P.G. DEPARTMENT OF COMPUTER SCIENCE

Nallamuthu Gounder Mahalingam College

(Autonomous)

(An ISO 9001:2015 Certified Institution)

Re-Accredited by NAAC

Pollachi-642001

SYLLABUS

M. Sc. COMPUTER SCIENCE

BATCH 2022-2024

NGM COLLEGE

VISION

Our dream is to make the College an institution of excellence at the national level by imparting quality education of global standards to make students academically superior, socially committed, ethically strong, spiritually evolved and culturally rich citizens to contribute to the holistic development of the self and society.

MISSION

Training students to become role models in academic arena by strengthening infrastructure, upgrading curriculum, developing faculty, augmenting extension services and imparting quality education through an enlightened management and committed faculty who ensure knowledge transfer, instill research aptitude and infuse ethical and cultural values to transform students into disciplined citizens in order to improve quality of life.

PG DEPARTMENT OF COMPUTER SCIENCE

VISION

Exploring innovative approaches to enhance learning opportunities through the integration of technology and to develop more responsive strategies for adapting curriculum and changing demands in the Computing Profession.

MISSION

To provide strong theoretical foundation complemented with extensive practical training. Provide a learning ambience to enhance innovations, problem solving skills, leadership qualities, team spirit and ethical responsibilities.

SCHEME OF EXAMINATION

Course Code	Course Title	Hours		Examination				
		Theory	Practical	Hours	CIA	ESE	Total	Credits
I SEMESTER								
22PCS101	Design & Analysis of Algorithms	4	-	3	50	50	100	4
22PCS102	Data Mining using R	2	4	3	50	50	100	5
22PCS103	Advanced Operating System	4	-	3	50	50	100	4
22PCS104	Advanced Java Programming	2	4	3	50	50	100	5
22PCS105	Programming Lab I: Design & Analysis of Algorithms	-	5	3	50	50	100	3
22PCS1E1	Elective I: Advanced Networks	5	-	3	50	50	100	5
22PCS1E2	Elective I: Wireless Networks							
22PCS1E3	Elective I: Network Security & Cryptography							
	Total	17	13		300	300	600	26
II SEMESTER								
22PCS206	Android Programming	4	-	3	50	50	100	4
22PCS207	Cloud Computing	4	-	3	50	50	100	4
22PCS208	Big Data Analytics	2	4	3	50	50	100	5
22PCS209	Advanced Database Management System	2	4	3	50	50	100	5
22PCS210	Programming Lab II: Android Programming	-	4	3	50	50	100	2
22PCS2E1	Elective II: Software Project Management	4	-	3	50	50	100	4
22PCS2E2	Elective II: Software Engineering and Testing							
22PCS2E3	Elective II: Object Oriented Analysis and Design with UML							
22PCS2N1/ 22PCS2N2	Non Major Elective I: Web Designing Lab/ Advanced Internet Technologies Lab	-	2	2	-	100	100	2
	Total	16	14		300	400	700	26

Course Code	Course Title	Hours		Examination				
		Theory	Practical	Hours	CIA	ESE	Total	Credits
III SEMESTER								
22PCS311	Internet of Things	4	-	3	50	50	100	4
22PCS312	Full Stack Web Development	2	3	3	50	50	100	4
22PCS313	Python Programming	2	3	3	50	50	100	4
22PCS314	Digital Image Processing	3	-	3	50	50	100	3
22PCS315	Programming Lab III: Internet of Things	-	3	3	50	50	100	2
22PCS316	Programming Lab IV: Digital Image Processing using MATLAB	-	3	3	25	25	50	2
22PCS3P1	Pilot Project – I	-	2	-	-	50	50	2
22PCS3E1	Elective III: Artificial Intelligence & Machine Learning	5	-	3	50	50	100	5
22PCS3E2	Elective III: Natural Language Processing and Text Analytics							
22PCS3E3	Elective III: Robotic Process Automation for Business							
	Total	16	14		375	375	700	26
IV SEMESTER								
22PCS4P2	Project Work and Viva-Voce	-	-	-	-	200	200	12
						GRAND TOTAL	**2200**	**90**

# CO-SCHOLASTIC COURSES					**Grade/ Credit**
	Teaching Hours	**CIA**	**ESE**	**TOTAL**	
ONLINE COURSES					
Swayam, MOOC Course etc.,	-	-	-	-	**Grade**
VALUE ADDED COURSES					
Value Added Courses	30	25	25	50	2
CERTIFICATE COURSE					
Certificate Course	30	-	-	-	2
ADVANCED LEARNER COURSE					
Advanced Learner Course	-	-	-	-	**Grade**
The scholastic courses are only counted for the final grading and ranking. However for the award of the degree, the completion of co-scholastic one online course is mandatory. All other co-scholastic courses are optional only.					

1	Semester I	#SWAYAM/ MOOC	Any Online Course **(Compulsory)**
2	Any Semester	#Value Added Course	Virtual Reality**(Compulsory)**
3	Any Semester	#Certificate Course	Software Testing Lab– Selenium **(Optional)**
4	Any Semester	#Advanced Learner Course	User Interface Design Lab – Figma **(Optional)**

Question Paper Pattern

(Based on Bloom's Taxonomy)

K1-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

1. Theory Examinations: 50 Marks (Part I, II, & III)

(i) Test- I & II, ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q 1 -10)	A (Q 1 – 5 MCQ) (Q 6–10 Define/Short Answer)	10 x 1 = 10	MCQ Define	**50**
K3 (Q 11-15)	B (Either or pattern)	5 x 3 = 15	Short Answers	
K4 & K5 (Q 16 – 20)	C (Either or pattern)	5 x 5 = 25	Descriptive/ Detailed	

2. Theory Examinations: 50 Marks (Part IV : NME)

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q 1 -10)	A (Q 1 – 5 MCQ) (Q 6–10 Define / Short Answer)	10 x 1 = 10	MCQ Define	**50**
K3, K4 & K5 (Q 11-15)	B (Either or pattern)	5 x 8 = 40	Short Answers	

3. Practical Examinations: 100/50 Marks

Knowledge Level	Criterion	External/Internal Marks	Total
K3	Record work & Practical	50/50	100
		25/25	50

Components of Continuous Assessment

THEORY

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Test 1	(50 / 3.33) = 15	15+15+10+05+05	50
Test 2 / Model	(50 / 3.33) = 15		
Assignment / Digital Assignment	10		
Seminar / Socratic Seminar	05		
Group Task : GD, Role Play, APS	05		

Maximum Marks: 50; CIA Mark: 25

Components		Calculation	CIA Total
Test / Model	10	10+5+5+5	25
Assignment / Digital Assignment	5		
Seminar / Socratic Seminar	5		
Group Task : GD, Role Play, APS	5		

PRACTICAL

Maximum Marks: 50; CIA Mark: 25

Components		Calculation	CIA Total
Test / Model	15	15+5+5	25
Observation Note	5		
Record	5		

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Test / Model	30	30+5+15	50
Observation Note	5		
Record	15		

Maximum Marks: 200; CIA Mark: 100

Components		Calculation	CIA Total
Test / Model	60	60+10+30	

Observation Note	10		100
Record	30		

PROJECT

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Review I	10	10+10+10+20	50
Review II	10		
Review III	10		
Report Submission	20		

Maximum Marks: 200

External Assessment: 200 Marks

Mode of Evaluation	Marks	Total	Grand Total
Project Report			200
Title Relevance of the Industry/Institute	20	120	
Technology	20		
Design and development Publishing	40		
Testing, Report	40		
Viva Voce			
Project Presentation	40	80	
Q&A Performance	40		

***** *Components for 'Review' may include the following:*

Synopsis, System Planning, Design, Coding, Input form, Output format, Preparation of Report & Submission for Computer Science cluster.

STUDENT SEMINAR EVALUATION RUBRIC

Grading Scale:

A	B	C	D
5	4	2 - 3	0 - 1

CRITERIA	A - Excellent	B - Good	C - Average	D - Inadequate	Score
Organization of presentation	Information presented as interesting story in logical, easy to follow sequence	Information presented in logical sequence; easy to follow	Most of information presented in sequence	Hard to follow; sequence of information jumpy	
Knowledge of subject & References	Demonstrated full knowledge; answered all questions with elaboration **&** Material sufficient for clear understanding **AND** exceptionally presented	At ease; answered all questions **but** failed to elaborate **&** Material sufficient for clear understanding **AND** effectively presented	At ease with information; answered most questions **&** Material sufficient for clear understanding **but** not clearly presented	Does not have grasp of information; answered only rudimentary Questions **&** Material not clearly related to topic **OR** background dominated seminar	
Presentation Skills using ICT Tools	Uses graphics that explain and reinforce text and presentation	Uses graphics that explain text and presentation	Uses graphics that relate to text and presentation	Uses graphics that rarely support text and presentation	
Eye Contact	Refers to slides to make points; engaged with audience	Refers to slides to make points; eye contact majority of time	Refers to slides to make points; occasional eye contact	Reads most slides; no or just occasional eye contact	
Elocution – (Ability to speak English language)	Correct, precise pronunciation of all terms Voice is clear and steady; audience can hear well at all times	Incorrectly pronounces few terms; Voice is clear with few fluctuations; audience can hear well most of the time	Incorrectly pronounces some terms; Voice fluctuates from low to clear; difficult to hear at times	Mumbles and/or Incorrectly pronounces some terms; Voice is low; difficult to hear	

WRITTEN ASSIGNMENT RUBRIC

Grading Scale:

A	B	C	D	F
09 - 10	**07- 08**	**05 - 06**	**03 - 04**	**01 - 02**

CRITERION	A - Excellent	B – Good	C - Average	D - Below Average	F - Inadequate
Content & Focus	Hits on almost all content exceptionally clear	Hits on most key points and writing is interesting	Hits in basic content and writing is understandable	Hits on a portion of content and/or digressions and errors	Completely off track or did not submit
Sentence Structure & Style	∗ Word choice is rich and varies ∗ Writing style is consistently strong ∗ Students own formal language	∗ Word choice is clear and reasonably precise ∗ Writing language is appropriate to topic ∗ Words convey intended message	∗ Word choice is basic ∗ Most writing language is appropriate to topic ∗ Informal language	∗ Word choice is vague ∗ Writing language is not appropriate to topic ∗ Message is unclear	∗ Not adequate
Sources	Sources are cited and are used critically	Sources are cited and some are used critically	Some sources are missing	Sources are not cited	Sources are not at all cited
Neatness	Typed; Clean; Neatly bound in a report cover; illustrations provided	Legible writing, well-formed characters; Clean and neatly bound in a report cover	Legible writing, some ill-formed letters, print too small or too large; papers stapled together	Illegible writing; loose pages	Same as below standard
Timeliness	Report on time	Report one class period late	Report two class periods late	Report more than one week late	Report more than 10 days late

Program Educational Objectives (PEOs)	
The goals that graduates are supposed to achieve within five to seven years after graduation are defined in the M.Sc. CS program.	
PEO1	To provide students with a clear understanding of the course goals and to visualize their needs.
PEO2	Employed in the software sector and attempting to acquire and implement new ideas and concepts as the field progresses.
PEO3	To instill the value of continuous learning and the importance of research and development for the betterment of society and the country as a whole.
PE04	Enhanced to cope with evolving technologies on the frontiers of computer science and incorporating Industry 5.0 Technologies into their careers based on industry requirements

PROGRAMME OUTCOMES

PO1	Develop core competence in computer science and to take up a career in the IT industry as well as to impart the analytical skills in research and development.
PO2	Ability to instill various thrust areas of computer science with sound knowledge of theory and hands-on practical skills.
PO3	Ability to design, implement and evaluate the principles of computer science and apply these in the multidisciplinary environments to manage project.
PO4	Ability to analyze the local, global needs of computing in par with IT industry and society.
PO5	Develop innovative computing skills through information technology solutions
PO6	Review of the most up-to-date tools and mechanisms for tool handling
PO7	Work in accordance with ethical and professional standards.
PO8	Determine the viewpoint on business practices, risks, and constraints.
PO9	Develop responsibilities on entrepreneurial spirit roles.
P10	Ability to plan, conduct, and analyze experiments, as well as extrapolate results

.

PROGRAMME SPECIFIC OUTCOMES

PSO1	Able to understand, analyze and develop computer programs in the areas related to various domains for efficient design of computer-based systems of varying complexity.
PSO2	Acquire foundation for research into the theory, practice of programming and apply the knowledge gained during the course of the program from advanced computing and solve real life complex problems faced in society.

PEO and PO MAPPING:

PEO / PO	PEO1	PEO2	PEO3	PEO4
PO1	**H**	**H**	**H**	**H**
PO2	**M**	**H**	**H**	**H**
PO3	**H**	**H**	**H**	**H**
PO4	**M**	**M**	**H**	**H**
PO5	**H**	**H**	**H**	**H**
PO6	**M**	**H**	**H**	**H**
PO7	**L**	**H**	**M**	**L**
PO8	**L**	**H**	**H**	**M**
PO9	**L**	**H**	**H**	**M**
P10	**H**	**H**	**H**	**H**

SEMESTER I

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS101	**Course Title:**	Design & Analysis of Computer Algorithms		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		4	**Tutorial Hrs/Sem**	-	**Semester:**	I
					Credits:	4

Course Objective

To prepare the students for a job in industry and to learn the systematic way of solving the problems using data structures and algorithms.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember and Understand the concepts of time and space complexity, worst case, average case and best case complexities and the big-O notation	K1
CO2	Identify the key characteristics of a given problem and analyse the suitability of a specific algorithm design technique for the problem.	K2
CO3	Apply important algorithmic design paradigms and methods of analysis.	K3,K4
CO4	Analyze major graph algorithms and to employ graphs to model engineering problems	K4,K5
CO5	Analyze worst-case running times of algorithms using various algorithms	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	H	H	H	M	H	H	H	M	H	H	M
CO2	H	M	M	H	H	H	M	M	H	H	M	H	H	H	M
CO3	H	H	H	M	M	H	H	H	M	M	M	H	H	M	H
CO4	M	H	M	H	M	M	H	M	H	M	H	M	H	H	M
CO5	M	H	H	H	M	M	H	H	H	M	H	H	M	M	H

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	**Introduction:** Algorithm definition and specification – Performance Analysis –Elementary Data structures:- Stacks and Queues – Trees – Dictionaries – Priority Queues – Sets and Disjoint set-Union – Graphs – Basic traversal and search techniques – Techniques for Binary Tree – Techniques for Graphs: Breadth First Search and Traversal, Depth First Search and Traversal.	**11**
UNIT II	**Divide – and – Conquer: -** General method – Binary search – Merge sort – Quick sort –The Greedy method: - General method – Knapsack problem – Minimum cost spanning tree –Single source shortest path.	**12**
UNIT III	**Dynamic Programming:** General method – Multistage graphs – All pair shortest path –Optimal binary search trees – 0/1 Knapsack – Traveling salesman problem – Flow shop scheduling.	**12**
UNIT IV	**Backtracking:** General method – 8-Queens problem – Sum of subsets – Graph coloring – Hamiltonian cycles – Knapsack problem.	**12**

UNIT V	**Branch and bound:** The method – Least Cost (LC) Search – The 15 puzzle: An Example – Control abstractions for LC Search – Bounding – FIFO Branch and Bound – LC Branch and Bound- Traveling salesperson. **Case study:** Activity or Task Scheduling Problem- Median of the two sorted arrays- Sudoku.	**13**
	Total Contact Hours	**60**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran	Design and Analysis of Computer Algorithms	2nd Edition, Galgotia Publications	2008

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Ellis Horrowitz, Sartaj Sahni	Fundamentals of data structures	Reprinted Edition, Galgotia Publications	2015
2	Alfred V.Aho, John E.Hopcroft& Jeffery D Ullman	Data structures and Algorithms	Reprinted Edition , PHI learning PVT Ltd	2009
3	Adam Drozdek	Data Structures and Algorithms in C++	4th Edition, Vikas publishing house, New Delhi	2012

