								
1	Anthony Hill Educ	T. Velte, "Cloud Computing: A Practical Approach", 1st Edition cation Private Limited, 2009.	, Tata McGraw							
1 K	letted On	tal ag in/gaymag/106/105/106105167/								
1	https://np	un tutorial maint com/aland accepting/index htm								
2	2 <u>https://www.tutorialspoint.com/cloud_computing/index.htm</u>									
3 <u>https://www.javatpoint.com/cloud-computing-tutorial</u>										
	Course Designed Put									
	Course Designed By:									

Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	L	S	М	S	M	S	М	М	М	S	
CO2	М	S	М	S	S	S	М	М	М	S	
CO3	S	S	S	S	S	S	S	S	S	S	
CO4	S	S	S	S	S	S	S	S	S	S	
CO5	М	S	S	S	S	S	S	S	S	S	

Course code		NETWORK SECURITY AND		L	Т	Р	С				
Core/Elective/S	Supportive	Core		4			4				
Pre-requisi	te	Basics of Networks & its Security		Syllat	ous	2021-	22				
Course Objec	tives:										
The main obje	ctives of thi	s course are to:									
 Enable students to learn the Introduction to Cryptography, Web Security and Case studies in Cryptography. To gain knowledge on classical encryption techniques and concepts of modular arithmetic and number theory. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms. To explore the design issues and working principles of various authentication Applications and various secure communication standards including Kerberos, IPsec, and SSL/TLS and email. 											
Expected Cou	Irse Outcon										
On the succ	essful comp	etion of the course, student will be able to:				77.1 7					
I Underst	and the prod	ess of the cryptographic algorithms	1 .		1	K1,I	<u>K2</u>				
2 Compar problem	ns related to	confidentiality and authentication	nniqu	es to	solv	e K2,I	K3				
3 Apply a problem	and analyze n	appropriate security techniques to solve	netwo	ork se	curit	^y K3,I	K4				
4 Explore	suitable cry	otographic algorithms				K4,1	K5				
5 Analyze design s	e different secure appli	digital signature algorithms to achieve an actions	uthent	cicatior	n an	^d K5,I	K6				
K1 - Remen	nber; K2 - U	nderstand; K3 - Apply; K4 - Analyze; K5 -	Evalu	ate; K	6 - C	reate					
	T	EDUCATE TO ELEVATE									
Unit:1		INTRODUCTION				12 ho	urs				
Introduction to cipher and B Algorithms: In	Cryptograp lock ciphe atroduction -	hy – Security Attacks – Security Services – - Symmetric and Asymmetric-key Cryp DES – Triple DES – AES – IDEA – Blowfi	Secur ptosys <u>sh – F</u>	ity Alg stem S RC5.	gorith Symn	nm- St netric	ream Key				
Unit:2		CRYPTO SVSTEM				12 ho	urs				
Public-key Cryptosystem: Introduction to Number Theory - RSA Algorithm – Key Management - Diffie-Hell man Key exchange – Elliptic Curve Cryptography Message Authentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.											
Unit:3		NETWORK SECURITY				12 ho	urs				
Unit:3 NETWORK SECURITY 12 hours Network Security Practice: Authentication Applications – Kerberos – X.509 Authentication services and Encryption Techniques. E-mail Security – PGP – S / MIME – IP Security. 12 hours											

U	nit:4	WEB SECURITY	10 hours					
Wel and	o Security - Viruses – I	Secure Socket Layer – Secure Electronic Transaction. System Sec Firewalls– Password Security.	urity - Intruders					
U	nit:5	CASE STUDY	12 hours					
Cas	e Study: In	mplementation of Cryptographic Algorithms – RSA – DSA – J	ECC (C / JAVA					
Prog	gramming).							
Net	work Foren	nsic - Security Audit - Other Security Mechanism: Introduction t	o: Stenography –					
Qua	intum Cryp	tography – Water Marking - DNA Cryptography						
U	Unit:6 Contemporary Issues		2 hours					
E	xpert lectur	res, online seminars – webinars						
		Total Lastura hours	60 hours					
		I otal Lecture nours	ov nours					
Т	ext Books							
1	William S	Stallings, "Cryptography and Network Security", PHI/PearsonEduc	cation.					
2	Bruce Scl	hneir, "Applied Cryptography", CRC Press.						
R	eference B	ooks						
1	A.Menez Press, 199	es, P Van Oorschot and S.Vanstone, "Hand Book ofApplied Cryp 97	tography", CRC					
2	AnkitFad	ia,"Network Security",MacMillan.						
		The second						
R	elated Onl	line Contents [MOOC, <mark>SWAYAM, NPTEL,</mark> Websites etc.]						
1	https://np	tel.ac.in/courses/106/105/106105031/						
2	http://ww	w.nptelvideos.in/2012/11/cryptography-and-network-security.html	L					
3	3 <u>https://www.tutorialspoint.com/cryptography/index.htm</u>							
~								
C	ourse Desig	gned By:						

Mapping with Programming Outcomes												
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	М	S	М	L	S	М	S	М	S		
CO2	S	S	S	S	S	S	S	S	S	S		
CO3	S	S	S	S	S	S	S	S	S	S		
CO4	S	S	S	S	S	S	S	S	S	S		
CO 5	S	S	S	S	S	S	S	S	S	S		

Course code	DATA SCIENCE & ANALYTICS	L	Т	Р	С							
Core/Elective/Supportive	Core	4			4							
Pre-requisite	Basics of Data Science & its Applications	Syllat	ous	2021-2	22							
Course Objectives:												
The main objectives of the	s course are to:											
1. Introduce the student	s to data science, big data & its eco system.											
2. Learn data analytics	& its life cycle.											
3. To explore the progra	amming language R, with respect to the data minin	ig algor	rithm	IS.								
4. Relate the relationship	p between artificial intelligence, machine learning	and da	ta sc	ience.								
Expected Course Outcon	nes:											
On the successful comp	letion of the course, student will be able to:			-								
1 Understand the co	oncept of data science and its techniques			K1,1	K2							
2 Review data analytics												
3 Apply and determ applications	ine appropriate Data Mining techniques using R to	o real ti	me	K3,1	K4							
4 Analyze on clustering algorithms												
5 Analyze on regression methods in Al												
K1 - Remember; K2 - V	Jnderstand; <mark>K3 - Apply; K4 - Anal</mark> yze; K5 - Evalu	iate; K	6 - C	reate								
Unit:1	INTRODUCTION			12 ho	urs							
Introduction of Data Scie Ecosystem- The Data Scie	ence: data science and big data – facets of data- ence process – six steps- Machine Learning.	data sc	ienc	e proc	ess-							
	Combatore co											
Unit:2	BASICS OF DATA ANALYTICS			12 ho	urs							
Data Analytics life cycle tools.	- review of data analytics - Advanced data Anal	lytics-t	echn	ology	and							
Unit:3	DATA ANALYTICS USING R			12 ho	urs							
Basic Data Analytics using R : R Graphical User Interfaces – Data Import and Export – Attribute and Data Types –Descriptive Statistics – Exploratory Data Analysis –Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables – Data Exploration Versus Presentation.												
Unit:4	Unit:4 CLUSTERING 12 hours											
Overview of Clustering : K-means – Use Cases – Overview of the Method – Perform a K-means Analysis using R –Classification – Decision Trees – Overview of a Decision Tree – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Tree in R – Bayes' Theorem – Naïve Bayes Classifier – Smoothing – Naïve Bayes in R.												

Unit:5 ARTIFICIAL INTELLIGENCE 10 hours Artificial intelligence: Machine Learning and deep learning in data science - Clustering, association rules. Linear regression-logistic regression-Additional regression methods. Clustering, association rules. Linear regression-logistic regression-Additional regression methods. Unit:6 Contemporary Issues 2 hours Expert lectures, online seminars – webinars 60 hours Text Books 60 hours 1 Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf 2 Data science in big data analytics-Wiley 2015 John Wiley & Sons Reference Books 1 1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data 1 https://www.tutorialspoint.com/puthon_data_science/index.htm 2 https://www.tutorialspoint.com/puthon_data_science/index.htm 3 https://www.ijavatpoint.com/data-science 3 https://www.ijavatpoint.com/data-science 4 bata Science & Big Data Analytics: Discovering, Anal											
Artificial intelligence: Machine Learning and deep learning in data science - Clustering, association rules. Linear regression-logistic regression-Additional regression methods. Unit:6 Contemporary Issues 2 hours Expert lectures, online seminars – webinars Total Lecture hours 60 hours Text Books Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf 2 Data science in big data analytics-Wiley 2015 John Wiley & Sons Reference Books 1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/data-science 3 https://www.ijavatpoint.com/data-science 3 https://www.ijavatpoint.com/data-science 3 https://www.ijavatpoint.com/data-science 4 bata Science Big Data Analytics: Discovering 5 Websites etc.] 1 1 <td>U</td> <td>nit:5</td> <td>ARTIFICIAL INTELLIGENCE</td> <td>10 hours</td>	U	nit:5	ARTIFICIAL INTELLIGENCE	10 hours							
Unit:6 Contemporary Issues 2 hours Expert lectures, online seminars – webinars 60 hours Total Lecture hours 60 hours Total Lecture hours 60 hours Text Books 1 Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf 2 Data science in big data analytics-Wiley 2015 John Wiley & Sons Reference Books Introducing Data Science - Lars Nielson 2015 1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/python.data_science/index.htm 2 https://www.javatpoint.com/data-science 3 https://nptel.ac.in/courses/106/106/106/106/106/106/106/106/106/106	Arti asso	Artificial intelligence: Machine Learning and deep learning in data science - Clustering, association rules. Linear regression-logistic regression-Additional regression methods.									
Expert lectures, online seminars – webinars Total Lecture hours 60 hours Text Books 1 Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf 2 Data science in big data analytics-Wiley 2015 John Wiley & Sons Reference Books 1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/python_data_science/index.htm 2 https://www.javatpoint.com/data-science 3 https://www.javatpoint.com/data-science 4 Data Science Bay:	U	nit:6	Contemporary Issues	2 hours							
Total Lecture hours 60 hours Text Books 1 Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf 2 Data science in big data analytics-Wiley 2015 John Wiley & Sons Reference Books 1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/python_data_science/index.htm 2 https://www.javatpoint.com/data-science 3 https://www.javatpoint.com/data-science 3 https://www.javatpoint.com/data-science 3 https://mptel.ac.in/courses/106/106/106/106/106/106/106/106/106/106	E	xpert lectu	res, online seminars – webinars								
Total Lecture hours 60 hours for a books 1 Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf 2 Data science in big data analytics-Wiley 2015 John Wiley & Sons Reference Books 1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/python_data_science/index.htm 2 https://www.javatpoint.com/data-science 3 https://www.javatpoint.com/data-science 3 https://www.javatpoint.com/data-science											
Text Books 1 Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf 2 Data science in big data analytics-Wiley 2015 John Wiley & Sons Reference Books 1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Introducinal Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/pata-science 3 https://www.javatpoint.com/data-science 3 https://nptel.ac.in/courses/106/106/106179/			Total Lecture hours	60 hours							
Text Books 1 Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf 2 Data science in big data analytics-Wiley 2015 John Wiley & Sons Reference Books 1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Visualizing Con/data s											
1 Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. 2 Data science in big data analytics-Wiley 2015 John Wiley & Sons Reference Books 1 A simple introduction to Data Science - Lars Nielson 2015 1 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/python_data_science 3 https://www.javatpoint.com/data-science 3 https://nptel.ac.in/courses/106/106/106106179/	T	ext Books									
2 Data science in big data analytics-Wiley 2015 John Wiley & Sons Reference Books 1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Vertext Conline Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/python_data_science/index.htm 2 https://www.javatpoint.com/data-science 3 https://nptel.ac.in/courses/106/106/106106179/	1	Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf									
Reference Books 1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Vertex of the test of the test of	2	Data scie	nce in big data analytics-Wiley 2015 John Wiley & Sons								
1 A simple introduction to Data Science - Lars Nielson 2015 2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data 7 Hatted Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/python_data_science/index.htm 2 https://www.javatpoint.com/data-science 3 https://nptel.ac.in/courses/106/106106179/	R	eference B	Books								
2 Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication 3 R Programming for Data Science - Roger D.Peng 2015 Lean Publication 4 Data Science & Big Data Analytics: Discovering, Analyzing , Visualizing and Presenting Data Visualizing Analytics: Discovering, Analytics: Discover	1	A simple	introduction to Data Science - Lars Nielson 2015								
 R Programming for Data Science - Roger D.Peng 2015 Lean Publication Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] https://www.tutorialspoint.com/python_data_science/index.htm https://www.javatpoint.com/data-science https://nptel.ac.in/courses/106/106/106106179/ 	2	Introduci Publicati	ng Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali on	2016 Manning							
 4 Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/python_data_science/index.htm 2 https://www.javatpoint.com/data-science 3 https://nptel.ac.in/courses/106/106/106106179/ 	3	R Progra	mming for Data Science - Roger D.Peng 2015 Lean Publication								
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/python_data_science/index.htm 2 https://www.javatpoint.com/data-science 3 https://nptel.ac.in/courses/106/106/106106179/ Course Designed By:	4	Data Scie	nce & Big Data Analytics: Discovering, Analyzing, Visualizing and Press	enting Data							
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://www.tutorialspoint.com/python_data_science/index.htm 2 https://www.javatpoint.com/data-science 3 https://nptel.ac.in/courses/106/106/106106179/ Course Designed By:											
1 <u>https://www.tutorialspoint.com/python_data_science/index.htm</u> 2 <u>https://www.javatpoint.com/data-science</u> 3 <u>https://nptel.ac.in/courses/106/106/106106179/</u> Course Designed By:	R	elated On	line Contents [MOO <mark>C, SWAYAM, NPTEL, W</mark> ebsites etc.]								
2 <u>https://www.javatpoint.com/data-science</u> 3 <u>https://nptel.ac.in/courses/106/106/106/106179/</u> Course Designed By: Course Designed By:	1	https://w	ww.tutorialspoint.com/python_data_science/index.htm								
3 <u>https://nptel.ac.in/courses/106/106/106106179/</u> Course Designed By:	2	https://w	ww.javatpoint.com/data-science								
Course Designed By:	3	https://np	tel.ac.in/courses/106/106/106106179/								
Course Designed By:			Contrainty Contrainty								
	С	ourse Desi	gned By:								

Mappin	Mapping with Programming Outcomes												
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10			
CO1	S	S	S	S	S	S	S	М	М	S			
CO2	S	S	S	S	S	S	S	М	S	S			
CO3	S	S	S	S	S	S	S	М	S	S			
CO4	S	S	S	S	S	S	S	М	S	S			
CO5	S	S	S	S	S	S	S	М	S	S			

*S-Strong; M-Medium; L-Low

ſ

Core/Elective/Supportive Core 4 4 Pre-requisite Basic Programming of Image Processing & Syllabus an intro to MATLAB Syllabus Version 2021-22 Course Objectives: Use of this course are to: 1. 1. 2021-22 1. To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques 3. To enable the students to learn the fundamentals of image compression and segmentation 3. To understand Image Restoration & Filtering Techniques 4. K1.K2 4. Implementation of the above using MATLAB Expected Course Outcomes: K1.K2 On the successful completion of the course, student will be able to: K1.K2 1 To write programs in MATLAB for image processing using the techniques K1.K2 2 To able to implement Image Enhancements & Restoration techniques K2.K3 3 Capable of using Compression techniques in an Image K3.K4 4 Must be able to manipulate the image and Segment it K5.K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create IIST OF PROGRAMS 1 Implement Image Filtering. S. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. Implement Image compression.<	Course code		PRACTICAL V : DIGITAL IMAGE PROCESSING Using MATLAB	L	Т	Р	С					
Pre-requisite Basic Programming of Image Processing & Syllabus Version 2021-22 Course Objectives:	Core/Elective/S	Supportive	Core			4	4					
Course Objectives: The main objectives of this course are to: 1. To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques 2. To enable the students to learn the fundamentals of image compression and segmentation 3. To understand Image Restoration & Filtering Techniques 4. Implementation of the above using MATLAB Expected Course Outcomes: On the successful completion of the course, student will be able to: 1 To write programs in MATLAB for image processing using the techniques K1,K2 2 To able to implement Image Enhancements & Restoration techniques K2,K3 3 Capable of using Compression techniques in an Image K3,K4 4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROGRAMS 60 hours 1 Implement Image enhancementTechnique, K1 2 Histogram Equalization K1 3 ImageRestoration, K1 4 Implement Image Filtering, Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6 6 Implemen	Pre-requisit	te	Basic Programming of Image Processing & an intro to MATLAB	Syllal Versi	ous on	2021-	22					
The main objectives of this course are to: 1. To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques 2. To enable the students to learn the fundamentals of image compression and segmentation 3. To understand Image Restoration & Filtering Techniques 4. Implementation of the above using MATLAB Expected Course Outcomes: On the successful completion of the course, student will be able to: 1 To write programs in MATLAB for image processing using the techniques X1,K2 2 To able to implement Image Enhancements & Restoration techniques X2,K3 3 Capable of using Compression techniques in an Image K3,K4 4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROCRAMS 60 hours 1. Implement Image enhancement fechnique. 2. Histogram Equalization 3. ImageRestoration. 4. Implement Image Filtering. 5. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. Implement Image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Total Lecture hours 60 hours	Course Objec	tives:										
1. To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques 2. To enable the students to learn the fundamentals of image compression and segmentation 3. To understand Image Restoration & Filtering Techniques 4. Implementation of the above using MATLAB Expected Course Outcomes: On the successful completion of the course, student will be able to: 1 To write programs in MATLAB for image processing using the techniques K1,K2 2 To able to implement Image Enhancements & Restoration techniques K2,K3 3 Capable of using Compression techniques in an Image K3,K4 4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROCRAMS 60 hours 1. Implement Image enhancementTechnique. 2. Histogram Equalization Statement for the students of the student	The main object	ctives of thi	s course are to:									
2. To enable the students to learn the fundamentals of image compression and segmentation 3. To understand Image Restoration & Filtering Techniques 4. Implementation of the above using MATLAB Expected Course Outcomes: On the successful completion of the course, student will be able to: To write programs in MATLAB for image processing using the techniques K1,K2 To able to implement Image Enhancements & Restoration techniques K2,K3 Capable of using Compression techniques in an Image K3,K4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROGRAMS Solution I. Implement Image enhancement Technique. Histogram Equalization ImageRestoration. Implement Image Filtering. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) Implement image compression. Timage Subtraction Boundary Extraction using morphology. Image Segmentation Total Lecture hours 60 hours	1.To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques											
 3. To understand Image Restoration & Filtering Techniques 4. Implementation of the above using MATLAB Expected Course Outcomes: On the successful completion of the course, student will be able to: 1 To write programs in MATLAB for image processing using the techniques K1,K2 2 To able to implement Image Enhancements & Restoration techniques K2,K3 3 Capable of using Compression techniques in an Image K3,K4 4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROGRAMS 60 hours 1. Implement Image enhancementTechnique.u 2. Histogram Equalization 3. ImageRestoration. 4. Implement Image Compression. 5. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Text Books	2. To enable t	the students	to learn the fundamentals of image compression as	nd seg	men	tation						
 4. Implementation of the above using MATLAB Expected Course Outcomes: On the successful completion of the course, student will be able to: 1 To write programs in MATLAB for image processing using the techniques K1,K2 2 To able to implement Image Enhancements & Restoration techniques K2,K3 3 Capable of using Compression techniques in an Image K3,K4 4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROGRAMS 60 hours 1. Implement Image enhancement Technique. In University of the statement of the stat	3. To understa	and Image I	Restoration & Filtering Techniques									
Expected Course Outcomes: On the successful completion of the course, student will be able to: Image processing using the techniques K1,K2 Image of using Compression techniques in an Image K3,K4 K2,K3 Image of using Compression techniques in an Image K3,K4 Image of using Compression techniques in an Image K3,K4 Image of using Compression techniques in an Image K3,K4 Image of using Compression techniques in an Image K3,K4 Image of using Compression techniques in an Image K3,K4 Image of using Compression techniques in an Image K3,K4 Image of using Compression techniques in an Image K3,K4 Image of using Compression techniques in an Image K3,K4 Image of using Compression techniques in an Image K3,K4 Image of using Compression techniques in an Image K6 - Create Image of using Compression techniques in an Image in	4. Implement	ation of the	above using MATLAB									
Expected Course Outcomes: On the successful completion of the course, student will be able to: Image of the successful completion of the course, student will be able to: 1 To write programs in MATLAB for image processing using the techniques K1,K2 2 To able to implement Image Enhancements & Restoration techniques K2,K3 3 Capable of using Compression techniques in an Image K3,K4 4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create 60 hours 1. Implement Image enhancementTechnique. 60 hours 1. Implement Image enhancementTechnique. Image enhancement and the segment and the segme												
On the successful completion of the course, student will be able to: 1 To write programs in MATLAB for image processing using the techniques 2 To able to implement Image Enhancements & Restoration techniques 3 Capable of using Compression techniques in an Image 4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create 60 hours 1 Implement Image enhancementTechnique. 60 hours 1 Implement Image Filtering. 5. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Text Books	Expected Cou	rse Outcon	nes:									
1 To write programs in MATLAB for image processing using the techniques K1,K2 2 To able to implement Image Enhancements & Restoration techniques K2,K3 3 Capable of using Compression techniques in an Image K3,K4 4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create 60 hours 1 Implement Image enhancementTechnique. 60 hours 2 Histogram Equalization Sequences and the formation of the sequence of the sequen	On the succe	essful comp	letion of the course, student will be able to:									
2 To able to implement Image Enhancements & Restoration techniques K2,K3 3 Capable of using Compression techniques in an Image K3,K4 4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create 60 hours 1 Implement Image enhancementTechnique. 60 hours 1. Implement Image enhancementTechnique. 60 hours 3 ImageRestoration. 60 hours 4 Implement Image Compression. 7. 5 Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. 6 Implement image compression. 7. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation 60 hours	1 To write	e programs	in MATLAB for image processing using the techn	iques		K1,K	2					
3 Capable of using Compression techniques in an Image K3,K4 4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create 60 hours 1 Implement Image enhancement Technique. In the second	2 To able	to impleme	nt Image Enhancements & Restoration techniques			K2,K	3					
4 Must be able to manipulate the image and Segment it K5,K6 K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROGRAMS 60 hours 1. Implement Image enhancement Technique. 2. Histogram Equalization 3. ImageRestoration. 4. Implement Image Filtering. 5. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Total Lecture hours 60 hours	3 Capable	e of using C	ompression techniques in an Image			K3,K	4					
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create LIST OF PROGRAMS 60 hours 1. Implement Image enhancementTechnique. 2. Histogram Equalization Secure of the	4 Must b	$\frac{1}{1}$ U	inipulate the image and Segment it	4 17	<u> </u>	K5,K	6					
LIST OF PROGRAMS 60 hours 1. Implement Image enhancementTechnique. 60 hours 2. Histogram Equalization 60 hours 3. ImageRestoration. 60 hours 4. Implement ImageFiltering. 5. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Total Lecture hours 60 hours	KI - Remen	nber; K2 - (Inderstand; K3 - Apply; K4 - Analyze; K5 - Evalu	ate; K	6 - (reate						
1. Implement Image enhancement Technique. In Unit of the transmission of transmission of the transmission of transmission of transmission of transmission of the transmission of transmissin of transmission of transmission of transmi			LIST OF PROGRAMS			60 ha	ours					
 2. Histogram Equalization 3. ImageRestoration. 4. Implement ImageFiltering. 5. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Text Books 1 Refael C. Computer Richard F. Woods, "Disited Image Processing" Second Edition	1. Implement	nt Image en	nancementTechnique. IR UNING 68									
 3. ImageRestoration. 4. Implement ImageFiltering. 5. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Total Lecture hours 60 hours Text Books 1 Parfael C. Congrelez, Pichard E. Woods, "Digital Image Proceeding," Second Edition	2. Histogram	n Equalizati	on									
 4. Implement ImageFiltering. 5. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Total Lecture hours 60 hours Text Books 1 Paral C. Gonzalez, Pichard F. Wooda, "Digital Image Proceeding," Second Edition	3. ImageRes	storation.										
 5. Edge detection using Operators (Roberts, Prewitts and Sobelsoperators) 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Total Lecture hours 60 hours Text Books 1. Refeal C. Conzelaz, Pichard F. Woods, "Digital Image Proceeding", Second Edition	4. Implemen	nt ImageFilt	ering.									
 6. Implement image compression. 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Total Lecture hours 60 hours Text Books 1 Refael C. Conzelez, Richard F. Woods, "Digital Image Processing", Second Edition	5. Edge dete	ection using	Operators (Roberts, Prewitts and Sobelsoperators)									
 7. Image Subtraction 8. Boundary Extraction using morphology. 9. Image Segmentation Total Lecture hours 60 hours 	6. Implemen	nt image con	npression.									
8. Boundary Extraction using morphology. 9. Image Segmentation Total Lecture hours 60 hours Text Books I Pafeol C. Conzelez, Pichard F. Woods, "Digital Image Processing", Second Edition	7. Image Su	btraction										
9. Image Segmentation Total Lecture hours 60 hours Text Books 1 Pafeol C. Conzelez, Pichard F. Woods, "Digital Image Processing", Second Edition	8. Boundary	8. Boundary Extraction using morphology.										
Total Lecture hours 60 hours Text Books 1 Pafeol C. Conzeloz. Pichard E. Woods. "Disital Image Processing". Second Edition	9. Image Se	gmentation										
Text Books	Total Lecture hours 60 hours											
1 Dafael C. Conzelez, Dishard F. Woods, "Disital Image Drossesing" Second Edition	Toyt Doole											
	1 Defect C	Conceler	Dishard E. Woods "Disital Image Processing" S		E dit	ion						