Web References

1. https://onlinecourses.nptel.ac.in/noc21_cs22/preview
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/analysis_of_algorithms.htm
3. https://www.javatpoint.com/daa-tutorial
4. http://cs.uef.fi/pages/franti/asa/notes.html
5. https://vssut.ac.in/lecture_notes/lecture1428551222.pdf

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: Dr.M.Rathamani Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS102	**Course Title:**	Data Mining using R		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		6	**Tutorial Hrs/Sem**	-	**Semester:**	I
					Credits:	5

Course Objective

To understand the basic concepts and techniques of Data Mining and to develop skills of using recent data mining software for solving practical problems using R

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the basic concepts of data mining techniques	K1
CO2	Understand the concept of data warehouse and its backend process	K2
CO3	Apply various clustering and association finding algorithms for feature selection	K3
CO4	Demonstrate an understanding of the basic algorithmic methods that support knowledge discovery	K4
CO5	Evaluate what has been learned through the application of the appropriate statistics.	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	H	M	H	M	H	H	H	H	M	M	H
CO2	M	H	M	H	H	H	M	M	H	H	H	M	M	H	M
CO3	H	H	H	M	M	H	H	M	M	M	M	H	M	H	M
CO4	M	M	H	H	M	M	H	M	H	M	M	M	H	M	M
CO5	H	H	M	H	M	M	H	H	H	H	H	H	M	H	M

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	**Introduction:** Data Mining – R – R-Studio – Datasets **Data Import and Export:** Save and Load R Data - Import from and Export to .CSV Files - Import Data from SAS - Import/Export via ODBC - Read and Write EXCEL files with package xlsx .	**18**
UNIT II	**Data Exploration and Visualization:** Have a Look at Data - Explore Individual Variables - Explore Multiple Variables - More Explorations - Save Charts into Files. **Decision Trees and Random Forest:** Decision Trees with Package party - Decision Trees with Package rpart - Random Forest.	**18**
UNIT III	**Regression:** Linear Regression - Logistic Regression - Generalized Linear Regression - Non-linear Regression. **Clustering:** The k-Means Clustering - The k-Medoids Clustering - Hierarchical Clustering. **Outlier Detection:** Univariate Outlier Detection - Outlier Detection with LOF - Outlier Detection by Clustering - Outlier Detection from Time Series.	**18**
UNIT IV	**Time Series Analysis and Mining:** Time Series Data in R - Time Series Decomposition - Time Series Forecasting - Time Series Clustering - Time Series Classification - Classification with Original Data - Classification with Extracted Features - k-NN Classification. **Association Rules:** Basics of Association Rules - The Titanic Dataset - Association Rule Mining - Removing Redundancy - Interpreting Rules - Visualizing Association Rules.	**18**

UNIT V	**Text Mining:** Retrieving Text from Twitter - Transforming Text - Stemming Words - Building a Term-Document Matrix - Frequent Terms and Associations - Word Cloud - Clustering Words - Clustering Tweets. **Social Network Analysis:** Network of Terms - Network of Tweets - Two-Mode Network. **Case Study:** Analysis and Forecasting of House Price Indices.	**18**
	Total Contact Hours	**90**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Yanchang Zhao	R and Data Mining: Examples and Case Studies	Elsevier	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Luis Torgo	Data Mining with R Learning with Case Studies	2nd Edition, Chapman and Hall/CRC	2017
2	Jiawei Han & Micheline Kamber	Data Mining Concepts & Techniques	9th Edition, Academic Press	2011

Web References

1. https://swayam.gov.in/nd2_cec20_cs12/preview
2. https://onlinecourses.nptel.ac.in/noc20_mg24/preview
3. https://www.rdatamining.com/examples/decision-trees
4. https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining
5. https://www.jnec.org/labmanuals/it/te/sem1/R-lab.pdf

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: M.Dhavapriya Signature:	Name: Dr.M. Sakthi Signature:	Name: K.Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS103	**Course Title:**	Advanced Operating Systems		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		4	**Tutorial Hrs/Sem**	-	**Semester:**	I
					Credits:	4

Course Objective

To understand the concepts of operating system, distributed operating systems, real time operating systems, operating system for handheld systems, LINUX OS and iOS.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the basic concepts of Operating Systems and its applications.	K1
CO2	Understand the advanced concepts in operating system, the concepts of distributed operating systems, the information about Linux operating system and iOS architecture, layers and its functions.	K2
CO3	Apply different Operating Systems	K3
CO4	Analyze deadlock situations, the reason for deadlock, recovery of deadlocks, how to avoid deadlocks, the need for Real time operating system and security issues.	K4
CO5	Evaluate the use of Palm OS and Android in handheld devices.	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	L	L	M	H	H	M	H	H	H	M	L	L	M
CO2	H	M	M	M	L	H	M	M	H	H	H	M	M	M	L
CO3	H	M	M	L	M	H	H	H	M	M	H	L	L	M	M
CO4	H	H	H	L	M	M	H	M	H	M	H	H	H	L	L
CO5	H	L	M	L	M	M	H	H	H	M	H	L	M	L	M

H: High; M: Medium; L: Low

Units	Contents	Hrs
UNIT I	**Process Synchronization** : Overview : Introduction – Functions of an operating system – Design approaches – Why Advanced Operating Systems – Types of Advanced Operating Systems - **Synchronization Mechanisms** : Introduction – Concept of a Process – Concurrent Processes – The Critical Section Problem – Other Synchronization Problems - **Process Deadlocks:** Introduction – Preliminaries – Models of Deadlocks.	**12**
UNIT II	**Distributed Operating Systems :**Issues in Distributed Operating Systems – Communication Primitives – Theoretical **Foundation:** Lamport's Logical Clocks – Distributed Deadlock. **Detection:** Deadlock Handling Strategies in Distributed Systems – Issues in Deadlock Detection and Resolution- **Distributed File Systems:** Design Issues.	**12**
UNIT III	**Real Time Operating Systems :**Introduction – Applications of Real Time Systems – Basic Model of Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling.	**12**
UNIT IV	**Operating Systems for Handheld Systems:** Handheld Systems – The requirements – Technology	**12**

	Overview – Handheld Operating Systems – PalmOS–Symbian OS - Google Android- Securing Handheld Systems.	
UNIT V	**Linux and iOS**: Linux : Introduction – Linux Kernel Architecture - Process Management and Linux Scheduler : Process management - Process Scheduling – Linux Inter-Process Communication–Linux Memory management–Linux File Systems – **iOS**: Architecture and SDK Framework - Media Layer -Services Layer - Core OS Layer. **Case study** – An example iOS 4 iphone camera application.	**12**
	Total Contact Hours	**60**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	MukeshSinghal and Niranjan G. Shivaratri. (Units– I &II)	Advanced Concepts in Operating Systems –Distributed , Database and Multiprocessor Operating Systems	Tata McGraw-Hill Publishers	2017
2	Rajib Mall (Unit –III)	Real-Time Systems: Theory and Practice	Pearson Education India Publishers , First Edition	2009
3	Pramod Chandra P.Bhatt, (Unit – IV & Unit –V)	An Introduction To Operating Systems : Concepts And Practice (GNU / Linux)	PHI Learning Pvt Ltd., Fourth Edition	2019
4	Neil Smyth. (Unit –V)	iPhone iOS 4 Development Essentials – Xcode	Payload media Publishers, Fourth Edition	2011

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	YoonSeokPyo,HanCheol Cho,RyuWoonJung,	ROS Robot Programming from the basic concept to practical	Robotics Co., Ltd., Tae Hoon Lim	2017
2	Andrew S. Tanenbaum	Modern Operating System Programming and Robot Application	Prentice – Hall, Inc, Third Edition	2008
3	Anis Koubaa	Robot Operating Systems (ROS): The Complete Reference (Volume I)	Springer Publishers, First Edition	2016

Web References

1. http://nptel.ac.in/courses/Webcourse-contents/IIScBANG/Operating%20Systems/New_index1.html
2. https://www.tutorialspoint.com/operating_system/index.htm
3. https://www.coursera.org/courses?languages=en&query=operating+system
4. https://in.udacity.com/course/advanced-operating-systems--ud189
5. http://wiki.ros.org/ROS/Tutorials
6. https://www.toptal.com/robotics/introduction-to-robot-operating-system.

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: S.S.Shanthi Signature:	Name: Dr.M. Sakthi Signature:	Name: K.Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS104	**Course Title:**	Advanced Java Programming		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		6	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	5

Course Objective

To understand the advanced Java concepts, also develop Java based applications by applying java components and implementing in web based applications**.**

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Recollect different classes, constructors and methods of Swing components	K1
CO2	Get an idea to construct an enterprise application using Java Beans	K2.,K3
CO3	Develop RMI programs for real world applications and establishing DATABASE Connectivity using Java.	K4,K5
CO4	Analyze session tracking using Session objects and Cookies	K4,K5
CO5	Validate server side java programs using Servlets and JSP	K5

MAPPING

PO/PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	H	H	M	H	H	H	H	M	M	H	H	H	H	H	M
CO2	M	M	H	M	H	H	M	M	H	H	M	H	H	M	M
CO3	H	H	H	H	M	H	H	H	M	H	H	M	H	H	H
CO4	H	H	H	H	H	M	H	M	H	M	H	H	M	H	M
CO5	H	H	M	H	M	M	H	H	H	M	H	M	M	H	H

H: High; M: Medium; L: Low.

Units	**Contents**	**Hrs**
UNIT I	**Java Swings:** JPanel-JFrame-JApplet-JSplitPane-JTabbedPane-JViewport-JMenu-Items and Labels-JTextField-JTextArea-JButtons-JButtonClasses-JCheckBoxes-JRadioButton-JComboBoxes-JList.	**17**
UNIT II	**Advanced Components:** JTree - JTable - JInternalFrame - JDesktopPane –JTextPane - JProgressbar.	**16**
UNIT III	**Java Beans:** Introduction to Java Bean-Advantages of a Java Bean-Application Builder tools-The Bean Developer Kit (BDK)-Jar files-Introspection-Developing a Simple Bean-UsingBound Properties-Using Bean Info Interface-Constrained Properties-Persistence-Customizers-Java Bean API.	**18**
UNIT IV	**Servlet Overview and Architecture:** Movement to Server Side Java-Practical Applications for Java Servlets-Java Servlet Alternatives-Reason to use Java Servlets-Java Server Architecture – Servlet Basics-The Lifecycle of Servlet-A Basic Servlet. **Servlet Chaining:** Definition for Servlet Chaining-Uses of Servlet Chains-A Practical example using Servlet Chaining-Servlets and JDBC-Two Tier and Three Tier Database access models-	**19**

	JDBC Servlet-Session Tracking-Using Cookies-Using Session Objects.	
UNIT V	**Java Server Page (JSP):**Introduction-Server-side programming-Life Cycle of JSP- To create and run JSP- Architecture of JSP-Scripting tag Elements- Implicit Object- Beans - Conditions - Directives - Declarations – Implicit Variables -Expressions. **RMI (Remote Method Invocation):** Introduction - RMI Architecture-Bootstrapping and RMI Registry - The RMI Compiler - Object Specialization and Parameter Passing - A Simple example.	**20**
	Total Contact Hours	**90**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Herbert Schildt	Java-2, The Complete Reference	11th Edition, Tata McGraw Hill	2019
2	Jim Keogh	The Complete Reference J2EE	Tata McGraw Hill	2017
3	SamsSeries, JamesGoodWill	Developing Java Servlets	1st Edition, SAMS Techmedia	2017
4	Sam Series	Java RMI	Tata McGraw Hill	2016

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Brian Cole, Robert Eckstein, James Elliott, Marc Loy, David Wood	Java Swing	2nd Edition, O"Reilly Publishers	2012
2	Stephen Potts, Mike Kopack	Web Services	Kindle Edition, Pearson Education	2015

Web References

1. https://www.javatpoint.com/java-swing
2. https://www.geeksforgeeks.org/introduction-javaservlets
3. https://www.javatpoint.com/servlet-tutorial
4. https://www.javatpoint.com/RMI
5. https://stackoverflow.com/questions/5658929/what-is-rmi-registry

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: Dr.R.Nandhakumar Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS105	**Course Title:**	**Programming Lab I:** Design & Analysis of Algorithms		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		5	**Tutorial Hrs/Sem**	-	**Semester:**	I
					Credits:	3

Course Objective

To deal with a wide variety of computational problems and to provide a thorough knowledge of the most common algorithms and data structures.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Understand problems by applying appropriate algorithms.	K3
CO2	Analyze the efficiency of various algorithms.	K4
CO3	Apply various data structure techniques to solve problems.	K4
CO4	Solve a program in many ways using different techniques.	K4,K5
CO5	Identify and evaluate complex problems using principles of mathematics and engineering science.	K5

MAPPING

PO/PSO CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	M	H	M	H	M	H	H	M	H	H	H	M	H	H	H
CO2	H	M	M	H	L	H	M	M	H	H	H	M	H	M	M
CO3	M	H	M	H	M	H	H	H	M	H	M	M	M	M	H
CO4	H	H	H	M	H	M	H	M	H	M	H	M	H	H	M
CO5	H	M	M	H	H	M	H	H	H	M	H	H	H	M	H

H: High; M: Medium; L: Low.

Contents	**Hrs**
1. Sort a given set of elements using the Quick sort method and determine the time required to sort theelements 2. Implement a Merge Sort algorithm to sort a given set of elements and determine thetime required to sort the elements	**10**
3. Implement a 0/1 Knapsack problem using DynamicProgramming. 4. Obtain the Topological ordering of vertices in adigraph	**10**
5. In a weighted connected graph, find shortest paths to other vertices using Dijkstra'salgorithm. 6. Print all the nodes reachable from a starting node in a digraph using BFSmethod.	**10**
7. Find Minimum Cost Spanning Tree of a undirected graph using Kruskal'salgorithm 8. Find Minimum Cost Spanning Tree of a undirected graph using Prim’salgorithm	**10**

9. Check whether a given graph is connected or not using DFSmethod 10. Find a subset of a given set S = {s1,s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9	**11**
11. Implement N Queen's problem using BackTracking 12. Implement All-Pairs Shortest Paths problem using Floyd'salgorithm	**12**
13. Implement Travelling Sales Person problem using Dynamicprogramming. 14. Design and implement the presence of Hamiltonian Cycle in an undirected Graph G of nvertices	**12**
Total Contact Hours	**75**

Pedagogy and Assessment Methods:

Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran	Design and Analysis of Computer Algorithms	2nd Edition, Galgotia Publications	2008
2	Anany Levitin	Introduction to the Design and Analysis of Algorithms	Pearson Education, Delhi, 2nd Edition	2007

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Ellis Horrowitz, Sartaj Sahni	Fundamentals of data structures	Reprinted Edition, Galgotia Publications	2015
2	Adam Drozdek	Data Structures and Algorithms in C++	4th Edition, Vikas publishing house, NewDelhi	2012

Web References

1. https://iare.ac.in/sites/default/files/lab1/II%20YEAR_DAA_LAB_MANUAL.pdf
2. http://camelliait.ac.in/Lab%20Manual/ADA%20Lab%20Programs.pdf
3. http://www.anuraghyd.ac.in/cse/wp-content/uploads/sites/10/DAA-through-Java-Lab.pdf
4. https://www.ahirlabs.com/practicals/design-analysis-of-algorithms-lab-practical/
5. https://www.cet.edu.in/noticefiles/278_DAA%20Complete.pdf

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: Dr.M.Rathamani Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

ELECTIVE I

S.No	COURSE CODE	COURSE TITLE
1	22PCS1E1	Advanced Networks
2	22PCS1E2	Wireless Networks
3	22PCS1E3	Network Security & Cryptography

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS1E1	**Course Title:**	**Elective I:**Advanced Networks		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		5	**Tutorial Hrs/Sem**	-	**Semester:**	I
					Credits:	5

Course Objective

To gain depth knowledge of Transmission protocol/Internet protocols and their functionalities.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recollect OSI and TCP/IP layers and their tasks. Interpret and explain physical, logical and port addresses.	K1
CO2	Comprehend Standard Ethernet and Mapping techniques.	K2
CO3	Deploy Logical addressing and discuss the format of IPv4 and IPv6 addresses	K3
CO4	Analyze the problems and solutions associated with delivery and forwarding of packets	K4
CO5	Present knowledge on Mobile IP and Client-Server interactions	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	H	H	H	M	H	H	H	M	H	H	H
CO2	H	M	H	M	H	H	M	M	H	H	H	M	M	M	H
CO3	H	M	H	M	H	H	H	H	M	M	M	H	M	H	H
CO4	H	H	M	M	M	M	H	M	H	M	M	H	H	M	M
CO5	H	H	H	M	M	M	H	H	H	M	M	H	H	M	H

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	Introduction and overview: TCP/IP internet, Internet Service: Application Level, Network Level.Network Technologies: Two Approaches To network Communication-Wide Area and Local Area Networks-Hardware addressing scheme, Ethernet (IEEE802.3),WiFi (IEEE 802.11),ZigBee (IEEE802.15.4) Internetworking Concept and Architectural Model - Protocol Layering	**14**
UNIT II	Internet Addressing - Mapping Internet Addresses to Physical Addresses (ARP) - Internet Protocol : Connectionless Datagram Delivery(IPV4 , IPV6)	**15**
UNIT III	Internet Protocol: Forwarding IP Datagram's - Internet Protocol: Error and Control Messages (ICMP) - User Datagram Protocol(UDP)	**15**
UNIT IV	Reliable Stream Transport Service (TCP): Needs-properties-Reliability-Sliding Window paradigm-TCP Layering, ports, connection and end points-passive and active open-segments, streams and sequence number-variable window size and flow control-TCP segment format, options, checksum, acknowledgment, retransmission andtimeouts. Routing among Autonomous Systems (BGP) - Label Switching , Flows , and MPLS - Packet Classification	**16**

UNIT V	Network Visualization - Bootstrap And Auto configuration (DHCP , NDP , IPv6 – ND) Electronic Mail (SMTP, POP, IMAP): Introduction -Electronic Mail-Mailbox Names And Aliases-Alias Expansion And Mail Forwarding-TCP/IP Standards For Electronic Mail Service-Simple Mail Transfer Protocol (SMTP)-Mail Retrieval And Mailbox Manipulation Protocols. **Case Study:** TCP/IP Framework Case Study- Communication, Internet, Infrastructure and Development.	**15**
	Total Contact Hours	**75**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Douglas E. Comer	Internetworking with TCP/IP Principles, protocols and Architecture	Volume I, 6th Edition	2017

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Douglas E. Comer	Internetworking with TCP/IP Volume I	Prentice Hall	2015
2	Douglas E. Comer, David L.Stevens	Internetworking with TCP/IP Volume II	Prentice Hall	2010
3	Uyless Black	TCP/IP & Related Protocols	Tata McGraw-Hill	2005

Web References

1. https://my.ine.com/ITEssentials/courses/9e5b2567/introduction-to-networking-technologies
2. https://nptel.ac.in/courses/106/105/106105183/
3. https://www.tutorialspoint.com/The-TCP-IP-Reference-Model
4. https://www.javatpoint.com/osi-vs-tcp-ip
5. https://youtu.be/rl2ZvdT4hRI

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: Dr.R.Nandhakumar Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS1E2	**Course Title:**	**Elective I:** Wireless Networks		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		5	**Tutorial Hrs/Sem**	-	**Semester:**	I
					Credits:	5

Course Objective

To state the art wireless network convention, models Adhoc network and Wireless Sensor.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn state-of-the-art wireless technologies and the fundamental principles of Electromagnetic wave propagation and the parameters that dictate its performance.	K1,K2
CO2	Understand the medium access control protocols and address physical layer issues	K2
CO3	Evaluate key routing protocols for sensor networks and main design issues.	K3,K4
CO4	Sensor management, sensor network middleware, operating systems.	K5
CO5	Analyze low-power devices equipped with sensing, computation, and wireless communication capabilities.	K6

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	H	H	H	M	H	H	H	M	H	H	H
CO2	H	M	H	M	H	H	M	M	H	H	H	M	H	M	H
CO3	H	M	H	M	H	H	H	H	M	M	M	M	H	H	H
CO4	H	H	H	M	H	M	H	M	H	H	M	M	H	M	M
CO5	H	H	H	M	M	M	H	H	H	M	M	H	H	M	H

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	**Wireless Networks Introduction:** Evolution of wireless networks – Challenges - Transmission fundamentals: Analog and digital data transmission - Transmission media - Modulation techniques for wireless systems - Multiple access for wireless systems - Performance increasing techniques for wireless networks.	**14**
UNIT II	**Wireless LAN :** Introduction to Wireless LANs – WLAN Equipment, Topologies, Technologies, IEEE 802.11 WLAN – Architecture and Services - Physical Layer - MAC Sub Layer –MAC Management Sub Layer, Other IEEE 802.11 Standards.	**15**
UNIT III	**Wireless Personal Area Networks :** Introduction – Bluetooth: Architecture - Protocol Stack - Physical Connection – Mac mechanism – Frame format – Connection management –Low Rate and High Rate WPAN, ZigBee Technology IEEE 802.15.4: Components – Network topologies – PHY – MAC.	**16**
UNIT IV	**Ad-hoc Wireless Networks: Introduction-** Characteristics of Adhoc Networks - Classifications of MAC Protocols: Connection Based protocols, Reservation Mechanism - Table driven Routing protocols: DSDV, WRP - On Demand routing protocols: DSR,AODV,TORA –Routing Protocol with Efficient Flooding Mechanism: OLSR - Hierarchical routing protocols – CBRP, FSR.	**16**

UNIT V	**Wireless Sensor Networks:** Introduction - Challenges for wireless sensor networks - Comparison of sensor network with ad-hoc network - Single node architecture: Hardware components - Energy consumption of sensor nodes - Network architecture: Sensor network scenarios - Designprinciples – Operating systems-Case Studies.	**14**
	Total Contact Hours	**75**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Nicopolitidis P	Wireless Networks	John Wiley and Sons	2010
2	Vijay K Garg	Wireless Communication and Networking	Morgan Kaufmann Publishers	2010

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Siva Ram Murthy C.,Manoj B S	Ad Hoc Wireless Networks: Architectures and Protocols	Prentice Hall	2012
2	Holger Karl and Andreas Willig,	Protocol and Architecture for Wireless Sensor Networks	John Willey Publication	2011

Web References

1. https://www.tutorialspoint.com/Wireless-Networks
2. https://en.wikipedia.org/wiki/Wireless_network
3. https://www.arubanetworks.com/products/security/network-access-control/
4. https://www.labnol.org/tech/types-of-wireless-networks/
5. https://www.cisco.com/c/en_in/products/wireless/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: Dr.R.Nandhakumar Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS1E3	**Course Title:**	Network Security & Cryptography		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		5	**Tutorial Hrs/Sem**	-	**Semester:**	I
					Credits:	5

Course Objective

To understand Cryptography Theories, Algorithms and necessary approaches and techniques to build protection mechanisms in order to secure computer networks.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the basics of network security and cryptography	K1
CO2	Understand the symmetric key cryptography and Mathematics of symmetric key cryptography	K2
CO3	Apply the mathematics of asymmetric key cryptography	K3
CO4	Analyze differential message authentication and integrity	K4
CO5	Evaluate various security practice and system security	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	H	M	H	H	M	H	M	M	M	M	H	M	M	M
CO2	H	H	H	H	M	M	M	M	H	H	M	M	M	H	H
CO3	M	H	M	M	M	M	H	H	M	M	M	H	H	M	M
CO4	H	H	H	M	M	M	H	M	H	M	M	H	M	H	M
CO5	H	M	M	L	H	M	M	M	L	M	M	M	M	L	M

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	**Introduction:** Computer Security Concepts- OSI Security Architecture –Security Attacks-Security Services-Security Mechanisms-Fundamental Security Design Principles-Attack Surfaces and Attack Trees-A Model for NetworkSecurity.	**14**
UNIT II	**Symmetric Ciphers** **Classical Encryption Techniques:** Symmetric Cipher Models-Substitution Techniques-Transportation Techniques-Rotor Machines-Steganography-**Block Ciphers and the Data Encryption standard:** Traditional Block Cipher structure-The Data Encryption Standard-A DES Example-The Strength of DES-Block Cipher Design Principles.	**15**
UNIT III	**Asymmetric Ciphers** **Public Key Cryptography and RSA:** Principles of Public -Key Cryptosystems-The RSA Algorithm- **Other Public -Key Cryptosystems:** Diffie Hellman key Exchange – Elgamal Cryptographic System – Elliptic Curve Arithmetic-Elliptic Curve Cryptography-Pseudorandom Number Generation Based on an Asymmetric Cipher.	**15**
UNIT IV	**Cryptographic Data Integrity Algorithms** **Cryptographic Hash Functions:** Applications of Cryptographic Hash Functions-Two simple	**15**

	Hash Functions- Hash Functions Based on Cipher Block Chaining – Secure Hash Algorithm– SHA–**DigitalSignature:**ElgamalDigitalSignatureScheme–SchnorrDigitalSignatureScheme – Elliptic Curve Digital Signature Algorithm-RSS-PSS Digital Signature Algorithm.	
UNIT V	**Network and Internet Security** **Network Access Control and Cloud Security:** Network Access Control-Extensible Authentication Protocol. **Transport-Level Security:** Web Security Considerations-Transport Layer Security-HTTPS-Secure Shell **Electronic Mail security** – Email Formats-S/MIME –Pretty Good Policy– IP security – Web Security – System Security: Malicious software – Intruders –Firewalls.	**16**
	Total Contact Hours	**75**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	William Stallings	Cryptography and Network Security: Principles and Practice	PHI, 7th Edition	2017

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	C K Shyamala, N Harini and Dr. T R Padmanabhan	Cryptography and Network Security	Wiley India Pvt .Ltd	2010
2	BehrouzA.Foruzan	Cryptography and Network Security	Tata McGraw Hill	2007
3	Charlie Kaufman, Radia Perlman, and Mike Speciner	Network Security: Private Communication in a Public World	Prentice Hall, ISBN 0-13-046019-2	2008

Web References

1. https://www.tutorialspoint.com/cryptography/index.htm
2. https://www.tutorialspoint.com/network_security/index.htm
3. https://www.javatpoint.com/computer-network-security
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/lecture-videos/lecture-21-cryptography-hash-functions/
5. https://www.youtube.com/watch?v=TcBNTU67hew

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: P.Jayapriya Signature:	Name: Dr. M. Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

SEMESTER II

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS206	**Course Title:**	Android Programming		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		4	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	4

Course Objective

To inculcate knowledge on Android operating system and enrich the programming skills to develop mobile applications for smart gadgets using Google's Android open-source platform.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the basics of Android operating system and the structure of Android application.	K1
CO2	Understand the various components and layout managers used for user interface design.	K2
CO3	Apply the packages and classes to create a SQLite database.	K3
CO4	Analyze the functions of various sensors.	K4
CO5	Evaluate the run time security during the deployment of an application.	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	M	M	M	M	M	M	H	H	M	M	H	H
CO2	H	H	H	H	M	H	M	M	L	H	H	M	M	H	M
CO3	H	H	H	M	M	M	M	M	L	H	H	M	M	H	M
CO4	H	H	H	M	M	M	M	M	L	H	H	M	M	H	M
CO5	H	H	H	H	H	H	H	H	L	H	H	M	M	H	H

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	**Android:** Introduction –Android's Fundamental Components – Exploring the Structure of an Android Application – Examining the Application Life Cycle. **Introduction to Android Application Architecture:** Exploring a simple Android Application – Defining UI through Layout Files – Specifying Comments in Layout Files – Adding Views and View groups in Layout Files – Specifying Control Properties in Layout Files – Indicating View Group Properties – Controlling Width and Height of a Control – Introducing Resources and Backgrounds – Working with Text Controls in the Layout File – Working with Auto generated IDs for Controls – Loading the Layout File into an Activity – Gathering Controls – Placing the Files in the Android Project – Android Activity Life Cycle – Resources.	**12**
UNIT II	**User Interface Development and Controls:** UI Development in Android - Building a UI Completely in Code - Building a UI Completely in XML - *Building a UI in XML with Code*. Android's Common Controls: Text Controls – Button Controls – The Image View Control – Date and Time Controls – The Map View Control. Adapters and List Controls: Simple Cursor Adapter – Array Adapter – The Basic List Control List View – The Grid View Control – The Spinner Control – The Gallery Control – Styles and Themes – Layout Managers - Menus and Action Bars.	**12**
UNIT III	**Fragments:** Introduction- Use of Fragments-The Structure of Fragment-Sample Program of	**12**

	Fragment .Broadcast Receivers-Coding a Simple Receiver-Registering a Receiver-Multiple Receivers. **SQLite:** Saving State using SQLite-SQLite Packages and Classes - Creating an SQLite Database-Migrating a Database-Inserting Rows-Deleting Rows- Reading Rows-Exploring Databases on the Emulator and available devices-Content Providers.	
UNIT IV	**Touch Screens and Sensors:** Understanding Motion Events – The Motion Event Object – Recycling Motion Events – Using Velocity Tracker – Multi-touch – Gestures. **Implementing Drag and Drop:** Exploring Drag and Drop – Basics of Drag and Drop in 3.0+ –Drag-and-Drop Example Application.**Sensors:**Introduction–DetectingSensors–GettingSensorEvents–Interpreting Sensor Data.	**12**
UNIT V	**Application Security and Deployment:** Security and Permissions – Understanding the Android Security Model – Performing Runtime Security Checks – Deploying the Application: Becoming a Publisher – *Preparing the Application for Sale* – Uploading the Application. **Case Study:**Android Operating System- Architecture, Security Challenges and Solutions.	**12**
	Total Contact Hours	**60**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Dave MacLean, Satya Komatineni, Grant Allen	Pro Android 5	Apress Publications	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Barry Burd	Application Development – All-in-one for Dummies	Wiley India, 2nd Edition	2016
2	Jerome (J. F) DiMarzio	Android – A Programmer's Guide	McGraw Hill Education, 8th reprint	2015
3	Paul Deitel, Harvey Deitel, Alexander Wald	Android 6 for Programmers – An App-driven Approach	Pearson Education, 3rd Edition	2016

Web References

1. https://www.tutorialspoint.com/android/index.htm
2. https://www.javatpoint.com/android-tutorial
3. https://www.edureka.co/blog/android-tutorial/
4. https://www.w3schools.in/category/android-tutorial/
5. https://developer.android.com

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: N.Arulkumar Signature:	Name: Dr.M. Sakthi Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS207	**Course Title:**	Cloud Computing		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		4	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	4

Course Objective

To gain knowledge on cloud computing, parallel vs. distributed computing, virtualization and data intensive computing .To enable the students to learn the applications of cloud in scientific, business and consumer and third-party cloud services.