	PHI/Pearson Education.								
2	B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.								
R	Reference Books								
1	Nick Efford, "Digital Image Processing a practical introducing using Java", Pearson								
1	Education, 2004.								
R	elated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]								
1	https://nptel.ac.in/courses/117/105/117105135/								
2	https://www.tutorialspoint.com/dip/index.htm								
3	https://www.javatpoint.com/digital-image-processing-tutorial								

Course Designed By:

Mapping with Programming Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	S	М	S	S	S	М	М	S	S		
CO2	S	S	S	S	S	S	S	М	S	S		
CO3	S	S	S	S	S	S	S	М	S	S		
CO4	S	S	S	S	S	S	S	М	S	S		



Course code		PRACTICAL VI : CLOUD COMPUTING LAB	L	Т	Р	С					
Core/Elective/S	upportive	Core			4	4					
Pre-requisit	e	Basic Programming using Cloud	Syl	labus	2021-2	22					
Course Object	tives:										
The main object	ctives of thi	s course are to:									
1.This course	covers the	basic data structures like Stack, Queue, Tree,	List.								
2. This course	enables the	e students to learn the applications of the data	structi	ires us	sing						
various techni	ques		0.0	D							
3. It also enabl	le the stude: $of OOPS co$	nts to understand C++ language with respect to	to OOA	AD coi	ncepts						
	01 001 5 0										
Expected Cou	rse Outcor	nes:									
On the succe	ssful comp	letion of the course, student will be able to:									
1 Underst		K1,K2									
2 Able to		K3,K4									
3 Impleme	ntation of c	lata structure <mark>s like</mark> Stack, Queue, Tree, List u	sing C	++	K4,K5						
4 Application different	on of the da techniques.	ata structures for Sorting, Searching using			K5,K6						
K1 - Remem	ber; K2 - U	Inderstand <mark>; K3</mark> - Apply; K4 - Analyze; K5 - I	Evaluat	e; K6	- Create						
					(0.1						
1 Working w	ith Google	Drive to make spreadsheet and notes			60 NO	urs					
2 Launch a L	inux Virtua	1 Machine									
2. Eachert a E	intia wabait	Ebucare to elevate									
J. To nost a st		, and four the fallowing of Standard h) Shaving	of do	(a. a)							
4. Exploring calendar, to-de	o lists, d) a	document editing tool	, or da	la c)	manage y	′our					
5. Working an	nd installation	on of Google App Engine									
6. Working an	nd installati	on of Microsoft Azure									
7. To Connect	t Amazon R	edshift with S3 bucket									
8. To Create a	nd Query a	NoSQL Table									
Expert lectur	Expert lectures, online seminars – webinars										
Total Lecture hours 60 hours											
Toyt Dooks											
1 Michael M											
Reference P	1 Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009. Performance Pearlys										
Neier ence D	UUKS										

1	Anthony T. Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata McGraw Hill Education Private Limited, 2009.
R	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/courses/106/105/106105167/
2	https://www.tutorialspoint.com/cloud_computing/index.htm
3	https://www.javatpoint.com/cloud-computing-tutorial
C	Course Designed By:

Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	М	S	S	S	М	М	S	S	
CO2	S	S	S	S	S	S	S	М	S	S	
CO3	S	S	S	S	S	S	S	М	S	S	
CO4	S	S	S	S	S	S	S	М	S	S	



Course code		PRACTICAL VII : WEB APPLICATION DEVELOPMENT AND HOSTING	L	Т	Р	С		
Core/Elective/S	Supportive	Core			2	2		
Pre-requisi	te	Basic Programming using HTML tags	ITML tags Syllabus 2021-2					
Course Objec	tives:							
The main obje	ctives of this	s course are to:						
1.Able to desig	gn a web pag	ge using HTML tags						
2.To enable th tags	e students to	o use Framesets, hyper links and different format	ting fe	atures	s of HT	ML		
3.Enable the st	udents to us	e Forms & other controls in a web page						
4.To create int	eractive app	lications using PHP						
Expected Cou	rse Outcon	nes:						
On the succe	essful compl	etion of the course, student will be able to:			-			
1 Unders	tand & impl	lement the basic HTML tags to create static web	pages		K1,K2	2		
2 Capable	e of using hy	perlinks, fra <mark>mes</mark> , images, tables,in a web pag	ge		K2,K3	3		
3 Able to	write dynan	nic web applications using HTML forms			K4,K5	5		
4 Must b XAMP	e able to wr P.	ite dynamic web applications in PHP & HTML t	ags us	ing	K5,K	6		
K1 - Remen	nber; K2 - U	Inderstand; K3 - Apply; K4 - Analyze; K5 - Eva	luate;	K6 - (Create			
		A HIAR UNIVERS		1				
1 Davalan	wabaita far	LIST OF PROGRAMS			30 ho	urs		
1. Develop a	i website for	your conege using advanced tags of HTML.						
2. Write na world.html. E open india.htm	mes of sev Each country ml and it sho	real countries in a paragraph and store it as name must be a hot text. When you click India ould provide a brief introduction about India.	an H (for e	TML xamp	docum le), it n	ent, nust		
3. Develop display the Ta	a HTML do able Format	ocument to i)display Text with Bullets / Number Data	ers - U	Jsing	Lists ii) to		
4. Develop about a Hosp	a Complete ital using H	Web Page using Frames and Framesets which FML.	gives	the I	nforma	tion		
5. Write a H	TML docun	nent to print your Bio-Data in a neat format using	g sevei	al con	nponen	ts.		
6. Develop a	1 HTML doc	cument to display a Registration Form for an inte	r-colle	egiate	functio	n.		
7. Using HT Email address	TML form a sand validat	ccept Customer details like Name, City, Pin co- te the data and display appropriate messages for	de, Ph violati	one n ons us	umber sing PH	and P		
(Eg. Name i	s Mandatory	/ field; Pin code must be 6 digits, etc.).						

8. Write a program to accept two numbers n1 and n2 using HTML form and display the Prime

nu	mbers between n1 and n2 using PHP.									
	Total Lecture hours	30 hours								
Т	ext Books									
1	Ivan Bayross, "Web Enabled Commercial Applications Development Using	Ivan Bayross, "Web Enabled Commercial Applications Development Using HTML,								
1	JavaScript, DHTML and PHP", BPB Publications, 4th Revised Edition, 2010.									
R	Reference Books									
2	A.K.Saini and SumintTuli, "Mastering XML", First Edition, New Delhi, 20	02.								
R	elated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://www.tutorialspoint.com/xml/index.htm									
2	https://www.tutorialspoint.com/internet_technologies/websites_developmen	<u>it.htm</u>								
3	https://www.youtube.com/watch?v=PlxWf493en4									
C	ourse Designed By:									

Course Designed By:

Manning with Programming Outcomes

Mapping with Hogramming Outcomes												
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	S	М	S	S	S	М	М	S	S		
CO2	S	S	S	S of	S	S	S	М	S	S		
CO3	S	S	S	S	S	S	S	М	S	S		
CO4	S	S	S	S	S	S	S	М	S	S		



Course code		MULTIMEDIA AND ITS	L	Т	Р	C				
		APPLICATIONS		-	•	<u>ر</u>				
Core/Elective/S	Supportive	Elective	4 S-ula			4				
Pre-requisit	te	Basics of Multimedia	Syllab	bus	2021-	22				
Course Object	tives:									
The main object	ctives of thi	s course are to:								
 To introduce the students the concepts of Multimedia, Images & Animation. To introduce Multimedia authoring tools To understand the role of Multimedia in Internet To know about High Definition Television and Desktop Computing – Knowledge based Multimedia systems 										
Expected Cou	rse Outcon	nes:								
On the succe	essful comp	letion of the course, student will be able to:								
1 Unders	stand the ba	sic concepts of Multimedia			K1,F	K2				
2 Demor	nstrate Mult	imedia authoring tools			K2,ł	K 3				
3 Analyz	ze the conce	pts of Sound, Images, Video & Animation			ŀ	ζ4				
4 Apply applicat	and Analyz ions	e the role of Multimedia in Internet and real time			K4,K5					
5 Analyz	ze multimed	lia applications using HDTV			K5,ł	K6				
K1 - Remem	nber; K2 - U	Inderstand <mark>; K3</mark> - Apply; K4 - Analyze; K5 - Evalu	ate; K	6 - C	reate					
TT:4-1		INTRODUCTION	<u> </u>		12 ha					
		INTRODUCTION			<u>12 no</u>	urs				
What is Mult Production plat	timedia? – tforms – Ba	sic Software tools.	itosh a	and	Windo	ows				
		Bissiunen 2-un	<u> </u>							
Unit:2		MULTIMEDIA TOOLS			12 ho	urs				
Making Instant Sound.	t Multimedi	a – Multimedia authoring tools – Multimedia build	ling blo	ocks	– Text	; —				
Unit:3		ANIMATION			10 ho	urs				
Images – Anim	nation – Vid	eo.			10 110	uis				
					10.1					
Unit:4		INTERNET			12 ho	urs				
Multimedia an Designing for t	d the Intern the World V	net – The Internet and how it works – Tools for Vide Web.	World	l Wie	le We	b –				
Unit:5		MULTIMEDIA SYSTEMS			12 ho	urs				
High Definition	n Television	n and Desktop Computing – Knowledge based Mu	ltimedi	a sys	stems.					

U	J nit:6	Contemporary Issues	2 hours								
F	xpert lectu	res, online seminars - webinars									
		Total Lecture hours	60 hours								
Γ	Text Books										
1	Tay Vau	Tay Vaughan, "Multimedia making it work", Fifth Edition, Tata McGrawHill.									
2	2 John F. Koegel Bufford, "Multimedia Systems", Pearson Education.										
R	eference B	Books									
1	Judith Je	ffloate, "Multimedia in Practice (Technology and Applications)", PH	I,2003.								
F	Related On	line Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://w	ww.tutorialspoint.com/multimedia/index.htm									
2	https://www.tutorialspoint.com/basics_of_computer_science/basics_of_computer_science_m ultimedia.htm										
3	https://n	ptel.ac.in/courses/117/105/117105083/									
C	Course Des	igned By:									

Mapping with Programming Outcomes											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	S	M	S	Μ	М	М	S	
CO2	S	S	S	S	M	S	M	S	S	S	
CO3	S	S	S	5 STRA	S	S	S S	S	S	S	
CO4	S	S	S	S	S	Scole	S	S	S	S	
CO5	S	S	S	S BE E	S 55 ULITON 2	un S	S	S	S	S	
*S-St	rong: M-	Medium:	L-Low		EDUCATE TO ELEVI	ATE					

Course code	EMBEDDED SYSTEMS	L	Т	Р	С					
Core/Elective/Supportive	Elective	4			4					
Pre-requisite	Basics of Micro Controller	Sylla	ous	2021	-22					
Course Objectives:	1									
The main objectives of the	is course are to:									
1. Present the introduction to 8051 Microcontroller Instruction Set, concepts on RTOS &										
Software tools.										
2. Gain the knowledge about the embedded software development.										
5. Learn about Microco	introner and software tools in the embedded syste	<u>IIIS.</u>								
Expected Course Outco	mes:									
On the successful comp	eletion of the course, student will be able to:									
1 Understand the co	oncept of 8051 microcontroller			K1,1	K2					
2 Understand the In	struction Set and Programming			K2,1	K3					
3 Analyze the conce	epts of RTOS			K3,1	K4					
4 Analyze and desig	gn various real time embedded systems using RT	OS		K	5					
5 Debug the malfur	nctioning system using various debugging techniq	ues		K5,1	K6					
K1 - Remember; K2 - V	Understand; K3 - Apply; K4 - Analyze; K5 - Eva	luate; K	6 – Ci	reate						
	8051 MICROCONTROLLER		1	<u>12Ho</u>	urs					
8051 Microcontroller: In External Memory - Count	troduction - 8051 Architecture-Input/Output Pir	is, Ports ats	and	Circui	its -					
External Wentery - Count	ers / Inners - Serial Data Input / Sulput - Interru	7.5								
Unit:2	PROGRAMMING BASICS			12Ho	urs					
Instruction Set and Pa	rogramming Moving Data-Addressing Mode	s-Logic	al o	peratio	ons-					
Arithmetic Operation-Jun	mp and Call Instructions-Simple Program. A	pplicatio	ons:	Keybo	oard					
Interface- Display Interface	ce-Pulse Measurements-DIA and AID Conversion	ns-Multi	ple Iı	nterrup	ots.					
Unit:3	CONCEPTS ON RTOS			12Ho	urs					
CONCEPTS ON RTOS:	Introduction to RTOS-Selecting an RTOS-Task a	und Task	state	es - Ta	asks					
and data- Semaphores an	nd shared data. MORE operating systems serve	ces: Int	errup	t Proc	cess					
communication - Messag	ge Queues, Mailboxes and pipes- Timer Functi	ons-Eve	ents -	Mem	ory					
	butines in an RTOS Environment.									
Unit:1	DESIGN USING PTOS			1010	11 16					
				10110						
Basic Design using a RT	OS: Principles - Encapsulating semaphores and	Queues-	Hard	real t	ıme					
	-saving memory space and power- mubductions	WALL	ayr							
Unit:5										
	SOFTWARE TOOLS 12Hour									

Linl	cer/Locator	s for Embedded software-getting Embedded software into the	Farget systems.						
Deb	ugging Te	chniques: Testing on your Host machine -Instruction set simulat	ors- The assert						
mac	macro- using laboratory tools.								
U	nit:6	Contemporary Issues	2 hours						
E	xpert lectur	es, online seminars – webinars							
		Total Lecture hours	60Hours						
Т	ext Books								
1	David E.	Simon, "An Embedded Software primer" Pearson Education Asia,	2003.						
2	Kenneth	J Ayala, "The 8051 Microcontroller and Architecture pro-	gramming and						
2	applicatio	n", Second Edition, Penram International.							
R	eference B	ooks							
1	Raj Kama Hill, 2003	al, "Embedded Systems – Architecture, programming and design", ' 3.	Tata McGraw –						
R	elated Onl	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1	https://on	linecourses.nptel.ac.in/noc20_cs14/preview_							
2	https://ww	vw.javatpoint.com/embedded-system-tutorial							
3	https://ww	ww.tutorialspoint.com/embedded_systems/index.htm							
C	ourse Desig	gned By:	_						
		B Contraction							

Mapping with Programming Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	L	L	L	S ^{ist} er &	M	un is S	S	М	М	S		
CO2	М	М	S	S	EDUCA MO ELEN	ITE S	М	S	S	S		
CO3	М	S	S	S	S	S	S	S	S	S		
CO4	S	S	S	S	S	S	S	S	S	S		
CO 5	S	S	S	S	S	S	S	S	S	S		

Course code	INTERNET OF THINGS	L	Т	Р	С					
Core/Elective/Supportive	Elective	4			4					
Pre-requisite	Basics of Sensors & its Applications	Syllab	ous	2021	-22					
Course Objectives:										
The main objectives of this course are to:										
 About Internet of Things where various communicating entities are controlled and managed for decision making in the application domain. Enable students to learn the Architecture of IoT and IoT Technologies Developing IoT applications and Security in IoT, Basic Electronics for IoT, Arduino IDE, Sensors and Actuators Programming NODEMCU using Arduino IDE. 										
Europeted Course Outcor										
On the successful comp	nes: letion of the course, student will be able to:									
1 Understand about 1	To T its Architecture and its Applications			K11	22					
2 Understand basic el	ectronics used in IoT & its role			K2 I	<u>x</u> 2 X3					
3 Develop application	as with C using Arduino IDE			- 162,1	<u><</u>					
4 Analyze about sens	sors and actuators			K51	ζ6					
5 Design IoT in re	al time applications using today's internet &	wire	less	K6						
K1 - Remember; K2 - U	Jnderstand; K3 - Apply; K4 - Analyze; K5 - Evalu	iate; K	6 - C	reate						
Unit:1	INTRODUCTION			12 ho	urs					
Introduction to IoT: Evolu – Technologies for IoT – Security in IoT	ttion of IoT – Definition & Characteristics of IoT Developing IoT Applications – Applications of I	- Arch oT – Iı	itectı ndust	ure of rial Io	IoT T –					
Unit:2	BASIC ELECTRONICS FOR IoT			12 ho	urs					
Basic Electronics for I Calculations – Logic Chip A/D and D/A Conversion	oT: Electric Charge, Resistance, Current and os – Microcontrollers – Multipurpose Computers – – Pulse Width Modulation.	l Volta - Electi	age ronic	– Bir Signa	ary ls –					
Unit:3	PROGRAMMING USING ARDUINO			12 ho	urs					
Onic:sPROGRAMMING USING ARDUINO12 hoursProgramming Fundamentals with C using Arduino IDE: Installing and Setting up the ArduinoIDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements andLoops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.										
TI:4-4	SENSODS AND ACTUATODS			10 1-						
				<u>10 NO</u>						
Sensors and Actuators: A	nalog and Digital Sensors – Interfacing temperati	ire sens	sor, i	utraso	und					

sensor and infrared (IR) sensor with Arduino – Interfacing LED and Buzzer with Arduino.									
U	nit:5	SENSOR DATA IN INTERNET	12 hours						
Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (ThingSpeak).									
Unit:6		Contemporary Issues	2 hours						
E	xpert lectu	res, online seminars – webinars							
		Total Lecture hours	hours						
Т									
1	ext Books								
1	Arshdeep ISBN: 97	9 Bahga, Vijay Madisetti, "Internet of Things: A Hands-On Ap 78-0996025515	proach", 2014.						
2	Boris Ad Artech H	ryan, Dominik Obermaier, Paul Fremantle, "The Technical Found ouser Publishers, 2017.	lations of IoT",						
R	eference B	Books							
1	Michael	Margolis, "Arduino Cookbook", O"Reilly, 2011							
2	Marco So	hwartz, "Internet of Thi <mark>ngs with ESP8266", P</mark> ackt Publishing, 2016	5.						
3	Dhivya I Dev. Kiť	Bala, "ESP8266: Step by Step Tutorial for ESP8266 IoT, Arduin ", 2018.	no NODEMCU						
R	elated On	line Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1	https://on	linecourses.nptel.ac.in/noc20_cs66/preview							
2	https://ww	ww.javatpoint.com/iot-internet-of-things							
3	https://w	ww.tutorialspoint.com/internet of things/index.htm							
Course Designed By:									
		D							

Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	М	М	М	S	М	S	М	М	S	М	
CO2	М	S	М	S	М	S	М	S	S	S	
CO3	S	S	S	S	М	S	М	S	S	S	
CO4	S	S	S	S	S	S	S	S	S	S	
CO5	S	S	S	S	S	S	S	S	S	S	

Course code		CRITICAL THINKING, DESIGN THINKING AND PROBLEM SOLVING	L	Т	Р	С						
Core/Elective/S	Supportive	Elective	4			4						
Pre-requisit	te	Basics of Logical & Reasoning Skills	Syllab	Syllabus		22						
Course Objec	tives:		•									
The main objectives of this course are to:												
1. Learn critical thinking and its related concepts												
2. Learn design thinking and its related concepts												
3. Develop I	i ninking pa	uerns, Problem solving & Reasoning										
Expected Cou	rse Outcon	nes:										
On the succe	essful comp	letion of the course, student will be able to:										
1 Understand the concepts of Critical thinking and its related technology K1,K2												
2 Focus on the explicit development of critical thinking and problem solving skills												
3 Apply d	lesign think	ing in problems			K3,I	K4						
4 Make a	decision an	d take actions based on analysis			K4,I	K5						
5 Analyze the concepts of Thinking patterns, Problem solving & Reasoning in real time applications												
K1 - Remen	nber; K2 - U	Jnderstand; <mark>K3</mark> - Apply; K4 - Analyze; K5 - Evalu	ate; K	6 - C	reate							
	I											
Unit:1		CRITICAL THINKING			12 ho	urs						
Critical Think finding, evalua Applied critica critical thinkin	ing: Definitation, Infere at thinking g and science	ition, Conclusions and Decisions, Beliefs and ences, Facts – opinion, probable truth, probably : Inference, Explanation, Evidence, Credibility, ce, critical evaluation, self assessment.	Claims false, V Two	s, Ev Venn Case	videnco diagr e Stud	e – am. ies,						
		EDUCATE TO ELEVATE										
Unit:2		DESIGN THINKING			12 ho	urs						
Design Thinking: Introduction, Need of Design Thinking, problem to question - design thinking process, Traditional Problem Solving versus Design Thinking, phases of Design Thinking, problem exploration, Stake holder assessment, design thinking for manufacturers, smart Idea to implementation.												
Unit:3		CASE STUDY			12 ho	urs						
Thinking to confidence, fear management, duty Vs passion, Team management, Tools for Thinking, prototype design, Relevance of Design and Design Thinking in engineering, human centered design, case study: apply design thinking in problem.												
Unit:4 Problem solvi	Unit:4 PROBLEM SOLVING 10 hours											
data processir	ng, solution	methods, solving problems by searching, recogni	izing p	atter	ns, spa	itial						

reasoning, necessity and sufficiency, choosing and using models, making choices and decisions.								
Unit:5 REASONING 12 hours								
Reasoning: Deductive and hypothetical reasoning, computational problem solving; generating, implementing, and evaluating solutions, interpersonal problem solving. Advanced problem solving: Combining skills – using imagination, developing models, Carrying out investigations, Data analysis and inference. Graphical methods of solution, Probability, tree diagrams and decision trees								
Unit:6 Contemporary Issues 2 hours								
Expert lectures, online seminars – webinars								
Total Lecture hours 60 hours								
Text Books								
1John Butterworth and Geoff Thwaites, Thinking skills: Critical Thinking and Problem Solving, Cambridge University Press, 2013.								
2 H. S. Fogler and S. E. LeBlanc, Strategies for Creative Problem Solving, 2nd edition Pearson, Upper Saddle River, NJ, 2008.								
Reference Books								
A. Whimbey and J. Lochhead, Problem Solving & Comprehension, 6th edition, Lawrence Erlbaum, Mahwah, NJ, 1999.								
2 M. Levine, Effective Problem Solving, 2nd edition, Prentice Hall, Upper Saddle River, NJ 1994.								
3 Michael Baker, The Basic of Critical Thinking, The Critical Thinking Co press, 2015.								
4 David Kelley and Tom Kelley, Creative Confidence, 2013.								
Comphane C								
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]								
1 <u>https://www.tutorialspoint.com/critical_thinking/index.htm</u>								
2 <u>https://www.tutorialspoint.com/design_thinking/design_thinking_quick_guide.htm</u>								
3 <u>https://nptel.ac.in/courses/109/104/109104109/</u>								
Course Designed By:								

Mapping with Programming Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	S	М	S	S	S	М	S	S	S		
CO2	S	S	М	S	S	S	М	S	S	S		
CO3	S	S	М	S	S	S	S	S	S	S		
CO4	S	S	S	S	S	S	S	S	S	S		
CO5	S	S	S	S	S	S	S	S	S	S		

Course code		MOBILE COMPUTING	L	Т	Р	С					
Core/Elective/S	upportive	Elective	4			4					
Pre-requisit	e	Basics of Mobile Communication	Syllab	abus 2021-22		22					
Course Object	tives:										
The main object	ctives of thi	s course are to:									
 Present the overview of Mobile computing, Applications and Architectures. Describe the futuristic computing challenges. Enable the students to learn the concept of mobile computing. 											
Furnested Course Outcomest											
Expected Course Outcomes: On the successful completion of the course, student will be able to:											
1 Understand the need and requirements of mobile communication K1.K2											
2 Focus on mobile computing applications and techniques											
3 Demonstrate satellite communication in mobile computing											
4 Analyz	e about win	eless local loop architecture			K5,	K6					
5 Analyz	e various n	nobile communication technologies			K	6					
K1 - Remem	ıber; K2 - U	Inderstand; K3 - Apply; K4 - Analyze; K5 - Evalu	iate; K	6 - C	Create						
Unit:1		INTRODUCTION			12 ho	urs					
Introduction: A communication History of Mob	Advantages 1: Need for bile Commu	of Digital Information - Introduction to Telepho Mobile Communication – Requirements of Mob mication.	one Sys ile Cor	stem mmu	s –Mo inicatio	bile on –					
I		MODILE COMMUNICATION			13 ha						
Unit:2		MOBILE COMMUNICATION			12 no	ours					
Introduction to Management –	Cellular M Frequency	Iobile Communication – Mobile Communication Management – Cordless Mobile Communication	Standa System	ards 1s.	-Mob	ility					
Unit•3		MOBILE COMPUTING			12 ho	urs					
				1							
Mobile Compu System – Sat Communication Interferences in	iting: Histo ellites in n – Chang n Cellular N	ry of data networks – Classification of Mobile da Mobile Communication: Satellite classification eover from one satellite to other – Global Mobi fobile Communication.	ata netv 1 – G ile Cor	work loba nmu	ts - CL 1 Sate nicatio	DPD llite n –					
Unit:4	Ν	IOBILE COMMUNICATION SYSTEM			11 ho	urs					
Important Parameters of Mobile Communication System – Mobile Internet: Working of Mobile IP – Wireless Network Security – Wireless Local Loop Architecture: Components in WLL – Problems in WLL – Modern Wireless Local Loop – Local Multipoint Distribution Service – Wireless Application Protocol.											
TT		COMMUNICATION TECHNOLOGY	I		11 1						
Unit:5 COMMUNICATION TECHNOLOGY 11											

WCDMA Technology and Fiber Optic Microcellular Mobile Communication – Ad hoc Network and Bluetooth technology – Intelligent Mobile Communication system – Fourth Generation Mobile Communication systems.								
U	nit:6	Contemporary Issues	2 hours					
E	xpert lectu	res, online seminars – webinars						
Total Lecture hours 60 hours								
		· · · · ·						
Т	ext Books							
1	T.G. Palanivelu, R. Nakkeeran, "Wireless and Mobile Communication", PHI Limited, 2009.							
2	Jochen S	chiller, "Mobile Communications", Second Edition, Pearson Educa	tion, 2007.					
R	eference F	Books						
1	Asoke K	Talukder, Hasan Ahmed, Roopa Yavagal, "Mobile Computing", TM	ИН, 2010.					
R	elated On	line Contents [MOOC, SWAYAM, NPTEL, Websites etc.]						
1	https://w	ww.tutorialspoint.com/mobile_computing/index.htm						
2	https://www.javatpoint.com/mobile-computing							
3	3 https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/							
		and Day						
C	ourse Desi	gned By:						

Mapping with Programming Outcomes											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	L	М	L	L	М	S	М	М	М	М	
CO2	S	S	S	М	М	S	М	S	S	S	
CO3	S	S	S	S	Μ	S	S	S	S	S	
CO4	S	S	S	S	S	S	S	S	S	S	
CO5	S	S	S	S	S	S	S	S	S	S	

Course code	BLOCK CHAIN TECHNOLOGY	Course code BLOCK CHAIN TECHNOLOGY L T										
Core/Elective/Supportive	Elective	4			4							
Pre-requisite	Basics of Block Chain & Crypto Currency	Sylla	bus	2021-22								
Course Objectives:												
The main objectives of this course are to:												
1. Understand the fundamentals of block chain and cryptocurrency.												
2. Understand the influence and role of block chain in various other fields.												
3. Learn security features and its significance.												
4. Identify problems & challenges posed by Block Chain.												
Expected Course Outcomes:												
On the successful completion of the course, student will be able to:												
2 Understand the using	in a machanism in blackshair			K1,	<u>x2</u>							
2 Understand the mir	ang mechanism in diockenain	hot all-			NZ							
3 Apply and identify people to trade and	transact with bitcoins	nat ano	W	K3,1	K4							
4 Apply and analyze	Blockchain in health care industry			K4.]	K5							
5 Analyze security, p	privacy, and efficiency of a given Blockchain syste	m		K5.1	K6							
K1 - Remember: K2 - U	Inderstand: K3 - Apply: K4 - Analyze: K5 - Eval	iate: K	6 - C	reate	10							
Unit:1	INTRODUCTION			12 ho	urs							
Introduction to Blockchai Bitcoin versus Cryptocur Strategic analysis of the major application: currenc	in - The big picture of the industry – size, grow rencies versus Blockchain - Distributed Ledger space – Blockchain platforms, regulators, appli- cy, identity, chain of custody.	th, stru Techn cation	icture nolog provi	e, play y (DI ders. '	ers. LT). The							
				10.1								
	NETWORK AND SECURITY			12 no	urs							
Advantage over conventi Distributed Consensus, B Privacy, Security issues in	ional distributed database, Blockchain Network, Blockchain 1.0, 2.0 and 3.0 – transition, advand Blockchain.	Minin cements	ng Mo s and	echani featu	sm, res.							
Unit:3	CRYPTOCURRENCY			12 ho	ours							
Cryptocurrency - History, Distributed Ledger, Bitcoin protocols -Symmetric-key cryptography - Public-key cryptography - Digital Signatures -High and Low trust societies - Types of Trust model: Peer-to-Peer, Leviathan, and Intermediary. Application of Cryptography to Blockchain												
Unit:4 CRYPTOCURRENCY REGULATION 11 hours												
Ont:4CRYPTOCUKKENCY REGULATIONII hoursCryptocurrency Regulation - Stakeholders, Roots of Bit coin, Legal views - exchange of cryptocurrency - Black Market - Global Economy. Cyrptoeconomics – assets, supply and												

demand, inflation and deflation – Regulation.									
U	nit:5	CHALLENGES IN BLOCK CHAIN	11 hours						
Opportunities and challenges in Block Chain – Application of block chain: Industry 4.0 – machine to machine communication – Data management in industry 4.0 – future prospects. Block chain in Health 4.0 - Blockchain properties - Healthcare Costs - Healthcare Quality - Healthcare Value - Challenges for using blockchain for healthcare data									
T	Unit:6 Contemporary Issues 2 hours								
E E	xpert lectur	res, online seminars – webinars	2 11001 5						
		Total Lecture hours	60 hours						
Т	ext Books								
1	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, 1 "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press (July 19, 2016).								
2	Antonopo	oulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies"							
R	eference B	sooks							
1	Satoshi N	Jakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System"							
2	Rodrigo Technolo	da Rosa Righi, Antonio Marcos Alberti, Madhusudan Sing gy for Industry 4.0" Springer 2020.	h, "Blockchain						
R	elated On	line Contents [MOOC_SWAVAM_NPTFL_Websites etc.]							
1	https://ww	ww.javatpoint.com/blockchain-tutorial							
2	https://ww	ww.tutorialspoint.com/blockchain/index.htm							
2	https://pp	tel ac in/noc/courses/noc20/SEM1/noc20-cs01/							
5	<u>m.ps.//np</u>	101.001.111.1100/0001303/110020/011/110020-0301/							
C	ourse Desi	gned By:							

Mapping with Programming Outcomes											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	S	S	S	S	М	S	М	
CO2	S	S	S	S	S	S	S	S	S	S	
CO3	S	S	S	S	S	S	S	S	S	S	
CO4	S	S	S	S	S	S	S	S	S	S	
CO5	S	S	S	S	S	S	S	S	S	S	

Course code	WEB SERVICES	L	Т	Р	С							
Core/Elective/Supportive	Elective	4			4							
Pre-requisite	Basics of Distributed Computing	Syllah Versi	vllabus Version 2021		-22							
Course Objectives:												
The main objectives of th	s course are to:											
 Present the Web Services, Building real world Enterprise applications using Web Services with Technologies XML, SOAP, WSDL, UDDI Get overview of Distributed Computing, XML, and its technologies Undate with OoS and its features 												
3. Update with QoS and	1 its features											
4. Develop Stalidards a	Ind future of web services											
Expected Course Outco	nes:											
On the successful comp	letion of the course, student will be able to:											
1 Understand web s	ervices and its related technologies			K1.J	K2							
2 Understand XML concepts												
3 Analyze on SOA	3 Analyze on SOAP and UDDI model											
4 Demonstrate the 1	road map for the standards and future of web service	es		K5								
5 Analyze QoS ena	bled applications in web services			K5.J	K6							
K1 - Remember; K2 - N	Understand; K3 - Apply; K4 - Analyze; K5 - Evalu	iate; K	6 - C	reate								
Unit:1	INTRODUCTION			12 ho	urs							
Introduction to web servio	ces – Overview of Distributed Computing- Evoluti	on and	imp	ortanc	e of							
web services-Industry st	andards, Technologies and concepts underlying	g web	serv	ices-V	Veb							
services and enterprises-w	veb services standards organization-web services p	latform	IS.									
Unit:2	XML FUNDAMENTALS			12 ho	urs							
XML Fundamentals – XN	IL documents - XML Namespaces- XML Schema	-Proce	essing	, XML	.							
Unit:3	SOAP MODEL			12 ho	urs							
SOAP: The SOAP model- SOAP messages-SOAP encoding- WSDL: WSDL structure- interfacedefinitions-bindings-services-Using SOAP and WSDL-UDDI: About UDDI- UDDI registrySpecification- Core data structures-Accessing UDDI												
Unit:4	TECHNOLOGIES AND STANDARDS			12 ho	urs							
Unit:4TECHNOLOGIES AND STANDARDS12 hoursAdvanced web services technologies and standards: Conversations overview-web services conversation language-WSCL interface components. Workflow: business process management- workflows and workflow management systems Security: Basics-data handling and forwarding- data storage-errors-Web services security issues.												

U	Unit:5 QUALITY OF SERVICE							
Qua enal stan	Quality of Service: Importance of QoS for web services-QoS metrics-holes-design patterns-QoS enabled web services-QoS enabled applications. Web services management-web services standards and future trends.							
T	mit.(Contomporary Issues	2 hours					
E E	nn:0 xpert lectur	contemporary issues	2 nours					
		es, onnie seminars – weomars						
		Total Lecture hours	60 hours					
Т	ext Books							
1	Sandeep Guide", P	Chatterjee, James Webber, "Developing Enterprise Web Services Prentice Hall, Nov 2003.	: An Architects					
2	2 Keith Ballinger, "NET Web services: Architecture and Implementation with .Net", Pearson Education, First Edition, Feb 2003.							
R	eference B	ooks						
1	Ramesh 1 Web Serv	Nagappan, "Developing Java Web Services: Architecting and de vices Using Java", John Wiley and Sons, first Edition Feb 2003.	veloping secure					
2	Eric A Marks and Mark J Werrell, "Executive Guide to Web services", John Wiley and sons, March 2003.							
3	Anne Tho	omas Manes, "Web Services: A managers Guide", Addison Wesley	y, June 2003.					
R	elated Onl	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]						
1	https://www.tutorialspoint.com/webservices/index.htm							
2	https://www.javatpoint.com/web-services-tutorial							
3	3 <u>https://www.btechguru.com/trainingprogrammingxmlweb-servicesweb-services-part-</u> 1-video-lecture1180124147.html							
C	ourse Desig	gned By:						

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	М	М	S	М	М	М	S
CO2	S	S	S	М	М	S	М	S	М	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

1

ſ

Course code	ROBOTIC PROCESS AUTOMATION FOR BUSINESS	L	Т	Р	С					
Core/Elective/Supportive	Elective	4			4					
Pre-requisite	Basics of Robots & its Applications	Basics of Robots & its Applications Syllabus								
Course Objectives:										
The main objectives of the	is course are to:									
 Learn the concepts of RPA, its benefits, types and models. Gain the knowledge in application of RPA in Business Scenarios. Identify measures and skills required for RPA 										
Expected Course Outco	mas									
On the successful com	pletion of the course, student will be able to:									
1 Demonstrate the	benefits and ethics of RPA			K1,I	K2					
2 Understand the A	Automation cycle and its techniques			ŀ	K2					
3 Draw inferences	and information processing of RPA			K3,I	K4					
4 Implement & Ap	ply RPA in Business Scenarios			I	Κ5					
5 Analyze on Robo	ots & leveraging automation			K5,K6						
K1 - Remember; K2 -	Understand; K3 - Apply; K4 - Analyze; K5 - Eval	uate; K	6 - C	reate						
				40.1						
Unit:1 INTRODUCTION 12										
& domains fit for RPA RPA & Best Practices implementing RPA - Cer - Approach for implement	 Identification of process for automation - Types Automation and RPA Concepts - Different htre of Excellence – Types and their applications - Inting RPA initiatives. 	of Rob busine Building	oots - ss m g an 1	Ethics odels RPA te	s of for eam					
Unit•2	AUTOMATION			12 ho	urs					
		р ·		12 110						
Role of a Business Mana successful automation - different business proce successful implementatio stages and activities perfe	Role of a Business Manager in Automation initiatives - Skills required by a Business Manager for successful automation - The importance of a Business Manager in automation - Analyzing different business processes - Process Mapping frameworks - Role of a Business Manager in successful implementation - Part 1 - Understanding the Automation cycle - First 3 automation stages and activities performed by different people.									
Unit.2	ΑΠΤΟΜΑΤΙΟΝ ΙΜΒΙ ΕΜΕΝΤΑΤΙΟΝ			12 ho	11 MG					
	AUTOMATION IMPLEMENTATION			<u>12 no</u>	urs					
Evaluating the Automation Implementation Detailed description of last 3 stages and activities performed by different people - Role of a Business Manager in successful completion – Part 2 - Activities to be performed post-implementation - Guidelines for tracking the implementation success - Metrics/Parameters to be considered for gauging success - Choosing the right licensing option - Sending emails - Publishing and Running Workflows.										
Unit:4	ROBOT			12 ho	urs					
	I		1 0 10							

Ability to process information through scopes/systems - Understand the skill of information processing and its use in business - Leveraging automation - Creating a Robot - New Processes. Establish causality by variable behavior - Understand the skill of drawing inference or establishing causality by tracking the behavior of a variable as it varies across time/referenced variable - Leveraging automation for this skill - Robot & new process creation.

Unit:5

ROBOT SKILL

10 hours

Inference from snapshots of curated terms – Omni-source data curation - Multisource trend tracking - Understand the skill of drawing inference from the behavior of curated terms by taking snapshots across systems in reference to time/variable(s) - Leveraging automation for this skill – Robot creation and new process creation for this skill.

Unit:6	Contemporary Issues	2 hours
Expert lectur	es, online seminars – webinars	

Total Lecture hours

60 hours

Τ	Text Books						
1	Alok Mani Tripathi" Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool" Packt Publishing Limited March 2018.						
2	Tom Taulli "The Robotic Process Automation Handbook" Apress, February 2020.						
Re	ference Books						
1	Steve Kaelble" Robotic Process Automation" John Wiley & Sons, Ltd., 2018						
R	elated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]						
1	https://www.tutorialspoint.com/uipath/uipath_robotic_process_automation_introduction.htm						
2	https://www.javatpoint.com/rpa						
3	https://onlinecourses.nptel.ac.in/noc19_me74/preview_						
C	ourse Designed By:						

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	М	S	S
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S
CO5	S	S	S	S	S	S	S	М	S	S



M.Sc. COMPUTER SCIENCE

Syllabus (With effect from 2021 -2022 & Onwards)

Program Code:

DEPARTMENT OF COMPUTER SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

MISSION

- 1. To keep pace with emerging technologies and concepts, students are thrown open to the ever changing arena, meeting the industry requirements and standards, with the necessary knowledge and skill sets.
- 2. Are trained to explore more, at their own pace, knowing the demands of the IT world.
- 3. Apart from all the technical stuff, to inculcate the students about the Human Values and Professional ethics and to play a vital role in the society. Imparting them not only as world class Professionals, but also as tech savvy human beings to serve mankind.

4. ELECTIVE – I

- 5. 1.1. Multimedia and its Applications
- 6. 1.2. Embedded Systems
- 7. 1.3. Internet of Things
- 8. 1.4. Critical Thinking, Design Thinking and Problem Solving

9.

10.