Course Outcomes (CO)

On successful completion of the course, students will be ableto

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of Cloud computing Paradigms.	K1,K2
CO2	Collaborate Cloud Service Architecture and its Service models	K3,K4
CO3	Analyze the Virtualization Concepts	K4
CO4	Analyze intensive computation in Cloud Computing	K4
CO5	Explore applications and management of Cloud Computing	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	H	M	H	M	H	M	M	M	H	M	M	M	H	L
CO2	M	H	L	H	H	H	M	M	M	H	M	H	M	H	H
CO3	H	H	H	M	H	H	H	H	H	H	H	H	H	L	L
CO4	H	H	M	H	M	H	H	H	H	H	H	H	H	H	H
CO5	M	H	H	H	H	H	M	H	H	H	M	H	H	H	H

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	**Introduction:** Cloud computing at a glance - Historical developments- Building cloud computing environments - Principles of Parallel and Distributed Computing: Eras of Computing – Parallel vs distributed Computing – Elements of parallel computing – Elements of distributed computing - Technologies for distributed computing.	**12**
UNIT II	**Virtualization:** Introduction. - Characteristics of virtualized environments - Taxonomy of virtualization techniques - Virtualization and cloud computing – Pros and cons of virtualization - Technology examples.	**12**
UNIT III	**Cloud Computing Architecture :** Introduction. - The cloud reference model - Types of clouds - Open challenges – Aneka : Framework overview. - Anatomy of the Aneka container - Building Aneka clouds - Cloud programming and management.	**12**
UNIT IV	**Data-Intensive Computing** : Introduction to data-intensive computing - Technologies for data-intensive computing - Aneka MapReduce programming - Cloud Platforms in Industry : Amazon web services - Google App Engine - Microsoft Azure .	**12**
UNIT V	**Cloud Applications.** : Scientific applications - Business and consumer applications. - Advanced Topics in Cloud Computing : Energy efficiency in clouds - Market-based management of clouds - Federated clouds/Inter Cloud - Third-party cloud services.	**12**
	Total Contact Hours	**60**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Rajkumar Buyya , Christian Vecchiola, S. Thamarai Selvi	Mastering Cloud Computing Foundations and Applications Programming	McGraw Hill Education	2017

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	M.N. Rao	Cloud Computing	PHI Learning Private Ltd.,	2015
2	Rajkumar Buyya, James Broberg, Andrzej Goscinski	Cloud Computing :Principles and Paradigms	Wiley Publication , First Edition	2013

Web References

1. https://www.allabout-engineering.com/mastering-cloud-computing-by-rajkumar-buyya/
2. http://docshare04.docshare.tips/files/3693/36931147.pdf
3. https://www.tutorialspoint.com/cloud_computing/index.htm
4. https://www.javatpoint.com/cloud-computing- tutorial
5. https://nptel.ac.in/courses/106/105/106105167/
6. https://www.youtube.com/watch?v=FxI9wQBOMco

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name:S.S.Shanthi Signature:	Name: Dr.M. Sakthi Signature:	Name: K.Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS208	**Course Title:**	Big Data Analytics		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		6	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	5

Course Objective

To possess the skills necessary for utilizing tools (including deploying them on Hadoop/MapReduce) to handle a variety of big data analytics and to learn Hadoop, MapReduce, Hive, HBase and Pig.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember how to collect, manage, store, query, and analyze various forms of big data	K1
CO2	Understand the foundations of Hadoop and Hadoop Distributed File System. Design of HDFS and file-based data structures along with virtualization concept.	K2,K3, K6
CO3	Analyze the working of Map Reduce and YARN for job scheduling.	K4
CO4	Analyze un-modeled, multi-structured data using Hadoop, MapReduce	K4,K5
CO5	Compute basic summary statistics and data analysis using Pig Programming	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	H	H	H	M	H	H	M	M	H	H	H
CO2	H	M	M	H	H	H	M	M	H	H	H	M	H	H	H
CO3	H	H	H	M	M	H	H	H	M	M	H	H	M	M	M
CO4	M	H	M	H	M	M	H	M	H	M	H	M	H	M	H
CO5	M	H	H	H	M	M	H	H	H	M	M	H	H	M	H

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	**Fundamentals of Big Data**: Understanding Big Data: Concepts and Terminology – Big Data Characteristics – Types of Data – Case Study Background – Drivers for Big Data Adoption: Information and Communication Technology – Big Data Analytics Lifecycle	**17**
UNIT II	**Fundamentals of Hadoop**: Core components of Hadoop- Apache Hadoop – HDFS Daemons – MapReduce Daemons – HDFS High Availability Daemons – Benefits and Challenges of HDFS – File Sizes, Block Sizes and Block Abstraction in HDFS – Data Replication – How does HDFS Store, Read, and Write Files? – Data Serialization Options – File System Shell Commands for HDFS	**18**
UNIT III	**HDFS and MapReduce**: Choosing Key and Value Types for MapReduce Jobs – The Relationship of Input Keys to Output Keys – Sorting Keys and Values – Sort and Shuffle Process – MapReduce Job Configuration and Submission Hadoop Distributed File System – MapReduce Framework – Setting the Environment – Hadoop Cluster Modes – Running a MapReduce Job with the MR1Framework - Running a MapReduce Job with the Yarn Framework – Running Hadoop Streaming	**19**
UNIT IV	**Hive and HBase**: Apache Hive: Setting the Environment – Configuring Hadoop, Hive – Starting HDFS, Hive Server, CLI – Creating and Using a Database– Creating a Managed Table – Loading data into a Table Creating a Table using LIKE – Adding Data into a Table from Queries – Adding Data using INSERT INTO TABLE - Adding Data using INSERT OVERWRITE – Creating a table using CREATE TABLE AS SELECT – Altering, Truncating and Dropping a Table– Creating an External Table – Apache HBase: Setting the Environment - Configuring Hadoop, Hive and HBase – Starting the HBase and HBase Shell – Creating HBase Table – Adding Data to a Table – Listing all Tables – Getting a Row of Data – Scanning a Table – Counting the Number of Rows in a Table – Altering a Table – Deleting a Table Row, Column – Disabling and Enabling	**19**

	a Table – Truncating and Dropping a Table – Determining If Table Exists – Creating a Hive External Table stored by HBase	
UNIT V	**Pig:** Introduction – Installing and Running Pig – Grunt – Pig‟s Data Model – Introduction to Pig Latin – Advanced Pig Latin – Developing and Testing Pig Latin Scripts – Making Pig Fly – Writing Evaluation and Filter Functions – Writing and Loading Store Function	**17**
	Total Contact Hours	**75**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS / EDITION	YEAR OF PUBICATION
1	Thomas Erl, Wajid Khattak, Paul Buhler	Big Data Fundamentals Concepts, Drivers & Techniques	Service Tech Press, 1st Edition	2016
2	Deepak Vohra	Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools	Apress, 1st Edition	2016
3	Alan Gates	Programming Pig	Oreilly Publication, Inc., 2nd Edition	2016

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Shopper Technology Institute	The little book on Big Data	Outskirts Press, Incorporated	2016
2	Anil Maheshwari	Data Analytics	Kindle Edition	2022

Web References

1. https://nptel.ac.in/courses/106/104/106104189/
2. https://www.edureka.co/blog/big-data-tutorial
3. https://www.coursera.org/learn/big-data-introduction
4. https://www.tutorialspoint.com/hbase/index.htm
5. https://www.guru99.com/hive-query-language-built-operators-functions.html

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: M.Dhavapriya Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS209	**Course Title:**	Advanced Database Management System		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		6	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	5

Course Objective

To improve the knowledge of database management system and effectively demonstrate the key concepts of advanced SQL and NoSql.

Course Outcomes(CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Remember and Understand the design and creation of tables in databases.	K1
CO2	Understand Relational data model and design theory with different indexing structures and physical databases.	K2
CO3	Remember and Apply advanced SQL, Sub-queries, embedded and dynamic SQL.PL/SQL concepts with triggers.	K1,K4
CO4	Analyze the history of NoSql with features, DB design, Applying consistency methods, Evaluating keys.	K4,K5
CO5	Ability to understand features of Document database, Hybrid NoSql.	K5

MAPPING

PO/PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	M	H	H	H	H	H	M	M	H	H	H	H	M	M	L
CO2	M	M	H	H	H	M	M	M	H	H	H	H	M	L	M
CO3	M	H	H	H	M	H	H	H	M	H	M	M	H	M	M
CO4	M	H	M	M	H	M	H	M	H	M	H	H	H	H	H
CO5	H	H	M	M	H	M	H	H	H	M	H	H	H	H	H

H: High; M: Medium; L: Low.

Units	**Contents**	**Hrs**
UNIT I	**Introduction:** Introduction: Purpose of Database Systems -View of Data -Database Languages -Data Storage and Querying-Transaction Management –Storage Management –Data Mining and Information Retrieval -Specialty Databases -Database Users and Administrators–Relational Databases: Introduction to the Relational Model -Structure of Relational Databases-Database Schema -Keys-Schema Diagrams -Relational Query Languages -Relational Operations.	**18**
UNIT II	**Advanced SQL:** Advanced SQL: Constraints- SQL CREATE INDEX- SQL functions-The GROUP BY statement-The HAVING clause- SQL special functions- SQL alias- SQL join – Sub queries- Recursive queries-Data control language-Views and assertion- PL/SQL- a basic introduction-Triggers- Event condition action model-Functions and procedures-Embedded SQL and dynamic SQL- The java way to access RDBMS: JDBC- SQLJ.	**18**

UNIT III	**Transaction Processing and Security:** Advanced transaction processing and recovery: Defining a transaction in DBMS-Defining a concurrent transaction in DBMS- Serializability and Recoverability- Enhanced lock-based and time-stamp based concepts-Multiple granularity-Multi version schemes-optimistic concurrency control techniques-Deadlock handling-Recovery in DBMS-Advanced recovery techniques-Use of SQL in recovery -RAID. Data security: Data security issues- Discretionary access control- Mandatory access control- Role based access control.	**18**
UNIT IV	**Distributed DBMS:** Distributed Database Management Systems: The Evolution of Distributed Database Management Systems -DDBMS Advantages and Disadvantages -Distributed Processing and Databases -Characteristics of Distributed DBMS -DDBMS Components -Levels of Data and Process Distribution -Distribution Transparency -Transaction Transparency-Distributed Database Design -Client/Server vs. DDBMS.	**18**
UNIT V	**Business Intelligence and Data Warehouse**: Business Intelligence and Data Warehouses: The Need for Data Analysis -Business Intelligence and Architecture -Data Warehouse-OLAP -Star Schemas -Implementing a Data Warehouse -SQL Extensions for OLAP. Database Connectivity -Internet Databases. Security and authorization: Access control- Discretionary access control-Mandatory access control – security for internet applications-Issues related to security. Case study: Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops.	**18**
	Total Contact Hours	**90**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Rini Chakrabarti, Shilbadra Dasgupta, Subhash K. Shinde,	Advanced Database Management System	KLSI, Dreamtech press	2014
2	Raghu Ramakrishnan, Johannes Gehrke	Database Management Systems	McGraw Hill, Third Edition	2004
3	RamezElmasriand ShamkantB.Navathe	Fundamentals of Data base systems	7 th Edition	2017
4	John Wiley and adam fowler	NoSQL For Dummies	1st Edition, Kindle Edition	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Silberschatz, H.Korth and S.Sudarshan	Database System Concepts	6th Edition	2011
2	Hector Garcia-Molina , Jeffrey D.Ullman, Jennifer Widom	Database System: The Complete Book	7th Edition	2019
3	Henry F Korth, Abraham Silberschatz, S. Sudharshan	Database System Concepts	5th Edition, McGraw Hill	2016
4	Gerardus Blokdyk	NoSQL Databases A Complete Guide	2020 Edition	2021

Web References

1. https://www.w3schools.in/dbms/database-normalization/
2. https://www.guru99.com/indexing-in-database.html

3. https://cs.uwaterloo.ca/~tozsu/courses/cs856/F02/lecture-1-ho.pdf
4. https://www.youtube.com/watch?v=M-55BmjOuXY
5. https://www.youtube.com/watch?v=0buKQHokLK8
6. https://www.guru99.com/nosql-tutorial.html

Course Designed by	**Verified by HOD**	**Checked by**	**Approved by**
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: N.Karthikeyan Signature:	Name: Dr.M. Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS210	**Course Title:**	**Programming Lab II:** Android Programming		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		4	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	2

Course Objective

To inculcate knowledge on Android operating system and enrich the programming skills to develop mobile applications for smart gadgets using Google's Android open-source platform.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Use various controls and layout managers for user interface design.	K3
CO2	Analyze the different methods to build user interface for an application.	K4
CO3	Apply the packages and classes to create a SQLite database.	K3
CO4	Analyze the functions of various sensors.	K4
CO5	Evaluate the deployment of applications on mobile devices.	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	M	M	M	M	M	M	H	H	M	M	H	H
CO2	H	H	H	H	M	H	M	M	L	H	H	M	M	H	M
CO3	H	H	H	M	M	M	M	M	L	H	H	M	M	H	M
CO4	H	H	H	M	M	M	M	M	L	H	H	M	M	H	M
CO5	H	H	H	H	H	H	H	H	L	H	H	M	M	H	H

H: High; M: Medium; L: Low.

Contents	Hrs
1. Develop an application forCalculator. 2. Develop an application forReminder. 3. Develop an application forQuiz. 4. Develop an application forConverter	**12**
5. Develop an application for ImageViewer. 6. Develop an application for Text Clock and AnalogClock. 7. Develop an application forGallery.	**12**
8. Develop an application for Student details using SQLiteDatabase. 9. Develop an application for Employee salary details using SQLiteDatabase. 10. Develop an application to send and receive SMS using BroadcastReceivers.	**12**
11. Develop an application to perform single touch operation onscreen. 12. Develop an application to perform multi touch operation onscreen. 13. Develop an application for Drag andDrop.	**12**
14. Develop an application to change the color of screen while moving the phone usingsensor. 15. Develop an application to display the various sensors available in an androiddevice.	**12**
Total Contact Hours	**60**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Dave MacLean, SatyaKomatineni, Grant Allen	Pro Android 5	Apress Publications	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Barry Burd	Application Development – All-in-one for Dummies	Wiley India, 2nd Edition	2016
2	Jerome (J. F) DiMarzio	Android – A Programmer's Guide	McGraw Hill Education, 8th reprint	2015
3	Paul Deitel, Harvey Deitel, Alexander Wald	Android 6 for Programmers – An App-driven Approach	Pearson Education, 3rd Edition	2016

Web References

1. https://www.tutorialspoint.com/android/index.htm
2. https://www.javatpoint.com/android-tutorial
3. https://www.edureka.co/blog/android-tutorial/
4. https://www.w3schools.in/category/android-tutorial/
5. https://developer.android.com

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: N.Arulkumar Signature:	Name: Dr.M. Sakthi Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

ELECTIVE -II

S.No	COURSE CODE	COURSE TITLE
1	22PCS2E1	Software Project Management
2	22PCS2E2	Software Engineering and Testing
3	22PCS2E3	Object Oriented Analysis and Design with UML

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS2E1	**Course Title:**	**Elective II:** Software Project Management		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		4	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	4

Course Objectives

To provide in depth knowledge about the basic concepts of software project management, project planning, step wise framework in project planning and cost benefit.

Course Outcomes (CO)

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the model from the conventional software product to the modern.	K1
CO2	Understand various estimation levels of cost and effort.	K2
CO3	Deploy various artifacts sets for better understanding of software development.	K3
CO4	Analyze and design the software architecture.	K4
CO5	Validate appropriate project management approach through an evaluation of the business context and scope of the project.	K5

Mapping

PO\PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	M	M	M	L	L	H	H	L	M	L	H	L	M
CO2	H	M	M	H	H	L	M	H	M	H	H	L	H	M	M
CO3	H	L	L	H	L	M	H	M	M	H	L	M	H	L	L
CO4	H	M	L	L	M	M	H	M	L	M	M	M	H	M	L
CO5	H	L	L	H	M	M	M	H	L	M	M	M	H	L	L

H-High; M-Medium; L-Low.