- 11. ELECTIVE II
- 12. 2.1. Mobile Computing
- 13. 2.2. Block Chain Technology
- 14. 2.3. Web Services
- 15.2.4. Robotic Process Automation for Business

M. Sc. COMPUTER SCIENCE

Syllabus

AFFILIATED COLLEGES

Program Code: 32K

2021 – 2022 onwards



BHARATHIAR UNIVERSITY

(A State University, Accredited with "A" Grade by NAAC, Ranked 13th among Indian Universities by MHRD-NIRF, World Ranking : Times - 801-1000, Shanghai - 901-1000, URAP - 982)

Coimbatore - 641 046, Tamil Nadu, India

Program Educational Objectives (PEOs)

The **M.Sc. CS** program describe accomplishments that graduates are expected to attain within five to seven years after graduation To enrich the students with the clear picture of the course objectives and to mar

PEO1 PEO2	To enrich the students with the clear picture of the course objectives and to map
	their requirements.
	To enable the students, to understand the core concepts, visualize and to apply
	them in the real time scenarios.
PEO3	To impart the need for consistent learning, importance of research & development
	for the welfare of the society and to the nation at large.



Program Specific Outcomes (PSOs)							
After the	After the successful completion of M.Sc. CS program, the students are expected to						
PSO1	Able to analyze, design and develop problem solving skills in the discipline of computer science.						
PSO2	Acquire evaluation of potential benefits of alternative solution in designing software and/or hardware systems in broad range of open source programming languages to withstand technological changes.						
PSO3	Able to pursue careers in IT industry/ consultancy/ research and development, teaching and allied areas related to computer science.						
PSO4	Adapt to the continuous technological change in computational science and update themselves to meet the industry requirements and standards.						
PSO5	Apply the practices and strategies of computer science for software project development to deliver a quality software product and contribute to research in the chosen field and perform effectively.						



Program Outcomes (POs)						
On succe	On successful completion of the M.Sc. CS program					
PO1	Develop creativity and problem solving skills with the knowledge of computing and mathematics.					
PO2	Ability to develop and carry out experiments, interpret and infer data.					
PO3	Design algorithms and develop software to aid solutions to industry and governments.					
PO4	Review the latest technology and tool handling mechanism.					
PO5	Analyze the outcome to solve global environment related issues.					
PO6	Apply the knowledge in lifelong learning journey to equip themselves.					
PO7	Identify the perspective of business practices, risks and limitations.					
PO8	Work with professional and ethical values.					
PO9	Formulate the responsibilities of human rights and entrepreneurial spirit.					
PO10	Understand the methods to communicate effectively and work collectively.					

BHARATHIAR UNIVERSITY :: COIMBATORE 641 046

M. Sc. Computer Science (*Affiliated Colleges*) (*Effective For the candidates admitted during the academic year -2021 – 2022 & onwards*)

Course	Title of the Course	Credita	H	ours	Maximum Marks				
Code		Creuits	Theory	Practical	CIA	ESE	Total		
FIRST SEMESTER									
	Paper I : Analysis &	4	5		50	50	100		
	Design of Algorithms			\sim					
	Paper II : Object Oriented	4	5	9.	50	50	100		
	Analysis and Design &			151					
	C++		Vot	1 6					
	Paper III : Python	4	5	AVD	<mark>50</mark>	50	100		
	Programming								
	Paper IV : Advanced	4	5	23 10	50	50	100		
N 4	Software Engineering	4 And	and the	FT IG					
	Practical I : Algorithm	4	TY	5	<u>50</u>	50	100		
	and OOPS Lab	and in		~ 7 3					
	Practical II : Python	4		5	50	50	100		
	Programming Lab	2	~	18					
	Total	24	20	10	50				
	5								
	Se SE	COND SI	EMESTE	R	600				
	Paper V : Data Mining	4	4	C	50	50	100		
	and Warehousing			91					
	Paper VI Advanced	4	4	150	50	50	100		
	Operating Systems	ப்பால	J 2 U						
	Paper VII Advanced	CAT ₄ TO	ELE4ATE		50	50	100		
	Java Programming								
	Paper VIII : Artificial	4	4		50	50	100		
	Intelligence & Machine								
	Learning								
	Elective – I	4	4		50	50	100		
	Practical III: Data Mining	4		5	50	50	100		
	Lab using R								
	Practical IV: Advanced	4		5	50	50	100		
	Java Programming Lab								
	Total	28	20	10					
			- I						

REVISED SCHEME OF EXAMINATIONS – CBCS PATTERN
THIRD SEMESTER								
Paper IX : Dig	ital Image	4	4		50	50	100	
Paper X: Clou Computing	d	4	4		50	50	100	
Paper XI: Network	work	4	4		50	50	100	
Paper XII : Da & Analytics	ta Science	4	4		50	50	100	
Elective – II		4	4		50	50	100	
Practical V: D Processing La MATLAB	igital Image b using	4	2 Sali	4	50	50	100	
Practical VI : Computing La	Cloud b	4		4	50	50	100	
Practical VII : Application de &hosting	Web evelopment	2	J.	2	25	25	50	
Total 30 20 10								
401	FO	URTH SH	EMESTE	ER 🔜 !	1 · · · ·		,	
Project work a voce (200 mar	nd Viva- ks)	8	X		h. B		200*	
1	Total	8		~.7 3	5		200	
Q	Frand Total	90	~	12			2250	
	O	NLINE C	OURSE	S				
1. #SWAYA	M/MOOC	2						
2. #J Certifi	ob oriented icate course	2	12		1660			
* Project Report – 100 m	arks & Viva V	/ <mark>oce – 10</mark> (<mark>) mar</mark> ks	C				
# During II or III Semester (Optional)								



Course coo	le	ANALYSIS & DESIGN OF ALGORITHMS	L	Т	Р	С		
Core/Electi	ve/Supportive	Core	4			4		
Pre-requ	ıisite	Basic Data Structures & Algorithms	Syllal Versi	ous ion	202	1-22		
Course Ob	jectives:							
The main o	bjectives of thi	s course are to:						
 Enable Preser Discussion metho Under 	e the students to its an introduct so various met d, Dynamic pro stood the vario	b learn the Elementary Data Structures and algori on to the algorithms, their analysis and design nods like Basic Traversal And SearchTechniqu ogramming, backtracking us design and analysis of the algorithms.	thms. les, divi	de an	d con	quer		
Expected (Course Outcor	nes:						
On the su	accessful comp	letion of the course, student will be able to:						
Get knowledge about algorithms and determines their time complexity.1Demonstrate specific search and sort algorithms using divide and conquerK1,K2technique.								
2 Gain	good understa	nding of Greedy method and its algorithm.			K2,1	K3		
3 Able	3 Able to describe about graphs using dynamic programming technique. K3,K4							
4 Den	4 Demonstrate the concept of backtracking & branch and bound technique. K5,K6							
5 Explore the traversal and searching technique and apply it for trees and graphs. K6								
K1 - Rer	nember; K2 - U	J <mark>nderstand; K3 - Apply; K4 - Analyze;</mark> K5 - Eva	luate; K	6 - Ci	reate			
	4.012	A standard and a standard a	77-					
Unit:1		INTRODUCTION	1		15 ho	urs		
Introductio Asymptotic Search Tree	n: - Algorithm Notations - E e - Heap – Hea	Definition and Specification – Space complex lementary Data Structure: Stacks and Queues – psort- Graph.	tity-Tim Binary	e Co Tree	mplex - Bir	ity- 1ary		
		Colors and a						
Unit:2	T	RAVERSAL AND SEARCH TECHNIQUES			15 ho	urs		
Basic Trav Divide and	ersal And Sear Conquer: - Ge	ch Techniques: Techniques for Binary Trees-Te neral Method – Binary Search – Merge Sort – Qu	echnique lick Sort	s for	Grap	hs -		
Unit:3		GREEDY METHOD			15 ho	urs		
The Greedy Single Sour	The Greedy Method: - General Method – Knapsack Problem – Minimum Cost Spanning Tree – Single Source Shortest Path.							
Unit:4		DYNAMIC PROGRAMMING			15 ho	urs		
Dynamic Programming - General Method – Multistage Graphs – All Pair Shortest Path – Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.								

U	Unit:5 BACKTRACKING 13 hours						
Bac Har	ktracking: niltonian C	- General Method – 8-Queens Problem – Sum Of Subsets – Grycles – Branch And Bound: - The Method – Traveling Salesperson	caph Coloring –				
U	nit:6	Contemporary Issues	2 hours				
E	xpert lectur	es, online seminars – webinars					
		Total Lecture hours	75 hours				
Т	ext Books						
1	Ellis Hore	owitz,"Computer Algorithms", Galgotia Publications.					
2	Alfred V.Aho,John E.Hopcroft,Jeffrey D.Ullman, "Data Structures and Algorithms".						
R	Reference Books						
1	Goodrich	, "Data Structures & Algorithms in Java", Wiley 3rd edition.					
2	Skiena,"7	The Algorithm Design Manual",SecondEdition,Springer , 2008					
3	AnanyLe Asia, 200	vith,"Introd <mark>uction to</mark> the Design and Analysis of algorithm", Pea 3.	arson Education				
4	Robert S Addison-	edgewick,Phillipe Flajolet,"An Introduction to the Analysis of Wesley Publishing Company,1996.	of Algorithms",				
R	elated Onl	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]					
1	https://np	tel.ac.in/courses/106/106/106106131/					
2	https://ww	ww.tutorialspoint.com/design_and_analysis_of_algorithms/index.h	<u>tm</u>				
3	https://ww	ww.javatpoint.com/daa-tutorial					
C	ourse Desig	gned By:					

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	S	М	S	L	М	L	S	М
CO2	S	S	S	S	S	М	S	М	S	М
CO3	S	S	S	S	S	М	S	М	S	М
CO4	S	S	S	S	S	М	S	М	S	М
CO5	S	S	S	S	S	М	S	М	S	М

Course code	OBJECT ORIENTED ANALYSIS AND DESIGN & C++	L	Т	Р	С			
Core/Elective/Supportiv	ve Core	4			4			
Pre-requisite	Basics of C++ and Object Oriented Concepts	Syllah Versio	yllabus Version 2021-2					
Course Objectives:								
The main objectives of	this course are to:							
 Present the object model, classes and objects, object orientation, machine view and model management view. Enables the students to learn the basic functions, principles and concepts of object oriented analysis and design. Enable the students to understand C++ language with respect to OOAD 								
Expected Course Out	comes:							
On the successful co	mpletion of the course, student will be able to:							
1 Understand the techniques	concept of Object-Oriented development and	model	ing	K1,I	K2			
2 Gain knowledge about the various steps performed during object design J								
3 Abstract object-based views for generic software systems								
4 Link OOAD with C++ language								
5 Apply the basic concept of OOPs and familiarize to write C++ program K5.								
K1 - Remember; K2	- Understand; K3 - Apply; K4 - Analyze; K5 - Evalu	iate; K	6 - Ci	reate				
	Contraction of the second seco	7						
Unit:1	OBJECT MODEL	1		15 ho	urs			
The Object Model: T Applying the Object M Objects.	ne Evolution of the Object Model – Elements of odel. Classes and Objects: The Nature of an Object -	the Ol – Relat	bject ionsh	Mode ip am	ıl – ong			
Unit:2	CLASSES AND OBJECTS			15 ho	urs			
CLASSES AND OBJECTS 15 hours Classes and Object: Nature of Class – Relationship Among classes – The Interplay of classes and Objects. Classification: The importance of Proper Classification –identifying classes and objects – Key Abstractions and Mechanism.								
Unit:3 C++ INTRODUCTION 1								
Introduction to C++ - Input and output statements in C++ - Declarations -control structures – Functions in C++.								
Unit:4 INHERITANCE AND OVERLOADING 13 hours								
Classes and Objects – Inheritance – Pointers a	Constructors and Destructors –operators overloadin, and Arrays.	g –Typ	e Co	nversi	on-			

U	Jnit:5	POLYMORPHISM AND FILES	15 hours				
Mer Har	Memory Management Operators- Polymorphism – Virtual functions – Files – Exception Handling – String Handling - Templates.						
U	J nit:6	Contemporary Issues	2 hours				
E	xpert lectur	es, online seminars – webinars					
		Total Lecture hours	75 hours				
Т	ext Books						
1	"Object Oriented Analysis and Design with Applications", Grady Booch, Second Edition, Pearson Education.						
2	² "Object -Oriented Programming with ANSI & Turbo C++", Ashok N.Kamthane, First Indian Print -2003, Pearson Education.						
R	eference Bo	ooks					
1	Balagurus	amy "Obje <mark>ct Orien</mark> ted Programming with C++", TMH, Second Ec	lition, 2003.				
R	Related Onli	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]					
1	https://on	inecourses.nptel.ac.in/noc19_cs48/preview					
2	https://npt	tel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/					
3	3 <u>https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis_htm</u>						
	100						
C	Course Desig	gned By:					

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	М	S	М	S	М	S	S
CO2	S	S	S	М	S	М	S	М	S	S
CO3	S	S	S	М	S	М	S	М	S	S
CO4	S	S	S	М	S	М	S	М	S	S
CO5	S	S	S	М	S	М	S	М	S	S

Course code		PYTHON PROGRAMMING	L	Т	Р	C		
Core/Elective/S	Supportive	Core	4			4		
Pre-requisit	te	Basics of any OO Programming Language	Syllab	ous	2021-2	22		
Course Object	tives:							
The main object	ctives of thi	s course are to:						
 Presents an introduction to Python, creation of web applications, network applications and working in the clouds Use functions for structuring Python programs Understand different Data Structures of Python Represent compound data using Python lists, tuples and dictionaries 								
Expected Cou	rse Outcon	nes:						
On the succe	essful comp	letion of the c <mark>ourse, stude</mark> nt will be able to:						
1 Understand the basic concepts of Python Programming								
2 Unders	stand File of	perations, Classes and Objects			K2,I	Χ3		
3 Acquir	re Object O	riented Skills in Python			K3,I	ζ4		
4 Develop web applications using Python K5								
5 Develop Client Server Networking applications								
K1 - Remen	nber; K2 - U	I <mark>nde</mark> rstand; K3 - Apply; K4 - A <mark>nal</mark> yze; K5 - Evalu	ate; K	6 - Ci	reate			
	4							
Unit:1	A 7	INTRODUCTION			15 ho	urs		
Python: Introc Comparison.	luction – N	umbers – Strings – Variables – Lists – Tuples –	Dictio	onarie	s – Se	ets-		
Unit:2		CODE STRUCTURES			15 ho	urs		
Code Structur Functions – G except – User I	res: if, elsei enerators – Exceptions.	f, and else – Repeat with while – Iterate with for Decorators – Namespaces and Scope – Handle	– Con Errors	npreh s wit	ensior h try	ıs – and		
Unit:3	Ν	IODULES, PACKAGES AND CLASSES			15 ho	urs		
Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. Objects and Classes: Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.								
Unit•4		DATA TYPES AND WER			13 ho	urs		
Data Types: Structured Te	Text String xt Files – St	gs – Binary Data. Storing and Retrieving Data: tructured Binary Files - Relational Databases – No.	File I SQL D	Input ata S	Outpu/Outpu/	ui - 1t -		
Web: Web Cl	lients – Wel	o Servers – Web Services and Automation						

U	nit:5	SYSTEMS AND NETWORKS	15 hours				
Sys	stems: Files	s –Directories – Programs and Processes – Calendars and Clocks.					
Con	Concurrency: Queues – Processes – Threads – Green Threads and gevent – twisted – Redis.						
Networks: Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – ZeroMQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds.							
U	2 hours						
E	xpert lectur	es, online seminars – webinars					
	75 hours						
Т	Text Books						
1	Bill Luba	novic, "Introducing Python", O'Reilly, First Edition-Second Relea	se, 2014.				
2	Mark Lut	z, "Learning Python", O'Reilly, Fifth Edition, 2013.					
Re	eference Bo	poks					
1	David M Edition,2	M. Beazle <mark>y,"Pyth</mark> on Essential Reference", Developer's L 009.	ibrary, Fourth				
2	SheetalTa Approach	aneja,Naveen Kumar, "Python Programming-A n",PearsonPublications.	Modular				
R	elated Onl	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]					
1	https://wv	ww.programiz.com/python-programming/					
2	2 <u>https://www.tutorialspoint.com/python/index.htm</u>						
3	3 https://onlinecourses.swayam2.ac.in/aic20_sp33/preview_						
С	ourse Desig	gned By:					
		10 miles					

Mappin	Mapping with Programming Outcomes									
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	Μ	S	S	S	М	М	S	М
CO2	S	S	S	S	S	S	S	М	S	М
CO3	S	S	S	S	S	S	S	М	S	М
CO4	S	S	S	S	S	S	S	М	S	М
CO5	S	S	S	S	S	S	S	М	S	М

Course code	ADVANCED SOFTWARE ENGINEERING	L	Т	Р	С			
Core/Elective/Supportive	Core	4			4			
Pre-requisite	Basics of Software Engineering & SPM	Syllal	ous	2021-	22			
Course Objectives:								
The main objectives of th	is course are to:							
 Introduce to Softwar Enable the students to 	e Engineering, Design, Testing and Maintenance. o learn the concepts of Software Engineering.							
3. Learn about Softwar	e Project Management, Software Design & Testing							
Expected Course Outcomes:								
On the successful completion of the course, student will be able to:								
1Understand about Software Engineering processK1,K2								
2 Understand about Software project management skills, design and quality management K2,K3								
3 Analyze on Software Requirements and Specification K3,K4								
4 Analyze on Software Testing, Maintenance and Software Re-Engineering								
5 Design and conduct various types and levels of software quality for a software project K5,K6								
K1 - Remember; K2 -	Understand; K3 - Apply; K4 - Analyze; K5 - Evalu	iate; K	6 - C	reate				
United	INTRODUCTION			15 ho				
	INTRODUCTION			15 110	urs			
Introduction: The Problem Approach – Software Pr Software Development Pr	m Domain – Software Engineering Challenges - Socesses: Software Process – Characteristics of a rocess Models – Other software processes.	Softwa Softw	re Ei /are	ngineer Proces	ring ss –			
Unit:2	SOFTWARE REQUIREMENTS			15 ho	ours			
Software Requirements Analysis and Specification : Requirement engineering – Type of Requirements – Feasibility Studies – Requirements Elicitation – Requirement Analysis – Requirement Documentation – Requirement Validation – Requirement Management – SRS - Formal System Specification – Axiomatic Specification – Algebraic Specification - Case study: Student Result management system. Software Quality Management – Software Quality, Software Quality Management System, ISO 9000, SEI CMM.								
Unit:3	PROJECT MANAGEMENT			15 ho	urs			
Software Project Management: Responsibilities of a software project manager – Project planning – Metrics for Project size estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Halstead"s software science – Staffing level estimation – Scheduling – Organization and Team Structures – Staffing – Risk management – Software Configuration Management – Miscellaneous Plan.								
Unit:4	SOFTWARE DESIGN			15 ho	ours			

Software Design: Outcome of a Design process – Characteristics of a good software design – Cohesion and coupling - Strategy of Design – Function Oriented Design – Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.

Unit:5

SOFTWARE TESTING

13 hours

Software Testing: A Strategic approach to software testing – Terminologies – Functional testing – Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging – Testing tools - Metrics-Reliability Estimation. Software Maintenance - Maintenance Process - Reverse Engineering – Software Re-engineering - Configuration Management Activities.

Unit:6	Contemporary Issues	2 hours
Expert lectur	es, online seminars – webinars	

Total Lecture hours

75 hours

Т	Yext Books
1	An Integrated Approach to Software Engineering – Pankaj Jalote, Narosa Publishing House, Delhi, 3rd Edition.
2	Fundamentals of Software Engineering – Rajib Mall, PHI Publication, 3rd Edition.
Re	eference Books
1	Software Engineering – K.K. Aggarwal and Yogesh Singh, New Age International Publishers, 3 rd edition.
2	A Practitioners Approach-Software Engineering, - R. S. Pressman, McGraw Hill.
3	Fundamentals of <mark>Software Engineering - Carlo</mark> Ghezzi, M. Jarayeri, D. Manodrioli,PHIPublication.
R	celated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.javatpoint.com/software-engineering-tutorial
2	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
3	https://onlinecourses.nptel.ac.in/noc19_cs69/preview
C	Course Designed By:

Mappin	g with P	rogramn	ning Out	comes						
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	S	S	S	М	М	М	М
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S
CO5	S	S	S	S	S	S	S	М	S	S

Course code		PRACTICAL I : ALGORITHM AN OOPS LAB	D L	Т	Р	С
Core/Elective/Su	opportive	Core			4	4
Pre-requisite	9	Basic Programming of C++ language	Syl	labus	202	1-22
Course Objecti	ives:		÷			
The main object	tives of thi	s course are to:				
1.This course of 2. This course	covers the l	basic data structures like Stack, Queue, T	ree , List. data structi	1700 110	ing	
various techniqu	ues	students to rear in appreations of the		iics us	sing	
3. It also enabl	e the stude	nts to understand C++ language with resp	pect to OO	AD co	ncepts	
4. Application	of OOPS of	concepts.				
Expected Cour	se Outcon	nes:				
On the succes	ssful comp	etion of the course, student will be able t	0:			
1 Understan	nd the cond	epts of object oriented with respect to C-	++		K1,K2	
2 Able to u	inderstand	and implement OOPS concepts			K3,K4	
3 Impleme	ntation of	data structures like Stack, Queue, Tree, I	List using C	2++	K4,K5	
4 Applicati	techniques	ata structures for Sorting, Searching usir	Ig		K5,K6	
K1 - Rememb	ber; K2 - U	Inderstand; K3 - Apply; K4 - Analyze; K	<mark>5 -</mark> Evalua	te; K6	- Create	
1) Write a 1	program to	LIST OF PROGRAMS	milian	1	75 h	ours
2) Write a	program to	traverse through binary search trae using	trovorcole			
2) Write a	program to	perform various operations on stack usit	g linked li	• ot		
3) Write a j	program to	perform various operation in circular qu		51.		
$\frac{4}{2} \text{Write a}$	program to	sort an array of an elements using quick	sort			
$5) \text{Write a} \\ 6) \text{Write a} \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ $	program to	solve number of elements in ascending	son.	hoon	ort	
$\begin{array}{c} 0) \text{Write a} \\ \end{array}$	program to	solve the knopseck problem using gread	w mothod	neap	son.	
7) Write a j	program to	source for an element in a tree using div	ida & cong	uor str	atogy	
0) Write a	program to	place the 8 queens on an 2V8 matrix so	that no two		alegy.	
$\frac{9}{10} $ Write a		prace the 8 queens on an 8X8 matrix so	inat no two	queer	15 Allack	•
10) Write a 11 Write a	C + progr	and to perform Peremeterized constructor				
11) Write a	C + progr	and to perform Friend Eurotion				
12) write a	C++ progr	and to perform Function Quarloading				
15) write a	C++ progi	and to perform Function Overloading				
14) Write a 15 W	C++ prog	and to perform Single Inheritance				
15) Write a	C ++ progra	am to perform Employee Details using fil	es.			
Expert lecture	es, online s	eminars – webinars				

	Total Lecture hours 75 hours
	· · · · · ·
T	Yext Books
1	Goodrich, "Data Structures & Algorithms in Java", Wiley 3rd edition.
2	Skiena,"The Algorithm Design Manual",SecondEdition,Springer, 2008
F	Reference Books
1	AnanyLevith,"Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003.
2	Robert Sedgewick, Phillipe Flajolet,"An Introduction to the Analysis of Algorithms", Addison-Wesley Publishing Company, 1996.
R	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3	https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm
C	Course Designed By:
	E I Share I was the

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	S	S	S	М	Μ	S	S
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	SG	М	S	S
*S-St	rong; M-I	Medium;	L-Low	PAGe 1		New P	13.5 ⁸			
				Sein	Incent R	unadin				

Cour	rse code		PRACTICAL II : PYTHON PROGRAMMING LAB	L	Т	Р	С	
Core/	/Elective/Su	pportive	Core			4	4	
Pro	e-requisite		Basics of any OO Programming Language	Sylla	ibus	2021	-22	
Cour	rse Objecti	ves:	a course are to:					
1. 7 2. 7 3. 7 4. 7	This course To understa To Understa To develop	presents and and w and the O web appl	an overview of elementary data items, lists, dicti rite simple Python programs OPS concepts of Python ications using Python	onaries	s, sets	s and tu	ples	
Expe	ected Cours	se Outcor	nes:					
On	the succes	sful comp	pletion of the course, student will be able to:					
1	Able to	write prog	grams in Python using OOPS concepts			K1,K2		
2	To unders	stand the	concepts of File operations and Modules in Pyth	on		K2,K	3	
3	Implemen	ntation of	lists, dictionaries, sets and tuples as programs			K3,K4		
4 K1	10 develo	$\frac{b}{b}$ web ap	Inderstand: K3 - Apply: K4 - Applyze: K5 - Ey	aluate	K6 -	KJ,K Create	.0	
			inconstante, ino rippiy, inter rindigite, inconstante	illutte,	IXU	create		
			LIST OF PROGRAMS	1		75 h	ours	
	Impleme	nt the foll	lowing in Python:	77				
	1. Progra	ums using	elementary data items, lists, dictionaries and tup	les				
	2. Progra	ums using	conditional branches,					
	3. Progra	ums using	loops.					
	4. Progra	ums using	functions					
	5. Progra	ums using	exception handling					
	6. Progra	ums using	inheritance					
	7. Progra	ums using	polymorphism					
	8. Progra	ums to im	plement file operations.					
	9. Progra	ums using	modules.					
	10. Progi	rams for c	reating dynamic and interactive web pages using	g forms	•			
			Total Lecture h	ours		75 h	ours	
					I			
Te	xt Books							
1	Bill Luban	ovic, "Int	roducing Python", O'Reilly, First Edition-Secon	d Rele	ase, 2	2014.		
2	Mark Lutz	, "Learnir	ng Python", O'Reilly, Fifth Edition, 2013.					
Ref	ference Boo	oks						

M. Sc. Computer Science 2021-22 onwards - Affiliated Colleges - Annexure No.27(a)(1) SCAA DATED: 23.06.2021

1	David M. Beazley, "Python Essential Reference", Developer's Library, Fourth Edition, 2009.
2	SheetalTaneja,Naveen Kumar, "Python Programming-A Modular Approach",PearsonPublications.
R	elated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.programiz.com/python-programming/
2	https://www.tutorialspoint.com/python/index.htm
3	https://onlinecourses.swayam2.ac.in/aic20_sp33/preview_
C	ourse Designed By:

Mappin	ng with P	rogramn	ning Out	comes						
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	Μ	S	S	S	М	М	S	S
CO2	S	S	S	S	S	S	S	М	S	М
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S





Course code		DATA MINING AND WAREHOUSING	L	Т	P	С				
Core/Elective/S	upportive	Core	4			4				
Pre-requisit	æ	Basics of RDBMS & Algorithms	Syllał	ous	2021	-22				
Course Object	tives:									
The main object	ctives of thi	s course are to:								
 Enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing. Develop skills of using recent data mining software for solving practical problems. Develop and apply critical thinking, problem-solving, and decision-making skills. 										
Expected Cou	rse Outcon	nes:								
On the succe	essful comp	letion of the course, student will be able to:								
1 Unders	tand the ba	sic data mining techniques and algorithms			K1,I	K2				
2 Unders content	tand the As s	sociation rules, Clustering techniques and Data wa	rehous	sing	K2,I	X 3				
3 Compa predicti	re and eva	Iluate different data mining techniques like cla ing and association rule mining	assifica	tion,	K4,I	Χ5				
4 Design operation	data war	ehouse with dimensional modeling and appl	ly OL	AP	K5,I	K6				
5 Identi	fy appro <mark>pria</mark>	te data mining algorithms to solve real world prob	lems		ŀ	K6				
K1 - Remen	ber; K2 - U	Jnderstand; K3 - Apply; K4 - Analyze; K5 - Evalu	ate; K	6 - Ci	reate					
		(in the feet Ving /	-9							
Unit:1	a start	BASICS AND TECHNIQUES	14		12 ho	urs				
Basic data min issues – data r	ning tasks - nining metr	- data mining versus knowledge discovery in da ics – social implications of data mining – data m	tabases	s – d from	ata mi a data	ning base				
perspective.			-							
Data mining t	echniques.	Introduction $-$ a statistical perspective on data	minin	σ_	simila	ritv				
measures – dec	cision trees	– neural networks – genetic algorithms.		5	omma	iity				
		Sector and a sector sector								
Unit · 2		ALGORITHMS			12 ho	urs				
Classification:	Introductio	n – Statistical – based algorithms - distance – base	d algo	rithm	s- dec	ision				
tree - based alg	gorithms - r	neural network – based algorithms –rule - based al	lgorith	ms –	combi	ning				
techniques.										
Unit:3		CLUSTERING AND ASSOCIATION			12 ho	urs				
Clustering: Int	roduction – gorithms.	Similarity and Distance Measures – Outliers – Hi	erarchi	cal A	lgorit	hms				
Association ru	les: Introdu	uction - large item sets - basic algorithms – pa	arallel	& 0	listrib	uted				
algorithms $-c$ measuring the	omparing a quality of r	pproaches- incremental rules – advanced associati	ion rule	es tec	hniqu	es –				
Unit•4	D	ATA WAREHOUSING AND MODELING			11 ho	urs				
Data warehous	ing: introdu	action - characteristics of a data warehouse – data	marts	– oth	er asp	ects				

of data mart. Online analytical processing: introduction - OLTP & OLAP systems
Datamodeling –star schema for multidimensional view –data modeling – multifactstar schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.
Unit:5 APPLICATIONS OF DATA WAREHOUSE 11 hours
Developing a data WAREHOUSE: why and how to build a data warehouse –data warehouse architectural strategies and organization issues - design consideration – data content – metadata distribution of data – tools for data warehousing – performance considerations – crucial decisions in designing a data warehouse. Applications of data warehousing and data mining in government: Introduction - national data warehouses – other areas for data warehousing and data mining.
Unit:6 Contemporary Issues 2 hours
Expert lectures, online seminars – webinars
Total Lecture hours 60 hours
Text Books
1 Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson education,2003.
2 C.S.R. Prabhu, "Data Warehousing Concepts, Techniques, Productsand Applications", PHI, Second Edition.
Reference Books
1 Arun K.Pujari, "Data Mining Techniques", Universities Press (India) Pvt. Ltd., 2003.
2 Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", TMCH, 2001.
3 Jiawei Han & Micheline Kamber, "Data Mining Concepts & Techniques", 2001, Academicpress.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1 https://www.javatpoint.com/data-warehouse
2 https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3 <u>https://www.btechguru.com/trainingitdatabase-management-systemsfile-structures</u> introduction-to-data-warehousing-and-olap-2-video-lecture1205426151.html
Course Designed By:

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	S	S	S	S	Μ	Μ	М	М
CO2	S	S	S	S	S	S	S	Μ	S	S
CO3	S	S	S	S	S	S	S	Μ	S	S
CO4	S	S	S	S	S	S	S	Μ	S	S
CO5	S	S	S	S	S	S	S	Μ	S	S

Course code		ADVANCED OPERATING SYSTEMS	L	Т	Р	C	
Core/Elective/S	Supportive	Core	4			4	
Pre-requisit	te	Basics of OS & its functioning	Syllał	ous	2021-	2021-22	
Course Objec	tives:						
The main object	ctives of thi	s course are to:					
 Enable the Gain know Gain insig systems. Learn case 	e students to wledge on I ght into the e studies in	b learn the different types of operating systems and Distributed Operating Systems components and management aspects of real time a Linux Operating Systems	their f	iunct	ioning operat	;. ting	
Expected Cou	rse Outcor	nes:					
On the succe	essful comp	letion of the course, student will be able to:					
1 Underst	and the desi	gn issues associated with operating systems			K1,	K2	
2 Master and dist	various pro ributed file	cess management concepts including scheduling, systems	deadl	ocks	K3,	K4	
3 Prepare	Real Time	Task Scheduling			K4,	K5	
4 Analyze	Operating	Systems for Handheld Systems				K5	
5 Analyze	Operating	Systems like LINUX and iOS			K5,	K6	
Unit:1 Basics of Ope Systems – Mi Systems – H Scheduling – O Avoidance – D	rating Syste ultiprocesso andheld Sy Cooperating Petection – I	BASICS OF OPERATING SYSTEMS ems: What is an Operating System? – Main fram or Systems – Distributed Systems – Clustered S ystems – Feature Migration – Computing En- g Processes – Inter Process Communication- Dead Recovery.	e Syst System vironn llocks	ems 1s –H 1ents –Pre	<u>12 ho</u> –Desl Real-T -Pro- eventio	ktop ime cess on –	
	1	ASSIST OF FRONT SAME					
Unit:2		DISTRIBUTED OPERATING SYSTEMS			12 ho	ours	
Distributed Op – Deadlock ha systems –desig	erating Sys andling stra m issues – (tems: Issues – Communication Primitives – Lamp ategies – Issues in deadlock detection and resolu- Case studies – The Sun Network File System-Coda.	ort"s l ution-(Logic distri	cal Clo buted	ocks file	
Unit:3		REAL TIME OPERATING SYSTEM			10 ha	ours	
Realtime Op Model of Re Scheduling	perating Sy al Time S	stems : Introduction – Applications of Real Tir ystem – Characteristics – Safety and Reliability	ne Sy / - Re	stem al T	s – B ime T	asic Fask	
Unit:4		HANDHELD SYSTEM			<u>12_h</u> c	ours	
Operating Sys	tems for H tems – Palr	andheld Systems: Requirements – Technology C nOS-Symbian Operating System- Android –Archi) vervi	ew – e of	Handl andro	held id –	

Sec	uring handł	neld systems							
U	Unit:5 CASE STUDIES 12 hours								
Cas Sch Frai	e Studies : eduling Po mework - M	Linux System: Introduction – Memory Management – Proces licy - Managing I/O devices – Accessing Files- iOS : Archite Iedia Layer - Services Layer - Core OS Layer - File System.	s Scheduling – cture and SDK						
U	nit:6	Contemporary Issues	2 hours						
E	xpert lectur	es, online seminars – webinars							
		Total Lecture hours	60 hours						
T	ext Books								
1	Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.								
2	2 MukeshSinghal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.								
R	eference Bo	poks							
1	Rajib Ma	ll, "Rea <mark>l-Time S</mark> ystems: Theory and Practice", <mark>Pearson</mark> Education I	ndia, 2006.						
2	Pramod (Third edi	Chandra P.Bhatt, An introduction to operating systems, concept an tion, 2010.	d practice, PHI,						
3	Daniel.P.	Bovet& Marco Cesati, "Understanding the Linux kernel", 3 rd edition.	O"Reilly, 2005						
4	Neil Smy media, 20	7th, "iPhone iOS 4 Development Essentials – Xcode", Fourth E 011.	dition, Payload						
D	Palatad On	ine Contents MOOC SWAVAM NETEL Websites etc.							
1	https://on	line contents [MOOC, SWATAN, NTTEL, Websites etc.]							
2	https://ww	ww.udacity.com/course/advanced-operating-systemsud189							
2	https://w	nnie tubs org/CompArch/Resources/os-notes.pdf							
5	<u></u>	miletunstorg/ comp/ neuracesources/ 05 notes.put							
С	ourse Desig	gned By:							

Mappin	Mapping with Programming Outcomes									
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	S	S	S	S	М	М	М	Μ
CO2	S	М	S	S	S	S	S	М	S	М
CO3	S	М	S	S	S	S	S	М	S	М
CO4	S	М	S	S	S	S	S	М	S	М
CO5	S	М	S	S	S	S	S	М	S	М

Course code		ADVANCED JAVA PROGRAMMING	L	Т	Р	C		
Core/Elective/S	Supportive	Core	4			4		
Pre-requisit	te	Basics of Java & its Usage	Syllal	ous	¹⁸ 2021-22			
Course Objec	tives:							
The main object	ctives of thi	s course are to:						
 Enable the students to learn the basic functions, principles and concepts of advanced java programming. Provide knowledge on concepts needed for distributed Application Architecture. Learn JDBC, Servlet packages, JQuery, Java Server Pages and JAR file format 								
Expected Cou	rse Outcon	nes:						
On the succe	essful comp	letion of the course, student will be able to:						
1 Unders	tand the adv	anced concepts of Java Programming			K1,1	K2		
2 Unders	tand JDBC	and RMI concepts			K2,1	K3		
3 Apply a	and analyze	Java in Database			K3,1	K4		
4 Handle and class	different ev	vent in java using the delegation event model, ev	ent list	tener	I	K5		
5 Design interactive applications using Java Servlet, JSP and JDBC								
K1 - Remen	nber; K2 - U	I <mark>nde</mark> rstand; <mark>K3 -</mark> Apply; K4 - Analyze; K5 - Evalu	iate; K	6 - C	reate			
	<u> </u>		2-22		10.1			
Unit:1		BASICS OF JAVA			12 ho	urs		
Java Basics F features – Med	Review: Co lia technique	mponents and event handling – Threading cor es	ncepts	– Ne	etwork	ting		
Unit:2		REMOTE METHOD INVOCATION			12 ho	urs		
Remote Metho Defining Remo	od Invocation ote objects-	n-Distributed Application Architecture- Creating Remote Object Activation-Object Serialization-Ja	stubs va Spa	and s	skeleto	ons-		
Unit:3		DATABASE			10 ho	ours		
Java in Databa	ases- JDBC	principles – database access- Interacting- datab	ase se	arch	– Cre	ating		
multimedia dat	tabases – Da	atabase support in web applications						
TT . A. A					10 1			
Unit:4 Java Servlets:	Java Servl	SERVLEIS et and CGI programming. A simple java Servle	ot_∆nat	omv	$\frac{12}{0}$ no	urs iava		
Servlet-Readin	gdata from	a client-Reading http request header-sending	data t	o a (client	and		
writing the http response header-working with cookies								
Java Server Pages: JSP Overview-Installation-JSP tags-Components of a JSP page-Expressions-								
Scriptiets-Dire	cuves-Decla	arations-A complete example						
Unit:5		ADVANCED TECHNIQUES			12 ho	urs		
JAR file form	nat creation	n – Internationalization – Swing Programmin	g – A	Advar	iced j	ava		

tech	iniques							
U	nit:6	Contemporary Issues	2 hours					
E	Expert lectures, online seminars – webinars							
		Total Lecture hours	60 hours					
Т	'ext Books							
1	Jamie Jaworski, "Java Unleashed", SAMS Techmedia Publications, 1999.							
2	Campion	Campione, Walrath and Huml, "The Java Tutorial", AddisonWesley,1999.						
R	eference B	ooks						
1	Jim Keogh," The Complete Reference J2EE", Tata McGrawHill Publishing Company Ltd,2010.							
2	David S Publicati	awyer McFarland, "JavaScript And JQuery- The Missing Ma ons, 3rd Edition,2011.	anual", Oreilly					
3	Deitel an	d Deitel, "Java How to Program", Third Edition, PHI/Pearson Educ	ation Asia.					
R	elated On	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]						
1	https://w	ww.javatpoint.com/servlet-tutorial						
2	https://ww	ww.tutorialspoint.com/java/index.htm						
3	https://on	linecourses.nptel.ac.in/noc19_cs84/preview						
С	ourse Desi	gned By:						

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	М	М	М	S
CO2	S	S	S	S	S	S	S	Μ	S	S
CO3	S	S	S	S	S S	S	S	Μ	S	S
CO4	S	S	S	S	S	S	S	Μ	S	S
CO5	S	S	S	S	S	S	S	М	S	S

Course code	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	L	Т	Р	С			
Core/Elective/Supportive	Core	4			4			
Pre-requisite	Basics of AI & an Introduction about ML	Syllabus 2021-22						
Course Objectives:								
The main objectives of thi	s course are to:							
 Enable the students to learn the basic functions of AI, Heuristic Search Techniques. Provide knowledge on concepts of Representations and Mappings and Predicate Logic. Introduce Machine Learning with respect Data Mining, Big Data and Cloud. Study about Applications & Impact of ML. 								
Expected Course Outcor	nes:							
On the successful comp	letion of the course, student will be able to:							
1 Demonstrate AI pro	oblems and techniques			K1,I	K2			
2 Understand machin	e learning concepts			K2,I	K3			
3 Apply basic princip inference, perception	oles of AI in solutions that require problem solving on, knowledge representation, and learning	5,		K3,I	K4			
4 Analyze the impact	4 Analyze the impact of machine learning on applications							
5 Analyze and design the dynamic behave	n a real world problem for implementation and und	derstand	1	K5,I	K6			
K1 - Remember; K2 - U	J <mark>nderstand; K3 - Apply; K4 - Analyze; K5</mark> - Eval	uate; K	6 - C	reate				
	a company of the	17						
Unit:1	INTRODUCTION	£.		12 ho	urs			
Introduction: AI Problem Search: State space search Search.	s - Al techniques - Criteria for success. Proble n - Production Systems - Problem Characteristics	ems, Pro s - Issue	obler es in	n Spa desigr	ces, 1 of			
Unit.?	SEADCH TECHNIQUES			12 ho	11 KG			
	SEARCH LECHNIQUES							
Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.								
Unit:3	Unit:3 PREDICATE LOGIC 12 hours							
Using Predicate logic: Representing simple facts in logic - Representing Instance and Isa relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge - Logic programming - Forward Vs Backward reasoning - Matching - Control knowledge.								
Unit:4	MACHINE LEARNING			12 ho	urs			

Understanding Machine Learning: What Is Machine Learning?-Defining Big Data-Big Data in Context with Machine Learning-The Importance of the Hybrid Cloud-Leveraging the Power of Machine Learning-The Roles of Statistics and Data Mining with Machine Learning-Putting Machine Learning in Context-Approaches to Machine Learning. **APPLICATIONS OF MACHINE LEARNING** Unit:5 10 hours Looking Inside Machine Learning: The Impact of Machine Learning on Applications - Data Preparation-The Machine Learning Cycle. Unit:6 **Contemporary Issues** 2 hours Expert lectures, online seminars – webinars **Total Lecture hours** 60 hours **Text Books** Elaine Rich and Kevin Knight," Artificial Intelligence", Tata McGraw Hill Publishers 1 company Pvt Ltd, Second Edition, 1991. 2 George F Luger, "Artificial Intelligence", 4th Edition, Pearson Education Publ, 2002. **Reference Books** Machine Learning For Dummies[®], IBM Limited Edition by Judith Hurwitz, Daniel 1 Kirsch. Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] https://www.ibm.com/downloads/cas/GB8ZMQZ3 1 2 https://www.javatpoint.com/artificial-intelligence-tutorial https://nptel.ac.in/courses/106/105/106105077/ 3 Course Designed By:

Manning with Programming Outcomes

mappin	Suppling with Frequencies									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	М	М	S
CO2	S	S	S	S	S	S	S	Μ	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S
CO5	S	S	S	S	S	S	S	М	S	S