Units	Contents	Hrs
UNIT I	**Introduction**: Software Project Management -Software Project Versus Other Project – Requirement Specification –Information and Control in Organization –Introduction to step wise Project Planning –Select –Identify Scope and Objectives -Identify Project Infrastructure –Analyze Project Characteristics –Products and Activities –Estimate Effort for each Activity –Identify Activity Risks –Allocate Resources -Review / Publicize Plan – Execute Plan and Lower Levels of Planning.	**12**
UNIT II	**Project Evaluation:** Introduction –Strategic Assessment –Technical Assessment –Cost Benefit Analysis –Cash Flow Forecasting –Cost Benefit Evaluation Techniques –Risk Evaluation –Selection of an Appropriate Project App roach –Choosing Technologies – Choice of Process Models –Structured Methods – Rap id Application Development – Waterfall Model –V-Process Model –Spiral Model – Software Prototyping –Ways of Categorizing Prototypes –Tools –Incremental Delivery –Selection Process Model.	**12**
UNIT III	**Software Effort Estimation :** Introduction –where estimation done-problem with over	**12**

	and under estimation-basics for software estimation-software effort estimation techniques-basics of software estimating-software effort estimation techniques-estimation by analogy-albrech function point analysis-function point mark II-procedural code oriented approach-COCOMO a parametric model-publishing resource schedules-cost scheduling-scheduling sequence.	
UNIT IV	**Monitoring and Control:** Introduction – creating the framework-collecting the data-visualizing progress-cost monitoring-earn values-priority monitoring-getting the project back to target-change control Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops.	**12**
UNIT V	**Managing Contracts:** Introduction –Types of Contract –Stages in Contract Placement – Terms of Contract –Contract Management –Acceptance –Managing People and Organizing Teams –Organizational Behavior Background –Selecting the Right Person for the Job –Instruction in the Best Methods – Motivation –Decision Making –Leadership – Organizational Structures –Software Quality –Importance –Practical Measures –Product.	**12**
	Total Contact Hours	**60**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Bob Hughes , Mike Cotterell , Rajib Mall	Software Project Management	6th Edition	2017

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Walker Royce	Software Project Management: A Unified Framework	Addison Wesley	1998
2	DerrelInce, H. Sharp and M. Woodman	Introduction to Software Project Management and Quality Assurance	Tata McGraw Hill,	1995

Web References

1. https://www.wrike.com/project-management-guide/faq/what-is-software-project-management/
2. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
3. https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/
4. https://www.forecast.app/blog/benefits-of-using-project-management-software

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: N.Karthikeyan Signature:	Name: Dr.M.Sakthi Signature:	Name: K.Srinivasan Signature:	Name: Dr.R.Muthukumaran Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS2E2	**Course Title:**	**Elective – II:** Software Engineering and Testing		Batch	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		4	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	4

Course Objective

To learn all the software development approaches, design methodologies, test metrics, measurements, tools in software development process and testing

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Recollect basic software process models to ensure that software designs, development and maintenance meet or exceed applicable standards.	K1
CO2	Understand concepts of software management activities, requirement gathering, design, analysis and maintenance.	K2
CO3	Apply advanced software projects in designing, testing, cost estimation and risk management.	K3
CO4	Analyze and implement the design by types of testing, scenarios, process, methodologies and architecture for automation, using testing tools and solve challenges in testing.	K4
CO5	Access verification and validation, integrate functional and non-functional testing, to perform regression testing, framework for test tools, testing an application using WinRunner tool.	K5

MAPPING

PO/PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	M	M	M	H	H	M	M	M	M	H	H	M	M	M	H
CO2	M	H	M	M	H	H	M	M	H	M	H	H	M	M	H
CO3	H	H	H	M	H	H	H	M	H	H	H	H	H	M	H
CO4	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

H: High; M: Medium; L: Low.

Units	**Contents**	**Hrs**
UNIT I	**Software Engineering** : Defining software, Software Application Domains, **Process models**: A generic process model– Defining a framework activity, identifying a Task Set, Process Patterns. **Requirement Modeling:** Requirement Analysis, Data modeling concepts, Class-based modeling, Requirement modeling strategies, Flow oriented modeling.	**12**
UNIT II	**Design Concepts**: The evolution of software design -, Design concepts – Abstraction, Architecture, *Patterns*, Separation of concerns, Modularity, information hiding, Functional Independence, refinement, Aspects, Refactoring, Object Oriented design concepts- Design classes , The design Model – Data Design elements, Architectural Design elements, Interface Design Elements, Component-Level, Design elements, Deployment level Design elements.	**12**

UNIT III	**Software Quality Assurance:** SQA tasks, Goals and metrics, Formal approaches to SQA, Statistical Software quality assurance- SQA plan. **Project Management concepts:** The management spectrum. **Estimation for software projects:** The project planning process, Software project estimation, Decomposition techniques, Empirical estimation models, Project scheduling. **Risk management**: Risk identification, Risk projection, The RMMM plan.	**12**
UNIT IV	**Software Development Life Cycle Models**-Phases of Software Project - Quality – Assurance – Control –Testing - Verification- SDLC Models - TYPES OF TESTING: White Box Testing-Static Testing-Structural Testing. Black Box Testing-Integration Testing - Scenario Testing-Defect Bash. System and Acceptance Testing –Functional System Testing-Non Functional Testing-Regression Testing-Internalization testing-Ad hoc testing. **Performance Testing:** Methodology-Tools-Process-Challenges.	**12**
UNIT V	**Software Test Automation*:*** Design and Architecture for Automation-Generic requirements for Test Tools Framework-Selecting a Test Tool-Challenges. Test Metrics and Measurements: Metrics in *Testing*-Types of Metrics. **WinRunner:** Overview of WinRunner-Testing an Application Using WinRunner tool.	**12**
	Total Contact Hours	**60**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Pressman S. Roger	Software Engineering A Practitioner's Approach	McGraw Hill, International Editions, 8th edition	2019
2	Srinivasan Desikan, Gopalaswamy Ramesh	Software Testing Principles and Practices	PearsonEducation-10th impression	2015
3	DrK.V.K.KPrasad	Software testing tools	Dream tech press, New Delhi	2007

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Sommerville Ian	Software Engineering	Addison Wesley,10th Edition	2015
2	Rumbaugh, James	Object Oriented Modeling and design	Pearson Education, New Delhi Evaluation Pattern.	2005
3	Roger S. Pressman	Software Engineering	Tata McGraw Hill Publication, 6th Edition.	2009

Web References

1. https://www.youtube.com/watch?v=WxkP5KR_Emk&list=PLrjkTql3jnm9b5nr-ggx7Pt1G4UAHeFlJ
2. https://www.youtube.com/watch?v=smqQxsdDRII&list=PLrjkTql3jnm9b5nr ggx7Pt1G4UAHeFlJ&index=3
3. https://www.youtube.com/watch?v=WnHOgMeszWI&list=PLYwpaL_SFmcCB7zUM0YSDR-1mM4KoiyLM
4. https://www.youtube.com/watch?v=HylDB3bN6hQ
5. https://www.youtube.com/watch?v=0DWOT9KNtHQ

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: M. MeenaKrithika Signature:	Name: Dr.M. Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS2E3	**Course Title:**	**Elective II:** Object Oriented Analysis and Design with UML		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		4	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	4

Course Objective

To prepare the students for job in developing the area of system analysis and design concepts using object-oriented approach

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember and Understand OOAD concepts and various UML diagrams	K1
CO2	Identify the classes and responsibilities of the problem domain	K2
CO3	Apply the concepts of architectural design for deploying the code for software.	K3
CO4	Analyze the systems, various components and collaborate them interchangeably.	K4
CO5	Ability to Construct projects using UML diagrams	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	H	H	H	M	H	H	M	H	H	M	M
CO2	H	M	M	H	H	H	M	M	H	H	M	M	H	H	M
CO3	H	H	H	M	M	H	H	H	M	M	H	M	M	H	H
CO4	M	H	M	H	M	M	H	M	H	M	M	H	M	H	M
CO5	M	H	H	H	M	M	H	H	H	M	H	M	H	H	M

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	An overview of Object-oriented systems development – introduction- two orthogonal views of the software – object oriented systems development methodology – why an object orientation? – Overview of the unified approach. Object-oriented systems development life cycle: Introduction – the software development process- building high-quality software. Object-oriented system development a use-case driven approach-reusability	**11**
UNIT II	Object-oriented methodologies-introduction toward unification too many methodologies-survey of some of the object-oriented methodologies-Rumbaugh object modeling technique-the Booch methodology-the Jacobson methodologies-patterns-frameworks-the unified approach.	**13**
UNIT III	UML overview: UML history -goals of UML- UML concept areas –syntax of expression and diagrams – nature and purpose of models: a model, levels of models, meaning of mode. UML walkthrough: UML views, static view-use case view-interaction view-state machine view-activity view-physical view-model management view-extensibility constructs. Staticview:overview-classifiers-relationship-associations-generalization-realization- dependencies,constraints-instances.	**13**

	Use case view: overview, actor, use case.	
UNIT IV	Static machine view; overview: state machine-event state-transition-composite state. Activity view: overview-activity diagram-activities and other views activation-collaboration-interaction-sequence diagram-physical view: overview, component -node.	**11**
UNIT V	Model management view-packages-dependencies on packages- access and import dependency-model and subsystem. Extension mechanism: constraints-tagged view, stereo types-tailoring with uml. Uml environment-semantics-responsibilities-notation responsibilities-programming language responsibilities- modeling with tools	**12**
	Total Contact Hours	**60**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Ali Bahrami	Object Oriented System Development using the unified modeling language	Tata McGraw-Hill Education Pvt. Ltd, First Edition	2008
2	Ivar Jacobson, James Rumbaugh, Grady Booch	The UML Reference Manual	Addison Wesley Longman Inc., Second Edition	2010
3	Grady Booch, James Rumbaugh, Ivar Jacobson	The Unified Modeling LanguageUser Guide	Addison Wesley Longman Inc., Second Edition	2005

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Mahesh P.Matha	Object-Oriented Analysis and Design Using UML	PHI Learning Private Limited, Second Edition	2012
2	Craig Larman	Applying UML and Patterns,	2nd Edition, Pearson	2002

Web References

1. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_uml_behavioural_diagrams.htm
2. https://people.ucalgary.ca/~far/Lectures/SENG401/PDF/OOAD_with_UML.pdf
3. https://www.uml-diagrams.org/uml-object-oriented-concepts.html
4. https://www.geeksforgeeks.org/unified-modeling-language-uml-introduction/
5. https://www.uml-diagrams.org/index-examples.html

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: S.Sharmila Signature:	Name: Dr.M. Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS2N1	**Course Title:**	**Non-Major Elective I:** Web Designing Lab		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		2	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	2

Course Objective

To enable the students to develop and design various applications using Web Technology.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Apply critical thinking skills	K3
CO2	Analyze and write a well formed / valid XML document	K4
CO3	Access and analyze website performance by interpreting analytics to measure site traffic, SEO, engagement, and activity on social media	K3
CO4	Access XSL transformation, sorting..	K4
CO5	Design and create websites	K5, K6

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	M	H	H	H	M	M	H	H	H	H	H	M
CO2	H	M	M	H	H	H	M	M	H	H	M	H	H	M	M
CO3	H	H	H	M	H	H	H	H	M	H	H	M	H	H	H
CO4	M	H	M	H	M	M	H	M	H	M	H	H	M	H	M
CO5	M	H	H	H	M	M	H	H	H	M	H	M	M	H	H

H: High; M: Medium; L: Low.

Contents	Hrs
• HTML Tags • Tables • Forms • Frames • CSS Rules, CSS Grouping Style, XML usingCSS	**15**
• Address Book • DTD for BookInformation • Resume Creation usingDTD • XSL Transformation, XSLSorting • Event Handling • Filters	**15**
Total Contact Hours	**30**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Assignments.	

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Kogent Learning Solutions Inc.	Web Technologies: Black Book	Kindle	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Prof. Satish Jain and M. GeethaIyer	Web Designing and Publishing	BPB Publication	2013

Web References

1. https://www.youtube.com/watch?v=alswD2tCc_Q
2. https://www.youtube.com/watch?v=ruYb2C12dA4
3. https://99designs.com/blog/web-digital/best-web-design-tutorials/
4. https://mdbootstrap.com/education/
5. https://www.youtube.com/watch?v=3Wd2uEsbc_c

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: Dr.R.Nandhakumar Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS2N2	**Course Title:**	**Non-Major Elective I:** Advanced Internet Technologies		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		2	**Tutorial Hrs/Sem**	-	**Semester:**	II
					Credits:	2

Course Objective

To develop and design fundamentals of Internet, use Google and the Web functions.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of Internet and the Web concepts.	K3
CO2	Analyze and apply the online information resources.	K4
CO3	Inspect and utilize the appropriate Google Apps for education effectively.	K4
CO4	Analyze the concepts of World wide web	K5
CO5	Developing Web forms	K5

MAPPING

PO/PSO CO	PO 1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	H	H	H	M	M	H	H	H	H	H	M
CO2	M	M	H	M	H	H	M	M	H	H	M	H	H	M	M
CO3	H	H	H	H	M	H	H	H	M	H	H	M	H	H	H
CO4	H	H	H	H	H	M	H	M	H	M	H	H	M	H	M
CO5	H	H	M	H	M	M	H	H	H	M	H	M	M	H	H

H: High; M: Medium; L: Low.

Contents	Hrs
• Create a meeting using Google calendar and share meeting id to the attendees. Transferthe ownership to the Manager once the meeting id isgenerated. • Create a label and upload bulk contacts using import option in GoogleContacts • Create your own Google classroom and invite all your friends through email id. Post studymaterial in Google classroom using Google drive. Create a separate folder for every subject and upload all unit wise E-ContentMaterials. • Create and share a folder in Google Drive using 'share a link' option and set the permissionto access that folder by your friendsonly.	**10**
• Create one-page story in your mother tongue by using voice recognition facility of GoogleDocs. • Create a registration form for your Department Seminar or Conference using GoogleForms. • Create a question paper with multiple choice types of questions for a subject of your choice,using Google Forms. • Create a Google form with minimum 25 questions to conduct a quiz and generate a certificate aftersubmission.	**10**
• Create template for a seminar certificate using GoogleSlides. • Create a mark statement in Google Sheets and download it as PDF, .xls and .csvfiles	**10**
Total Contact Hours	**30**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Ian Lamont	Google Drive & Docs in 30 Minutes	2nd Edition.	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Sherry Kinkoph Gunter	My Google Apps	BPB Publication	2012

Web References

1. https://www.youtube.com/watch?v=hGER1hP58ZE
2. https://www.youtube.com/watch?v=NzPNk44tdlQ
3. https://www.youtube.com/watch?v=PKuBtQuFa-8
4. https://www.youtube.com/watch?v=RKHz556u_g0
5. https://www.youtube.com/watch?v=BBFrm-QU8ZE

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: Dr.R.Nandhakumar Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

III SEMESTER

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS311	**Course Title:**	Internet of Things		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		4	**Tutorial Hrs/Sem**	-	**Semester:**	III
					Credits:	4

Course Objective

To explore the fundamentals of Internet of Things, IoT Protocols and to apply the concept of Internet of Things in the real world scenario.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Remember the basics of IoT and IIoT	K1
CO2	Understand IoT reference layer and various protocols of IoT	K2,K3
CO3	Deploy cloud in the context of IoT	K4
CO4	Design IoT applications in different domain and be able to analyze their performance	K4,K5
CO5	Implement basic IOT Applications on Embedded Platforms	K5

MAPPING

PO/PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	H	H	M	H	H	H	H	M	H	H	H	M	H	H	H
CO2	H	M	M	H	L	H	M	M	H	H	H	H	H	M	M
CO3	M	H	H	H	M	H	H	H	M	M	M	M	M	M	H
CO4	M	H	H	M	H	M	H	M	H	M	H	M	H	H	M
CO5	H	M	M	H	L	M	H	H	H	M	H	H	H	M	H

H: High; M: Medium; L: Low.