Course code		PRACTICAL III : DATA MINING USING R	L	Т	Р	С			
Core/Elective/	Supportive	Core			4	4			
Pre-requisi	ite	Basics of DM Algorithms & R Programming	ous on	2021-22					
Course Obje	ctives:								
The main obje	ectives of thi	s course are to:							
1. To enable	le the stude	ents to learn the concepts of Data Mining	algorith	ms n	amely				
2. To under	stand & writ	te programs using the DM algorithms							
3. To apply	statistical in	terpretations for the solutions							
4. Able to u	se visualizat	ions techniques for interpretations							
Expected Co	urse Autcor	nos•							
On the succ	essful comp	letion of the course, student will be able to:							
1 Able to	write progr	ams using R for Association rules, Clustering	technique	es	K1,K2				
2 To imp	lement data	mining techniques like classification, prediction	on		K2,K3				
3 Able to	use differen	nt visualizations techniques using R			K4,K5				
4 To app	ly different	lata mining algorithms to solve real world app	lications		K5,K6				
K1 - Remei	nber; K2 - U	J <mark>nde</mark> rstand; K3 - Apply; K4 - A <mark>n</mark> alyze; K5 - E	valuate;	K6 -	Create				
			- h. d	(75.1				
1 Impl	ement Aprio	ri algorithm to extract association rule of data	mining		/5 no	ours			
2. Impl	ement k-mea	ins clustering technique.	inning.						
3. Imple	ement any o	ne Hierarchal Clustering.	77						
4. Imple	ement Classi	fication algorithm.	1						
5. Imple	ement Decis	ion Tree.							
6. Linea	ar Regressio	n. Pspillinent a with							
7. Data	Visualizatio	n.							
		Total Lecture	hours		75 ho	ours			
Torre Doctor									
I ext Books	t U Dunhar	"Data Mining Introductory and Advanced"	Forming?	Door	1010				
1 educatio	on,2003.	ii, Data Minning. Introductory and Advanced	ropies,	reals	SOII				
2 C.S.R. F Second	2 C.S.R. Prabhu, "Data Warehousing Concepts, Techniques, Products and Applications", PHI, Second Edition								
Reference Books									
1 ArunK.l	Pujari, "Data	Mining Techniques", Universities Press (Indi	a) Pvt. L	td.,20	003.				
2 Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", TMCH, 2001.									
Related Or	line Conter	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							

1	https://www.javatpoint.com/data-warehouse
2	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3	https://www.btechguru.com/trainingitdatabase-management-systemsfile-structures introduction-to-data-warehousing-and-olap-2-video-lecture1205426151.html
С	Course Designed By:

Mappir	Mapping with Programming Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	S	S	S	М	М	S	S
CO2	S	S	S	S	S	S	S	М	S	М
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	М	S	S



Course code		PRACTICAL IV : ADV JAVA LAB	ANCED	L	Т	Р	С	
Core/Elective/S	upportive	Core				4	4	
Pre-requisit	e	Basics in Java Programm	ng	Syl	labus	202	1-22	
Course Object	tives:							
The main objec	ctives of thi	course are to:						
 1.To enable the students to implement the simple programs using JSP, JAR 2.To provide knowledge on using Servlets, Applets 3.To introduce JDBC and navigation of records 4.To understand RMI & its implementation 5.To introduce to Socket programming 								
Expected Cou	rse Outcor	les:	- C.					
On the succe	ssful comp	etion of the course, student v	vill be able to:					
1Understand to the implement concepts of Java using HTML forms, JSP & JARK1,K2								
2 Must be	capable of implementing JDBC and RMI concepts K3,K4							
3 Able to	write Apple	ts with Event handling mech	anism			K4,K5		
4 To Creat	te interactiv	e web based applications usi	ng <mark>se</mark> rvlets and j	sp 📐	A	K5,K6		
K1 - Remem	ıber; K2 - U	nderstand; <mark>K3 -</mark> Apply; <mark>K4</mark> -	Analyze; K5 - E	valuat	e; K6	- Create		
		Link Stee Ving		12	-3			
	-	LIST OF PROGRAMS		alig q	1	75 h	ours	
1 Display a	walcoma	assage using Servlet		11	1			
2 Design a	Purchase (rder form using Html form a	ndServlet					
3. Develop	a program	or calculating the percentage	of marks of a stu	dent i	isingI	SP		
4 Design a	Purchase (rder form using Html form a	ndISP	aont t	.5111551	51.		
5. Prepare a	Employee	pay slip usingJSP.	MS F					
6. Write a p	rogram usi	g JDBC for creating a table,	Inserting, Deletin	ng rec	ords a	nd listou	t	
therecord	ls.							
7. Write a p 8. Write a s	rogram usi imple Serv dvalues	ng Java servlet to handle form et program to create a table of	ndata. of all the headers i	t rece	ives al	ong with	ntheir	
9. Write a p	orogram in .	SP by using sessionobject.						
10. Write a pr	ogram to b	uild a simple Client Server ap	plication usingR	MI.				
11. Create an	applet for a	calculator application.						
12. Program t system (use so	12. Program to send a text message to another system and receive the text message from the system (use socket programming).							
Expert lectur	es, online s	eminars – webinars						
				1.				
	Total Lecture hours 75 hours							

AL COMPS

Т	Text Books						
1	Jamie Jaworski, "Java Unleashed", SAMS Techmedia Publications, 1999.						
2	Campione, Walrath and Huml, "The Java Tutorial", AddisonWesley, 1999.						
R	eference Books						
1	Jim Keogh," The Complete Reference J2EE", Tata McGrawHill Publishing Company Ltd,2010.						
2	David Sawyer McFarland, "JavaScript And JQuery- The Missing Manual", Oreilly Publications, 3rd Edition, 2011.						
R	elated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]						
1	https://www.javatpoint.com/servlet-tutorial						
2	https://www.tutorialspoint.com/java/index.htm						
3	https://onlinecourses.nptel.ac.in/noc19_cs84/preview_						
•							
С	ourse Designed By:						

		4		P	10		1			
Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	S	S	S	Μ	Μ	S	Μ
CO2	S	S	S	S	S	S	S	Μ	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S



Cou	rse code		I	DIGITAL IN	MAGE PRO	CESSING	L	Т	Р	С
Core	/Elective/S	upportive			Core		4			4
Pr	e-requisit	e	Basi	cs of Image I	Processing		Syllal	ous	2021-	22
Cou	rse Object	tives:								
The	main objec	ctives of thi	is course	are to:						
 Learn basic image processing techniques for solving real problems. Gain knowledge in image transformation and Image enhancement techniques. Learn Image compression and Segmentation procedures. 										
Expe	ected Cou	rse Outcon	nes:							
On the successful completion of the course, student will be able to:										
1	Unders	tand the fun	ndamenta	als of <mark>Digital</mark>	Image Proce	essing			K1,1	K2
2	Underst image a	tand the m cquisition, i	nathemat image tra	ical foundat ansformation	ions for dig a, and image	rital image repro enhancement	esentat	ion,	K2,1	K3
3	Apply, problem	Design and	d Impler	nent and get	solutions fo	r digital image	process	sing	K3,1	K4
4	Apply t	he concepts	s of filter	ring and segr	nentation for	[.] d <mark>igital im</mark> age re	trieval		K4,1	K5
5	Explore an effici	e the concept tent manner	pts of M	lulti-resolutio	on process a	nd recognize the	object	s in	K5,I	K6
K	1 - Remem	iber; K2 - U	J <mark>nde</mark> rsta	nd; K3 - A pp	oly; <mark>K4</mark> - Ana	aly <mark>ze; K5 -</mark> Evalu	iate; K	6 - C	reate	
				an starter	State -		- 2			
Uı	nit:1	al.	22/2	INTRO	DUCTION	and the second s	13		12 ho	urs
Intro DIP Fund sensi Pixel	duction: V – Fundam lamentals: ing and ac ls – Linear	Vhat is Digitentals steps Elements of quisition – & Nonline	ital imag s in DIP of Visual Image s ear opera	ge processing – Compone l perception sampling and tions.	g – the origin nts of an im – Light and I Quantizatio	of DIP – Exam age processing s the electromagne on – Some Basic	ples of system. etic spe relatio	field Digi ctrun onship	ls that ital Im n – Im o betw	use lage lage reen
	•			- QUCATE T	مسطلها والم					
Uı	nit:2			IMAGE EN	HANCEME	NT			12 ho	urs
Image Enhancement in the spatial domain:- Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.										
Uı	nit:3]	MAGE RES	STORATIO	N			12 ho	ours
IntrageIntrageIntrageIntrageIntrageIntrageIntrageIntrageImageRestoration:A model of the ImageDegradation / RestorationProcess – Noisemodels –Restoration is the process of noise only – Spatial Filtering – Periodic NoiseRestoration byFiltering – Periodic Noisereduction byfrequencydomainfiltering – Linear, Portion – InvariantDegradations – Estimatingthedegradationfunction – Inversefiltering – Minimummean squareErrorFiltering – Constrainedleastsquaresfiltering – Geometricmean filter – GeometricTransformations.										

M. Sc. Computer Science 2021-22 onwards - Affiliated Colleges - Annexure No.27(a)(1) SCAA DATED: 23.06.2021

U	nit:4	IMAGE COMPRESSION	11 hours					
Image Compression: Fundamentals – Image compression models – Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.								
T		IMACE SECMENTATION	11 hours					
U	nit:5	IMAGE SEGMENTATION	11 nours					
Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction –								
Inre	esholding –	- Region-Based segmentation – Segmentation by Morphological w	atersheds – The					
use		n segmentation.						
U	nit:6	Contemporary Issues	2 hours					
E	xpert lectur	res, online seminars – webinars	2 110415					
		Total Lecture hours	60 hours					
T	ext Books	- 0°						
1	Rafael C PHI/Pear	. Gonzalez, Richard E. Woods, "Digital Image Processing", S son Education.	Second Edition,					
2	B. Chand	a, D. Dutta <mark>Maju</mark> mder, "Digital Image Processing and Analysis", P	HI, 2003.					
R	eference B	ooks						
1	Nick Eff Education	Ford, "Digital Image Processing a practical introducing using n, 2004.	Java", Pearson					
	elated On	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]						
1	https://np	tel.ac.in/courses/11//105/11/105135/						
2	https://ww	ww.tutorialspoint.com/dip/index.htm						
3	3 <u>https://www.javatpoint.com/digital-image-processing-tutorial</u>							
~								
C	Course Designed By:							
		A WATE TO BLENN						

Mappir	Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	М	S	S	S	Μ	S	Μ	Μ	S	
CO2	S	S	S	S	S	Μ	S	Μ	S	S	
CO3	S	S	S	S	S	S	S	Μ	S	S	
CO4	S	S	S	S	S	S	S	М	S	S	
CO5	S	S	S	S	S	S	S	Μ	S	S	

Course code		CLOUD COMPUTING	L	Т	Р	C			
Core/Elective/S	upportive	Core	4			4			
Pre-requisit	e	Basics of Cloud & its Applications	Syllab	ous	2021-2	22			
Course Object	tives:	· · · ·							
The main object	ctives of thi	s course are to:							
 Gain know Enable th How to stop 	vledge on c e students t ore and sha	loud computing, cloud services, architectures and a o learn the basics of cloud computing with real time re, in and from cloud?	pplica e usag	itions ge	S.				
Expected Cou	rse Autcor	165.							
On the succe	ssful comp	letion of the course, student will be able to:							
1 Understand the concepts of Cloud, and its services K1 K2									
2 Collaborate Cloud for Event & Project Management						K4			
3 Analyz Databas	e on clou	d in – Word Processing, Spread Sheets, Mail, o	Calen	dar,	K4,	K5			
4 Analyze cloud in social networks						K6			
5 Explor	e cloud stor	age and sharing			K6				
K1 - Remem	ıber; K2 - U	I <mark>nde</mark> rstand; K3 - Apply; K4 - Analyze; K5 - Evalua	ate; K	6 - C	reate				
			A						
Unit:1		INTRODUCTION	1.0		12 ho	urs			
INTRODUCTI cloud computin development, d	ON Cloud ng, pros an liscovering	Computing Introduction, From, Collaboration to d cons, benefits, developing cloud computing ser- cloud services.	cloue vices,	d, W Clou	orking id serv	g of vice			
IL . A O					10 1				
Unit:2		CLOUD COMPUTING			12 no	urs			
CLOUD CON computing for events, cloud c road.	MPUTING communit computing	FOR EVERYONE Centralizing email com y, collaborating on schedules, collaborating on for corporation, mapping, schedules, managing pro	munic group ojects,	eation pro pres	ns, cl ojects senting	oud and g on			
Unit:3		CLOUD SERVICES			12. ho	mrs			
					1 <u>2</u> IIU	<u>, ar 9</u>			
USING CLOUD SERVICES Collaborating on calendars, Schedules and task management, exploring on line scheduling and planning, collaborating on event management, collaborating on contact management, collaborating on project management, collaborating on word processing, spreadsheets, and databases.									
Unit.1		OUTSIDE THE CLOUD			17 ha				
OUTSIDE TH Evaluating we	HE CLOU b conferer	D Evaluating web mail services, Evaluating ice tools, creating groups on social networks,	insta Evalu	nt n 1ating	nessag g on	ing, line			

groupware, collaborating via blogs and wikis.										
U	nit:5	STORING AND SHARING	10 hours							
STORING AND SHARING Understanding cloud storage, evaluating on line file storage, exploring on line book marking services, exploring on line photo editing applications, exploring photo sharing communities, controlling it with web based desktops.										
U	Unit:6 Contemporary Issues 2 hours									
E	xpert lectu	res, online seminars – webinars								
		Total Lecture hours	60 hours							
T	'ext Books	and the second								
1	Michael	Miller, "Cloud Computin <mark>g", Pearson</mark> Education, New Delhi, 2009.								
R	eference B	Books								
1	Anthony Hill Educ	T. Velte, "Cloud Computing: A Practical Approach", 1st Edition cation Private Limited, 2009.	, Tata McGraw							
R	elated On	line Contents [MOOC, SWAYAM, NPTEL, Websites etc.]								
1	https://np	otel.ac.in/courses/106/105/106105167/								
2	https://w	ww.tutorialspoint.com/cloud_computing/index.htm								
3	https://w	ww.javatpoint.com/cloud-computing-tutorial								
C	ourse Desi	gned By:								

Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	L	S	М	S	М	S	M	Μ	Μ	S	
CO2	М	S	М	S	S	S	М	М	М	S	
CO3	S	S	S	S	S	S	S	S	S	S	
CO4	S	S	S	S	S	S	S	S	S	S	
CO5	М	S	S	S	S	S	S	S	S	S	

Course code		NETWORK SECURI CRYPTOGRAPH	ГY AND IY	L	Т	Р	С			
Core/Elective/	Supportive	Core		4			4			
Pre-requisi	te	Basics of Networks & its Sect	ırity	Sylla	ous	2021-	.22			
Course Object	ctives:									
The main obje	ctives of thi	course are to:								
 Enable students to reall the infoduction to Cryptography, web security and Case studies in Cryptography. To gain knowledge on classical encryption techniques and concepts of modular arithmetic and number theory. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms. To explore the design issues and working principles of various authentication Applications and various secure communication standards including Kerberos, IPsec, and SSL/TLS and email. 										
	0.4									
Expected Cou	arse Outcor	es: tion of the course student will l	a able to:							
	and the prov	as of the eruptographic election				V 1	K)			
1 Underst	and the prod	different energytion and dea	IIS	was to	colv		<u>K</u> 2			
2 probler	ns related to	onfidentiality and authentication	n		SOIV	K2,1	K3			
3 Apply probler	and analyze n	appropriate security technique	s to solve net	work se	curit	^у КЗ,	K4			
4 Explore	suitable cry	ographic algorithms	2	7.7		K4,	K5			
5 Analyze design	e different secure appli	igital signature algorithms to ations	achieve authe	nticatio	n an	d K5,1	K6			
K1 - Remer	nber; K2 - U	nderstand; K3 <mark>- Apply; K</mark> 4 - Ana	alyze; K5 - Eva	luate; K	6 - C	reate				
			31-	n						
Unit:1		INTRODUCTION	and the second se			12 ho	urs			
Introduction to cipher and E Algorithms: Ir	Cryptograp Block ciphe atroduction -	 y – Security Attacks – Security Symmetric and Asymmetric DES – Triple DES – AES – IDE 	v Services –Secu c-key Cryptos EA – Blowfish –	urity Alg ystem S - RC5.	gorith Symr	nm- St netric	ream Key			
Unit:2		CRYPTO SYSTEM				12 ho	ours			
Public-key Cryptosystem: Introduction to Number Theory - RSA Algorithm – Key Management - Diffie-Hell man Key exchange – Elliptic Curve Cryptography Message Authentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.										
Unit:3		NETWORK SECURIT	Y			12 ho	ours			
Network Security Practice: Authentication Applications – Kerberos – X.509 Authentication services and Encryption Techniques. E-mail Security – PGP – S / MIME – IP Security.										

M. Sc. Computer Science 2021-22 onwards - Affiliated Colleges - Annexure No.27(a)(1) SCAA DATED: 23.06.2021

Unit:4 WEB SECURITY	10 hours								
Web Security - Secure Socket Layer – Secure Electronic Transaction. System Security - Intruders and Viruses – Firewalls– Password Security.									
	Γ								
Unit:5 CASE STUDY	12 hours								
Case Study: Implementation of Cryptographic Algorithms – RSA – DSA	– ECC (C / JAVA								
Programming).									
Network Forensic – Security Audit - Other Security Mechanism: Introduction to: Stenography – Quantum Cryptography – Water Marking - DNA Cryptography									
Unit 6 Contomporary Issues	2 hours								
Expert lectures online seminars – webinars	2 1100115								
Expert fectures, online seminars – weomars									
Total Lecture hour	60 hours								
Text Books									
1 William Stallings, "Cryptography and Network Security", PHI/PearsonE	ducation.								
2 Bruce Schneir, "Applied Cryptography", CRC Press.									
Reference Books									
A.Menezes, P Van Oorschot and S.Vanstone, "Hand Book of Applied C Press, 1997	yptography", CRC								
2 AnkitFadia,"Network Security",MacMillan.	1								
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1 <u>https://nptel.ac.in/courses/106/105/106105031/</u>									
2 <u>http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html</u>									
3 <u>https://www.tutorialspoint.com/cryptography/index.htm</u>									
Salution +-									
Course Designed By:									

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	М	S	М	L	S	М	S	Μ	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Course code		DATA SCIENCE & ANAL	YTICS	L	Т	Р	С	
Core/Elective/S	Supportive	Core		4			4	
Pre-requisit	te	Basics of Data Science & its App	olications	Syllat	ous	2021-2	22	
Course Object	tives:			1				
The main object	ctives of thi	course are to:						
1. Introduce	the student	to data science, big data & its eco s	ystem.					
2. Learn data	a analytics a	its life cycle.			•.1			
3. To explore	e the progra	nming language R, with respect to t	he data minin	g algoi	ithm	S.		
4. Kelate the		between artificial interligence, mac	inne leannig			lence.		
Expected Cou	rse Outcor	es:						
On the succe	essful comp	etion of the c <mark>ourse, stude</mark> nt will be a	ble to:					
1 Unders	stand the co	cept of data science and its technique	ues			K1,	K2	
2 Review data analytics							K3	
3 Apply and determine appropriate Data Mining techniques using R to real time K3,K4							K4	
4 Analyze on clustering algorithms						K4,1	K5	
5 Analyz	ze on reg <mark>res</mark>	ion methods in AI	19]	X6	
K1 - Remem	1ber; K2 - U	nderstand; <mark>K3</mark> - Apply; <mark>K4</mark> - Analyz	ze; K5 - Evalı	iate; K	6 - C	reate		
		President and the	19-					
Unit:1		INTRODUCTION		1		12 ho	urs	
Introduction of Ecosystem- Th	f Data Scie e Data Scie	ce: data science and big data – fa	ncets of data- arning.	data sc	ience	e proc	ess-	
		A STAR UNDER	18					
Unit:2	1	BASICS OF DATA ANALYT	ICS			12 ho	urs	
Data Analytics tools.	s life cycle	review of data analytics - Advance	ced data Ana	lytics-t	echno	ology	and	
Unit:3		DATA ANALYTICS USING	R			12 ho	urs	
Basic Data Analytics using R : R Graphical User Interfaces – Data Import and Export – Attribute and Data Types –Descriptive Statistics – Exploratory Data Analysis –Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables – Data Exploration Versus Presentation.								
Unit:4		CLUSTERING				12 ho	urs	
Overview of C Analysis using Tree Algorithm Bayes Classifie	lustering : 1 g R –Classi ns – Evalua er – Smooth	-means – Use Cases – Overview of cation – Decision Trees – Overvie ing a Decision Tree – Decision Tre ng – Naïve Bayes in R.	f the Method ew of a Deci ee in R – Bay	– Perfo sion Tr es' Th	orm a ree – eorer	K-me Decis n – Na	ans sion aïve	

U	nit:5	ARTIFICIAL INTELLIGENCE	10 hours						
Arti asso	Artificial intelligence: Machine Learning and deep learning in data science - Clustering, association rules. Linear regression-logistic regression-Additional regression methods.								
U	nit:6	Contemporary Issues	2 hours						
E	xpert lectu	res, online seminars – webinars							
	Total Lecture hours60 hours								
Т	'ext Books								
1	1 Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf								
2	Data scie	nce in big data analytics- <mark>Wiley 2015</mark> John Wiley & Sons							
R	eference B	ooks							
1	A simple	introduction to Data Science - Lars Nielson 2015							
2	Introduci Publicati	ng Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali	2016 Manning						
3	R Program	mming f <mark>or Data</mark> Science - Roger D.Peng 2015 Lean Publication							
4	Data Scien	nce & Big Data Analytics: Discovering, Analyzing, Visualizing and Prese	enting Data						
	<u>)</u>								
R	elated On	line Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1	https://w	ww.tutorialspoint.com/python_data_science/index.htm							
2	2 <u>https://www.javatpoint.com/data-science</u>								
3	https://np	tel.ac.in/courses/106/106/106106179/							
С	ourse Desi	gned By:							
		Stulling a-Wild							