Units	**Contents**	**Hrs**
UNIT I	**Introduction to IoT:** Introduction– Physical Design – Logical Design – IoT Enabling Technologies – IoT Levels & Deployment Templates – Domain Specific IoTs. **IoT and M2M: M2M –** Difference between IoT and M2M – SDN and – NFV forIoT.	**12**
UNIT II	**IoT System Management with NETCONF – YANG:** Need for IoT Systems Management - Simple Network Management Protocol – Network Operator Requirements – NETCONF – YANG. **IoT Platforms Design Methodology:** Introduction – Design Methodology. **IoT Architecture:** M2M high-level ETSI Architecture – IETF Architecture for IoT.	**12**
UNIT III	IoT Reference model – Domain model - Information model - Functional model – Communication model - IoT Reference Architecture. **IoT Protocols:** Protocol Standardization for IoT – Efforts – M2M and WSN Protocols - SCADA and RFID Protocols –Protocols – IEEE 802.15.4 – BACNet Protocol - Modbus –	**12**

	Zigbee Architecture - Network Layer – 6LowPAN – CoAP – Security.	
UNIT IV	**Building IoT with RASPBERRY Pi and ARDUINO:** Building IoT with RASPBERRY Pi – IoT Systems – Logical Design using Python – IoT Physical Devices and Endpoints – IoT Device – Building blocks – Raspberry Pi – Board – Linux on Raspberry Pi – Raspberry Pi Interfaces - Programming Raspberry Pi with Python – *Other IoT Platforms* - Arduino	**12**
UNIT V	Introduction- IIoT, Industry 4.0 – IIoT architecture – IIoT Connectivity- Standardization of IIoT - Opportunities – Challenges. **Case studies:** HomeAutomation – Cities – Environment – Agriculture – Productivity Application. **Tools for IoT**: Chef – Chef Case Studies – Puppet – Puppet Case Study. *Amazon Web Services forIoT.*	**12**
	Total Contact Hours	**60**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	ArshdeepBahga , Vijay Madisetti	Internet of Things –A hands –on approach	First Edition, Universities Press	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Dieter Uckelmann , Mark Harrison, Michahelles,Florian (Eds)	Architecting the Internet of Things	First Edition, Springer	2011
2	Honbo Zhou	The Internet of Things in the cloud: A Middleware Perspective	First Edition, CRC Press	2012
3	Jan Holler, VlasiosTsiatsis , Catherine Mulligan	Machine – to- Machine to the Internet of Things – Introduction to a New Age of Intelligence	First Edition, Elsevier	2014

Web References

1. tutorialspoint.com/internet_of_things/internet_of_things_overview.htm
2. https://onlinecourses.nptel.ac.in/noc20_cs69/unit?unit=17&lesson=18
3. http://cdn.ttgtmedia.com/rms/IoTAgenda/PracticalIndustrialInternetofThingsSecurity-Chapter2.pdf
4. https://www.maximintegrated.com/en/design/technical-documents/app-notes/6/6142.html
5. https://profile.iiita.ac.in/bibhas.ghoshal/IoT_2019/Lecture_Slides/Chapter-7_raspberryPi.pdf

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: M.Dhavapriya Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS312	**Course Title:**	Full Stack Web Development		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		5	**Tutorial Hrs/Sem**	-	**Semester:**	III
					Credits:	4

Course Objective

To understand full stack web development and use HTML, CSS and Javascript to handle front-end operations and back-end server scripting. MEAN is a full-stack development toolkit used to develop a fast and robust web application.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the basics of HTML, CSS and Javascript	K1, K2
CO2	Understand the principles, knowledge and skills for the design and construction of web-enabled internet applications	K2
CO3	Design, implement and deploy an inhouse project using MongoDB, Express.js, AngularJS and Node.js	K4, K5
CO4	Analyze and design appropriate database services based on the requirements	K4, K5
CO5	Evaluate different web application development alternatives and choose the appropriate one for a specific scenario	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	H	M	M	H	H	M	H	H	H	M	H	H	M
CO2	M	M	H	H	H	H	M	M	H	H	H	M	H	H	M
CO3	H	H	H	M	H	H	M	H	M	H	H	M	H	H	H
CO4	M	H	M	M	H	M	H	M	H	M	H	M	H	H	H
CO5	M	M	H	H	H	H	H	H	H	H	M	H	H	H	H

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	**Introduction:** Basics of HTML, CSS, and Javascript HTML, CSS, Bootstrap, Javascript basics – Variables, functions, and scopes, Logic flow and loops, Events and Document object model, Handling JSON data, Understanding Jsoncallbacks.	**15**
UNIT II	**Node JS:** Introduction to Node JS Installation, Callbacks, Installing dependencies with npm, Concurrency and event loop fundamentals, Node JS callbacks, Building HTTP server, Importing and exporting modules, Building chat application using web socket.	**15**
UNIT III	**REST Services:** Building REST services using Node JS REST services, Installing Express JS, Express Node project structure, Building REST services with Express framework, Routes, filters, template engines – Jade, ejs.	**15**

UNIT IV	**MongoDB:** MongoDB Basics and Communication with Node JS Installation, CRUD operations, Sorting, Projection, Aggregation framework, MongoDB indexes, Connecting to MongoDB with Node JS, Introduction to Mongoose, Connecting to MongoDB using mongoose, Defining mongoose schemas, CRUD operations using mongoose.	**15**
UNIT V	**Angular JS:** Building Single Page Applications with AngularJS Single Page Application – Introduction, Two-way data binding(Dependency Injection), MVC in Angular JS, Controllers, Getting user input, Loops, Client side routing – Accessing URL data, Various ways to provide data in Angular JS – Services and Factories, Working with filters, Directives and Cookies, The digest loop and use of $apply.	**15**
	Total Contact Hours	**75**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Simon Holmes	Getting MEAN with Mongo, Express, Angular, and Node	Manning Publications, First Edition	2015
2	Jeff Dickey	Write Modern Web Apps with Mean Stack	Peachpit Press	2015
3	Ken Williamson	Learning Angular JS	O′Reilly, First Edition	2015
4	Mithun Satheesh	Web development with MongoDB and Node JS	Packt Publishing Limited, Second Revised Edition	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Laura Lemay, Rafe Colburn, Jennifer Kyrnin	Mastering HTML, CSS & JavaScript Web Publishing	Paperback	2016
2	Jon Duckett	Web Design with HTML, CSS, JavaScript and jQuery	Paperback	2014
3	Mardan, Azat	Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB	Apress	2015

Web References

1. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
2. https://www.javatpoint.com/how-to-be-a-full-stack-developer
3. https://www.fita.in/full-stack-developer-tutorial/
4. https://www.mongodb.com/languages/mean-stack-tutorial
5. https://intellipaat.com/blog/tutorial/angularjs-tutorial/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: N.Arulkumar Signature:	Name: Dr.M. Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS313	**Course Title:**	Python Programming		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		5	**Tutorial Hrs/Sem**	-	**Semester:**	III
					Credits:	4

Course Objective

To understand the core principles of the Python Language and use the tools to produce well designed programs in python and create effective GUI applications.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the principles of structured programming recognize and construct common programming idioms: variables, loop, branch, subroutine, and input/output.	K1, K2
CO2	Understand the common programming idioms: variables, loop, branch, subroutine, and input/output	K2
CO3	Deploy the concepts of lists, tuples, dictionaries, standard libraries, modular programming and the design of user interfaces	K3,K4
CO4	Ability to analyze and solve the problems using advanced facilities of the Python language	K4,K5
CO5	Apply the functions and python libraries to analyze and solve various data analytics problems	K4, K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	M	H	H	M	H	H	H	M	H	H	M
CO2	M	M	H	H	H	H	M	M	H	H	H	M	H	H	M
CO3	H	H	H	M	H	H	H	H	M	M	H	M	H	H	H
CO4	M	H	L	M	H	M	H	M	H	M	H	M	H	H	H
CO5	M	M	H	H	H	M	H	H	H	H	M	H	H	H	H

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	**Introduction to Python:** Introduction – Python overview – Getting started – Comments – Python identifiers – Reserved keywords – Variables – Standard data types – Operators – Statements and Expressions – String operations – Boolean expressions. **Classes and Objects:** Overview of OOP – Data encapsulation – Polymorphism–Class definition – Creating objects – *Inheritance* – Multiple inheritances – Method overriding – Data encapsulation – Data hiding.	**15**

UNIT II	**Control Statements and Functions:** For loop – While statement – if else and if else statement – Input from keyboard. Functions: Introduction – Built-in functions – Type conversion – Type coercion – Date and time – dir() function – help() function – User defined functions – Parameters & arguments – Function calls – The return statement – Python recursivefunction. **Strings and Lists:** Strings – Compound data type – len function – String slices – String traversal – Escape characters – String formatting operator – String formatting functions.Lists – Values and accessing elements – Traversing a list – Deleting elements from list – Built-in list operators – Built-in list methods.	**15**
UNIT III	**Tuples and Dictionaries:** Tuples – Creating tuples – Accessing values in tuples – Tuple assignment – Tuples as return values – Basic tuple operations – Built-in tuple functions. Dictionaries – Creating dictionary – Accessing values in dictionary – Updating dictionary – Deleting elements from dictionary – Operations in dictionary Built-in dictionary methods. **Files and Exceptions:** Introduction to File Input and Output-Using loops to process files-Processing Records-Exception.	**15**
UNIT IV	**Data Analysis with Python:** Reading and Writing Data in Text format – Reading Text Files in Pieces- writing data to text formats –Binary data formats-Reading Microsoft Excel Files-Interacting with Web API's-Interacting with Databases. Data Cleaning and Preparation: **H**andling Missing Data-Filtering Out Missing Data- Filling In Missing Data. **Data Transformation:** Removing Duplicates. Plotting and Visualization: A Brief mat plot lib API Primer-Figures and Subplots-Colors, Markers, and Line Styles-Annotations and Drawing on a Subplot-Saving Plots to File-mat plot lib Configuration.	**15**
UNIT V	**Numpy Basics:** Arrays and Vectorized Computation –TheNumPyndarrays: Aultidimensional Array Object –Creating ndarrays-Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing-Boolean Indexing –Fancy Indexing-Methods for Boolean Arrays-Mathematical and Statistical Methods-File Input and Output with Arrays-Sorting.	**15**
	Total Contact Hours	**75**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Mark Summerfield	Programming in Python 3: A Complete introduction to the Python Language	Addison-Wesley Professional 2nd Edition	2009
2	NumPy and IPython by Wes McKinny	Python for Data Analysis: Data Wrangling with Pandas	O'Reilly Media 2nd Edition	2012
3	Wesley J Chun	Core Python Applications Programming	Prentice Hall 3rd Edition	2012

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Mark Lutz	Learning Python	O'Reilly 5th Edition	2013

2	Welsey J. Chun	Core Python Programming	Prentice Hall 2nd Edition	2001
3	E Balagurusamy	Introduction to computing and problem solving using python	McGrawHill publication Kindle Edition	2016

Web References

1.https://www.python.org/
2.https://www.programiz.com/python-programmin
3. https://ipython.org/
4. https://numpy.org/
5. https://pandas.pydata.org/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: Dr. S.Sharmila Signature:	Name: Dr.M. Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS314	**Course Title:**	Digital Image Processing		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		3	**Tutorial Hrs/Sem**	-	**Semester:**	III
					Credits:	3

Course Objective

To prepare the students for solving real problems, knowledge in Image transformation, Image Enhancement techniques, Image compression and Segmentation procedures.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Get broad exposure and understanding of various applications of image processing in industry, medicine, and defense and other applications.	K1
CO2	To be familiar with basic concepts of two-dimensional signal acquisition, sampling, and quantization.	K2
CO3	To implement the fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.	K3,K4
CO4	To analyze programming skills in image compression, segmentation and restoration techniques.	K4,K5
CO5	To access digital images and process using MATLAB.	K5

MAPPING

PO/PSO CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	H	H	M	H	H	H	H	M	H	H	H	M	H	M	H
CO2	H	M	M	H	H	H	M	M	H	H	M	M	H	M	H
CO3	H	H	H	M	M	H	H	H	M	M	H	H	M	H	M
CO4	M	H	M	H	M	M	H	M	H	M	H	M	H	M	H
CO5	M	H	H	H	M	M	H	H	H	M	H	H	H	H	H

H: High; M: Medium; L: Low.

Units	**Contents**	**Hrs**
UNIT I	**Introduction:** What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. **Digital Image Fundamentals:** Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization– Some Basic relationship between Pixels – Linear & Nonlinear operations. **MATLAB**-Introduction-Basic features-Starting –Quitting-Creating variables.	**8**
UNIT II	**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.	**8**
UNIT III	**Image 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 –Modeling the Degradation function –Direct InverseFiltering-Wiener Filtering-Constrained Least Squares (Regularized) Filtering - Iterative Nonlinear Restoration using the Lucy-Richardson Algorithm-BlindDeconvolution.	**10**

UNIT IV	**Image Compression:** Fundamentals – Image compression models – Elements of Information Theory – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Image compression standards.	**10**
UNIT V	**Image Segmentation: P**oint, Line and Edge Detection–Line Detection Using the Hough Transform– Thresholding – Region-Based segmentation – Segmentation by Morphological watershed Transform.	**9**
	Total Contact Hours	**45**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Rafael C. Gonzalez, Richard E. Woods	Digital Image Processing	PHI/Pearson Education\3rd Edition	2017
2	Rafael C. Gonzalez, Richard E.Woods, Steven L, Eddins	Digital Image Processing Using MATLAB	Tata McGraw-Hill International Editions	2008

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Nick Efford	Digital Image Processing a practical introducing using Java	Pearson Education	2004
2	Chanda.B, Dutta Majumder.D	Digital Image Processing and Analysis	PHI/Pearson Education	2011

Web References

1.https://www.youtube.com/watch?v=xUCsfKA8bi0
2.https://www.youtube.com/watch?v=3qJej6wgezA
3.https://www.youtube.com/watch?v=sckLJpjH5p8
4.https://nptel.ac.in/courses/117/105/117105079/
5.https://nptel.ac.in/courses/117/105/117105135/

Course Designed by	Verified by HOD	Checked by	Approved by
Name: P.Jayapriya Signature:	Name: Dr. M. Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS315	**Course Title:**	**Programming Lab III:** Internet of Things		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		3	**Tutorial Hrs/Sem**	-	**Semester:**	III
					Credits:	2

Course Objective

To create an environment for design, development and testing of IoT solutions, in the field of distributed sensor devices and advanced user interfaces.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Implement IoT to different applications	K3
CO2	Analyze the revolution of Internet in Mobile Devices, Cloud & Sensor Networks	K4
CO3	Design IoT applications in different domain and be able to analyze their performance	K4,K5
CO4	Discover and demonstrate the promise of the Internet of Things	K4,K5
CO5	Design an IoT device to work with a Cloud Computing infrastructure.	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	H	H	H	M	H	H	H	M	H	H	H
CO2	H	M	M	H	L	H	M	M	H	H	H	H	H	M	M
CO3	M	H	H	H	M	H	H	H	M	M	M	M	M	M	H
CO4	M	H	H	M	H	M	H	M	H	M	H	M	H	H	M
CO5	H	M	M	H	L	M	H	H	H	M	H	H	H	M	H

H: High; M: Medium; L: Low.