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	М	М	S
CO2	S	S	S	S	S	S	S	Μ	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S
CO5	S	S	S	S	S	S	S	М	S	S
Course code		PRACTICAL V : DIGITAL IMAGE PROCESSING Using MATLAB	L	Т	Р	С				
---	---	--	-----------------	-----------	----------	----------	--	--	--	--
Core/Elective/S	Supportive	Core			4	4				
Pre-requisit	te	Basic Programming of Image Processing & an intro to MATLAB	Syllal Versi	ous on	2021-	22				
Course Objec	tives:									
1.To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques										
2. To enable t	he students	to learn the fundamentals of image compression and	nd seg	men	tation					
3. To understa	and Image H	Restoration & Filtering Techniques								
4. Implementa	ation of the	above using MATLAB								
Expected Cou	rse Outcon	nes:								
On the succe	essful comp	letion of the course, student will be able to:			17.1 17/					
1 To write programs in MATLAB for image processing using the techniques K1,K2 2 To while to image processing using the techniques K2,K2										
2 To able	2 To able to implement Image Enhancements & Restoration techniques K2,K3									
4 Must h	5 Capable of using Compression techniques in an image K5,K4 4 Must be able to monipulate the image and Segment it V5 V6									
K1 - Remen	nber; K2 - U	Inderstand; K3 - Apply; K4 - Analyze; K5 - Evalu	ate; K	6 - 0	Create	<u> </u>				
			7							
	1 3	LIST OF PROGRAMS	1		60 ho	urs				
1. Implement	it Image enl	hancement l'echnique.								
2. Histogram	n Equalizati	on								
3. ImageRes	storation.	SSULITOOT & WIPP								
4. Implemer	nt ImageFilt	ering.								
5. Edge dete	ection using	Operators (Roberts, Prewitts and Sobelsoperators)								
6. Implemer	nt image con	npression.								
7. Image Su	btraction									
8. Boundary	Extraction	using morphology.								
9. Image Se	gmentation									
	Total Lecture hours 60 hours									
Text Books	Text Books									
1 Rafael C	. Gonzalez,	Richard E. Woods, "Digital Image Processing", Se	econd	Edit	ion,					

	PHI/Pearson Education.									
2	B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.									
R	Reference Books									
1	Nick Efford, "Digital Image Processing a practical introducing using Java", Pearson									
1	Education, 2004.									
R	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://nptel.ac.in/courses/117/105/117105135/									
2	https://www.tutorialspoint.com/dip/index.htm									
3	https://www.javatpoint.com/digital-image-processing-tutorial									
C	Course Designed By:									

Course Designed By:

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	М	S	S
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S

*S-Strong; M-Medium; L-Low

Page 42 of 67

Course code	ourse code PRACTICAL VI : CLOUD COMPUTING LAB L T									
Core/Elective/Supportive	Core			4	4					
Pre-requisite	Basic Programming using Cloud	Syl	labus	2021-2	22					
Course Objectives:	·									
The main objectives of the	s course are to:									
1. This course covers the basic data structures like Stack, Queue, Tree, List.										
2. This course enables th	e students to learn the applications of the data	structu	ires us	ing						
various techniques	nts to understand Cull language with respect to		Deer	aconta						
4. Application of OOPS c	oncepts	JOOP		leepts						
Expected Course Outcon	nes:									
On the successful comp	letion of the course, student will be able to:									
1 Understand the co	1 Understand the concepts of object oriented with respect to C++									
2 Able to understand	Able to understand and implement OOPS concepts									
3 Implementation of	++	K4,K5								
4 Application of the d different techniques	ata structures for Sorting, Searching using			K5,K6						
K1 - Remember; K2 - U	J <mark>nderstand; K3 - Apply; K4 - Analyze; K5 - E</mark>	valuat	e; K6	- Create						
		4	ľ	60 ha						
1. Working with Google	Drive to make spreadsheet and notes.	7		00 110	Juis					
2. Launch a Linux Virtu	I Machine									
3 To host a static websit	e 0									
4. Exploring Google el	oud for the following a) Storage b) Sharing	of do	to a)	monogo	1011 r					
calendar, to-do lists, d) a	document editing tool	or ua	(a C)	manage y	oui					
5. Working and installati	on of Google App Engine									
6. Working and installati	on of Microsoft Azure									
7. To Connect Amazon I	Redshift with S3 bucket									
8. To Create and Query a	NoSQL Table									
Expert lectures, online	seminars – webinars									
	Total Lecture	hours	8	60 ha	ours					
Text Books										
1 Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009.										
Reference Books										

1	Anthony T. Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata McGraw Hill Education Private Limited, 2009.
R	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/courses/106/105/106105167/
2	https://www.tutorialspoint.com/cloud_computing/index.htm
3	https://www.javatpoint.com/cloud-computing-tutorial
C	Course Designed By:

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	М	S	S	S	М	М	S	S
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S



Course code		PRACTICAL VII : WEB APPLICATION DEVELOPMENT AND HOSTING	L	Т	Р	С	
Core/Elective/S	Supportive	Core			2	2	
Pre-requisi	te	Basic Programming using HTML tags	Sylla	bus	2021-22		
Course Objec	tives:						
The main obje	ctives of thi	s course are to:					
1.Able to desig	gn a web pag	ge using HTML tags					
2.To enable the tags	e students to	b use Framesets, hyper links and different format	ting fe	atures	s of HT	ML	
4 To grante int	orootivo or	lightions using DUD					
4.10 create int	eractive app						
Expected Cou	urse Outcon	nes					
On the succe	essful comp	letion of the course, student will be able to:					
1 Unders	tand & imp	lement the basic HTML tags to create static web	pages		K1.K2	2	
2 Capable	e of using hy	vperlinks, frames, images, tables,in a web pag	re	[K2.K3	3	
3 Able to	write dynar	nic web applications using HTML forms			K4.K5	5	
4 Must b XAMP	e able to wr P.	ite dynamic web applications in PHP & HTML ta	ags us	ing	K5,K	6	
K1 - Remen	nber; K2 - U	Jn <mark>derstand; K3 - Ap</mark> ply; K4 - Analyze; K5 - Eva	luate;	K6 - (Create		
	1 3						
1.5.1	1	LIST OF PROGRAMS			30 ho	urs	
1. Develop a 2. Write na world.html. E open india.htm	mes of sev Each country ml and it sho	r your college using advanced tags of HTML. reral countries in a paragraph and store it as name must be a hot text. When you click India puld provide a brief introduction about India.	an H' (for e	ГML xamp	docume le), it m	ent, 1ust	
3. Develop display the Ta	a HTML do able Format	ocument to i)display Text with Bullets / Number Data	ers - U	Jsing	Lists ii) to	
4. Develop about a Hospi	a Complete ital using H	Web Page using Frames and Framesets which TML.	gives	the I	nformat	tion	
5. Write a H	TML docum	nent to print your Bio-Data in a neat format using	g sevei	al cor	nponen	ts.	
6. Develop a	a HTML doo	cument to display a Registration Form for an inte	r-colle	giate	functio	n.	
7. Using HT Email address	TML form a sand valida	accept Customer details like Name, City, Pin context te the data and display appropriate messages for the data appropriate messages for the data and display appropriate messages for the data and display appropriate messages for the data appropriate m	de, Ph violati	one n ons us	umber sing PH	and P	

(Eg. Name is Mandatory field; Pin code must be 6 digits, etc.).

8. Write a program to accept two numbers n1 and n2 using HTML form and display the Prime

nu	numbers between n1 and n2 using PHP.									
	Total Lecture hours	30	hours							
Text Books										
1	IIvan Bayross, "Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP", BPB Publications, 4th Revised Edition, 2010.									
R	Reference Books									
2	A.K.Saini and SumintTuli, "Mastering XML", First Edition, New Delhi, 2002.									
R	elated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://www.tutorialspoint.com/xml/index.htm									
2	https://www.tutorialspoint.com/internet_technologies/websites_developmen	<u>t.htm</u>								
3	https://www.youtube.com/watch?v=PlxWf493en4									
C	Course Designed By:									

			0.0X							
Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	Μ	М	S	S
CO2	S	S	S	S	S	S	S	М	S	S
CO3	S	S	S	S	S	S	S	М	S	S
CO4	S	S	S	S	S	S	S	М	S	S



Course code		MULTIMEDIA AND ITS APPLICATIONS	L	Т	Р	C					
Core/Elective/S	upportive	Elective	4			4					
Pre-requisit	e	Basics of Multimedia	Syllat	ous	2021-	22					
Course Objectives:											
 To introduce the students the concepts of Multimedia, Images & Animation. To introduce Multimedia authoring tools To understand, the role of Multimedia in Internet 											
 4. To know about High Definition Television and Desktop Computing – Knowledge based Multimedia systems 											
Expected Course Outcomes:											
On the succe	essful comp	letion of the course, student will be able to:									
1 Unders	stand the ba	sic concepts of Multimedia			K1,	K2					
2 Demor	nstrate Mult	imedia authoring tools			K2,1	K3					
3 Analyze the concepts of Sound, Images, Video & Animation											
4 Apply and Analyze the role of Multimedia in Internet and real time applications											
5 Analyze multimedia applications using HDTV											
K1 - Remen	iber; K2 - U	Inderstand; K3 - Apply; K4 - Analyze; K5 - Evalu	late; K	6 - C	reate						
TT . 14. 1	-		-		10 1						
What is Mult Production pla	timedia? – tforms – Ba	Introduction to making Multimedia – Maci sic Software tools.	ntosh	and	Winde	ows					
Unit:2		MULTIMEDIA TOOLS			12 ho	urs					
Making Instant Sound.	t Multimedi	a – Multimedia authoring tools – Multimedia buil	ding bl	ocks	- Text	t —					
Unit:3		ANIMATION			10 ho	ours					
Images – Anim	nation – Vic	ео.									
Unit:4		INTERNET			12 ho	ours					
Multimedia an Designing for t	d the Intern he World V	net – The Internet and how it works – Tools for Vide Web.	World	ł Wi	de We	:b —					
Unit:5		MULTIMEDIA SYSTEMS			12 ho	ours					
High Definition	n Televisio	and Desktop Computing – Knowledge based Mu	ltimed	ia sy	stems.						

U	nit:6	Contemporary Issues	2 hours								
E	xpert lectu	res, online seminars - webinars									
	•										
		Total Lecture hours	60 hours								
Text Books											
1	Tay Vau	Tay Vaughan, "Multimedia making it work", Fifth Edition, Tata McGrawHill.									
2	John F. Koegel Bufford, "Multimedia Systems", Pearson Education.										
Re	Reference Books										
1	Judith Je	ffloate, "Multimedia in Practice (Technology and Applications)", Pl	HI,2003.								
R	elated On	line Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://w	ww.tutorialspoint.com/multimedia/index.htm									
2	https://w	ww.tutorialspoint.com/basics_of_computer_science/basics_of_comp	puter_science_m								
_	ultimedi	a.htm									
3	https://n	otel.ac.in/courses/117/105/117105083/									
C	ourse Des	igned By:									

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	М	S	М	М	М	S
CO2	S	S	S	S	М	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S
*S-St	rong; M-l	Medium;	L-Low	9.5,sin	noot e-	winish ^{ph}	and the second			

Course code		EMBEDDED SYSTEMS	L	Т	Р	С					
Core/Elective/S	upportive	Elective	4			4					
Pre-requisite	e	Basics of Micro Controller	Syllab	ous	2021-22						
Course Object	ives:										
The main objectives of this course are to:											
 Present the introduction to 8051 Microcontroller Instruction Set, concepts on RTOS & Software tools. Gain the knowledge about the embedded software development. Learn about Microcontroller and software tools in the embedded systems. 											
Expected Cour	rse Outcon	nes:									
On the succe	ssful comp	letion of the course, student will be able to:									
1 Unders	tand the co	ncept of 8051 microcontroller			K1,F	K2					
2 Unders	tand the Ins	struction Set and Programming			K2,F	ζ3					
3 Analyz	e the conce	pts of RTOS			K3,F	ζ4					
4 Analyze and design various real time embedded systems using RTOS											
5 Debug	the mal <mark>fun</mark>	<mark>ction</mark> ing system using various debugging techniqu	es		K5,F	K6					
K1 - Remem	ber; K2 - U	I <mark>nde</mark> rstand; K3 - Apply; K4 - Analyze; K5 - Evalu	iate; K	6 – Cı	eate						
Unit:1	· 11 T. (8051 MICROCONTROLLER	D	1	<u>12Ho</u>	urs					
External Memo	ry - Counte	ers / Timers - Serial Data Input / Output –Interrupt	, Ports s	and	Circui	ts -					
Unit:2	103	PROGRAMMING BASICS	£		12Ho	urs					
Instruction Se Arithmetic Op Interface- Displ	t and Pr eration-Jun lay Interfac	ogramming Moving Data-Addressing Modes- np and Call Instructions-Simple Program. App e-Pulse Measurements-DIA and AID Conversions	-Logica plicatio -Multi	al oj ons: ple Ir	peratio Keybo nterrup	ons- ard ots.					
		11 11 12 12 12 12 12 12 12 12 12 12 12 1									
Unit:3		CONCEPTS ON RTOS			12Ho	urs					
CONCEPTS O and data- Sem communication Management-Ir	N RTOS: I aphores an - Messag nterrupt Ro	ntroduction to RTOS-Selecting an RTOS-Task and d shared data. MORE operating systems servic e Queues, Mailboxes and pipes- Timer Function utines in an RTOS Environment.	d Task es: Int ns-Eve	errup nts -	es - Ta t Proc Mem	sks æss ory					
Unit:4		DESIGN USING RTOS			10Ho	urs					
Basic Design u scheduling cons	sing a RTC siderations-	OS: Principles - Encapsulating semaphores and Q Saving memory space and power- introductions to	o RTL	Hard &QN	real ti X.	ime					
IInit.5		SOFTWADE TOOLS	<u> </u>		1711-	1100					
		SOFTWARE TOOLS			12110	urs					

M. Sc. Computer Science 2021-22 onwards - Affiliated Colleges - Annexure No.27(a)(1) SCAA DATED: 23.06.2021

Lin	ker/Locator	s for Embedded software-getting Embedded software into the	Farget systems.								
Deb	ougging Te	chniques: Testing on your Host machine -Instruction set simulat	tors- The assert								
mac	cro- using la	boratory tools.									
U	Init:6	Contemporary Issues	2 hours								
E	xpert lectur	es, online seminars – webinars									
		Total Lecture hours	60Hours								
Т	'ext Books										
1	David E.	Simon, "An Embedded Software primer" Pearson Education Asia,	2003.								
2	Kenneth	J Ayala, "The 8051 Microcontroller and Architecture pro	gramming and								
Z	applicatio	n", Second Edition, Penram International.									
R	eference B	ooks									
1	Raj Kama	al, "Embedded Systems – Architecture, programming and design",	Tata McGraw –								
	Hill, 200.	ð.									
K	lated Onl	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]									
1	https://on	linecourses.nptel.ac.in/noc20_cs14/preview_									
2	https://ww	vw.javatpoint.com/embedded-system-tutorial									
3	https://ww	vw.tutorialspoint.com/embedded_systems/index.htm									
		Stew Steeland To The									
С	ourse Desig	gned By:									

Mappin	Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	L	L	L	S	M	S	S	Μ	М	S		
CO2	М	М	S	S	М	S	М	S	S	S		
CO3	М	S	S	S	S	S	S	S	S	S		
CO4	S	S	S	S	S	S	S	S	S	S		
CO5	S	S	S	S	S	S	S	S	S	S		

Course code	INTERNET OF THINGS	L	Т	Р	C						
Core/Elective/Supportive	Elective	4			4						
Pre-requisite	Basics of Sensors & its Applications	Syllab	ous	2021	-22						
Course Objectives:											
The main objectives of this course are to:											
 About Internet of Things where various communicating entities are controlled and managed for decision making in the application domain. Enable students to learn the Architecture of IoT and IoT Technologies Developing IoT applications and Security in IoT, Basic Electronics for IoT, Arduino IDE, Sensors and Actuators Programming NODEMCU using Arduino IDE. 											
Erraciad Course Outer	moga										
On the successful com	bletion of the course student will be able to:										
1 Understand about	IoT its Architecture and its Applications			K11	<i>र</i> 2						
2 Understand basic e	lectronics used in IoT & its role			K2.1	X3						
3 Develop applicatio	ns with C using Arduino IDE			III,	K4						
4 Analyze about sen	sors and actuators			K5.J	K6						
5 Design IoT in real time applications using today's internet & wireless K6											
K1 - Remember; K2 -	Understand; K3 - Apply; K4 - Analyze; K5 - Evalu	ate; K	6 - C	reate							
	Barland and	1									
Unit:1	INTRODUCTION			12 ho	urs						
Introduction to IoT: Evol – Technologies for IoT – Security in IoT	ution of IoT – Definition & Characteristics of IoT Developing IoT Applications – Applications of I	- Arch oT – Ii	itect ndust	ure of trial Io	IoT T –						
Unit:2	BASIC ELECTRONICS FOR IoT			12 ho	urs						
Basic Electronics for Calculations – Logic Chi A/D and D/A Conversion	loT: Electric Charge, Resistance, Current and ps – Microcontrollers – Multipurpose Computers – – Pulse Width Modulation.	Volta - Electi	age ronic	– Bin Signa	ary ls –						
Unit.3	PROCRAMMING USING ARDUINO			12 ho	urc						
				12 110	u1 5						
Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.											
I Init•4	SENSORS AND ACTUATORS			10 ho	ure						
Sansors and Actuators: A	nalog and Digital Sensors Interfacing temperatu	ire con	or 1	ltraco	und						

sens	sor and infr	ared (IR) sensor with Arduino – Interfacing LED and Buzzer with A	Arduino.							
U	nit:5	SENSOR DATA IN INTERNET	12 hours							
Sen Prog fron	Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (ThingSpeak).									
U	nit:6	Contemporary Issues	2 hours							
E	xpert lectur	res, online seminars – webinars								
		Total Lecture hours	hours							
Т	ext Books									
1	1 Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-On Approach", 2014. ISBN: 978-0996025515									
2	Boris Ad Artech H	ryan, Dominik Obermaier, Paul Fremantle, "The Technical Found ouser Publishers, 2017.	lations of IoT",							
R	eference B	ooks								
1	Michael 1	Margolis <mark>, "Ardu</mark> ino Cookbook", O"Reilly, <mark>20</mark> 11								
2	Marco Sc	hwartz, <mark>"Intern</mark> et of Th <mark>ings w</mark> ith ESP8266", Packt Publishing, 2016	б.							
3	Dhivya I Dev. Kit'	Bala, "E <mark>SP8266: Step by Step Tutorial for ESP8266</mark> IoT, Arduin ', 2018.	no NODEMCU							
R	elated On	line Contents [MOOC, SWAYAM, NPTEL, Websites etc.]								
1	https://on	linecourses.nptel.ac.in/noc20_cs66/preview								
2	https://ww	ww.javatpoint.com/iot-internet-of-things								
3	https://ww	ww.tutorialspoint.com/internet_of_things/index.htm								
		and Dru								
C	ourse Desig	gneu By:								

Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	М	М	Μ	S	М	S	М	М	S	М	
CO2	М	S	Μ	S	М	S	Μ	S	S	S	
CO3	S	S	S	S	М	S	М	S	S	S	
CO4	S	S	S	S	S	S	S	S	S	S	
CO5	S	S	S	S	S	S	S	S	S	S	

Course code	CRITICAL THINKING, DESIGN THINKING AND PROBLEM SOLVING	L	Т	Р	С						
Core/Elective/Supportive	Elective	4			4						
Pre-requisite	Basics of Logical & Reasoning Skills	Syllab	ous	2021-	-22						
Course Objectives:											
The main objectives of the	is course are to:										
1. Learn critical thinkin	g and its related concepts										
2. Learn design thinkin	g and its related concepts										
3. Develop Hinking pa	merns, Froblem solving & Reasoning										
Expected Course Outcon	mes:										
On the successful comp	eletion of the course, student will be able to:										
1 Understand the cor	ncepts of Critical thinking and its related technolog	У		K1,	K2						
2 Focus on the expl skills	2 Focus on the explicit development of critical thinking and problem solving K2,K3										
3 Apply design think	3 Apply design thinking in problems K3,										
4 Make a decision ar	nd take actions based on analysis			K4,	K5						
5 Analyze the concerned for the concerned for the second s	5 Analyze the concepts of Thinking patterns, Problem solving & Reasoning in real time applications K5,K6										
K1 - Remember; K2 - U	Understand; <mark>K3 -</mark> Apply; <mark>K4</mark> - Analyze; <mark>K5 -</mark> Evalu	ate; K	6 - 0	reate							
	Manufactor and a the	10									
Unit:1	CRITICAL THINKING	71-2		12 ho	ours						
Critical Thinking: Defin finding, evaluation, Infer Applied critical thinking critical thinking and scien	ition, Conclusions and Decisions, Beliefs and ences, Facts – opinion, probable truth, probably g: Inference, Explanation, Evidence, Credibility, ce, critical evaluation, self assessment.	Claims false, Two	s, E Venr Cas	videnc 1 diagr e Stud	e – [.] am. lies,						
Unit:2	DESIGN THINKING			12 ho	ours						
Design Thinking: Introdu process, Traditional Prol problem exploration, Stal implementation.	ction, Need of Design Thinking, problem to quest blem Solving versus Design Thinking, phases ke holder assessment, design thinking for manufa	tion - c of Des cturers	lesig sign , sm	n thinl Think art Ide	cing ing, a to						
Unit:3	CASE STUDY			12 ho	ours						
Thinking to confidence, Thinking, prototype design centered design, case stud	fear management, duty Vs passion, Team ma gn, Relevance of Design and Design Thinking in ly: apply design thinking in problem.	nagem n engin	ent, eerii	Tools 1g, hui	for man						
Unit.4	DDORLEM SOLVING	<u> </u>		10 h-							
Problem solving: problem	n definition, problem solving methods, selecting a	nd usir	ng in	format	ion						
data processing, solution	i methods, solving problems by searching, recogn	izing p	atter	ns, spa	atial						

reasoning, necessity and sufficiency, choosing and using models, making choices and decisions.								
U	nit:5	REASONING	12 hours					
Reasoning: Deductive and hypothetical reasoning, computational problem solving; generating, implementing, and evaluating solutions, interpersonal problem solving. Advanced problem solving: Combining skills – using imagination, developing models, Carrying out investigations, Data analysis and inference. Graphical methods of solution, Probability, tree diagrams and decision trees								
Unit:6 Contemporary Issues								
E	xpert lectu							
		Total Lecture hours	60 hours					
Т	ext Books	and the second sec						
1	1John Butterworth and Geoff Thwaites, Thinking skills: Critical Thinking and Problem Solving, Cambridge University Press, 2013.							
2	H. S. Fo Pearson,	gler and S. E. LeBlanc, Strategies for Creative Problem Solvin Upper Saddle River, NJ, 2008.	ng, 2nd edition,					
R	eference B	Books						
1	A. Whim Erlbaum,	bey and J. Lochhead, Problem Solving & Comprehension, 6th ed Mahwah, NJ, 1999.	lition, Lawrence					
2	M. Levir 1994.	ne, Effect <mark>ive Pro</mark> blem Solving, 2nd edition, Prentice Hall, Upper S	addle River, NJ,					
3	Michael	Baker, The B <mark>asic of Critical Thinking, The Critical</mark> Thinking Co pr	ess, 2015.					
4	David Ke	elley and Tom Kelley, Creative Confidence, 2013.						
п		En Contact MOOC SWAVAM NETEL WALSTON AND						
1	https://www.	une contents [WOOC, SWAIAW, NPTEL, Websites etc.]						
1	https://w	www.tutorialspoint.com/design_thinking/index.num	de htm					
2	https://w	ww.tutoriaispoint.com/design_uniking/design_uniking_quick_gui						
3	<u>1111ps.//11</u> p	<u>101.ac.111/courses/107/104/107104107/</u>						
С	ourse Desi	gned By:						

Mappin	Mapping with Programming Outcomes											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	S	S	Μ	S	S	S	М	S	S	S		
CO2	S	S	М	S	S	S	М	S	S	S		
CO3	S	S	М	S	S	S	S	S	S	S		
CO4	S	S	S	S	S	S	S	S	S	S		
CO5	S	S	S	S	S	S	S	S	S	S		

Course code		MOBILE COMPUTING	L	Т	Р	С				
Core/Elective/S	upportive	Elective	4			4				
Pre-requisit	e	Basics of Mobile Communication	Syllat	ous	2021-2	22				
Course Object	tives:									
The main objec	ctives of thi	s course are to:								
1. Present the	e overview	of Mobile computing, Applications and Architectu	res.							
2. Describe the	he futuristi	c computing challenges.								
5. Enable the students to learn the concept of mobile computing.										
Expected Cour	rse Outcon	nes:								
On the succe	ssful comp	letion of the course, student will be able to:								
1Understand the need and requirements of mobile communicationK1,K2										
2 Focus of	on mobile c	omputing applications and techniques			K2,	K3				
3 Demon	strate satel	lite communication in mobile computing]	K4				
4 Analyz	4 Analyze about wireless local loop architecture									
5 Analyz	e various n	nobile communication technologies			K	6				
K1 - Remem	ber; K2 - U	J <mark>nders</mark> tand; K3 - Apply; K4 - An al <mark>yze; K5</mark> - Evalu	ate; K	6 - C	reate					
Unit:1		INTRODUCTION	-		12 ho	urs				
Communication History of Mob	i: Need for	Mobile Communication – Introduction to Telepho Mobile Communication – Requirements of Mobi inication.	ne Sys le Coi	nmu	s –Mo nicatio	bile on –				
TT:4-0			1		10 h -					
Unit:2		MOBILE COMMUNICATION			12 no	ours				
Introduction to Management –	Cellular M Frequency	Iobile Communication – Mobile Communication Management – Cordless Mobile Communication S	Standa System	ards is.	–Mobi	ility				
Unit.2		MODILE COMDUTINC			12 ha	1180				
					12 110					
Mobile Compu System – Sat Communication Interferences in	iting: Histo ellites in n – Chango n Cellular M	ry of data networks – Classification of Mobile da Mobile Communication: Satellite classification eover from one satellite to other – Global Mobil Iobile Communication.	ta netv – G le Cor	work lobal nmu	s - CE Sate nicatio	OPD llite on –				
Unit:4	N	10BILE COMMUNICATION SYSTEM			11 ha	ours				
Unit:4MOBILE COMMUNICATION SYSTEM11 hoursImportant Parameters of Mobile Communication System – Mobile Internet: Working of MobileIP – Wireless Network Security – Wireless Local Loop Architecture: Components in WLL – Problems in WLL – Modern Wireless Local Loop – Local Multipoint Distribution Service – Wireless Application Protocol.II hours										
Unit:5		COMMUNICATION TECHNOLOGY			11 ho	ours				

WC and Mol	DMA Tech Bluetooth oile Commu	nology and Fiber Optic Microcellular Mobile Communication – A technology – Intelligent Mobile Communication system – Fou inication systems.	d hoc Network rth Generation						
U	nit:6	Contemporary Issues	2 hours						
E	xpert lectur	es, online seminars – webinars							
		Total Lecture hours	60 hours						
Т	ext Books								
1	T.G. Palanivelu, R. Nakkeeran, "Wireless and Mobile Communication", PHI Limited, 2009.								
2	Jochen So	chiller, "Mobile Communications", Second Edition, Pearson Educat	ion, 2007.						
R	eference B	ooks							
1	Asoke K	Talukder, Has <mark>an Ahmed, Roopa Yavagal, "Mobil</mark> e Computing",TM	IH, 2010.						
R	elated Onl	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1	https://ww	vw.tutorialspoint.com/mobile_computing/index.htm							
2	https://ww	vw.javatpoint.com/mobile-computing							
3	https://np	tel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/							
С	ourse Desig	gned By:							
		and the second sec							

Mappin	Mapping with Programming Outcomes											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		
CO1	L	М	L	L	М	S	M	М	М	М		
CO2	S	S	S	M	М	S	М	S	S	S		
CO3	S	S	S	S	М	S	S	S	S	S		
CO4	S	S	S	S	S	S	S	S	S	S		
CO5	S	S	S	S	S	S	S	S	S	S		

Course code	urse code BLOCK CHAIN TECHNOLOGY L T										
Core/Elective/S	Supportive	Elective	4			4					
Pre-requisit	te	Basics of Block Chain & Crypto Currency	ics of Block Chain & Crypto Currency Syllabus								
Course Objectives:											
The main object	ctives of thi	s course are to:									
1. Understand the fundamentals of block chain and cryptocurrency.											
2. Understand the influence and role of block chain in various other fields.											
3. Learn sec	3. Learn security features and its significance.										
4. Identify p	roblems &c	hallenges posed by Block Chain.									
Expected Cou	rse Outcon	nes•									
On the succe	essful comp	letion of the course, student will be able to:									
1 Demons	strate block	chain technology and crypto currency			K1.J	K2					
2 Underst	and the min	ing mechanism in blockchain			ŀ	X 2					
3 Apply a people t	and identify to trade and	security measures, and various types of services the transact with bitcoins	nat allo	W	K3,I	K4					
4 Apply a	and analyze	Blockchain in health care industry			K4,1	K5					
5 Analyze	e security, p	rivacy, and efficiency of a given Blockchain syste	m		K5.I	K6					
K1 - Remen	nber; K2 - U	Inderstand; K3 - Apply; K4 - Analyze; K5 - Evalu	ate; K	6 - C	reate						
		A Reading and the States									
Unit:1		INTRODUCTION	1		12 ho	urs					
Introduction to Bitcoin versus Strategic analy major application	Blockchai Cryptocur ysis of the ion: currenc	n - The big picture of the industry – size, grow rencies versus Blockchain - Distributed Ledger space – Blockchain platforms, regulators, applic y, identity, chain of custody.	th, stru Techi cation	icture nolog provi	e, play y (DL ders. '	ers. LT). The					
	1										
Unit:2		NETWORK AND SECURITY			12 ho	urs					
Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Blockchain 1.0, 2.0 and 3.0 – transition, advancements and features. Privacy, Security issues in Blockchain.											
Unit:3	Unit:3 CRYPTOCURRENCY 12 hours										
Cryptocurrency - History, Distributed Ledger, Bitcoin protocols -Symmetric-key cryptography - Public-key cryptography - Digital Signatures -High and Low trust societies - Types of Trust model: Peer-to-Peer, Leviathan, and Intermediary. Application of Cryptography to Blockchain											
Unit:4		CRYPTOCURRENCY REGULATION			11 ho	urs					
Cryptocurrency Regulation - Stakeholders, Roots of Bit coin, Legal views - exchange of cryptocurrency - Black Market - Global Economy. Cyrptoeconomics - assets, supply and											

demand, inflation and deflation – Regulation.									
U	nit:5	CHALLENGES IN BLOCK CHAIN	11 hours						
Opportunities and challenges in Block Chain – Application of block chain: Industry 4.0 – machine to machine communication – Data management in industry 4.0 – future prospects. Block chain in Health 4.0 - Blockchain properties - Healthcare Costs - Healthcare Quality - Healthcare Value - Challenges for using blockchain for healthcare data									
T	nit·6	Contemporary Issues	2 hours						
E E	xpert lectur	res online seminars – webinars	2 110015						
		veenus							
		Total Lecture hours	60 hours						
Т	'ext Books								
1	Arvind N "Bitcoin Universit	arayanan, Joseph Bonneau, Edward Felten, Andrew Miller and St and Cryptocurrency Technologies: A Comprehensive Introduct y Press (July 19, 2016).	even Goldfeder, tion", Princeton						
2	Antonopo	oulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies"							
R	eference B	ooks							
1	Satoshi N	lakamot <mark>o, "Bitc</mark> oin: A Peer-to-Peer Electronic Cash System"							
2	Rodrigo Technolo	da Rosa Righi, Antonio Marcos Alberti, Madhusudan Sing gy for Industry 4.0" Springer 2020.	h, "Blockchain						
R	elated On	ine Contents MOOC, SWAYAM, NPTEL, Websites etc.]							
1	https://ww	ww.iavatpoint.com/blockchain-tutorial							
2	2 https://www.tutorialspoint.com/blockchain/index.htm								
3	https://np	tel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/							
		9							
C	ourse Desig	gned By:							

PO10	DOA		Mapping with Programming Outcomes												
	PO9	PO8	PO7	PO6	PO5	PO4	PO3	PO2	PO1	Cos					
Μ	S	М	S	S	S	S	S	S	S	CO1					
S	S	S	S	S	S	S	S	S	S	CO2					
S	S	S	S	S	S	S	S	S	S	CO3					
S	S	S	S	S	S	S	S	S	S	CO4					
S	S	S	S	S	S	S	S	S	S	CO5					
	S S S S S	M S S S S	S S S S	S S S S S S	S S S S	S S S S	S S S S	S S S S	S S S S	CO1 CO2 CO3 CO4 CO5					

Course code		WEB SERVICES	L	Т	Р	C					
Core/Elective/S	upportive	Elective	4								
Pre-requisit	e	Basics of Distributed Computing	sics of Distributed Computing Syllabus Version								
Course Objec	tives:										
The main object	ctives of thi	s course are to:									
 Present the Web Services, Building real world Enterprise applications using Web Services with Technologies XML, SOAP, WSDL, UDDI Get overview of Distributed Computing, XML, and its technologies Update with QoS and its features Develop Standards and future of Web Services 											
E	0.4	and the second s									
Expected Cou	rse Outcon	nes:									
	essiul comp	retion of the course, student will be able to:			17.1 1	70					
	stand web s	ervices and its related technologies			KI,I	<u>K2</u>					
2 Unders	stand XML	concepts			K2,I	<u>K3</u>					
3 Analyz	ze on SOAP	and UDDI model			K4,I	K5					
4 Demor	istrate the r	bad map for the standards and future of web servic	es		K5						
5 Analyz	ze QoS enat	bled applications in web services			K5,I	K6					
K1 - Remen	iber; K2 - U	J <mark>nde</mark> rstand; K3 - Apply; K4 - Analyze; K5 - Evalu	ate; K	6 - Ci	reate						
		and the part of the	.9								
Unit:1	-	INTRODUCTION			12 ho	urs					
Introduction to web services- services and er	web servic Industry staterprises-w	es – Overview of Distributed Computing- Evolution andards, Technologies and concepts underlying eb services standards organization-web services pl	on and g web atform	impo serv s.	ortance ices-V	e of Veb					
	1										
Unit:2		XML FUNDAMENTALS			12 ho	urs					
XML Fundame	entals – XM	L documents - XML Namespaces- XML Schema	-Proce	essing	XML	.					
Unit:3		SOAP MODEL			12 ho	urs					
					12 110	uis					
SOAP: The SOAP model- SOAP messages-SOAP encoding- WSDL: WSDL structure- interfacedefinitions-bindings-services-Using SOAP and WSDL-UDDI: About UDDI- UDDI registrySpecification- Core data structures-Accessing UDDI											
Unit:4		TECHNOLOGIES AND STANDARDS			12_ho	urs					
Advanced we conversation la workflows and data storage-er	b services anguage-W3 l workflow rors-Web se	technologies and standards: Conversations over SCL interface components. Workflow: business pre- management systems Security: Basics-data hand ervices security issues.	erview process ling ar	-web man nd for	servi agemo rwardi	ices ent- ing-					

U	Unit:5 QUALITY OF SERVICE 10 hour											
Quality of Service: Importance of QoS for web services-QoS metrics-holes-design patterns-QoS enabled web services-QoS enabled applications. Web services management-web services standards and future trends.												
U	Unit:6 Contemporary Issues 2 hours											
E	Expert lectures, online seminars – webinars											
		Total Lecture hours	60 hours									
Т	ext Books											
1	Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services: An Architects Guide", Prentice Hall, Nov 2003.											
2	Keith Ballinger, "NET Web services: Architecture and Implementation with .Net", Pearson Education, First Edition, Feb 2003.											
R	eference B	ooks										
1	Ramesh Web Serv	Nagappan, "Developing Java Web Services: Architecting and de vices Using Java", John Wiley and Sons, first Edition Feb 2003.	veloping secure									
2	Eric A M sons, Ma	Iarks and Mark J Werrell, "Executive Guide to Web services", rch 2003.	John Wiley and									
3	Anne The	omas Manes, "Web Services: A managers Guide", Addison Wesley	, June 2003.									
		Proprietor and a to										
R	elated On	ine Contents [MOOC, SWAYAM, NPTEL, Websites etc.]										
1	https://www.tutorialspoint.com/webservices/index.htm											
2	https://ww	ww.javatpoint.com/web-services-tutorial										
3	<u>https://ww 1-video-l</u>	ww.btechguru.com/trainingprogrammingxmlweb-serviceswe ecture1180124147.html	b-services-part-									
C	ourse Desi	gned By:										

Mapping with Programming Outcomes											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	М	М	S	М	М	М	S	
CO2	S	S	S	М	М	S	М	S	М	S	
CO3	S	S	S	S	S	S	S	S	S	S	
CO4	S	S	S	S	S	S	S	S	S	S	
CO5	S	S	S	S	S	S	S	S	S	S	

-

*S-Strong; M-Medium; L-Low

Г

		ROBOTIC PROCESS AUTOMATION FOR BUSINESS	ON L T P								
Core/Elective/S	Supportive	Elective	4			4					
Pre-requisit	te	Basics of Robots & its Applications	Syllabus								
Course Objectives:											
The main objectives of this course are to:											
1. Learn the concepts of RPA, its benefits, types and models.											
2. Gain the knowledge in application of RPA in Business Scenarios.											
3. Identify m	3. Identify measures and skills required for RPA										
Expected Cou	rse Outcor	nes•									
On the succe	essful comp	letion of the course, student will be able to:									
1 Demor	nstrate the b	enefits and ethics of RPA			K1,I	K2					
2 Unders	stand the A	utomation cycle and its techniques			I	K2					
3 Draw i	inferences a	nd information processing of RPA			K3,I	K4					
4 Impler	nent & App	ly RPA in Business Scenarios			I	K5					
5 Analyz	ze on Robot	s & leveraging automation			K5,I	K6					
K1 - Remen	nber; K2 - U	<mark>Jnder</mark> stand; K3 - Apply; K4 - <mark>An</mark> alyze; K5 - Evalu	iate; K	6 - C	reate						
Unit:1		INTRODUCTION			12 ho	urs					
Introduction to RPA - Overview of RPA - Benefits of RPA in a business environment - Industries & domains fit for RPA - Identification of process for automation - Types of Robots - Ethics of RPA & Best Practices - Automation and RPA Concepts - Different business models for implementing RPA - Centre of Excellence – Types and their applications - Building an RPA team - Approach for implementing RPA initiatives.											
- Approach for	· implement	re of Excellence – Types and their applications - B ing RPA initiatives.	Building	g an]	RPA te	for eam					
- Approach for	implement	re of Excellence – Types and their applications - B ing RPA initiatives.	Building	g an 1	RPA te	for eam					
- Approach for Unit:2	implement	re of Excellence – Types and their applications - B ing RPA initiatives.	Building	g an]	RPA te 12 ho	for eam urs					
- Approach for Unit:2 Role of a Busin successful auto different busin successful imp stages and activ	ness Managomation - ness process lementation vities perfo	re of Excellence – Types and their applications - B ing RPA initiatives. AUTOMATION er in Automation initiatives - Skills required by a I The importance of a Business Manager in auto ses - Process Mapping frameworks - Role of a I n – Part 1 - Understanding the Automation cycle rmed by different people.	Building Busine Omation Busine – Firs	ss Ma ss Ma n - A ss M t 3 a	RPA to 12 ho anager Analyz (anager utomat	for eam urs for ting t in tion					
- Approach for Unit:2 Role of a Busin successful auto different busin successful imp stages and activ	ness Managomation - ness process lementation vities perfo	re of Excellence – Types and their applications - B ing RPA initiatives. AUTOMATION er in Automation initiatives - Skills required by a I The importance of a Business Manager in auto ses - Process Mapping frameworks - Role of a I n – Part 1 - Understanding the Automation cycle rmed by different people. AUTOMATION IMPLEMENTATION	Busine Busine Demation Busine – Firs	g an l ss Ma n - A ss M t 3 a	RPA to 12 ho anager Analyz (anager utomation 12 ho	for eam for ing r in ion urs					
- Approach for Unit:2 Role of a Busin successful aut- different busin successful imp stages and activities Unit:3 Evaluating the performed by of Activities to b success - Metrionet	implement implement ness Manag omation - ness process plementation vities perfor ics/Paramet ng emails -	re of Excellence – Types and their applications - B ing RPA initiatives. AUTOMATION er in Automation initiatives - Skills required by a I The importance of a Business Manager in auto ses - Process Mapping frameworks - Role of a I n – Part 1 - Understanding the Automation cycle rmed by different people. AUTOMATION IMPLEMENTATION on Implementation Detailed description of last 3 ople - Role of a Business Manager in successful of ed post-implementation - Guidelines for tracking ers to be considered for gauging success - Choosi Publishing and Running Workflows.	Busine Busine Busine – Firs stages comple g the in ng the	ss Ma ss Ma n - A ss M t 3 a and etion mple right	RPA te 12 ho anager Analyz (anager utomat utomat 12 ho activi – Part mentat : licens	urs for ing for ing ting ties 2 - ion ing					

Ability to process information through scopes/systems - Understand the skill of information processing and its use in business - Leveraging automation - Creating a Robot - New Processes. Establish causality by variable behavior - Understand the skill of drawing inference or establishing causality by tracking the behavior of a variable as it varies across time/referenced variable - Leveraging automation for this skill - Robot & new process creation.

Unit:5

ROBOT SKILL

10 hours

Inference from snapshots of curated terms – Omni-source data curation - Multisource trend tracking - Understand the skill of drawing inference from the behavior of curated terms by taking snapshots across systems in reference to time/variable(s) - Leveraging automation for this skill – Robot creation and new process creation for this skill.

Unit:6	Contemporary Issues	2 hours
Expert lectur	es, online seminars – we <mark>binars</mark>	

Total Lecture hours

60 hours

Т	Text Books							
1	Alok Mani Tripathi" Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool" Packt Publishing Limited March 2018.							
2	Tom Taulli "The Robotic Process Automation Handbook" Apress , February 2020.							
Re	Reference Books							
1	Steve Kaelble" Robotic Process Automation" John Wiley & Sons, Ltd., 2018							
R	elated Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]							
1	https://www.tutorialspoint.com/uipath/uipath_robotic_process_automation_introduction.htm							
2	https://www.javatpoint.com/rpa							
3	https://onlinecourses.nptel.ac.in/noc19_me74/preview_							
	COLUMN THE STATE							
C	ourse Designed By							

Mapping with Programming Outcomes											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	S	S	S	S	М	S	S	
CO2	S	S	S	S	S	S	S	М	S	S	
CO3	S	S	S	S	S	S	S	М	S	S	
CO4	S	S	S	S	S	S	S	М	S	S	
CO5	S	S	S	S	S	S	S	М	S	S	



M.Sc. COMPUTER SCIENCE

Syllabus (With effect from 2021 -2022 & Onwards)



DEPARTMENT OF COMPUTER SCIENCE

Bharathiar University (A State University, Accredited with "A" Grade by NAAC and 13th Rank among Indian Universities by MHRD-NIRF) Coimbatore 641 046, INDIA

BHARATHIAR UNIVERSITY : : COIMBATORE 641046 DEPARTMENT OF COMPUTER SCIENCE

MISSION

- 1. To keep pace with emerging technologies and concepts, students are thrown open to the ever changing arena, meeting the industry requirements and standards, with the necessary knowledge and skill sets.
- 2. Are trained to explore more, at their own pace, knowing the demands of the IT world.
- 3. Apart from all the technical stuff, to inculcate the students about the Human Values and Professional ethics and to play a vital role in the society. Imparting them not only as world class Professionals, but also as tech savvy human beings to serve mankind.

4. ELECTIVE – I

- 5. 1.1. Multimedia and its Applications
- 6. 1.2. Embedded Systems
- 7. 1.3. Internet of Things
- 8. 1.4. Critical Thinking, Design Thinking and Problem Solving

9.

10.

11. ELECTIVE – II

- 12. 2.1. Mobile Computing
- 13. 2.2. Block Chain Technology
- 14. 2.3. Web Services
- 15.2.4. Robotic Process Automation for Business