Contents	Hrs
1. Design an IOT application using Arduino to measure temperature and humidity in digital/ analogmode. 2. Design an IOT application using Arduino to illustrate the working of ultrasonic sensor.	**6**
3. Design an IOT application using Arduino to illustrate the working of touch sensor. 4. Design an IOT application using Arduino to illustrate the working of vibration sensor.	**6**
5. Design an IOT application using Arduino to illustrate the working of IR sensor. 6. Design an IOT application using Arduino to illustrate the working of PIR sensor.	**6**
7. Design an IOT application using Arduino to illustrate the working of ultrasonic sensor with LED. 8. Design an IOT application using Arduino to illustrate the working of touch sensor with buzzer.	**6**

9. Design an IOT application using Arduino to illustrate the working of LED in digital and analog mode. 10. Design an IOT application using Arduino to illustrate the working of stepper motor.	**7**
11. Design an IOT application to allocate IP address to NodeMCU using WiFi. 12. Design an IOT application using WiFi to demonstrate data communication with MQTTFx.	**7**
13. Design an IOT application using WiFi to demonstrate data communication with Windows application (.NET). 14. Design an IOT application using ThingSpeak to demonstrate data communication with cloud.	**7**
Total Contact Hours	**45**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Yashavant Kanetkar, Shrirang Korde	21 IoT Experiments	First Edition, BPB Publications	2019
2	Alessandro Bassi, Martin Bauer Martin Fiedler,Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner	Enabling Things to Talk	First Edition, Springer open	2013

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Dr V K Sachan	Internet of Things (IoT) & Its Applications	First Edition (Independently Published)	2020
2	Anita Gehlot,Rajesh Singh, Praveen Kumar Malik,Lovi Raj Gupta, Bhupendra Singh	Internet of Things with 8051 and ESP8266	First Edition, CRC Press	2020

Web References

1. https://www.scribd.com/read/438569916/21-IoT-Experiments
2. https://www.softwaretestinghelp.com/best-iot-examples/#1_IoT_Sensors
3. https://www.youtube.com/watch?v=QlApoEKGfU4
4. https://www.youtube.com/watch?v=h0gWfVCSGQQ
5. http://fiesta-iot.eu/index.php/fiesta-experiments/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: M.Dhavapriya Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS316	**Course Title:**	**Programming Lab IV:** Digital Image Processing using MATLAB		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		3	**Tutorial Hrs/Sem**	-	**Semester:**	III
					Credits:	2

Course Objective

On successful completion of the course the students should understand about Image Processing, image compression and segmentation using MATLAB.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Implement the fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.	K3
CO2	Analyze and visualize data using MATLAB effectively	K4
CO3	Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives	K4
CO4	Analyze programming skills in image compression, segmentation and restoration techniques.	K4,K5
CO5	Apply numeric techniques and computer simulations to solve real time problems.	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	H	H	H	M	H	H	H	M	H	H	H
CO2	H	M	H	H	L	H	M	H	M	H	H	H	H	H	M
CO3	M	H	H	H	M	H	H	H	M	M	M	M	H	H	H
CO4	M	H	H	M	H	M	H	M	H	M	H	M	H	H	M
CO5	H	H	M	H	L	M	H	M	H	M	H	M	H	M	H

H: High; M: Medium; L: Low

Contents	Hrs
1. Crop, Resize, Rotate an image 2. Crop an image using Simulink 3. Resize an image using Simulink	**5**
4. Rotate an image using Simulink 5. Adjusting the contrast in color image using Simulink 6. Adjusting the contrast in intensity image using Simulink	**5**
7. Finding Histogram of a RGB image 8. Finding Histogram of a gray and negative image	**7**

9. Arithmetic Operations	
10. Blurring with Deconvolution Algorithm 11. Sharpening of an image using Simulink	**7**
12. Unsharp Masking and High Boost Filtering using Simulink 13. Removing Salt & Pepper noise 14. Remove Noise (Median Filter) using Simulink	**7**
15. Deblurring with Wiener Filter 16. Correct Non-Uniform Illumination using Simulink 17. Count Object in an image using Simulink	**7**
18. Image Compression using Discrete Cosine Transform. 19. Performing Morphological Operations. 20. Edge Detection using Prewitt, Sobel and Roberts.	**7**
Total Contact Hours	**45**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER S/ EDITION	YEAR OF PUBICATION
1	Rafael C.Gonzalez, Richard E. Woods	Digital Image Processing	PHI/Pearson Education\3rd Edition	2017
2	Rafael C.Gonzalez, Richard E.Woods, StevenL,Eddins	Digital Image Using Processing MATLAB	Tata McGraw-Hill International Editions	2008

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER S/ EDITION	YEAR OF PUBICATION
1	Nick Efford	Digital Image Processing a practical introducing using Java	Pearson Education	2004
2	Chanda.B, Dutta Majumder.D	Digital Image Processing and Analysis	PHI/Pearson Education	2011

Web References

1.https://www.youtube.com/watch?v=xUCsfKA8bi0
2.https://www.youtube.com/watch?v=3qJej6wgezA
3.https://www.youtube.com/watch?v=sckLJpjH5p8
4.https://nptel.ac.in/courses/117/105/117105079/
5.https://nptel.ac.in/courses/117/105/117105135/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: P.Jayapriya Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS3P1	**Course Title:**	Pilot Project-I		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		2	**Tutorial Hrs/Sem**	-	**Semester:**	III
					Credits:	2

Course Objective

To understand and develop recent applications based on the student project, also basic information of business processes according to project title.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Apply DBMS concepts	K3
CO2	Design Techniques like DFD or UML etc.	K4
CO3	Analyze and developing new app	K5
CO4	Implementation of entire applications.	K5
CO5	Creation of SDLC and models for software engineering	K6

MAPPING

PO/PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	H	H	M	H	H	H	H	M	H	H	H	H	M	M	H
CO2	M	M	H	M	H	M	M	H	M	H	H	M	M	H	H
CO3	H	H	H	H	M	H	H	H	H	H	H	H	H	M	H
CO4	H	H	H	H	H	H	H	H	H	M	M	H	M	H	M
CO5	H	H	M	H	M	M	H	M	M	M	M	H	H	H	M

H: High; M: Medium; L: Low.

Contents	**Hrs**
Students are required to develop entire new software system or to enhance/modify functionalities of existing software or to provide customization based on existing technology/framework to fulfill specific requirements	**07**
Area of Project Work: Using Android	**09**
DBMS concepts, Design Techniques like DFD or UML etc	**08**
Testing and Implementation of App	**06**
Total Contact Hours	**30**

The Guidelines in which the project report material should be arranged and bound as follows: 1) Cover Page & Title Page 2) Bonafide Certificates from Organization(Mandatory) 3) Declaration 4) Acknowledgement 5) Synopsis 6) Table of Contents 7) Chapters 8) Appendix Reference	

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Dave MacLean, Satya Komatineni, Grant Allen	Pro Android 5	Apress Publications	2015
2	Ivar Jacobson, James Rumbaugh, Grady Booch	The UML Reference Manual	Addison Wesley Longman Inc., Second Edition	2010
3	Pressman S.Roger	Software Engineering A Practitioner‘s Approach	McGraw Hill, International Editions, 7th edition	2014

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Barry Burd	Application Development – All-in-one for Dummies	Wiley India, 2nd Edition	2016
2	Jerome (J. F) DiMarzio	Android – A Programmer’s Guide	McGraw Hill Education, 8th reprint	2015
3	Mahesh P.Matha	Object-Oriented Analysis and Design Using UML	PHI Learning Private Limited, Second Edition	2012
4	Craig Larman	Applying UML and Patterns,	2nd Edition, Pearson	2002

Web References

1. https://www.uml-diagrams.org/uml-object-oriented-concepts.html
2. https://www.geeksforgeeks.org/unified-modeling-language-uml-introduction/
3. https://www.uml-diagrams.org/index-examples.html
4. https://www.youtube.com/watch?v=HylDB3bN6hQ
5. https://www.forecast.app/blog/benefits-of-using-project-management-software

Rules for the Project:

1. The students can develop their project individually or in a group of not more than 2 students. Group size can be increased with prior approval of head of institution.
2. The project can be developed in any language or platform but it is required to get approved bythe head/guide.

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: Dr.M.Sakthi Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

ELECTIVE III

S.No	COURSE CODE	COURSE TITLE
1	22PCS3E1	Artificial Intelligence & Machine Learning
2	22PCS3E2	Natural Language Processing and Text Analytics
3	22PCS3E3	Robotic Process Automation for Business

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS3E1	**Course Title:**	**Elective III:** Artificial Intelligence & Machine Learning		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		5	**Tutorial Hrs/Sem**	-	**Semester:**	III
					Credits:	5

Course Objective

To provide the knowledge of problem solving using AI techniques, knowledge representations and to understand the concepts of predicate logic.

To understand the basic concepts of machine learning, probability theory and also algorithms of supervised learning and unsupervised learning.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Learn about the artificial intelligence problem and the characteristics of the problem space.	K2
CO2	Identifies the Heuristics search techniques and issues in representing the knowledge and comprehend the statistical reasoning	K3
CO3	Understand the problem solving using predicates and infer the knowledge using rules	K2,K4
CO4	Design a learning model appropriate to the application and recognize the characteristics of machine learning techniques that are useful to solve real-world problems	K5
CO5	Design and implement various machine learning algorithms in a range of real-world applications	K5

MAPPING

PO/PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	H	L	L	L	L	L	L	L	L	L	M	M	M	L	M
CO2	M	L	M	M	L	L	L	L	L	L	M	M	M	L	M
CO3	M	L	M	L	M	L	L	L	L	M	M	M	M	L	M
CO4	H	H	H	H	H	H	L	L	L	H	H	H	H	H	H
CO5	H	H	H	H	H	H	L	L	L	H	H	H	H	H	H

H: High; M: Medium; L: Low.

Units	**Contents**	**Hrs**
UNIT I	Introduction: AI Problems - Al techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search. Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis.	**15**
UNIT II	Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.	**15**

	Statistical Reasoning: Probability and Baye's Theorem – Certainty Factors and Rule-based System – Bayesian Networks – Fuzzy Logic	
UNIT III	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.	**15**
UNIT IV	Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning –Machine Learning Process – Weight Space - Curse of Dimensionality – Testing Machine Learning Algorithms –Turning Data into Probabilities – The Bias-Variance Tradeoff – Linear Regression – Linear Discriminant Analysis - Principal Components Analysis – Nearest Neighbour Methods	**15**
UNIT V	Support Vector Machine: Optimal Separation – Kernels – Algorithm - Learning with Trees: Constructing Decision Trees – Bagging – Boosting – Random Forest - Unsupervised Learning: K-Means Algorithm - Graphical Models: Bayesian Networks - DeepLearning.CaseStudy:Implementationofclassificationalgorithmforproblemsin financial domain	**15**
	Total Contact Hours	**75**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Elaine Rich, Kevin Knight, &Shivashankar B Nair	Artificial Intelligence	Third Edition, McGraw Hill Education (India) Private Limited, New Delhi	2009, Reprint 2016.
2	Stephen Marsland	Machine Learning – An Algorithmic Perspective	Chapman and Hall, CRC Press, Second Edition	2014

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Stuart J. Russell, Peter Norvig	Artificial Intelligence - A Modern Approach	Third Edition, Pearson Publishers	2015
2	EthemAlpaydin	Introduction to Machine Learning	Third Edition, Prentice Hall of India	2015
3	P. Flach	Machine Learning: The art and science of algorithms that make sense of data	Cambridge University Press	2012
4	Elaine Rich and Kevin Knight	Artificial Intelligence	Tata McGraw Hill Publishers company Pvt Ltd, Second Edition	1991

Web References

1.https://www.javatpoint.com/machine-learning

2.https://onlinecourses.nptel.ac.in/noc21_cs24/preview
3.https://www.tutorialspoint.com/machine_learning_with_python.
4.https://www.upgrad.com/machine-learning-ms
5.https://www.google.com/search?q=artificial%20intelligence%
6.https://www.ant-pc.com/workstation/ai-and-deep-learning

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: G.Angayarkanni Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS3E2	**Course Title:**	**Elective III: Natural Language Processing and Text Analytics**		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		5	**Tutorial Hrs/Sem**	-	**Semester:**	III
					Credits:	5

Course Objective

To understand text processing for extracting information and to provide insights into fundamental concepts to speech processing and phonetic.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Understand the data science concepts and infer the knowledge about data science process	K2,K4
CO2	Illustrate the basics of natural language processing and apply feature engineering concept for text representation	K2,K3
CO3	Analyze text classification an devaluatethe classification model in real word application	K4,K5
CO4	Learn and apply different text analytics techniques to retrieve information from text	K3
CO5	Understand the basic concept of speech recognition and analyze the phonetic in speech	K2,K4

MAPPING

PO/PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	H	L	H	H	L	M	L	L	L	H	H	H	H	H	H
CO2	M	L	H	H	L	L	L	L	L	M	H	H	H	H	H
CO3	H	M	H	M	M	L	L	L	L	H	H	H	H	H	H
CO4	H	H	H	M	M	M	L	L	L	H	H	H	H	H	H
CO5	L	L	M	M	M	M	L	L	L	M	M	M	M	H	H

H: High; M: Medium; L: Low.

Units	**Contents**	**Hrs**
UNIT I	Introduction to data science - case for data science - data science classification - data science algorithms - Data Science Process - prior Knowledge - Data Preparation - Modeling - Application - Knowledge - Data Exploration - Objectives of data Exploration - Datasets - Descriptive Statistics - Roadmap for data exploration.	**15**
UNIT II	Natural language Processing basics - Language Syntax and Structure - Language Semantics - Natural language Processing - Text Analytics - Text Preprocessing and Wrangling - Understanding Text Syntax and Structure - Feature Engineering for Text Representation - Traditional Feature Engineering Models - bag of words model - bag of N-Grams model - TF - IDF Model – Topic Models	**15**
UNIT III	Text Classification - Automated Text Classification - Text Classification Blueprint - Classification Models - Multinomial Naïve Bayes - Logistic Regression - Support Vector	**15**

	Machines - Ensemble Models - Random Forest - Gradient Boosting Machines - Evaluating Classification Models – Text Similarity and clustering - Essential Concepts - Analyzing term Similarity - Analyzing Document Similarity - Document Clustering	
UNIT IV	Feature Engineering - K-means Clustering - Affinity Propagation - Wards Agglomerative Hierarchical Clustering - Semantic Analysis - Exploring Word net - Word Sense Disambiguation - Named Entity Recognition - Analyzing Semantic Representations - Sentiment Analysis - Unsupervised Lexicon-Based Models - Bing Lius Lexicon - MPQA Subjectivity Lexicon - Pattern Lexicon – Text Blob Lexicon - AFINN Lexicon – Senti WordNet Lexicon - VADER Lexicon - Classifying Sentiment with Supervised Learning.	**15**
UNIT V	Speech - Phonetics - Speech Sounds and Phonetic Transcription - Articulatory Phonetics - Phonological Categories and Pronunciation variation - Acoustics Phonetics and Signals - Speech Synthesis - Phonetic Analysis - Prosodic Analysis - Diphone Waveform synthesis - Automatic Speech Recognition - Speech Recognition Architecture - Applying Hidden Markov Model to Speech.	**15**
	Total Contact Hours	**75**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Vijay Kotu, Bala Deshpande	Data Science: Concepts and Practice	Second Edition, Elsevier Publications	2019
2	DipanjanSarkar	Text Analytics with Python: A Practitioner"s Guide to Natural Language Processing	A Press	2019
3	Daniel Jurafsky, James H. Martin	Speech and Language Processing	Pearson	2009

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	AdiAdhikari and John De Nero	Computational and Inferential Thinking: The Foundations of Data Science	First edition	2019
2	D. Jurafsky, J.H. Martin	Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition	3rd Edition Draft	2019

Web References

1. https://www.w3schools.com/datascience/
2. https://www.tutorialspoint.com/natural_language_processing/index.htm
3. https://www.analyticsvidhya.com/blog/2019/07/learn-build-first-speech-to-text-model-python/
4. https://www.kaggle.com/georgezoto/feature-engineering-v2-0-clustering-with-k-means
5. http://www.cs.columbia.edu/~julia/courses/CS6998-2019/%5B08%5D%20Speech%20Synthesis.pdf

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: G.Angayarkanni Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (ComputerScience)	
Course Code:	22PCS3E3	**Course Title:**	**Elective III:** Robotic Process Automation for Business		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		5	**Tutorial Hrs/Sem**	-	**Semester:**	III
					Credits:	5

Course Objective

To gain knowledge on concepts of RPA, its benefits, types and models. Also in applications of RPA in Business Scenarios and identify measures and skills required for RPA.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Remember the benefits and ethics of RPA	K1
CO2	Understand the Automation cycle and its techniques	K2
CO3	Apply the of design inferences and information processing of RPA	K3
CO4	Implement & Apply RPA in Business Scenarios	K4
CO5	Analyze on Robots & leveraging automation	K4

MAPPING

PO/PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	H	H	M	H	H	H	H	M	H	H	M	H	M	H	H
CO2	H	H	M	H	H	H	M	M	H	H	M	H	H	H	H
CO3	H	H	H	M	H	H	H	H	M	H	H	H	H	H	H
CO4	H	H	H	H	H	M	H	M	H	H	H	H	H	H	H
CO5	H	H	M	H	H	M	H	H	H	H	H	H	H	H	H

H: High; M: Medium; L: Low.

Units	**Contents**	**Hrs**
UNIT I	**INTRODUCTION**: 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.	**15**
UNIT II	**AUTOMATION** : 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 differentpeople.	**15**
UNIT III	**AUTOMATION IMPLEMENTATION**: 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 tobeconsideredforgaugingsuccess-Choosingtherightlicensingoption-Sending	**15**

	emails - Publishing and Running Workflows.	
UNIT IV	**ROBOT:** 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.	**15**
UNIT V	**ROBOT SKILL:** 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-Case Study.	**15**
	Total Contact Hours	**75**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Alok Mani Tripathi	Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool	Packt Publishing Limited	2018
2	Tom Taulli	The Robotic Process Automation Handbook	Apress	2020

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Steve Kaelble	Robotic Process Automation	John Wiley & Sons, Ltd.,	2018

Web References

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
4.https://www.info.com/serp?q=robotic+process+automation+tools&sc=D1P8CkHi8kSP02
5.https://irpaai.com/what-is-robotic-process-automation/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: G.Angayarkanni Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

SEMESTER IV

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCS4P2	**Course Title:**	Project Work and Viva -Voce		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		-	**Tutorial Hrs/Sem**	-	**Semester:**	IV
					Credits:	12

Course Objective

To enable the students to understand and select the task based on their core skills, also knowledge about analytical skill for solving the selected task. Students get confidence for implementing the task and solving the real time problems.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand and formulate a real world problem and develop its requirements	K2
CO2	Analyze the problem requirements	K3
CO3	Design solution for a set of requirements	K3,K4
CO4	Apply test cases and validate the conformance of the developed prototype against the original requirements of the problem	K4,K5
CO5	Responsible member and possibly a leader of a team in developing software solutions	K5

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	H	H	H	H	M	H	H	H	H	H	H
CO2	M	M	H	M	H	H	M	H	H	H	M	H	H	M	H
CO3	H	H	H	H	M	H	H	H	M	H	H	M	H	H	H
CO4	H	H	H	H	H	M	H	M	H	M	H	H	M	H	M
CO5	H	H	M	H	M	M	H	H	H	M	H	M	M	H	H

H: High; M: Medium; L: Low.

PROJECT and VIVA VOCE

Guidelines

Introduction

The title of the project work and the organization will be finalized at the end of fifth Semester. Each student will be assigned with a Faculty for guidance. The Project work and coding will be carried by using the facility of computer science lab as well as in the organization. Periodical review will be conducted to monitor the progress of the project work. Project report will be prepared and submitted at the end of the semester. External examiner appointed by the Controller of Examination will conduct the viva voce examination along with respective guide.

Area of Work

- Web Based Development
- Mobile app development
- Website development
- IoT Projects
- Big Data and Data Mining Projects
- Cloud Computing Projects
- Networking Projects
- Artificial Intelligence and Machine learning Projects
- Data Analytics Projects using Python, R, Tableau etc..
- System Software
- Web Security Projects
- Image Processing

Methodology

Arrangement of Contents:

The sequence in which the project report material should be arranged and bound as follows:

1. Cover Page & Title Page
2. Bonafide Certificates
3. Declaration
4. Acknowledgement
5. Synopsis
6. Table of Contents
7. Chapters
8. Appendix
9. References

Format of Table of Contents

TABLE OF CONTENTS

2.2 Proposed System

2.3 Planning and Scheduling

3 System Design

3.2 Overview of the Project

3.1 Modules of the Project

3.2 Input Design Format

3.3 Output Design

3.4 Table Design

3.5 Supporting Diagrams (ER/DFD/UseCase)

4 Implementation and Testing

4.1 Coding Methods

4.2 Testing Approach

4.3 Implementation and Maintenance

5 Project Evaluation

5.1 Project Outcome

5.2 Limitation of the Project

5.3 Further Scope of the Project

6 Conclusion

7 Appendix

7.1 Source Code

7.2 Screenshots and Reports

8 References

Size of the Project

The Project Report contents should be Maximum of not exceeding 70 pages.

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: Dr.M.Sakthi Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

Supportive Courses

1	Semester I	#SWAYAM/ MOOC	Any Online Course**(Compulsory)**
2	Any Semester	#VALUE ADDED COURSE	Virtual Reality/ Digital Entrepreneurship**(Compulsory)**
3	Any Semester	#CERTIFICATE COURSE	Software Testing Lab - Selenium **(Optional)**
4	Any Semester	#ADVANCED LEARNER COURSE	User Interface Design Lab Figma- **(Optional)**

VALUE ADDED COURSE

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	22PCSVA1	**Course Title:**	**VAC I:** Virtual Reality		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		1	**Total Hours**	30	**Semester:**	III
					Credits:	2

Course Objective

To impart knowledge in Virtual Reality (VR) technology in terms of used devices, building of the virtual environment and modalities of interaction and modeling and its various applications.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the fundamentals of Virtual Reality and its design in different applications	K1
CO2	Understand the foundations of modelling in VR and various sensing Gloves	K2
CO3	Apply the VR technology in digital entertainment – films, TV Production and games	K3
CO4	Analyze the design of VR- specific input & output devices , their principles, capacities and design tradeoffs of the current commercial VR output interfaces	K4
CO5	Analyze human factor issues, user performance, sensorial conflict aspects of VR	K4

MAPPING

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1O	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	M	H	M	M	H	H	M	M	H	M	M	M	H	M
CO2	H	M	M	H	H	M	M	M	M	H	H	M	M	H	M
CO3	H	H	H	M	M	M	M	M	M	H	M	M	M	M	M
CO4	H	H	H	H	M	H	M	M	M	M	H	M	M	H	M
CO5	H	H	M	H	M	H	M	H	M	M	H	M	M	M	H

H: High; M: Medium; L: Low.

Units	Contents	Hrs
UNIT I	**Introduction of Virtual Reality:** Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality. Multiple Models of Input and Output **Interface in Virtual Reality:** Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Audit ory / Haptic Devices.	**10**
UNIT II	**Visual Computation in Virtual Reality:** Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. **Advanced Techniques in CG:** Management of Large-Scale Environments & Real Time Rendering. **Interactive Techniques in Virtual Reality:** Body Track, Hand Gesture, 3D Manus, Object Grasp.	**10**
UNIT III	**Development Tools and Frameworks in Virtual Reality:** Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools etc. **Application of VR in Digital Entertainment:** VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games.	**10**
	Total Contact Hours	**30**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Burdea, G. C. and P. Coffet	Virtual Reality Technology	Wiley-IEEE Press, Second Edition	2003
2	Alan Craig, William Sherman and Jeffrey Will	Developing Virtual Reality Applications, Foundations of Effective Design	Morgan Kaufmann Publishers	2009

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	John Vince	Virtual Reality Systems	Pearson Education Asia	2007
2	Adams	Visualizations of Virtual Reality	Tata McGraw Hill	2000
3	M. LaValle	Virtual Reality	Cambridge University Press	2016

Web References

1. https://www.softwaretestinghelp.com/what-is-virtual-reality/
2. https://www.tutorialspoint.com/a_frame_web_vr_programming_tutorial_series_virtual_reality/index.asp
3. https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/what-is-virtual-reality
4. https://learn.unity.com/project/vr-beginner-the-escape-room
5. https://www.udemy.com/course/vr-in-unity-a-beginners-guide/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: N.Arulkumar Signature:	Name: Dr.M. Sakthi Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

VALUE ADDED COURSE

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (ComputerScience)	
Course Code:	22PCSVA2	**Course Title:**	**VAC II:** Digital Entrepreneurship		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		1	**Total Hours**	30	**Semester:**	III
					Credits:	2

Course Objective

To provide knowledge on how entrepreneurial ventures use digital technology to design and offer new products and services, acquire and retain customers, analyze customer data, and provide satisfying user experiences online.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Remember the principles of digital business design.	K1
CO2	Understand the basics of a content management system, and how it can be used as the foundation for an internet business presence.	K2
CO3	Launch a business-quality online presence, using widely available services and software.	K3
CO4	Analyze the usability and customer experience through web.	K4
CO5	Evaluate and monitor the progress of digital business through web analytics.	K5

MAPPING

PO/PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1O**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	M	M	M	H	H	M	M	H	H	M	M	M	M	H	H
CO2	M	M	M	H	H	M	M	H	H	M	H	M	M	H	H
CO3	M	H	H	H	H	H	M	H	H	H	H	M	M	H	H
CO4	M	M	M	H	H	M	M	H	H	M	M	M	M	H	H
CO5	M	H	H	H	H	M	M	H	H	M	M	M	M	H	H

H: High; M: Medium; L: Low.

Units	**Contents**	**Hrs**
UNIT I	**Digital Entrepreneurship:** Introduction - New Opportunities and Challenges - *Choosing a Digital Business Idea* - Creating a Digital Business Design - Building a Business Prototype.	**10**
UNIT II	**Digital Content:** Digital Content for Business - Business Prototype Look and Feel - Business Prototype Features.	**08**
UNIT III	**Digital Business and Web Analytics:** Introduction to Web Analytics - Usability and Customer Experience - *Customer Acquisition in a Digital World* - Digital Business Experiments - Launching a New Digital BusinessVenture.	**12**
	Total Contact Hours	**30**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.		

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/EDITION	YEAR OF PUBICATION
1	Jonathan P. Allen	Digital Entrepreneurship	Routledge, 1st edition	2019

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Michael Herlache	Digital Entrepreneurship	Createspace Independent	2016
2	Abeba N Turi	Technologies for Modern Digital Entrepreneurship	Apress	2020
3	MariuszSoltanifar, Mathew Hughes and Lutz Göcke	Digital Entrepreneurship - Impact on Business and Society	Springer	2021

Web References

1. https://www.learndigitalentrepreneurship.com/2019/02/16/what-is-digital-entrepreneurship/
2. https://rebelgrowth.com/benefits-for-being-entrepreneur/
3. https://www.udemy.com/course/digital-entrepreneurship/
4. https://www.roedl.com/insights/digitalisation/opportunities-challenges-entrepreneurs
5. https://www.coursera.org/learn/innovating-digital-world

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: N.Arulkumar Signature:	Name: Dr.M. Sakthi Signature:	Name: Mr. K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

CERTIFICATE COURSE

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	-	**Course Title:**	Software Testing Lab - Selenium		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		1	**Total Hours**	30	**Semester:**	Any Semester
					Credits:	2

Course Objective

To understand the basic concepts of software testing over various selenium methods and automation frameworks.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	**CO Statement**	**Knowledge Level**
CO1	Learn the importance of software testing	K1
CO2	Understand and use Selenium IDE	K2
CO3	Create programs using Selenium	K3
CO4	Create test beds for software testing	K4
CO5	Identify potential problems in software and develop solutions for testing	K5

Contents	**Hrs**
1. Create a payroll system and test using the tool.	**3**
2. Create a ration shop management system and test using the tool.	**3**
3. Create airline reservation system and test using the tool	**3**
4. Create Library management system and test using the tool.	**3**
5. Create Banking system and test using the tool.	**3**
6. Create Book shop management system and test using the tool.	**3**
7. Create Electricity billing system and test using the tool.	**3**
8. Create online cinema ticket reservation system and test using the tool.	**3**
9. Create Music gallery and test using the tool.	**3**
10. Create trading system and test the tool.	**3**
Total Contact Hours	**30**
Pedagogy and Assessment Methods: Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.	

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	AdithyaGarg, Ashish Mishra	A Practitioner's Guide to Test Automation Using Selenium	Tata McGraw Hill Education	2015
2	NavneeshGarg	Test Automation Using Selenium WebDriver with Java	AdactIn Group Pvt Ltd	2014

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Rex Allen Jones II	Selenium Web Driver for Functional Automation Testing	Test 4 Success, LLC.	2016
2	David Burns	Selenium 1.0 Testing Tools	Packt Publishing	2010

Web References

1. https://onlinecourses.nptel.ac.in/noc20_cs19/preview
2. https://www.youtube.com/watch?v=SxrtXHQ-rd0
3. https://www.guru99.com/introduction-to-selenium.html
4. https://medium.com/quick-code/top-tutorials-to-learn-selenium-for-beginners-4e1f301585
5. https://www.guru99.com/first-webdriver-script.html

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: M.Dhavapriya Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature:

ADVANCED LEARNER COURSE

Programme Code:		M.Sc CS	**Programme Title:**		Master of Science (Computer Science)	
Course Code:	-	**Course Title:**	User Interface Design - Figma		**Batch :**	2022-2024
Lecture Hrs./Week Or Practical Hrs./Week		1	**Total Hours**	30	**Semester:**	Any Semester

Course Objective

To ensure learners are exposed to describe the structure of user Interface, design process and learn how to organize the web systems and control.

Course Outcomes (CO)

On successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the Characteristics of Graphics Interface and its Principles.	K3
CO2	Understand the components of web systems and text boxes	K3
CO3	Design the standards and structures for Human computer interaction	K5
CO4	Demonstrate the Guidance of multimedia and Text boxes	K4,K5
CO5	Select, adapt and apply suitable interaction design approaches and techniques towards the design of an interactive product.	K5

Contents	Hrs
1. Working with Position, Size, Rotation, & Corner Radiusproperties 2. Working with ColorStyles	**3**
3. Usage ofMasks 4. Design and adapt for designs for Dark Mode with SelectionColors	**3**
5. Working withGradients 6. Designing Backgrounds and BlendingModes	**3**
7. Exploring Alignment and Tidy up properties 8. Working on union and cornerradius	**4**
9. Exploring ways to incorporate shadows and blur to yourdesign 10. Using Images and the Fill and various Strokeoptions	**4**
11. Playing with fonts onDesign 12. Designing responsive layout using Constraints and AutoLayout	**4**
13. Adding 3D Mockups and illustrations intodesign 14. DesigningIcons	**4**
15. Working with CSS code	**5**
Total Contact Hours	**30**

Pedagogy and Assessment Methods:
Direct Instruction, Flipped Class, Digital Presentation, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Everett N McKay	UI is Communication: How to Design Intuitive, User Centered Interfaces by Focusing on Effective Communication	Morgan Kaufmann, First Edition	2013

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS/ EDITION	YEAR OF PUBICATION
1	Jennifer Tidwell, Charles Brewer, Aynne Valencia	Designing Interfaces: Patterns for effective Interaction design	O'Reilly , Third Edition	2020
2	Wilbert O. Galitz	The Essential Guide to User Interface Design	Wiley, Third Edition	2007
3	Dan Saffer	Designing for Interaction	New Riders, Second Edition	2009

Web References

1. https://www.youtube.com/watch?v=g6rQFP9zCAM
2. https://www.udemy.com/course/learn-figma-user-interface-design-essentials-uiux-design/
3. https://learnux.io/course/figma
4. https://medium.com/quick-code/top-online-tutorials-to-learn-figma-for-ui-ux-design-4e9c6721a72d
5. https://rethmic.com/course/the-complete-figma-course-designing-mobile-web-app-ui-ux-0503-direct-free-download

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	**Name with Signature**	**CDC**	**COE**
Name: M.Dhavapriya Signature:	Name: Dr.M.Sakthi Signature:	Name: K. Srinivasan Signature:	Name: Dr.R.Manicka Chezian Signature: