SRI MEENAKSHI GOVT. ARTS COLLEGE FOR WOMEN (AUTONOMOUS) MADURAI – 625 002.

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc. COMPUTER SCIENCE

SYLLABUS TO BE INTRODUCED FROM THE ACADEMIC YEAR 2022 – 2024

(UNDER C.B.C.S)

SRI MEENAKSHI GOVERNMENT ARTS COLLEGE FOR WOMEN(A), MADURAI - 2

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

BRIEF INTRODUCTION

The PG and Research Department of Computer Science was established in 1993 with B. Sc Computer Science. In the academic year 2007-2008 B.Sc Computer Science (Shift II) was started, and introduced M.Sc Computer Science in 2017, M. Phil Computer Science and Ph.D. Computer Science during the academic year 2018 - 2019. The sanctioned strength is 60 (25 + 25) for under graduate Programmes and 20 for post graduate Programme. Full time and Part time Research Programmes are offered and it was approved by Madurai Kamaraj University, Madurai. The Department is functioning successfully with Eight regular staff members and Four guest lecturers.

One well-equipped connected Computer lab is installed with a variety of software in the latest trends in computing such as Dot Net, Java based packages, Design packages, R Tool, Python, Networking, Windows Programming, Linux Programming, and other programming languages.

We focus on the areas for research such as Big Data, Cloud Computing, Grid Computing, Data Mining and Warehousing, Digital Image Processing, Artificial Intelligence, Wireless Networks, Algorithms etc, Our Faculty members acted as Resource Persons, Chairpersons and Presented papers in many International / National level Conferences, Workshops, and Seminars and also published research papers in various reputed Journals.

COURSES OFFERED

- **B. Sc. Computer Science (Shift I & Shift II)**
- **M. Sc Computer Science (Shift I)**
- **M. Phil. Computer Science (Full Time)**
- **Ph. D Computer Science (Part Time and Full Time)**

VISION

"TO STRIVE, TO SEEK AN TO SUCCEED"

Learning Outcome

- Apply a broad understanding of the fundamental theories, concepts, and applications of Computer Science in their career.
- Analyze a multifaceted computing problem and to apply principles of computing and other relevant disciplines to identify solutions and compare alternative solutions to computing problems.
- Apply Computer Science theory and software development fundamentals to produce computing-based solutions.
- To attain an ability to use current techniques, skills, and tools necessary for computing practice.
- To affiliate in a wide range of careers and/or graduate studies in computer science or related fields with a zeal for lifelong learning.
- To communicate effectively, both orally and in writing and engage in collaborative teamwork.
- Recognize the social and ethical errands of a professional working in the discipline.

MISSION

The mission of the department is to impart computer education to the students in the rural area of Madurai district, so that they become enlightened and intelligent, and to improve the standards of their life, as well as to produce graduates who excel in research and service. We also aim to inculcate the attitudes and values for empowerment of women that will motivate them towards the continuous process of learning and leadership. We strive to educate ground-breaking skills and technology for the benefit of learners through incessant upgradation of curriculum.

Programme Outcomes for Master Programmes

PO 1: Computing Knowledge

To develop professionally competent citizens by applying the scientific knowledge of computer science with the ability to think clearly, rationally and creatively to support in evolving solutions to the social/public/scientific issues with responsible democratic participants.

PO 2: Critical Thinking

Ability and Willingness embark on new ventures, initiatives with critical thinking and desire for more continuous learning focusing on life skills.

PO 3: Design and Development of solutions

Design solutions for complex software problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental consideration.

PO 4: Communication

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO 5: Individual and Team Work

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Programme Specific Outcomes for M.Sc Computer Science

PSO 1 :

To produce knowledgeable and skilled human resources who are employable in IT and ITES (Information Technology Enabled Services) by applying scientific knowledge of Computer Science with the ability to create and design innovative methodologies to solve complex problems for the betterment of the society.

PSO 2:

To develop academically competent and professionally motivated personnel, equipped with objective, critical thinking, right moral and ethical values that compassionately foster the scientific temper with a sense of social responsibility.

PSO 3:

To create solid knowledge in computer science, including software engineering, programming and languages, operating system, data structure and algorithms, databases, network, etc.

PSO 4:

Ability to produce an ethical software engineer and/or researcher in the evolving disciplines of computer science and engineering and its allied application domains by employing soft and project management skills learnt through internships, project work and/or collaborative projects with industry.

PSO 5:

Through Digital Literacy, understand, assess and commit to professional and ethical principles, norms and responsibilities of the cyber world and the ability for work efficacy as a part of a team and engage effectively with diverse stakeholders.

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE
M.Sc COMPUTER SCIENCE

TITLE OF THE PAPERS AND DISTRIBUTION OF CREDITS & MARKS

SEMESTER–I

Course Type	Subject Code	Title of the Course	Hrs/ week	Credits	Exam Hrs	Int. Marks	Ext Marks	Total
CC-I	P22CS1	Advanced JAVA Programming	6	5	3	25	75	100
CC- II	P22CS2P	Lab 1: Advanced JAVA Programming	5	3	3	40	60	100
CC- III	P22CS3	Data Structures and Algorithms	6	5	3	25	75	100
CC-IV	P22CS4P	Lab 2: Data Structures and Algorithms	5	3	3	40	60	100
DSEC- I	P22DSS1A	1. Discrete Mathematical Structures	6	5	3	25	75	100
	P22DSS1B	2.Object Oriented Analysis and Design						
	P22DSS1C	3.Software Architecture						
SEC-I	P22SES1	Networking Protocols	2	2	3	25	75	100
		Total	30	23				600

SEMESTER–II

Course Type	Subject Code	Title of the Course	Hrs/ week	Credits	Exam Hrs	Int. Marks	Ext Marks	Total
CC-V	P22CS5	Python Programming	6	5	3	25	75	100
CC -VI	P22CS6P	Lab 3: Python Lab	5	3	3	40	60	100
CC - VII	P22CS7	Operating System Design Principles	6	5	3	25	75	100
CC-VIII	P22CS8P	Lab 4: Operating System	5	3	3	40	60	100
DSEC-II	P22DSS2A	1.Compiler Design	6	5	3	25	75	100
	P22DSS2B	2.DistributedComputing						
	P22DSS2C	3.Cloud Computing						
SEC-II	P22SES2	Network Security	2	2	3	25	75	100
		Total	30	23				600

SEMESTER–III

Course Type	Subject Code	Title of the Course	Hrs/ week	Credits	Exam Hrs	Int. Marks	Ext Marks	Total
CC-IX	P22CS9	Digital Image Processing	6	5	3	25	75	100
CC -X	P22CS10P	Lab 5: Image Processing	5	3	3	40	60	100
CC - XI	P22CS11	Soft Computing	6	5	3	25	75	100
CC-XII	P22CS12P	Lab 6: Soft Computing	5	3	3	40	60	100
DSEC-III	P22DSS3A	1. Internet of Things	6	4	3	25	75	100
	P22DSS3B	2. Wireless Sensor Networks						
	P22DSS3C	3.Mobile Computing						
NMEC-I	P22NMS1	Biometrics	2	2	3	25	75	100
		Total	30	22				600

SEMESTER–IV

Course Type	Subject Code	Title of the Course	Hrs/ week	Credits	Exam Hrs	Int. Marks	Ext Marks	Total
CC-XIII	P22CS13	Big Data Analytics	6	5	3	25	75	100
CC -XIV	P22CS14	Data Mining and Warehousing	6	5	3	25	75	100
CC - XV	P22CS15P	Lab 7: Data Analytics With R And MongoDB & Technical Documentation Lab	5	3	3	40	60	100
CC-XVI	P22CSPW	Project	8	5	3	80	20	100
DSEC- IV	P22DSS4A	1. Artificial Intelligence and Expert Systems	5	4	3	25	75	100
	P22DSS4B	2.Information Retrieval						
	P22DSS4C	3. Advanced Software Engineering						
		Total	30	22				500

DISTRIBUTION OF CREDITS & MARKS

PART	COURSES	Total No of Papers	HOURS	CREDIT	MARK
III	Core Course	15	83	61	1500
III	Core Project	1	8	5	100
III	Discipline Specific Elective Course	4	23	18	400
III	Non-Major Elective Course	1	2	2	100
III	Skill Enhancement Course	2	4	4	200
Total		**23**	**120**	**90**	**2300**

TOTAL CREDITS = 90 TOTAL MARKS = 2300

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc. COMPUTER SCIENCE

DISTRIBUTION OF CREDITS & MARKS

TOTAL CREDITS = 90 TOTAL MARKS = 2300

PART	COURSES	TOTAL NO OFCOURSES	HOURS	CREDIT	MARK
III	Core Course	15	83	61	1500
III	Core Project	1	8	5	100
III	Discipline Specific Elective Course	4	23	18	400
III	Non-Major Elective Course	1	2	2	100
III	Skill Enhancement Course	2	4	4	200
Total		**23**	**120**	**90**	**2300**

Core Papers : 15
Elective : 4
Non Major Elective : 1
Skilled Enhancement Course : 2
Core Project : 1

Mapping Score Matrix

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Mean Score of COs = Total of Value / Total No. of Pos & PSOs	Mean Overall Score of COs = Total of Mean Score / Total No. of COs

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc. COMPUTER SCIENCE

EVALUATION PATTERN FOR PG PROGRAMME

Theory Paper:

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Internal Evaluation:

Test Average of Best Two Internals Model Exam	 10 10
Quiz/Assignment/Seminar	5
Total	25

INTERNAL EVALUATION : 25
EXTERNAL EVALUATION : 75
TOTAL : 100

INTERNAL : NO MINIMUM
EXTERNAL : 45% OF 75 = 34
INTERNAL & EXTERNAL : 50%

Question paper pattern for External Examination:

Section A	5 X 5 = 25 (Internal Choice)	25
Section B	5 X10 = 50 (Internal Choice)	50
	Total	75

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EVALUATION PATTERN FOR PG PROGRAMME

Practical Paper:

Internal Evaluation:

Record	10
Viva-Voce	10
Internal Practical Exam	10
Model Exam	10
Total	40

INTERNAL EVALUATION - 40
EXTERNAL EVALUATION - 60
TOTAL -100

INTERNAL : NO MINIMUM
EXTERNAL : 45% OF 60 = 27
INTERNAL& EXTERNAL TOGETHER : 50%

Project Paper:

Internal	80
External - Viva-Voce	20
Total	100

Mark Split-up:

Internal	**Internal Examiner**	**External Examiner**	**Total**
Project Report	40	40	80
External	**Internal Examiner**	**External Examiner**	**Total (Avg)**
Viva-Voce	-	20	20
		Total	100

Programme : M. Sc Computer Science **Part III : Core**

Semester : I **Hours : 6 P/W 90Hrs P/S**

Sub. Code : P22CS1 **Credits : 5**

TITLE OF THE PAPER: ADVANCED JAVA PROGRAMMING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To enrich knowledge on Applet programming, Jscript, JDBC,RMI and servlet concepts.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Define the Applet fundamentals, GUI applications and AWT components.	**9**
UNIT 2	**CO2:** Discuss about Networking in java and Java database connectivity.	**22**
UNIT 3	**CO3:** What do you mean by Servlets and define the purpose.	**21**
UNIT 4	**CO4:** Outline the concepts JSP and HTTP.	**25**
UNIT 5	**CO5:** Develop the Web programming on client side and serverside.	**13**

Programme : M. Sc Computer Science	**Part III : Core**
Semester : I	**Hours : 6 P/W 90Hrs P/S**
Sub. Code : P22CS1	**Credits : 5**

TITLE OF THE PAPER: ADVANCED JAVA PROGRAMMING

UNIT I : Applets: Applet Fundamental-Applet Class-Applet Life Cycle-Steps For Developing An Applet Program-Passing Values Through Parameters-Graphics In An Applet Event Handling.

UNIT II : **GUI Applications:** Graphical User Interface-Creating Windows-Dialog Boxes Layout Managers-Awt Component Classes- Swing Component Classes-Event Handling AWT graphics classes.

UNIT III: Networking: Basics Of Networking-Networking In Java-Socket Programming Using Tcp/Ip-Socket Programming Using UDP-Url And Inet Address Classes. **Java Database Connectivity:** Types Of Drivers-Jdbc Architecture-Jdbc Classes And Interfaces-Basic Steps In Developing Jdbc Applications-Creating A New Database And Table With JDBC.

UNIT IV : Servlets: Basics-Advantages Over Applets-Servlet Alternatives-Servlet Strengths Servlet Architecture-Servlet Life Cycle-Generic Servlet-Http Servlet-Passing Parameters To Servlet-Server-Side Include-Cookies-Filters-Security Issues.

UNIT V: Java Server Pages: Overview-Jsp And Http-Jsp Engines- Working Of Jsp-Anatomy Of A Jsp Page-Jsp Syntax-Creating A Simple Jsp Page-Components Of Java Server Pages Implicit Objects-Client Side Validation Using Java Script-Handling Request And Response.

TEXT BOOK(S):

1. Java Programming for Core and Advanced Learners - Sagayaraj, Denis , Karthik and Gajalakshmi , University Press, 2018 .
2. Unit I : Chapters 12
   Unit II : Chapters 13 and 14
   Unit III : Chapter 15 and 16
   Unit IV : Chapter 19
   Unit V : Chapters 20,21.3 and 22.2

REFERENCE BOOKS:

1. Java The Complete Reference - Herbert Schildt, McGraw Hill Education, 10th Edition, New York, 2017

2. Advanced Java Programming – Uttam K.Roy , Oxford University Press, 2017 3. Core and Advanced Java, Black Book – Dreamtech Press, 2017

Programme : M. Sc Computer Science **Part III : Core**

Semester : I **Hours : 6 P/W 90Hrs P/S**

Sub. Code : P22CS1 **Credits : 5**

UNITS	TOPIC	LECTURE	MODE OF
	UNIT 1		
1.	Applets : Applet Fundamentals , Applet Class	2	Lecture
2.	Applet Life Cycle, Steps for developing an Applet	2	Lecture
3.	Passing values through Parameters	2	Lecture
4.	Graphics in an Applet , Event handling .	1	Lecture
5.	Discussion	2	Group
	UNIT 11		
6.	GUI Applications: Graphical User Interface	1	Lecture
7.	Creating Windows	1	Lecture
8.	Dialog Boxes	2	Lecture
9.	Layout Managers	2	Lecture
10.	AWT Component classes	2	Group
11.	Swing Component classes	2	Peer
12	Event handling	2	Lecture
13.	Other AWT Components	2	Tutorial
14.	AWT graphics classes	2	Lecture
15.	Other Swing controls	2	Lecture
16.	Exercises	2	Lecture
17.	Overview	2	ICT (NPTEL
	UNIT III		
18.	Networking: Basics , Networking in Java	1	Lecture
19.	Socket Programming using TCP/IP,	2	Lecture
20.	Socket Programming using UDP	2	Lecture
21.	URL and Inet Address Classes	1	Tutorial
22.	Java Database Connectivity: Types of drivers	2	Lecture
23.	JDBC Architecture	2	Tutorial
24.	JDBC Classes and Interfaces	2	Lecture
25.	Basic steps in developing JDBC applications	1	Lecture
26.	Creating a new database and table with JDBC	2	ICT (NPTEL
27.	Working with Database metadata	2	Lecture

28.	Exercise Problems	2	Lecture
29.	Overview of Unit II	2	Group
UNIT IV			
30.	Servlets : Basics	2	Lecture
31.	Advantages of servlet	2	Lecture
32.	Servlet alternatives , strengths ,Architecture	2	Lecture
33.	Servlet Life Cycle , Generic Servlet	2	Tutorial
34.	HTTP Servlet	2	Lecture
35.	Passing parameters	2	Lecture
36.	Retrieving parameters	2	Tutorial
37.	server side include	3	Lecture
38.	Cookies	2	Lecture
39.	Filters Implementing Interfaces	2	Lecture
40.	Exercise Problems	2	ICT (NPTEL
41.	Applications	2	Group
UNIT V			
42.	Java Server Pages **:** Overview , JSP and HTTP	1	Lecture
43.	JSP Engines, Working of JSP , Anatomy of JSP	2	Lecture
44.	JSP Syntax, Exercise Problems	2	Lecture
45.	Creating simple JSP page	2	Peer
46.	Components of JSP, Implicit Objects	2	Lecture
47.	Client Side Validation Using Java Script, Handling	2	Lecture
48.	Exercise problems and Applications	2	Peer

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	4	3	4	3	3	3	3	3.20
CO2	4	3	3	4	3	3	3	4	3	3	3.33
CO3	3	2	3	3	3	3	3	3	4	3	3.00
CO4	3	2	4	4	3	3	3	3	3	4	3.20
CO5	3	3	3	3	3	3	2	4	4	3	3.10
Mean Overall Score											3.17

Result: The Score for this Course is 3.17 (High Relationship)

COURSE DESIGNER: **Dr. A.PREMA**

Assistant Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : Core**

Semester : I | **Hours : 5 P/W 75 Hrs P/S**

Sub. Code : P22CS2P | **Credits : 3**

TITLE OF THE PAPER : Lab 1: ADVANCED JAVA PROGRAMMING

1. Program to display life cycle of an applet
2. Program to display digital clock using applet
3. Program to display different graphical shapes in applet
4. Program to display graphical bar chart by passing parameters in applet
5. Write an Applet which will play two sound notes in a sequence continuously use the play () methods available in the applet class and the methods in the Audio clip interface.
6. Program to find factorial value of N using AWT high level event handling
7. Program to illustrate window closing using AWT low level event handling
8. Program to illustrate TCP based network communication
9. Program to illustrate UDP based network communication
10. Program to find sum of digits using RMI
11. Program to find length of the given string using RMI
12. Write a program in Java to implement a Client/Server application using RMI. 13. Program using HTML/Java script to find length of the given string
14. Program using HTML/Java script to find biggest element of an array 15. Program to compute factorial value of N using GenericServlet
16. Program to compute factorial value of N using HTTPServlet
17. Use JDBC connectivity and create Table, insert and update data.
18. Write a program in Java to create a Cookie and set the expiry time of the same. 19. Write a program in Java to create Servlet to count the number of visitors to a web page. 20. Write a program in Java to create a form and validate a password using Servlet. 21. Develop a Java Bean to demonstrate the use of the same.
22. Write a program in Java to convert an image in RGB to a Grayscale image. 23. Develop Chat Server using Java.

Note: The above are sample problems; Instructor can add more exercises based on their requirements and the current technology

Programme : M. Sc Computer Science | **Part III : Core**

Semester : I | **Hours : 6 P/W 90Hrs P/S**

Sub. Code : P22CS3 | **Credits : 5**

TITLE OF THE PAPER: DATA STRUCTURES AND ALGORITHMS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To introduce advanced data structures and problem solving methods and enable the students to apply, demonstrate and implement the techniques learnt in solving complex problems.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Explain the dynamic structures – trees and graphs and Outline the application of these structures in finding simplified solutions	**16**
UNIT 2	**CO2:** Relate and Recall hash and priority queues and its application	**13**
UNIT 3	**CO3:** Classify binary search tree, balanced tree and multi-way indexed tree	**12**
UNIT 4	**CO4:** Explain dynamic programming and traversal techniques of trees and graphs	**16**
UNIT 5	**CO5:** Apply and solve problems using backtracking and branch-and-bound technique.	**18**

Programme : M. Sc Computer Science | **Part III : Core**

Semester : I | **Hours : 6 P/W 90Hrs P/S**

Sub. Code : P22CS3 | **Credits : 5**

TITLE OF THE PAPER: DATA STRUCTURES AND ALGORITHMS

UNIT I : Trees: Heaps – Binary Search Trees – Selection Trees – Forests – Representation of Disjoint Sets – Counting Binary Trees.
Graphs: The Graph Abstract Data type – Elementary Graph Operations – Minimum Cost Spanning Trees – Shortest Paths and Transitive Closure – Activity Networks.

UNIT II : Hashing: Introduction – Static hashing – Dynamic hashing – Bloom filters. Priority Queues: Single and Double ended priority queues – Leftist Trees – Binomial Heaps – Fibonacci Heaps – Pairing Heaps – Symmetric Min-Max Heaps – Interval Heaps.

UNIT III : Efficient binary search trees: Optimal Binary Search Trees – AVL Trees – Red Black Trees – Splay Trees.
Multiway Search Trees**:** m-way Search Trees – B-Trees – B^{+}-Trees.

UNIT IV : Dynamic Programming: The General Method – Multistage graphs – All-pairs shortest paths – Single-source shortest paths – Optimal binary search trees – string editing – 0/1 knapsack – reliability design – The Travelling Salesperson problem – flow shop scheduling. Basic Traversal and Search Techniques**:** Techniques for Binary Trees – Techniques for Graphs – Connected Components and Spanning Trees – Biconnected Components and DFS.

UNIT V: Backtracking: The General Method – The 8-Queens Problem – Sum of subsets – Graph coloring – Hamiltonian cycles – Knapsack problem.
Branch and Bound**:** The Method – 0/1 Knapsack problem – Traveling Salesperson(*) – Efficiency considerations.

TEXT BOOK(S):

1. Fundamentals of Data Structures in C++ – Ellis Horowitz, SartajSahni, Dinesh MehtUniversity Press(India) Private Limited, Second Edition, Reprinted 2017.

   Unit I : Chapter 5.6 – 5.11 and 6
   Unit II : Chapter 8 and 9
   Unit III : Chapter 10 and 11

2. Fundamentals of Computer Algorithms - Ellis Horowitz, SartajSahni, SanguthevarRajasekaran – University Press(India) Private Limited, Second Edition, Reprinted 2017.

   Unit IV : Chapter 5 and 6
   Unit V : Chapter 7 and 8

REFERENCE BOOK(S):

1. Data Structures and Algorithms, Alfred V.Aho, John E.Hopcraft and Jeffrey D.Ullman, Pearson Education, Fourteenth Impression, 2013.
2. Classic Data Structures in C++, Timothy A. Budd - Addison Wesley Publishing Co., First Edition.,1994.
3. Data Structure and Algorithm Analysis in C, Mark Allen Weiss, Second Edition, Addison Wesley Publishing Company, 1997.
4. Computer Algorithms – Introduction to Design & Analysis, Sara Baase and Allen Van Gelder, Third Edition, Pearson Education, New Delhi, 2000.
5. Data Structures, A. Chitra, P. T. Rajan, Vijay Nicol Imprints Pvt Ltd, Mc Graw Hill Education of India Pvt. Ltd., 2006.
6. Design and Analysis of Algorithms – S.Sridhar, Oxford University Press, 2015.

Programme : M. Sc Computer Science **Part III : Core**

Semester : I **Hours : 6 P/W 90Hrs P/S**

Sub. Code : P22CS3 **Credits : 5**

TITLE OF THE PAPER: DATA STRUCTURES AND ALGORITHMS

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT I		
1.	Describe static and dynamic data structures and motivate by highlighting the vast applications of data structures in computing in various discipline	2	Lecture
2.	Tutorial on implementing dynamic structures – linked list and binary tree	2	Tutorial
3.	Describe Heaps and Selection tree. Compare heaps and selection tree	2	Lecture
4.	Describe tree, forest and binary search tree	2	Lecture
5.	Discuss application of trees – Disjoint set and counting binary tree	2	Lecture
6.	Define graph and its terminologies. Describe graph representation	2	Lecture
7.	Describe the application of graphs. Explain minimum cost spanning tree	2	Lecture
8.	Describe shortest path problem and its application. Explain about single source and all pairs shortest path	2	Lecture
9.	Discuss transitive closure and activity network	2	Lecture
10.	Exercise problems	1	Peer teaching
	UNIT II		
11.	Discuss the role of hashing in improving performance and the relative merits and demerits of applying hashing	2	Lecture
12.	Static and dynamic hashing	2	Lecture
13.	Bloom filters	2	Lecture
14.	Single and double ended priority queue	2	Lecture

15.	Binomial and Fibonacci heap	3	Lecture
16.	Min-max and Interval heap	2	Lecture
17.	Analyse the complexity, efficiency and advantages of different methods	2	Group discussion

18.	Exercise problems	2	Group discussion
UNIT III			
19.	Discuss different tree forms and optimal binary search tree	2	Lecture
20.	AVL tree	2	Lecture
21.	Red-black tree	2	Lecture
22.	Splay tree	2	Lecture
23.	Multi-way search, B-Tree	2	Lecture
24.	B+-Tree	3	Lecture
25.	Exercise problems	2	Group discussion
UNIT IV			
26.	Explain dynamic programming. Describe the problems that could be best solved using dynamic programming	2	Lecture
27.	Multi-stage graph	1	Lecture
28.	Single source shortest path	2	Lecture
29.	All pairs shortest path	2	Lecture
30.	Knap sack problem definition and implementation	2	Lecture
31.	TSP problem definition and implementation	2	Lecture
32.	Flow-shop scheduling	2	Lecture
33.	Compare and contrast Binary tree and graphs in the context of organisation and applications	1	Group Discussion
34.	Concept of connectivity and connected components	1	Lecture
35.	Biconnected components	1	Lecture
36.	DFS with dynamic programming	1	Group Discussion

37.	Projects that apply graph model in solving problem	2	Group discussio n and Peer teaching
UNIT V			
38.	Describe backtracking technique	2	Lecture
39.	Discuss the applications of backtracking technique	1	Lecture
40.	Describe 8-Queens problem and implement the solution	2	Lecture
41.	Describe Sum of subset and implement the solution	2	Lecture
42.	Discuss Graph coloring problem and implementation	2	Lecture
43.	Hamiltonian cycle	1	Lecture
44.	Knap sack problem	2	Lecture
45.	Describe branch and bound technique	2	Lecture
46.	Define objective function and limits	1	Tutorial
47.	Knap sack problem solving using branch and bound technique	1	ICT resources
48.	Travelling salesperson problem	1	ICT resouces
49.	Analyse the efficiency of branch and bound technique	1	Group discussion
50.	Exercise problems	2	Group discussion, Peer teaching

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PO1	PO2	PO3	PO4	PO5	
CO1	3	4	3	3	2	3	4	4	3	3	3.20
CO2	4	4	4	3	2	4	4	4	3	3	3.50
CO3	4	4	4	3	2	4	3	4	3	3	3.4
CO4	4	4	4	3	2	4	4	4	3	3	3.6
CO5	4	4	4	3	2	3	3	3	4	3	3.4
Mean Overall Score											3.42

Result: The Score for this Course is 3.42 (High Relationship)

COURSE DESIGNER: **Mrs. A S. BABY RANI**
Associate Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : Core**
Semester : I | **Hours : 5 P/W 75 Hrs P/S**
Sub. Code : P22CS4P | **Credits : 3**

TITLE OF THE PAPER : Lab 2: DATA STRUCTURES AND ALGORITHMS

1. Implementation of Stack
    a) Using Array
    b) Using Linked List
2. Implementation of Queue
    a) Using Array
    b) Using Linked List
3. Implementation of Heap Tree.
4. Implementation of Tree Traversal.
5. Implementation of BFS.
6. Implementation of DFS.
7. Implementation of Merge Sort using Divide and Conquer.
8. Implementation of Knapsack Problem using Dynamic programming.
9. Implementation of Warshall's Algorithm using Dynamic Programming.
10. Implementation of Floyd's Algorithm using Dynamic Programming.
11. Implementation of Dijkstra's Algorithm using Greedy Technique.
12. Implementation of Prim's Algorithm using Greedy Technique.
13. Implementation of n-queens Problem using Backtracking.
14. Implementation of Assignment Problem using Branch and bound.

Note: The above are sample problems; Instructor can add more exercises on on their requirements and the current technology.

Programme : M. Sc Computer Science | **Part III : DSEC-I**

Semester : I | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS1A | **Credits : 5**

TITLE OF THE PAPER: DISCRETE MATHEMATICAL STRUCTURES

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To impart the knowledge on the basic concepts of mathematical logic, Inference theory, functions, relations, Finite Automata and Graph Theory, which are base of major research area of computer Science like Data Analytics, Mining, Natural Language processing and Artificial Intelligence.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:**Impart knowledge on mathematical logic and theory of inference	**18**
UNIT 2	**CO2:** Understand the concept of sets, relations, functions and mapping.	**18**
UNIT 3	**CO3:** Understand the concepts of Automata Theory, Regular expressions, NFA and Turing Machine	**19**
UNIT 4	**CO4:** Understand the concept of Probability theory.	**18**
UNIT 5	**CO5:** Understand the graph theory concepts and applications in computer science.	**17**

Programme : M. Sc Computer Science | **Part III : DSEC-I**

Semester : I | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS1A | **Credits : 5**

TITLE OF THE PAPER: DISCRETE MATHEMATICAL STRUCTURES

UNIT – I: MATHEMATICAL LOGIC AND INFERENCE : Statements and Notations – Connectives – Negation – Conjunction – Disjunction – Statement Formulas and Truth Tables – Conditional and Biconditional – Well Formed Formulas – Tautology – Equivalence of formulas – Duality of Law –Tautological Implications.
The theory of inference for statement calculus – Validity using truth table – rules of inference – consistency of premises and indirect method of proof.

UNIT – II: RELATIONS AND FUNCTIONS : Cartesian product of Two Sets – Relations – Representation of Relation – Operations on relation – Equivalence Relation. Function and Operator – One to one, onto functions – Special Type of Functions.

UNIT – III: AUTOMATA THEORY : Introduction – Alphabet, Words, Free semi group, Languages – Regular Expressions, Regular Languages – Finite State Automata – Grammars – Finite state Machine – Turing machine.

UNIT – IV: PROBABLITY THEORY : Introduction – Sample space and Event – Finite Probability Space – Conditional Probability – Independent Events.

UNIT – V: GRAPH THEORY: Introduction – Data structures – Graph and multigraph – Sub graph, Isomorphic and homeomorphism graphs – Path, connectivity – Bridges of Konigsberg, Traceable multigraph.

TEXT BOOKS:

1. Discrete mathematical structures with applications to computer science , J.P.Trembly, R.Manohar, Tata McGraw Hill Publications.

2. Discrete mathematics, Dr. M.K. Venkatraman, Dr. N. Sridhran, N.Charndrasekaran, The National Publishing Company, 2012.

3. Discrete mathematics, Schaum's outlines, 2nd Edition., Seymour Lipschutz, Mark Lipson, Tata McGraw Hill Edition, 7th reprint.

REFERENCE BOOKS:

1. Introduction to automata theory, languages and computation, John E Hopcroft, Jeffery D. Ullman, Narosa Publishing House.

2. Introduction to automata theory, languages and computation, John E Hopcroft, Jeffery D. Ullman, Rajeev Motwani, Narosa Publishing House.

3. Graph Theory with applications to engineering and computer science, Narsingh Deo, Prentice Hall of India.

4. Graph theory, Frank Harary, Narosa Publishing House

Programme : M. Sc Computer Science | **Part III : DSEC-I**

Semester : I | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS1A | **Credits : 5**

TITLE OF THE PAPER: DISCRETE MATHEMATICAL STRUCTURES

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT I		
1.	Statements and Notations: Introduction	1	Lecture
2.	Connectives: Negation, conjunction, disjunction, statement formulas & truth tables	2	Lecture
3.	Conditional and bi-conditional, well-formed formula	3	Lecture
4.	Tautologies, equivalence of formulas	2	Lecture
5.	Solving additional problems	2	Tutorial
6.	Duality law, tautological implications	2	Lecture
7.	The theory of inference for statement calculus Validity using truth table and Associated Problems	2	Lecture
8.	Rules of inference Consistency of premises and indirect method of proof Associated Problems	2	Lecture
9.	Summary of UNIT I	2	Peer teaching
	UNIT II		
10.	Relations and functions - Introduction	1	Lecture
11.	Cartesian product of Two Sets	2	Lecture
12.	Relation	2	Lecture
13.	Representation of Relation	2	Tutorial
14.	Operations on relation	2	Lecture

15.	Solving problems on Relations and its operations	2	Group Discussion
16.	Equivalence Relation Function and Operator - Introduction	2	Lecture
17.	Solving problems on Equivalence relations	2	Lecture
18.	One to one, onto functions Special Type of Functions Problems on functions	2	Tutorial
19.	Overview of Unit II	1	Peer Teaching
UNIT III			
20.	Introduction – Automata	2	Lecture
21.	Alphabet, Words, Free semi group, Languages	2	Lecture
22.	Regular Expressions	2	ICT (NPTEL Notes)
23.	Solving problems on regular expressions	2	Tutorial
24.	Regular Languages	1	Lecture
25.	Finite State Automata	2	Lecture
26.	Discussion on Finite automata with exercise problems	1	Tutorial
27.	Grammars and associated problems	2	Lecture
28.	Finite state Machine & solving Exercise problems	2	Tutorial
29.	Turing machine & solving exercise problem	2	Tutorial
30.	Summary of UNIT III	1	Lecture
UNIT IV			
31.	Introduction	1	Lecture
32.	Sample space and Event	2	Lecture
33.	Finite Probability Space	2	Lecture
34.	Solving problems on Sample space, event	2	Tutorial

35.	Solving problems on finite probability space and its real time applications	2	Lecture
36.	Conditional Probability	2	Lecture
37.	Solving problems on conditional probability	2	Tutorial
38.	Independent Events	2	Lecture
39.	Solving problems on independent events Real time applications using independent events	2	Lecture
40.	Summary of UNIT IV	1	Lecture
UNIT V			
41.	Introduction on Graph theory	2	Lecture
42.	Data structures , Graph and multigraph	3	Lecture
43.	Sub graph, Isomorphic and homeomorphism graphs	2	Lecture
44.	Demonstration of exercise problems	3	Lecture
45.	Path, connectivity and solving exercise problems	3	Tutorial
46.	Bridges of Konigsberg, Traceable multigraph	2	ICT (NPTEL Video)
47.	Summary of UNIT V	2	Peer Teaching

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO 5	
CO1	3	4	3	3	2	3	4	4	3	4	3.30
CO2	4	4	4	3	2	4	4	4	3	4	3.60
CO3	4	4	4	3	2	4	3	4	3	3	3.4
CO4	4	4	4	3	2	4	4	4	3	3	3.6
CO5	4	4	4	3	2	3	3	3	4	4	3.5
Mean Overall Score											3.48

Result: The Score for this Course is 3.48 (High Relationship)

COURSE DESIGNER: **Mrs. G.SUDHA**
Assistant Professor / Department of Computer Science.

Programme : M. Sc Computer Science **Part III : DSEC-I**

Semester : I **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS1B **Credits : 5**

TITLE OF THE PAPER: OBJECT ORIENTED ANALYSIS AND DESIGN

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To impart the knowledge in Object Oriented techniques, methodologies, tools and importance of UML based Software Development

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Define the basics of Object Oriented concepts	**10**
UNIT 2	**CO2:** Show the functioning methodologies provided by Booch and Jacobson; Introduction on unified approach.	**14**
UNIT 3	**CO3:**Illustration of UML diagrams applicable to various phases of software development.	**22**
UNIT 4	**CO4:** Demonstrate on Relationship between various objects in the application and various ways of their reorientations	**22**
UNIT 5	**CO5:** Utilize knowledge on packaging classes, distributing them among layers. Introducing the object-oriented databases.	**22**

Programme : M. Sc Computer Science | **Part III : DSEC-I**

Semester : I | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS1B | **Credits : 5**

TITLE OF THE PAPER: OBJECT ORIENTED ANALYSIS AND DESIGN

UNIT - I : Introduction – Two Orthogonal views – object oriented Systems development Methodology – Object orientation – unified approach – Object Basics – object oriented philosophy – objects – classes – attributes – behavior and methods – Message passing - Encapsulation and information hiding – hierarchy – polymorphism – object relationship and associations – aggregation – a case study – advanced topics.

UNIT – II : Object oriented system development life cycle (SDLC) – development process – building high quality software – use-case driven approach – reusability –Object oriented methodologies – introduction – Booch methodology – Jacobson methodologies – patterns – frame works – unified approach.

UNIT – III : Unified modeling language – introduction – static and dynamic models – modeling – unified modeling language - UML diagrams – UML class diagrams – Use-case diagram – UML dynamic modeling- model management –OOA process – introduction – difficulty in analysis - business object analysis – use-case driven object oriented analysis – business processing modeling – use-case model – developing effective documentation.

UNIT – IV : Object analysis – classification – common class patterns approach – use-case driven approach – CRC – naming classes – object relationships – associations – Super-Sub class relationships – aggregation – class responsibility – object responsibility - Object oriented design process and design axioms – introduction – design process – design axioms- design patterns.

UNIT – V : Designing classes – introduction - object oriented design philosophy – UML object constraint – designing classes – class visibility – defining attributes – designing methods and protocols – Packages and managing classes – Access layer – Object storage and object interoperability – introduction – object store and persistence – Database management systems – database organization and access control – distributed databases.

TEXT BOOK(S):

1. Object Oriented Systems Development – Ali Bahrami – Irwin/McGraw Hill Publications – 1999. (Chapters 1 to 11)

REFERENCE BOOK(S):

1.Object Oriented Analysis and Desing by Grady Booch

Programme : M. Sc Computer Science **Part III : DSEC-I**

Semester : I **Hours : 6 P/W 90 Hrs P/S**

Sub. Code :P22DSS1B **Credits : 5**

TITLE OF THE PAPER: OBJECT ORIENTED ANALYSIS AND DESIGN

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT I		
1.	Introduction: Two Orthogonal views, object-oriented Systems development Methodology, Object orientation	2	Lecture
2.	Unified approach, Object Basics, object-oriented philosophy, objects	2	Lecture
3.	Classes, attributes,behavior and methods	2	Lecture
4.	Message passing, Encapsulation and information hiding, hierarchy and polymorphism	2	Lecture
5.	object relationship and associations, aggregation with case studies.	2	Tutorial
	UNIT II		
6.	Object oriented system development life cycle (SDLC)	2	Lecture
7.	Development process in SDLC	1	Lecture
8.	Building high quality software – use-case driven approach	2	Lecture
9.	Reusability	1	Group Discussion
10.	Object oriented methodologies	1	Lecture
11.	Booch methodology	2	Lecture
12.	Jacobson methodologies	1	Lecture
13.	Patterns, Frameworks	2	Lecture

14.	Unified approach	1	Lecture
15.	Overview of Unit II	1	Peer Teaching
UNIT III			
16.	Unified modeling language :An introduction	1	Lecture
17.	Static and dynamic models – modeling	2	Lecture
18.	Unified modeling language - UML diagrams	2	Lecture
19.	Class diagrams – Use-case diagram	2	Tutorial
20.	Constructing a use case diagram for a sample application	2	Group Discussion
21.	UML dynamic modeling	2	Lecture
22.	Constructing dynamic UML diagrams for sample transactions - activity, sequence and collaboration.	2	Tutorial
23.	Model management	2	Lecture
24.	Object Oriented Analysis and its practical difficulty	1	Lecture
25.	Business object analysis, use-case driven object oriented analysis	2	Lecture
26.	Business processing modeling	1	Lecture
27.	Use-case model	1	Lecture
28.	Developing effective documentation	1	Lecture
29.	Overview of UNIT III	1	Peer Teaching
UNIT IV			
30.	Object analysis: Introduction	1	Lecture
31.	Classification theory with real time samples	2	Lecture
32.	Common class patterns approach	2	Lecture
33.	Use-case driven approach	1	Tutorial

34.	Solving exercise problems on classification	2	Lecture
35.	CRC – naming classes	2	Lecture
36.	Object relationships:associations, Super-Sub class relationships and aggregation	2	Tutorial
37.	Solving problems on exercises based on object relationship	2	Lecture
38.	Class responsibility and object responsibility	2	Lecture
39.	Object oriented design process	1	Lecture
40.	Object oriented design axioms	2	Lecture
41.	Design patterns and sample examples	2	Lecture
42.	Overview of UNIT IV	1	Group Discussion
UNIT V			
43.	Introduction to designing the classes and philosophy	2	Lecture
44.	UML object constraint	1	Lecture
45.	Designing classes, class visibility	1	Lecture
46.	Solving exercise problems on classes design , visibility	1	Tutorial
47.	Defining attributes, designing methods and protocols	2	Lecture
48.	Packages and managing classes	2	Lecture
49.	Access layer	1	Lecture
50.	Demonstrating Sample objects and its access layer	2	Demonstration
51.	Object storage and object interoperability	2	Lecture
52.	Object store and persistence	2	Lecture
53.	Database management systems	1	Lecture
54.	Database organization and access control	2	Lecture

55.	Distributed databases.	2	ICT (NPTEL notes)
56.	Summary of UNIT V	1	Peer Teaching

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO 5	
CO1	3	4	3	3	3	3	4	4	3	4	3.40
CO2	4	4	4	3	3	4	4	4	3	3	3.60
CO3	4	4	4	3	3	4	3	4	3	3	3.5
CO4	4	4	4	3	3	4	4	4	3	3	3.7
CO5	4	4	4	3	3	3	3	3	4	4	3.7
Mean Overall Score											3.58

Result: The Score for this Course is 3.58 (High Relationship)

COURSE DESIGNER: **Mrs. G.SUDHA**
Assistant Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : DSEC-I**

Semester : I | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code :P22DSS1C | **Credits : 5**

TITLE OF THE PAPER: SOFTWARE ARCHITECTURE

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To enrich the knowledge about creating, designing, analyzing and reusing architecture.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Define the Software Architecture and Software Architecture Reference Models.	**18**
UNIT 2	**CO2:** List the Functionalities and Create a New Software Architectural Patterns.	**20**
UNIT 3	**CO3:** Explain the Different Life Cycle and Create a Skeleton System.	**20**
UNIT 4	**CO4:** Experiment the Software Architecture with Different Analysis Method.	**15**
UNIT 5	**CO5:** Model the Reusability of Software architectures with Different Case Studies.	**17**

Programme : M. Sc Computer Science | **Part III : DSEC-I**

Semester : I | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code :P22DSS1C | **Credits : 5**

TITLE OF THE PAPER: SOFTWARE ARCHITECTURE

UNIT I: Compilers and Translators-Why Do We Need Translators?-The Structure of A Compiler- Lexical Analysis-Syntax Analysis-Intermediate Code Generation-Optimization Code Generation-Book Keeping-Error Handling-Compiler-Writing Tools-Getting started.

UNIT II: The role of the lexical analyzer-Simple approach to design of a lexical analyzer Regular Expressions- Finite Automata-From regular expression to finite automata-Minimizing the number of states of a DFA-A language for specifying lexical analyzer-Implementing a lexical analyzer.

UNIT III: The Syntactic Specification of Programming Languages- Context free grammars - Derivation and Parse Trees – Parsers-Shift-reduce Parsing-Operator-precedence parsing-Top down parsing-Predictive Parsers.

UNIT IV: LR parsers-The canonical collection of LR(0) items-constructing SLR parsing tables - constructing canonical LR parsing tables-constructing SLR parsing tables-constructing LALR parsing tables.
Syntax directed translation schemes - Implementation of syntax directed schemes-Intermediate Code-Parse Tree and Syntax Trees -Three Address code, quadruples, and triples-Translation of assignment statements.

UNIT V: The contents of a symbol tables-Data structure for a symbol table-Representing Scope information. Code Optimization -The principal sources of optimization-Loop optimization -The DAG representation of basic blocks-Peephole Optimization.

TEXT BOOK(S):

1. Principles of Compiler Design, AlfredV.Aho and Jeffrey D.Ullman.25th Reprint, 2002.
   UNIT I : Chapter 1
   UNIT II : Chapter 3(Except 3.9)
   UNIT III : Chapter 4 (4.1,4.2),5
   UNIT IV : Chapter 6(6.1 – 6.5), 7(7.1 – 7.7)
   UNIT V : Chapter 9,12(12.1,12.2,12.3), 15.7

REFERENCE BOOK(S):

1. Compiler Design in C ,Allen I. Holub Prentice Hall of India, 2003.
2. Crafting a compiler with C ,C. N. Fischer and R. J. LeBlanc, Benjamin cummings, 2003. 3. Introduction to Compiler Techniques, J.P. Bennet, Second Edition, Tata McGraw Hill,2003.

Programme : M. Sc Computer Science | **Part III : DSEC-I**

Semester : I | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code :P22DSS1C | **Credits : 5**

TITLE OF THE PAPER: SOFTWARE ARCHITECTURE

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I			
1.	Visualizing the need of Software Architecture	2	Lecture
2.	Role of Software Processes	2	Lecture
3.	Discussing about Architecture Business Cycle with real time examples	2	Lecture
4.	How to build a Good Architecture? What is Software Architecture?	2	Lecture
5.	Discussing about the Available Software Architectures	1	Group Discussion
6.	Architectural Patterns, Reference Models and Reference Architectures	2	Lecture
7.	Importance of Software Architecture	2	Lecture
8.	Architectural Structures and Views	2	Lecture
9.	Case study in utilizing Architectural Structures	2	Peer Teaching
10.	Overview of Unit I	1	ICT (NPTEL Videos)
UNIT II			
11.	Introduction on creating an Architecture	2	Lecture
12.	Different Functionalities of Architecture	2	Lecture
13.	Software Architecture Quality Attributes	2	Lecture
14.	System Quality Attributes	1	Lecture
15.	Case study on Quality Attribute Scenarios in Practice	1	Group Discussion

16.	Other Available System Quality Attributes	2	Peer Teaching
17.	Discussion on Business Qualities and Architecture Qualities	3	Lecture
18.	Tactics for Achieving the Good Quality	1	Lecture
19.	How to Relate the Tactics to Architectural Patterns	2	Lecture
20.	Describe different Architectural patterns and styles	2	Lecture
21.	A case study with high availability in designing	1	Lecture
22.	Overview of Unit II	1	ICT (NPTEL Videos)
UNIT III			
23.	Life Cycle of the Software Architecture	2	Lecture
24.	Deep Study on Designing Software Architecture	3	Lecture
25.	Structurizing a Designing Team	3	Lecture
26.	How to Implement a Skeletal System?	2	Lecture
27.	Exercise Problem	2	Peer Teaching
28.	How to Document Software Architecture?	2	Lecture
29.	How to Reconstruct Software Architectures?	2	Lecture
30.	Case study in an Architecture for Inerrability	2	Group Discussion
31.	Overview of Unit III	2	ICT (NPTEL Notes)
UNIT IV			
32.	How to Analyze Architectures?	2	Lecture
33.	Architecture Tradeoff Analysis Method (ATAM)	2	Lecture
34.	Participants in the ATAM	2	Lecture
35.	Outputs of the ATAM	2	Lecture

36.	Phases of the ATAM	2	Lecture
37.	Cost Benefit Analysis Method (CBAM)	2	Lecture
38.	A case study in interoperability	2	Group Discussion
39.	Overview of Unit IV	1	ICT (NPTEL Notes)
UNIT V			
40.	Why to Reuse Architecture?	2	Lecture
41.	Study on Software Product Line	2	Lecture
42.	Case Study in Product Line Development	2	Lecture
43.	The World Wide Web	2	Peer Teaching
44.	Case study of an Industry Standard Computing Infrastructure	3	Lecture
45.	The Luther Architecture	2	Lecture
46.	Case Study in Mobile applications using J2EE	2	Lecture
47.	Different Case Studies	1	Group Discussion
48.	Overview of Unit V	1	ICT (NPTEL Notes)

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO 5	
CO1	3	4	3	3	3	3	4	4	3	3	3.30
CO2	3	4	4	3	3	4	4	4	3	4	3.60
CO3	3	4	4	3	2	4	3	4	3	4	3.4
CO4	3	4	4	3	2	4	4	4	3	4	3.6
CO5	3	4	4	3	3	4	3	3	4	4	3.6
Mean Overall Score											3.5

Result: The Score for this Course is 3.5 (High Relationship)

COURSE DESIGNER: **Dr. M. SUMATHI**
Associate Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : Core**

Semester : I | **Hours : 2 P/W 30Hrs P/S**

Sub. Code :P22SES1 | **Credits : 2**

TITLE OF THE PAPER: NETWORKING PROTOCOLS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	2	1/2	0 / 1	0 / 1	0 / 1

PREAMBLE:

To impart the knowledge about the protocols underlying principles and protocol functions.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Define the basic concepts of Internet architecture services and addressing scheme.	**16**
UNIT 2	**CO2:** Describe the layering principle and justify the need for multiple protocols.	**13**
UNIT 3	**CO3:** Explain the purpose of internet protocol and its services.	**12**
UNIT 4	**CO4:** Explain the UDP protocol functions, error control, flow control and congestion control.	**16**
UNIT 5	**CO5:** Explain the connection oriented service with TCP and apply and apply application layer protocol for designing internet applications.	**18**

Programme : M. Sc Computer Science **Part III : SEC-I**

Semester : I **Hours : 2 P/W 40 Hrs P/S**

Sub. Code : P22SES1 **Credits : 2**

TITLE OF THE PAPER: NETWORKING PROTOCOLS

Unit – I

The TCP/IP Internet –Internet Services – History And Scope Of The Internet – Application-Level Interconnection – Network-Level Interconnection – Internet Architecture – Interconnection Through IP Routers – Universal Identifiers – The Original Classful Addressing Scheme – Network And Directed Broadcast Addresses – Limited Broadcast – IP Multicast Addresses – Loopback Addresses.

Unit – II

The Need For Multiple Protocols – The Conceptual Layers Of Protocol Software – Functionality Of The Layers – The protocol Layering principle – Layering In The Presence Of Network Substructure – The Basic Idea Behind Multiplexing And Demultiplexing .

Unit – III

A Virtual Network –Internet Architecture And Philosophy – Purpose Of The Internet Protocol – Internet Datagram Options – Delivery – Forwarding – Fragmentation –Options – Messages

Unit - IV

UDP Services - Process-to-Process Communications – Connectionless Services – Flow Control – Error Control – Congestion Control – Encapsulation and Decapsulation – Queuing – Multiplexing and Demultiplexing – Comparison between UDP and Generic Simple Protocol.

Unit - V

TCP Services – TCP Features – Segment – A TCP Connection – Windows In TCP –Flow Control – Error Control– Congestion Control - TCP Timers – Introduction – RIP – Telnet – FTP: Connections – Communication – Command Processing – File transfer – Anonymous –Security for FTP – Simple Mail Transfer protocol (SMTP).

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Text Book:

1. Internetworking with TCP/IP – Principles, Protocols and Architecture Douglas E. Comer PHI – Fifth Edition.
2. TCP/IP Protocol Suite Behrouz A. Forouzan – Fourth Edition.

Programme : M. Sc Computer Science | **Part III : SEC-I**

Semester : I | **Hours : 2 P/W 40Hrs P/S**

Sub. Code : P22SES1 | **Credits : 2**

TITLE OF THE PAPER: NETWORKING PROTOCOLS

UNITS	TOPIC	LECTURE	MODE OF
	UNIT 1		
1.	The TCP/IP Internet, Internet Services, History And Scope Of The Internet	1	Lecture
2.	Application-Level Interconnection , Network-Level Interconnection , Internet Architecture	1	Lecture
3.	Interconnection Through IP Routers , Universal Identifiers , The Original Classful Addressing Scheme	2	Lecture
4.	Network And Directed Broadcast Addresses, Limited Broadcast Addresses, Multicast Addresses, Loopback Addresses.	1	Lecture
	UNIT II		
6.	The Need For Multiple Protocols, The Conceptual Layers Of Protocol Software.	1	Lecture
7.	Functionality Of The Layers , The protocol Layering principle	1	Lecture
8.	Layering In The Presence Of Network structure	1	Lecture
13.	The basic idea behind multiplexing and demultiplexing	1	Tutorial
	UNIT III		
18.	A Virtual Network ,Internet Architecture And Philosophy – Purpose Of The Internet Protocol	1	Lecture
19.	Internet Datagram Options, Delivery, Forwarding	2	Lecture
20.	Fragmentation,Options ,Messages	1	Lecture
	UNIT IV		
30.	UDP Services , Process-to-Process communications	1	Lecture
31.	Connectionless services	1	Lecture
32.	Flow control,Error control	1	Lecture
33.	Congestion control,Encapsulation and Decapsulation	1	Tutorial
34.	Queuing, Multiplexing and Demultiplexing	1	Lecture

35.	Comparison between UDP and Generic simple protocol	1	Lecture
UNIT V			
42.	TCP Services – TCP Features – Segment	2	Lecture
43.	TCP Connection – Windows In TCP	2	Lecture
44.	Flow Control – Error Control– Congestion Control	2	Lecture
45.	TCP Timers – Introduction – RIP – Telnet	2	Peer
46.	FTP: Connections , Communication ,Command Processing	2	Lecture
47.	File transfer, Anonymous, Security for FTP ,SMTP	1	Lecture

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	4	3	4	3	3	3	3	3.20
CO2	4	3	3	4	3	3	3	4	3	3	3.33
CO3	3	2	3	3	3	3	3	3	4	3	3.00
CO4	3	2	4	4	3	3	3	3	3	4	3.20
CO5	3	3	3	3	3	3	2	4	4	3	3.10
Mean Overall Score											3.17

Result: The Score for this Course is 3.17 (High Relationship)

COURSE DESIGNER: **Dr. P.Punitha Ponmalar**

Associate Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : Core**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22CS5 | **Credits : 5**

TITLE OF THE PAPER: PYTHON PROGRAMMING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To impart the knowledge on python programming concepts.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Define the basic concepts of python programming, Functions and control structures.	**13**
UNIT 2	**CO2:** How to use Strings, Mutable and immutable objects.	**18**
UNIT 3	**CO3:** Explain Recursion and Files and exception.	**22**
UNIT 4	**CO4:** Explain classes, objects, polymorphism, encapsulation and inheritance.	**20**
UNIT 5	**CO5:** Apply python for collecting information from twitter, sharing data using sockets, managing database, and mobile application for android.	**17**

Programme : M. Sc Computer Science | **Part III : Core**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22CS5 | **Credits : 5**

TITLE OF THE PAPER: PYTHON PROGRAMMING

UNIT I : Python Programming: An Introduction - IDLE an Interpreter for Python, Python Strings, Relational Operators, Logical Operators, Bitwise Operators, Variables and Assignment Statements, Keywords, Script Mode. **Functions -** Built-in Functions, Function Definition and Call, Importing User-defined Module**,** Assert Statement, Command Line Arguments. **Control Structures -** if Conditional Statement, Iteration (for and while Statements).

UNIT II : **Scope -** Objects and Object ids, Scope of Objects and Names. **Strings -** Strings, String Processing Examples, Pattern Matching. **Mutable and Immutable Objects –** Lists, Sets, Tuples, Dictionary.

UNIT III : **Recursion -** Recursive Solutions for Problems on Numeric Data, Recursive Solutions for Problems on Strings, Recursive Solutions for Problems on Lists, Problem of Tower of Hanoi. **Files and Exceptions -** File Handling, Writing Structures to a File, Errors and Exceptions, Handling Exceptions Using try…except, File Processing Example.

UNIT IV : **Classes I -** Classes and Objects, Person: An Example of Class, Class as Abstract Data Type, Date Class. **Classes II -** Polymorphism, Encapsulation, Data Hiding, and Data Abstraction, Modifier and Accessor Methods, Static Method, Adding Methods Dynamically, Composition, Inheritance, Built-in Functions for Classes.

UNIT V : **Graphics -** 2D Graphics, Animation – Bouncing Ball. **Applications of Python -** Collecting Information from Twitter, Sharing Data Using Sockets, Managing Databases Using Structured Query Language (SQL), Developing Mobile Application for Android, Integrating Java with Python.

TEXT BOOK(S):

Python Programming a Modular Approach with Graphics, Database, Mobile, and Web Applications – Sheetal Taneja, Naveen Kumar – Pearson Publication, 2018. Unit I : Chapters 1,2,3
Unit II : Chapters 5,6,7
Unit III : Chapters 8,9
Unit IV : Chapters 10,11
Unit V : Chapters 17,18

REFERENCE BOOK(S):

1. Python Programming - Reema Thareja, Oxford University Press, 2017

2. Fundamentals of Python Programming, Lambert – Cengage Publications, 2017

3. Problem Solving using Python – E. Balagurusamy, Mc Graw Hill Education Ltd., 2017 CRC Press, 2012.

4. Architecting the Internet of Things, Dieter Uckelmann; Mark Harrison; Florian Michahelles, (Eds.) Springer, 2011.

5. The Internet of Things , Key Applications and Protocols, Oliver Hersent, David Boswarthick, Omar Elloumi, Wiley , 2017

Programme : M. Sc Computer Science | **Part III : Core**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22CS5 | **Credits : 5**

TITLE OF THE PAPER: PYTHON PROGRAMMING

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	**Python Programming: An Introduction -** IDLE an Interpreter for Python, Python Strings	2	Lecture
2.	Relational Operators, Logical Operators, Bitwise Operators, Variables	3	Lecture
3.	Assignment Statements, Keywords, Script Mode. **Functions -** Built-in Functions, Function Definition and Call, Importing User-defined Module**,** Assert Statement	3	Lecture
4.	Command Line Arguments. **Control Structures -** if Conditional Statement, Iteration (for and while Statements).	3	Lecture
5.	Discussion	2	Group Discussion
	UNIT 11		
6.	**Scope -** Objects and Object ids, Scope of Objects and Names.	2	Lecture
7.	**Strings -** Strings, String Processing Examples, Pattern Matching.	2	Lecture
8.	**Mutable and Immutable Objects**	2	Lecture
9.	Lists	3	Lecture
10.	Sets	3	Group Discussion

11	Tuples	2	Lecture
12.	Dictionary	2	Tutorial
13.	Discussion	2	ICT (NPTEL Videos)
UNIT III			
14.	**Recursion -** Recursive Solutions for Problems on Numeric Data	2	Lecture
15.	Recursive Solutions for Problems on Strings	3	Lecture
16.	Recursive Solutions for Problems on Lists	3	Lecture
17.	Problem of Tower of Hanoi.	2	Tutorial
18.	**Files and Exceptions -** File Handling	3	Lecture
19.	Writing Structures to a File	2	Tutorial
20.	Errors and Exceptions, Handling Exceptions Using try…except	3	Lecture
21.	File Processing Example	2	ICT (NPTEL Notes)
22.	Applications	2	Group Discussion
UNIT IV			
23.	**Classes I -** Classes and Objects, Person: An Example of Class.	2	Lecture
24.	Class as Abstract Data Type, Date Class.	2	Lecture

25.	**Classes II -** Polymorphism, Encapsulation	2	Lecture
26.	Data Hiding	2	Tutorial
27.	Data Abstraction	3	Lecture
28.	Modifier and Accessor Methods	2	Lecture
29.	Static Method	2	Tutorial
30.	Adding Methods Dynamically, Composition	2	Lecture
31.	Inheritance	1	Lecture
32.	Built-in Functions for Classes	1	ICT (NPTEL Notes)
33.	Discussion	1	Group Discussion
UNIT V			
34.	**Graphics -** 2D Graphics, Animation	3	Lecture
35.	Bouncing Ball.	2	Lecture
36.	**Applications of Python -** Collecting Information from Twitter,	2	Lecture
37.	Sharing Data Using Sockets	2	Peer Teaching
38.	Managing Databases Using Structured Query Language (SQL).	2	Lecture
39.	Developing Mobile Application for Android	2	Lecture
40.	Integrating Java with Python	2	Lecture

41.	Discussion	2	Group Discussion

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO 5	
CO1	3	3	3	4	3	4	3	3	3	3	3.20
CO2	4	3	3	4	3	3	3	4	3	3	3.33
CO3	3	2	3	3	3	3	3	3	4	3	3.00
CO4	3	2	4	4	3	3	3	3	3	4	3.20
CO5	3	3	3	3	3	3	2	4	4	3	3.10
Mean Overall Score											3.17

Result: The Score for this Course is 3.17 (High Relationship)

COURSE DESIGNER: **Dr. P.PUNITHA PONMALAR**
Associate Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science **Part III : Core**

Semester : II **Hours : 5 P/W 75 Hrs P/S**

Sub. Code :P22CS6P **Credits : 3**

TITLE OF THE PAPER: Lab 3: PYTHON PROGRAMMING

Section: A

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Write a Python program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria:

Grade A: Percentage >=80

Grade B: Percentage>=70 and <80

Grade C: Percentage>=60 and <70

Grade D: Percentage>=40 and <60

Grade E: Percentage<40

3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user. 4. Write a Python program to display the first 'n' terms of Fibonacci series. 5 Write a Python program to find factorial of the given number.
6. Write a Python program to find sum of the following series for n terms: 1 – 2/2! + 3/3! - - - - - n/n!
7. Write a Python program to calculate the sum and product of two

compatible matrices. **Section: B**

All the programs should be written using user defined functions, wherever possible. 1. Write a menu-driven program to create mathematical 3D objects

i. curve
ii. sphere
iii. cone
iv. arrow
v. ring
vi. cylinder

2. Write a Python program to read n integers and display them as a histogram. 3. Write a Python program to display sine, cosine, polynomial and exponential curves. 4. Write a Python program to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be entered by the user.
5. Write a Python program to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula m=60/(t+2), where t is the time in hours. Sketch a graph for t vs. m, where t>=0.
6. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion: velocity wrt time (v=u+at)

i. distance wrt time (s=u*t+0.5*a*t*t)
ii. distance wrt velocity (s=(v*v-u*u)/2*a)

7) A website requires the users to input username and password to register. Write a program to check the validity of password input by users.

Following are the criteria for checking the password:
1. At least 1 letter between [a-z]
2. At least 1 number between [0-9]
3. At least 1 letter between [A-Z]
4. At least 1 character from [$#@]
5. Minimum length of transaction password: 6
6. Maximum length of transaction password: 12

Your program should accept a sequence of comma separated passwords and will check them according to the above criteria. Passwords that match the criteria are to be printed, each separated by a comma.

8) Write a program to sort the (name, age, height) tuples by ascending order where name is string, age and height are numbers. The tuples are input by console. The sort criteria is: 1: Sort based on name;
2: Then sort based on age;
3: Then sort by score.
The priority is that name > age > score.
If the following tuples are given as input to the program:
Tom,19,80
John,20,90
Jony,17,91
Jony,17,93
Json,21,85
Then, the output of the program should be:
[('John', '20', '90'), ('Jony', '17', '91'), ('Jony', '17', '93'), ('Json', '21', '85'), ('Tom', '19', '80')]

9) Define a class with a generator which can iterate the numbers, which are divisible by 7, between a given range 0 and n.

10)_A robot moves in a plane starting from the original point (0,0). The robot can move toward UP, DOWN, LEFT and RIGHT with a given steps. The trace of robot movement is shown as the following:
UP 5
DOWN 3
LEFT 3
RIGHT 2

The numbers after the direction are steps. Write a program to compute the distance from current position after a sequence of movement and original point. If the distance is a float, then just print the nearest integer.
Example:
If the following tuples are given as input to the program:
UP 5
DOWN 3
LEFT 3
RIGHT 2

Then, the output of the program should be:
2

11)Write a program to compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.
Suppose the following input is supplied to the program:
New to Python or choosing between Python 2 and Python 3? Read

Python 2 or Python 3. Then, the output should be:

2:2
3.:1
3?:1
New:1
Python:5
Read:1
and:1
between:1
choosing:1
or:2
to:1

Reference Books :

1. Problem solving and Python Prgoramming – s.A.Kulkarni, Yesdee Publisher, 2017 2. Python Programming a Modular Approach with Graphics, Database, Mobile, and Web Applications – Sheetal Taneja, Naveen Kumar – Pearson Publication, 2018.

Note: The above are sample problems; Instructor can add more exercises based on their requirements and the current technology

Programme : M. Sc Computer Science | **Part III : Core**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code :P22CS7 | **Credits : 5**

TITLE OF THE PAPER: OPERATING SYSTEM DESIGN PRINCIPLES

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	0 / 1	0 / 1	0 / 1

PREAMBLE:

To impart the knowledge about the design principles of the Operating System and implement simple Operating System mechanism.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Define the computer organization, operating system function and relate the relation between underlying hardware and operating system software. Discuss the evolution of various types of operating system	**11**
UNIT 2	**CO2:** Outline the process management, process synchronization, unicore, multicore processors and microkernel	**18**
UNIT 3	**CO3:** What do you mean by deadlock and how to memory management	**17**
UNIT 4	**CO4:** Explain processor and process scheduling algorithms. Select appropriate algorithm in different types of operating system	**11**
UNIT 5	**CO5:** Apply I/O management and disk scheduling algorithms. List file system organization and security features of Linux and Windows	**18**

Programme : M. Sc Computer Science | **Part III : DSEC-II**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code :P22CS7 | **Credits : 5**

TITLE OF THE PAPER: OPERATING SYSTEM DESIGN PRINCIPLES

Objective: To impart the knowledge about the design principles of the Operating System and implement simple Operating System mechanism with the case study of LINUX environment.

UNIT I: Process, Thread, SMP and Concurrency Control

Process description and control - what is a process? - process states - process description - process control - execution of operating system - security issues. Threads, SMP, Micro kernels: Processes and threads - symmetric multiprocessing - micro kernels – Linux process and thread management. Concurrency: Mutual exclusion and Synchronization - Principles of concurrency -mutual exclusion: hardware support - semaphores - monitors - message passing - reader/writer problem.

UNIT II: Deadlock and Memory Management

Concurrency: Deadlock and Starvation - principles of deadlock - deadlock prevention - deadlock avoidance - deadlock detection - an integrated deadlock strategy - dining philosophers' problem – Linux kernal concurrency mechanisms. Memory management : memory management requirements - memory partitioning - paging - segmentation - security issues. Virtual memory : hardware and control structures - operating system software – Linux memory management.

UNIT III: Uni-Processor, Multiprocessor and real time Scheduling

Uni processor scheduling : types of scheduling - scheduling algorithms. Multiprocessor and Real time scheduling : multiprocessor scheduling - real time scheduling - Linux scheduling.

UNIT IV: I/O Management and File Systems

I/O management and Disk scheduling : I/O devices - organization of I/O function - operating system design issues - I/O buffering - disk scheduling - RAID - disk cache - Linux I/O. File management : overview - file organization and access - file directories - file sharing - record blocking -secondary storage management - file system security - Linux file management.

UNIT V: **Embedded Operating system, Distributed systems**

Embedded operating system: Embedded Systems- Characteristics of embedded operating systems – TinyOS. Distributed processing, client / server and clusters: client/server computing – Distributed message passing – remote procedure calls – clusters – Beowulf and Linux clusters.

TEXT BOOK(S):

1.Operating Systems - Internals and Design Principles, William Stallings, Sixth Edition, Pearson Education Ltd, 2014

UNIT I :Chapter 3.1 to 3.6, 4.1 to 4.3,4.6, 5.1 to 5.6
UNIT II :Chapter 6.1 to 6.6, 6.8, 7.1 to 7.5, 8.1, 8.2, 8.4
UNIT III :Chapter 9.1, 9.2, 10.1, 10.2, 10.3
UNIT IV :Chapter 11.1 to 11.7, 11.9, 12.1 to 12.7, 12.9
UNIT V: Chapter 13.1,13.2,13.4,16.1,16.2,16.3,16.4,16.7

REFERENCE BOOK(S):

1. Charles Crowley, "Operating system - A design oriented approach", TMH, 2009

Programme : M. Sc Computer Science | **Part III : DSEC-II**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22CS7 | **Credits : 5**

TITLE OF THE PAPER: OPERATING SYSTEM DESIGN PRINCIPLES

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	Process description and control - what is a process? - process states .	2	Lecture
2.	Process description- process control - execution of operating system - security issues.	2	Lecture
3.	Threads, SMP, Micro kernels: Processes and threads	2	Peer Teaching
4.	Symmetric multiprocessing - micro kernels	2	Lecture
5.	Linux process and thread management - Concurrency: Mutual exclusion and Synchronization	2	Lecture
6.	Principles of concurrency -mutual exclusion: hardware support - semaphores - monitors	2	Lecture
7.	Message passing - reader/writer problem.	2	Group Discussion
	UNIT 11		
8.	Concurrency: Deadlock and Starvation - principles of deadlock	2	Lecture
9.	deadlock prevention - deadlock avoidance	1	Lecture
10.	deadlock detection - an integrated deadlock strategy	2	Lecture
11.	dining philosophers' problem	1	Tutorial
12.	Linux kernal concurrency mechanisms.	2	Lecture
13.	Memory management : memory management requirements	2	Lecture

14.	memory partitioning	1	Peer Teaching
15	security issues	2	Lecture
16.	paging - segmentation	2	ICT (UGC EMIRC Video)
17.	Virtual memory : hardware and control structures	2	Lecture
18.	operating system software	1	Lecture
19.	Linux memory management	1	Lecture
20.	Revision of Unit-II	1	Presentation
UNIT III			
21.	Introduction to Uni processor scheduling	2	Lecture
22.	types of scheduling	2	Lecture
23.	scheduling algorithms	2	Lecture
24.	Problems on uniprocessor scheduling	2	Tutorial
25.	Introduction to Multiprocessor and Real time scheduling	2	Lecture
26.	multiprocessor scheduling	2	Lecture
27.	Solving problems on multiprocessor scheduling	2	Lecture
28.	real time scheduling	2	Tutorial
29.	Linux scheduling	1	Demonstration
30.	Revising uni-processor scheduling	2	Peer teaching
31.	Revising multi processor scheduling	2	Lecture
32.	Revising Unit-III	1	Lecture
UNIT IV			
33.	Introduction to I/O management and Disk scheduling	1	Lecture
34.	I/O devices	2	Group

			Discussion
35.	organization of I/O function	2	Lecture
36.	operating system design issues	2	Lecture
37.	I/O buffering	1	Lecture
38.	disk scheduling	2	Lecture
39.	RAID	2	Peer teaching
40.	disk cache	2	Lecture
41.	Linux I/O	1	Tutorial
42.	File management : overview	1	Lecture
43.	file organization and access	1	Lecture
44.	file directories, file sharing	1	Lecture
45.	record blocking, secondary storage management	1	Lecture
46.	file system security - Linux file management.	1	Tutorial
47.	Revising UNIT-IV	2	Lecture
UNIT V			
48.	Introduction to Embedded operating system	2	Lecture
49.	Embedded Systems	2	Lecture
50.	Characteristics of embedded operating systems	2	Lecture
51.	TinyOS	1	Lecture
52.	Introduction to Distributed processing, client / server and clusters: client/server computing	1	ICT-NPTEL Video
53.	Distributed message passing	1	Lecture
54.	remote procedure calls	1	Lecture
55.	Clusters, Beowulf and Linux clusters	2	Tutorial

56.	Review of UNIT - V	1	Peer teaching

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO 5	
CO1	3	4	3	3	2	3	4	4	3	3	3.20
CO2	4	4	4	3	2	4	4	4	3	3	3.50
CO3	4	4	4	3	2	4	3	4	3	3	3.4
CO4	4	4	4	3	2	4	4	4	3	3	3.6
CO5	4	4	4	3	2	3	3	3	4	3	3.4
Mean Overall Score											3.42

Result: The Score for this Course is 3.42 (High Relationship)

COURSE DESIGNER: **Mrs. G.Sudha**
Assistant Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : Core**

Semester : II | **Hours : 5 P/W 75 Hrs P/S**

Sub. Code : P22CS8P | **Credits : 3**

TITLE OF THE PAPER : Lab 4: OPERATING SYSTEM

1. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
2. Write programs using the I/O System calls of UNIX operating system. (open, read, write)
3. Write C Program to implement fork(), getpid() and wait().
4. Write C program to simulate UNIX command: ls. & Write C program to simulate UNIX command: grep.
5. Given the list of processes, their CPU burst times and arrival times. Display/print the Gantt chart for FCFS. Compute and print the average waiting time and average turnaround time.
6. Given the list of processes, their CPU burst times and arrival times. Display/print the Gantt chart for SJF. Compute and print the average waiting time and average turnaround time.
7. Given the list of processes, their CPU burst times and arrival times. Display/print the Gantt chart for Priority Scheduling. Compute and print the average waiting time and average turnaround time (2 sessions).
8. Given the list of processes, their CPU burst times and arrival times. Display/print the Gantt chart for Round robin. Compute and print the average waiting time and average turnaround time (2 sessions).
9. Develop Application using Inter-Process-Communication (Using shared memory, pipes or message queues).
10. Implement the Producer-Consumer problem using semaphores(Using UNIX system calls)
11. Implement some Memory management schemes like Paging and
    a. Segmentation.
12. Implement some Memory management schemes like FIRST FIT, BEST & WORST FIT.
13. Implement any file allocation techniques(Contiguous, Linked or Indexed)
14. Write a shell script program to display the process attributes, to change the priority of processes and to change the ownership of processes.

Programme : M. Sc Computer Science | **Part III : DSEC-II**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS2A | **Credits : 5**

TITLE OF THE PAPER: COMPILER DESIGN

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To impart the knowledge in various phases of compiler and its implementation and Application.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Define the basics of Compiler Structure	**8**
UNIT 2	**CO2:** Illustrate the functioning of Lexical Analyzer and implementation using Finite Automata.	**23**
UNIT 3	**CO3:** Identify the role of Context Free Grammar and Parsing Techniques	**25**
UNIT 4	**CO4:** Experiment the working methodology of LR Parsers and Representation of Intermediate Code Generation Phase	**20**
UNIT 5	**CO5:** What are all the Data Structures and various code optimization are used by compilers	**14**

Programme : M. Sc Computer Science | **Part III : DSEC-II**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS2A | **Credits : 5**

TITLE OF THE PAPER: COMPILER DESIGN

UNIT I: Compilers and Translators-Why Do We Need Translators?-The Structure of A Compiler- Lexical Analysis-Syntax Analysis-Intermediate Code Generation-Optimization Code Generation-Book Keeping-Error Handling-Compiler-Writing Tools-Getting started.

UNIT II: The role of the lexical analyzer-Simple approach to design of a lexical analyzer Regular Expressions- Finite Automata-From regular expression to finite automata-Minimizing the number of states of a DFA-A language for specifying lexical analyzer-Implementing a lexical analyzer.

UNIT III: The Syntactic Specification of Programming Languages- Context free grammars - Derivation and Parse Trees – Parsers-Shift-reduce Parsing-Operator-precedence parsing-Top down parsing-Predictive Parsers.

UNIT IV: LR parsers-The canonical collection of LR(0) items-constructing SLR parsing tables - constructing canonical LR parsing tables-constructing SLR parsing tables-constructing LALR parsing tables.
Syntax directed translation schemes - Implementation of syntax directed schemes-Intermediate Code-Parse Tree and Syntax Trees -Three Address code, quadruples, and triples-Translation of assignment statements.

UNIT V: The contents of a symbol tables-Data structure for a symbol table-Representing Scope information. Code Optimization -The principal sources of optimization-Loop optimization -The DAG representation of basic blocks-Peephole Optimization.

TEXT BOOK(S):

2. Principles of Compiler Design, AlfredV.Aho and Jeffrey D.Ullman.25th Reprint, 2002.
   UNIT I : Chapter 1
   UNIT II : Chapter 3(Except 3.9)
   UNIT III : Chapter 4 (4.1,4.2),5
   UNIT IV : Chapter 6(6.1 – 6.5), 7(7.1 – 7.7)
   UNIT V : Chapter 9,12(12.1,12.2,12.3), 15.7

REFERENCE BOOK(S):

4. Compiler Design in C ,Allen I. Holub Prentice Hall of India, 2003.
5. Crafting a compiler with C ,C. N. Fischer and R. J. LeBlanc, Benjamin Cummings, 2003. 6. Introduction to Compiler Techniques, J.P. Bennet, Second Edition, Tata McGraw Hill,2003.

Programme : M. Sc Computer Science | **Part III : DSEC-II**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS2A | **Credits : 5**

TITLE OF THE PAPER: COMPILER DESIGN

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.	Compilers and Translators- Why Do We Need Translators?	1	Lecture
2.	The Structure of A Compiler- Lexical Analysis-Syntax Analysis	2	Lecture
3.	Intermediate Code Generation-Optimization-Code Generation	2	Lecture
4.	Book Keeping-Error Handling-Compiler-Writing Tools, Getting started	2	Lecture
5.	Discussion	1	Group Discussion
UNIT 11			
6.	The role of the lexical analyzer	2	Lecture
7.	Simple approach to design of a lexical analyzer	2	Lecture
8.	Regular Expressions	2	Lecture
9.	Finite Automata	2	Lecture
10.	Construction of Regular Expression	2	Group Discussion
11.	Exercise Problems	2	Peer Teaching
12	From regular expression to finite automata	3	Lecture
13.	Exercise Problems	2	Tutorial
14.	Minimizing the number of states of a DFA	2	Lecture

15.	A language for specifying lexical analyzer	2	Lecture
16.	Implementing a lexical analyzer.	1	Lecture
17.	Overview of Unit II	1	ICT (NPTEL Videos)
UNIT III			
18.	The Syntactic Specification of Programming Languages	1	Lecture
19.	Context free grammars	2	Lecture
20.	Derivation and Parse Trees	2	Lecture
21.	Parse Tree Construction and Derivation : Examples	2	Tutorial
22.	Parsers-Shift-reduce Parsing	2	Lecture
23.	Exercise Problems	2	Tutorial
24.	Operator-precedence parsing : Precedence Relations	3	Lecture
25.	Operator-precedence parsing : Using Operator Grammar	2	Lecture
26.	Exercise Problems	2	ICT (NPTEL Notes)
27.	Top-down parsing	3	Lecture
28.	Predictive Parsers	3	Lecture
29.	Applications	1	Group Discussion
UNIT IV			
30.	LR Parses	1	Lecture
31.	The canonical collection of LR(0) items	2	Lecture
32.	constructing SLR parsing table	2	Lecture
33.	Exercise Problems	2	Tutorial

34.	constructing canonical LR parsing tables	2	Lecture
35.	constructing LALR parsing tables	2	Lecture
36.	Exercise Problems	2	Tutorial
37.	Syntax directed translation schemes	1	Lecture
38.	Implementation of syntax directed schemes	2	Lecture
39.	Intermediate Code	1	Lecture
40.	Parse Tree and Syntax Trees	1	Lecture
41.	Three Address code, quadruples, and triples	1	Lecture
42.	Translation of assignment statements	2	Lecture
43.	Challenges of Parses	1	ICT (NPTEL Notes)
44.	Applications	1	Group Discussion
UNIT V			
45.	The contents of a symbol tables	1	Lecture
46.	Data structure for a symbol table	2	Lecture
47.	Representing Scope information	2	Lecture
	Applications for Symbol Table	1	Peer Teaching
48.	Code Optimization	1	Lecture
49.	The principal sources of optimization	2	Lecture
50.	Loop optimization	2	Lecture
51.	The DAG representation of basic blocks	1	Lecture
52.	Peephole Optimization	1	Lecture
53.	Issues in Code Optimization	1	Group Discussion

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO 5	
CO1	3	3	3	3	2	3	3	4	3	3	3.00
CO2	4	4	4	3	3	4	4	4	3	4	3.70
CO3	4	4	4	3	3	4	3	4	3	4	3.6
CO4	4	4	4	3	3	4	4	4	3	4	3.8
CO5	4	4	4	4	3	4	4	3	3	3	3.6
Mean Overall Score											3.54

Result: The Score for this Course is 3.54 (High Relationship)

COURSE DESIGNER: **Dr. S. SUGUNA**
Assistant Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : DSEC-II**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS2B | **Credits : 5**

TITLE OF THE PAPER: DISTRIBUTED COMPUTING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0/ 1	0 / 1	0 / 1

PREAMBLE:

To learn about the principles and techniques in Distributed Computing

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Define the introductory concepts of Distributed Systems, Types of Communication	**19**
UNIT 2	**CO2:** Explain the Types of Processes and entities	**18**
UNIT 3	**CO3:** What do you mean by Synchronization and Consultancy of Distributed Systems	**23**
UNIT 4	**CO4:** Identify Fault Tolerance and Security Issues of Distributed Systems	**17**
UNIT 5	**CO5:** Summarize Distributed File System and Case Study	**13**

Programme : M. Sc Computer Science | **Part III : DSEC-II**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS2B | **Credits : 5**

TITLE OF THE PAPER: DISTRIBUTED COMPUTING

UNIT I: Introduction to Distributed System: Goals, Hardware concepts, Software concepts, and Client-Server model. Examples of distributed systems.
Communication: Layered protocols, Remote procedures call, Remote object invocation, Message-oriented communication, Stream-oriented communication.

UNIT II: Processes: Threads, Clients, Servers, Code Migration, Software agent. **Naming:** Naming entities, Locating mobile entities, Removing un-referenced entities.

UNIT III: Synchronization: Clock synchronization, Logical clocks, Global state, Election algorithms, Mutual exclusion, Distributed transactions.
Consistency and Replication: Introduction, Data centric consistency models, Client centric consistency models, Distribution protocols, Consistency protocols.

UNIT IV: Fault Tolerance: Introduction, Process resilience, Reliable client server communication, Reliable group communication. Distributed commit, Recovery. **Security:** Introduction, Secure channels, Access control, Security management.

UNIT V: Distributed File System: Sun network file system, CODA files system. **Case Study:**

CORBA, Distributed COM, Globe, Comparison of CORBA, DCOM, and Globe.

TEXT BOOK(S):

1. Distributed Systems: Principles and Paradigms A.S. Tanenbaum and M. van Steen, Pearson/Prentice-Hall, 2nd Edition, 2007.
   Unit I : Chapters 1,2 and 4
   Unit II : Chapters 3 and 5
   Unit III : Chapters 6 and 7
   Unit IV : Chapters 8 and 9
   Unit V : Chapters 11

REFERENCE BOOK(S):

1. Distributed Systems: Concepts and Design G. Coulouris, J. Dollimore, and T. Kindberg, 5th edition, Addison-Wesley, 2012.
2. Advanced Concepts in Operating Systems M. Singhal, N. Shivaratri, , McGraw-Hill Education (India) Pvt. Limited, 2001.

Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.

Programme : M. Sc Computer Science **Part III : DSEC-II**

Semester : II **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS2B **Credits : 5**

TITLE OF THE PAPER: DISTRIBUTED COMPUTING

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.	**Introduction to Distributed System:** Goals	3	ICT(PPT)
2.	Hardware concepts, Software concepts and Client Server model	4	ICT(PPT)
3.	Examples of distributed systems.	3	ICT(PPT)
4.	**Communication:** Layered protocols, Remote procedures call, Remote object invocation	4	ICT(PPT)
5.	Message-oriented communication, Stream-oriented communication.	3	ICT(PPT)
UNIT II			
6.	**Processes:** Threads, Clients, Servers	3	ICT(PPT)
7.	Code Migration, Software agent	4	ICT(PPT)
8.	**Naming:** Naming entities	4	ICT(PPT)
9.	Locating mobile entities	4	ICT(PPT)
10.	Removing un-referenced entities.	3	ICT(PPT)
11.	Discussion of UNIT II	2	Group Discussion
UNIT III			
12.	**Synchronization:** Clock synchronization, Logical clocks, Global state	4	ICT(PPT)
13.	Election algorithms, Mutual exclusion, Distributed transactions.	4	ICT(PPT)
14.	**Consistency and Replication:** Introduction	4	ICT(PPT)

15.	Data centric consistency models, Client centric consistency models	4	ICT(PPT)
16.	Distribution protocols, Consistency protocols	4	ICT (PPT)
17.	Summarize UNIT III	3	Peer team Teaching
UNIT IV			
18.	**Fault Tolerance:** Introduction, Process resilience	3	ICT (PPT)
19.	Reliable client server communication, Reliable group communication	2	ICT (PPT)
20.	Distributed commit, Recovery	3	ICT (PPT)
21.	**Security:** Introduction, Secure channels, Access control	3	ICT (PPT)
22.	Security management. Classification: Basic Concepts	3	ICT (PPT)
23.	Evaluation	3	Tutorial
UNIT V			
24.	**Distributed File System:** Sun network file system	1	ICT (PPT)
25.	CODA files system.	2	ICT (PPT)
26.	**Case Study:** CORBA, Distributed COM, Globe	3	ICT (PPT)
27.	Comparison of CORBA, DCOM, and Globe	3	ICT (PPT)
28.	Cluster Analysis Basic Concepts and Methods: Cluster Analysis	2	ICT (PPT)
29.	Evaluation	2	Open Book Test

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO 5	
CO1	2	4	4	2	3	3	4	4	4	4	3.4
CO2	3	2	4	4	4	4	4	4	4	4	3.7
CO3	4	4	4	5	4	4	4	4	4	5	4.2
CO4	4	4	4	4	4	4	4	5	4	4	4.1
CO5	4	3	3	5	4	4	4	4	4	5	4
Mean Overall Score											3.88

Result: The Score for this Course is 3.88 (High Relationship)

COURSE DESIGNER: **Dr. G. SUJATHA**
Associate Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science **Part III : DSEC-II**

Semester : II **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS2C **Credits : 5**

TITLE OF THE PAPER: CLOUD COMPUTING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To introduce the concepts of Cloud Computing technologies and application development using cloud platforms.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Define the Cloud Architecture and Model.	**18**
UNIT 2	**CO2:** Recall the basics and List the applications of Virtualization.	**19**
UNIT 3	**CO3:** Explain the different Cloud Infrastructure.	**18**
UNIT 4	**CO4:** Outline different programming model.	**17**
UNIT 5	**CO5:** Identiy the Cloud Security Challenges and Risks.	**18**

Programme : M. Sc Computer Science | **Part III : DSEC-II**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS2C | **Credits : 5**

TITLE OF THE PAPER: CLOUD COMPUTING

UNIT I: Cloud Architecture and Model: Technologies for Network-Based System – System Models for Distributed and Cloud Computing NIST Cloud Computing Reference Architecture. Cloud Models :- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud – Cloud Solutions – Cloud ecosystem – Service management – Computing on demand.

UNIT II: Virtualization: Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data - center Automation.

UNIT III: Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT IV: Programming Model: Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.

UNIT V: Security in The Cloud: Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

TEXT BOOK(S) :

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.

UNIT I : Chapters 1 and 2
UNIT II : Chapters 3 and 4
UNIT II : Chapters 5 and 6
UNIT IV : Chapters 7 and 8
UNIT V : Chapters 9

REFERENCE BOOK(S):

1. Cloud Computing: Implementation, Management, and Security,JohnW.Rittinghouse and James F.Ransome, CRC Press, 2010.
2. Cloud Computing, A Practical Approach,TobyVelte, Anthony Velte, Robert Elsenpeter, TMH, 2009.
3. Cloud Computing – insights into New-Era Infrastructure, Kumar Saurabh,Wiley India,2011.
4. Cloud, George Reese, O'Reilly.
5. Virtual Machines: Versatile Platforms for Systems and Processes James E. Smith, Ravi Nair, Elsevier/Morgan Kaufmann, 2005.

Programme : M. Sc Computer Science | **Part III : DSEC-II**

Semester : II | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22DSS2C | **Credits : 5**

TITLE OF THE PAPER: CLOUD COMPUTING

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.	Cloud Architecture and Model: Introduction	1	Lecture
2.	Technologies for Network-Based System	2	Lecture
3.	System Models for Distributed and Cloud Computing	2	Lecture
4.	NIST Cloud Computing Reference Architecture	1	ICT (Lecture Notes)
5.	Cloud Models : Characteristics	2	Lecture
6.	Cloud Services	2	Lecture
7.	Cloud models (IaaS, PaaS, SaaS)	1	Lecture
8.	Public vs Private Cloud	1	Group Discussion
9.	Cloud Solutions	1	Lecture
10.	Cloud ecosystem	2	Lecture
11.	Service management	1	Lecture
12.	Computing on demand	1	Lecture
13.	Challenges in Cloud Models	1	Peer Teaching
UNIT 11			
14.	Virtualization: Basics of Virtualization	1	Lecture
15.	Types of Virtualization	2	Lecture
16.	Implementation Levels of Virtualization	2	Lecture

17.	Purpose of Virtualization	2	ICT (Lecture Videos)
18.	Virtualization Structures	2	Lecture
19.	Tools and Mechanisms	1	Lecture
20.	Virtualization of CPU, Memory, I/O Devices	2	Lecture
21.	Virtual Clusters and Resource management	2	Group Discussion
22.	Virtual Clusters and Resource management	2	Lecture
23.	Virtualization for Data - center Automation	2	Lecture
24.	Applications of Virtualization	1	Peer Teaching
UNIT III			
25.	Cloud Infrastructure: Introduction	1	Lecture
26.	Architectural Design of Compute and Storage Clouds	3	Lecture
27.	Architectural Design of Compute and Storage Clouds	2	ICT (NPTEL Videos)
28.	Layered Cloud Architecture Development	3	Lecture
29.	Design Challenges	2	Tutorial
25.	Inter Cloud Resource Management	2	Lecture
26.	Resource Provisioning and Platform Deployment	2	Lecture
27.	Global Exchange of Cloud Resources	2	Lecture
28.	Applications of Cloud Resources	1	Peer Teaching
UNIT IV			
30.	LR Parsers	1	Lecture
31.	The canonical collection of LR(0) items	2	Lecture

32.	constructing SLR parsing table	2	Lecture
33.	Exercise Problems	2	Tutorial
34.	constructing canonical LR parsing tables	2	Lecture
35.	constructing LALR parsing tables	2	Lecture
36.	Exercise Problems	1	Tutorial
37.	Syntax directed translation schemes	2	Lecture
38.	Implementation of syntax directed schemes	1	Lecture
39.	Intermediate Code	1	Lecture
40.	Parse Tree and Syntax Trees	1	Lecture
41.	Three Address code, quadruples, and triples	1	Lecture
42.	Translation of assignment statements	2	Lecture
43.	Challenges of Parsers	1	ICT (NPTEL Notes)
44.	Applications of Three Address code, and Syntax directed translation schemes.	1	Group Discussion
UNIT V			
45.	Security in The Cloud: Security Overview	1	Lecture
46.	Cloud Security Challenges and Risks	2	Lecture
47.	Software-as-a-Service Security	1	Lecture
48.	Security Issues	2	Video
49.	Security Governance	1	Lecture
50.	Risk Management	2	Lecture
51.	Security Monitoring	1	Lecture
52.	Security Architecture Design	1	Peer Teaching
53.	Data Security	1	Lecture

54.	Application Security	1	Lecture
55.	Virtual Machine Security	1	Lecture
56.	Identity Management and Access Control	1	Lecture
57.	Autonomic Security	2	Lecture
58.	Application domains	1	Group Discussion

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO 5	
CO1	2	4	4	2	3	3	4	4	4	4	3.4
CO2	3	2	4	4	4	4	4	4	4	4	3.7
CO3	4	4	4	5	4	4	4	4	4	5	4.2
CO4	4	4	4	4	4	4	4	5	4	4	4.1
CO5	4	3	3	5	4	4	4	4	4	5	4
Mean Overall Score											3.88

Result: The Score for this Course is 3.88 (High Relationship)

COURSE DESIGNER: **Dr. S. SUGUNA**
Assistant Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science **Part III : SEC-II**

Semester : II **Hours : 2 P/W 30 Hrs P/S**

Sub. Code : P22SES2 **Credits : 2**

TITLE OF THE PAPER: NETWORK SECURITY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	2	1/2	0 / 1	0 / 1	0 / 1

PREAMBLE:

To learn about the essential of network security and security mechanisms.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Define the various network security concepts.	5
UNIT 2	**CO2:** Describe the functions of DES.	6
UNIT 3	**CO3:** Understand the Advanced encryption standard principles.	7
UNIT 4	**CO4:** Explain the Asymmetric key cryptography and message authentication.	7
UNIT 5	**CO5:** Explain the cryptographic hash functions and digital signature	5

Programme : M. Sc Computer Science | **Part III : SEC-II**

Semester : II | **Hours : 2 P/W 30 Hrs P/S**

Sub. Code : P22SES2 | **Credits : 2**

TITLE OF THE PAPER: NETWORK SECURITY

UNIT I:

Security Goals – Attacks – Services and Mechanism. Traditional Symmetric Key Ciphers: Instruction - Substitution Ciphers Transposition Ciphers - Stream and Block Ciphers. Introduction to Modern Symmetric Key Ciphers: Modern Block Ciphers - Modern Stream Ciphers.

UNIT II:

Data Encryption Standard (DES): Introduction - DES Structure - DES Analysis - Multiple DES - Security of DES.

UNIT III:

Advanced Encryption Standard (AES): Introduction - Transformations - Key Expansion - Ciphers - Examples - Analysis of AES.

UNIT IV:

Asymmetric Key Cryptography: Introduction - RSA Crypto System. Message Integrity and Message Authentication: Message Integrity - Random Oracle Model - Message Authentication.

UNIT V:

Cryptographic Hash Functions: Introduction - SHA – 512. Digital Signature: Comparison - Process - Services - Attacks on Digital Signature - Digital Signature Schemes.

Text Book:

Cryptography and Network Security - Behrouz A. Forouzan, TheMcGraw Hill, 2011.

UNIT I - Chapter 1,2,3,5
UNIT II - Chapter 6, 7
UNIT III - Chapter 10, 11
UNIT IV - Chapter 12, 13
UNIT V - Chapter 14, 15

Reference Book:

Cryptography and Network Security - William Stallings, PHI, 2008.

Programme : M. Sc Computer Science **Part III : SEC-II**

Semester : II **Hours : 2 P/W 30 Hrs P/S**

Sub. Code : P22SES2 **Credits : 2**

UNITS	TOPIC	LECTURE	MODE OF
	UNIT 1		
1.	Security Goals – Attacks – Services and Mechanism. -	1	Lecture
2.	Stream and Block Ciphers Traditional Symmetric Key Ciphers	1	Lecture
3.	Substitution Ciphers Transposition Ciphers Introduction to Modern Symmetric Key Ciphers:	2	Lecture
4.	Modern Block Ciphers, Modern Stream Ciphers.	1	Lecture
	UNIT II		
6.	Data Encryption Standard (DES): Introduction	2	Lecture
7.	DES Structure, DES Analysis	2	Lecture
8.	Multiple DES, Security of DES.	2	Lecture
	UNIT III		
9.	Advanced Encryption Standard (AES)	2	Lecture
10.	Transformations, Key Expansion	2	Lecture
11.	Ciphers, Examples , Analysis of AES.	3	Lecture
	UNIT IV		
12.	Asymmetric Key Cryptography: Introduction	1	Lecture
13.	RSA Crypto System. Message Integrity	2	Lecture
14.	Message Authentication	2	Lecture
15.	Message Integrity, Random Oracle Model, message Authentication	2	Tutorial
	UNIT V		
16.	Cryptographic Hash Functions: Introduction	1	Lecture

17.	SHA – 512. Digital Signature	2	Lecture
18.	Comparison, Process , Services	1	Lecture
19.	Attacks on Digital Signature - Digital Signature Schemes.	1	Peer

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	4	3	4	3	3	3	3	3.20
CO2	4	3	3	4	3	3	3	4	3	3	3.33
CO3	3	2	3	3	3	3	3	3	4	3	3.00
CO4	3	2	4	4	3	3	3	3	3	4	3.20
CO5	3	3	3	3	3	3	2	4	4	3	3.10
Mean Overall Score											3.17

Result: The Score for this Course is 3.17 (High Relationship)

COURSE DESIGNER: **Dr. P.Punitha Ponmalar**

Associate Professor / PG and Research Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : Core**

Semester III | **Hours : 6 P/W 90Hrs P/S Credits**

Sub. Code : P22CS9 | **Credits : 5**

TITLE OF THE PAPER: DIGITAL IMAGE PROCESSING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To enrich the knowledge about digital imaging system, digital image processing operations, image enhancement, image compression and image segmentation concepts

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** To impart the knowledge about image processing techniques and understand the concept of image analysis, storage formats of image	**18**
UNIT 2	**CO2:** To analyze the attitude of image processing arithmetic operations and image transformation techniques.	**13**
UNIT 3	**CO3:** Discuss about the image need for image enhancement and use of image restoration.	**18**
UNIT 4	**CO4:** To understand the concept of image compression models , measures and algorithms.	**18**
UNIT 5	**CO5:** Understand the role of image segmentation , various color models and color image transformation	**23**

Programme : M. Sc Computer Science	**Part III : Core**
Semester III	**Hours : 6 P/W 90Hrs P/S**
Sub. Code : P22CS9	**Credits :5**

TITLE OF THE PAPER: DIGITAL IMAGE PROCESSING

UNIT I: Introduction to Image Processing

Overview of Image Processing - Nature of Image Processing - Digital Image Representation- Types of Images-Based on Nature - Based on Attributes - Based on Colour - Based on Dimensions-Based on Data Types - Domain Specific Images- Digital Image Processing Operations - Fundamental Steps In Image Processing - Image Enhancement - Image Restoration - Image Compression - Image Analysis – Image Synthesis. **Digital Imaging Systems**: Overview of Digital Imaging Systems-Image Sensors-Image Storage-Image processors - Output Devices-Networking Components - Image Processing Software - Physical Aspects of Image Acquisition-Nature of Light-Simple Image Model - Colour Fundamentals - Lighting System Design-Simple Image Formation Process - Biological Aspects of Image Acquisition - Human Visual System - Properties of Human Visual System - Monochrome and Colour Image - Review of Digital Cameras-Sampling and Quantization - Sampling - Resampling - Image Quantization - Image Display Devices and Device Resolution - Digital Halftone Process - Random Dithering - Ordered Dithering - Non - periodic Dithering - Image Storage and File Formats - Need for File Formats -Types of File Formats - Structures of File Formats.

UNIT II: Digital Image Processing Operations

Basic Relationships and Distance Metrics - Image Coordinate System - Image Topology - Connectivity - Relations - Distance Measures - Important Image Characteristics - Classification of Image Processing Operations - Arithmetic Operations. Logical Operations - Geometrical Operations - Image Interpolation Techniques - Set Operations. **Digital Image Transforms:** Need for Image Transforms - Spatial Frequencies in Image Processing - Introduction to Fourier Transform - Discrete Fourier Transform - Fast Fourier Transform - Discrete Cosine Transform.

UNIT III: Image Enhancement

Image Quality and Need for Image Enhancement - Image Quality Factors - Image Quality Assessment Toll - Image Quality Metrics - Image Enhancement operations - Image Enhancement in Spatial Domain - Linear Point Transformations - Non - Linear Transformations –Square Function - Square root - Logarithmic Function –Exponential Function - Power Function - Gamma Correction - Histogram - Based techniques - Histogram Stretching –Histogram Sliding - Histogram Equalization - Histogram Specification - Local and Adaptive Contrast Enhancement - Spatial Filtering Concepts - Image Smoothing Spatial Filters - Box Filters - Gaussian Filters - Image Sharpening Spatial Filters - Gradient and Laplacian Filters - High - boost Filters - Unsharp Masking. **Image Restoration**: Introduction to Degradation - Types of Image Degradations - Image Degradation Model - Noise Modelling - Noise Categories Based on Distribution - Noise Categories Based on Correlation - Noise Categories Based on Nature - Noise Categories Based on Source - Estimation by Observation - Estimation by Experimentation - Estimation by Modelling - Image Restoration Techniques - Unconstrained Method - Inverse Filters - Wiener Filters.

UNIT IV: Image Compression

Image Compression Model - Compression - Measures - Compression Algorithm and its Types – Entropy Coding - Predictive Coding - Transform Coding - Layered Coding - Types of Redundancy - Coding Redundancy - Inter pixel Redundancy - Psychovisual Redundancy - Chromatic Redundancy - Lossless Compression Algorithms - Run - length Coding - Huffman Coding - Bit plane Coding - Arithmetic Coding - Dictionary - based Coding - Lossless Predictive Coding - Lossy Predictive Coding - Vector Quantization –Codebook design – Generalized Lloyd algorithm.

UNIT V: Image Segmentation:

Introduction - Formal Definition of Image Segmentation-Classification of Image Segmentation Algorithms - Detection of Discontinuities –Point Detection-Line Detection - Edge Detection - Stages in Edge Detection - Types of Edge detectors - First order Edge Detection - Edge operator performance - Edge linking Algorithms - Principle of Thresholding - Principle of Region – growing. **Colour Image Processing -** Introduction - Colour Image Storage and Processing - Colour Models - RGB Colour Model - HIS Colour Model - HSV Colour Model - HLS Colour Model - Printing Colour Models - Colour Quantization - Popularity or Populosity Algorithm - Median cut Algorithm - Octree based Algorithm - Pseudocolour Image Processing - Full colour Processing - Colour Transformatons - Image Filters for Colour Image - Colour image Segmentation .

TEXT BOOK(S):

1. DIGITAL IMAGE PROCESSING, S.Sridhar, Second Edition, OXFPRD University Press 2016.

Unit I:	Chapter 1 (1.1 to 1.2, 1.4-1.7)
	Chapter 2 (2.1 to 2.8)
Unit II:	Chapter 3 (Except 3.2.6 & 3.2.7)
	Chapter 4 (4.1 and 4.3)
Unit III:	Chapter 5 (5.1 and 5.7 Except 5.3.3)
	Chapter 6 (6.1 to 6.2, 6.4 to 6.6 and 6.9.1 to 6.9.4)
Unit IV:	Chapter 7 (7.1 and 7.5 Except 7.4.3 and 7.5.3)
Unit V:	Chapter 9 (9.1 to 9.4 Except 9.4.4) and (9.7 to 9.8)
	Chapter 11(11.1 to 11.2 and 11.5)

REFERENCE BOOK(S):

1. Digital Image Processing using MATLAB, Rafael C. Gonzalez, Richard E. Woods,2nd Edition, Prentice Hall of India, 2002.
2. Fundamentals of Digital Image Processing, A.Jain, Prentice Hall of India, 2010.
3. Digital Image Processing, Willliam K Pratt, John Willey, 2002.

Programme : M. Sc Computer Science | **Part III : Core**

Semester III | **Hours : 6 P/W 90Hrs P/S**

Sub. Code : P22CS9 | **Credits : 5**

TITLE OF THE PAPER: DIGITAL IMAGE PROCESSING

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	Overview of image processing and image representation,	2	Lecture
2.	Fundamental steps in image processing, introduction to imaging systems, image analysis techniques	3	Lecture
3.	Sensors-Image Storage-Image processors - Output Devices-Networking Components - Image Processing Software	2	Lecture
4.	Physical Aspects of Image Acquisition-Nature of Light-Simple Image Model,-Lighting System Design-Simple Image Formation Process	3	Lecture
5.	Biological Aspects of Image Acquisition - Human Visual System - Properties of Human Visual System - Monochrome and Colour Image	3	Lecture
6	Sampling - Resampling - Image Quantization - Image Display Devices and Device Resolution - Digital Halftone Process ,types of dithering	2	Lecture
7	Working methodology of image analysis system using matlab	1	Peer Teaching
8	Discuss about the overview of fundamental concept of digital image processing	1	Group discussion
9	Image Enhancement and sampling, quantization	1	ICT (NPTEL notes)
	UNIT 11		
10	Concepts of image coordinate system and relationships and distance metrics system	2	Lecture
11	Classification of image processing operations	2	Lecture
12	Image interpolation techniques	3	Lecture
13	Concepts and need of digital image transformation	2	Lecture
14	Fourier Transform - Discrete Fourier Transform - Fast Fourier Transform - Discrete Cosine Transform	3	Lecture
15	Applications of image transformation	1	Peer Teaching

UNIT III			
16	Image Quality Factors - Image Quality Assessment Tool Image Quality Metrics - Image Enhancement operations - Image Enhancement in Spatial Domain	3	Lecture
17	Difference between linear and non-linear transformation, Square Function - Square root - Logarithmic Function –Exponential Function - Power Function - Gamma Correction	2	Lecture
18	Histogram - Based techniques - Histogram Stretching –Histogram Sliding - Histogram Equalization - Histogram specification - Local and Adaptive Contrast Enhancement	3	Lecture
19	Image Smoothing Spatial Filters - Box Filters - Gaussian Filters - Image Sharpening Spatial Filters - Gradient and Laplacian Filters -	2	Lecture
20	High - boost Filters - Unsharp Masking.Concept of image restoration- Types of Image Degradations	3	Lecture
21	Image Restoration Techniques - Unconstrained Method Inverse Filters - Wiener Filters, - Image Degradation Model - Noise Modeling	2	Tutorial
22	Image Filter implementation using matlab	2	Peer Teaching
23	Overview of Unit III	1	ICT (NPTEL notes)
UNIT IV			
24	Image Compression Model - Compression - Measures - Compression Algorithm and its Types	2	Lecture
25.	Entropy Coding - Predictive Coding - Transform Coding - Layered Coding - Types of Redundancy -	3	Lecture
26.	Coding Redundancy - Inter pixel Redundancy - Psycho visual Redundancy - Chromatic Redundancy	2	Lecture
27.	Basic Compression methods	2	Tutorial
28.	Lossless Compression Algorithms - Run - length Coding - Huffman Coding - Bit plane Coding - Arithmetic Coding	3	Lecture
29.	Dictionary - based Coding - Lossless Predictive Coding	2	Lecture
30.	Lossy Predictive Coding - Vector Quantization – Codebook design –Generalized Lloyd algorithm.	2	Lecture
31.	Application of compression techniques	1	Group Discussion
32.	Image compression implementation using matlab	1	Peer Teaching

UNIT V			
33.	Fundamental concepts of Image Segmentation	2	Lecture
34.	Discuss about Classification of image Segmentation Algorithms	2	Lecture
35.	Detection of Discontinuities –Point Detection-Line Detection - Edge Detection - Stages in Edge Detection	2	Lecture
36.	Type of Edge Detectors- First order Edge Detection - Edge operator performance - Edge linking Algorithm	2	Lecture
37.	Concepts of image segmentation techniques- Thresholding - Principle of Region – growing.	2	Lecture
38.	Introduction to colour image processing and colour image storage.	2	Lecture
39.	Various Colour models: RGB Colour Model - HIS Colour Model - HSV Colour Model - HLS Colour Model	2	Lecture
40.	Printing Colour Models - Colour Quantization	2	Lecture
41.	Populosity Algorithm - Median cut Algorithm - Octree based Algorithm	2	Lecture
42.	Pseudocolour Image Processing - Full colour Processing	1	Lecture
43	Colour Transformatons - Image Filters for Colour Image	2	Lecture
44	Concept of Colour image Segmentation .	1	Lecture
45	Discuss about various image segmentation techniques	1	Group discussion

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	4	3	2	3	3	4	4	4	3	3.2
CO2	3	3	3	3	4	4	4	4	3	4	3.5
CO3	4	4	4	4	4	4	4	4	3	3	3.8
CO4	4	4	4	3	4	4	4	5	4	4	4
CO5	4	3	3	4	4	4	4	4	4	5	3.9
Mean Overall Score											3.68

Result: The Score for this Course is 3.68 (High Relationship)

COURSE DESIGNER: **Dr. M.SUMATHI**
Associate Professor / Department of Computer Science.

Programme : M. Sc Computer Science	**Part III : Core**
Semester III	**Hours : 5 P/W 75 Hrs P/S**
Sub. Code : P22CS10P	**Credits : 3**

TITLE OF THE PAPER: Lab 5: IMAGE PROCESSING

1. Implement the spatial image enhancement functions on a bitmap image – Mirroring (Inversion)
2. Implement the spatial image enhancement functions on a bitmap image – Rotation (Clockwise)
3. Implement the spatial image enhancement functions on a bitmap image – Enlargement (Double Size)
4. Implement (a) Low Pass Filter (b) High Pass Filter
5. Implement (a) Arithmetic Mean Filter (b) Geometric Mean Filter
6. Implement Smoothing and Sharpening of an eight bit color image
7. Implement (a) Boundary Extraction Algorithm (b) Graham's Scan Algorithm
8. Implement (a) Edge Detection (b) Line Detection
9. Display an image and its histogram
10. Write a Program to Perform shrinking, zooming and cropping of an image
11. Write a Program to perform the experiment for histogram equalization.
12. Write a Program to Perform blurring and de-blurring on an image.
13. Write a Program to Remove salt and pepper noise in an image.
14. Write a Program to Perform Edge detection using Operators.
15. Write a Program to Perform 2-D DFT and DCT.
16. Write a Program to Perform DWT of images.
17. Implement a function for image segmentation.
18. Implement a function for image morphology that analyze the form and shape detail of image structures.
19. Implement a function for Image Restoration.
20. Models for representing the color and methods of processing the color plane

Note: The above are sample problems; Instructor can add more exercises based on their requirements and current technology

Programme : M. Sc Computer Science | **Part III : Core**
Semester: III | **Hours : 6/W 90Hrs P/S**
Subject Code : P22CS11 | **Credits :5**

TITLE OF THE PAPER: SOFT COMPUTING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0/ 1	0 / 1	0 / 1

PREAMBLE:

To understand the basics of Neural Network, Fuzzy Sets, Evolutionary Computing Paradigm and its application to optimization problems.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:**Introduce the basic concepts and techniques of Soft Computing	**10**
UNIT 2	**CO2:**Differentiate Biological and Artificial Neural Network and Explain the types of Neural Networks	**20**
UNIT 3	**CO3:**Analyze various fuzzy models in developing fuzzy inference systems to be appropriate with specific real time problems	**20**
UNIT 4	**CO4:**Use genetic algorithms to combinatorial optimization problems	**20**
UNIT 5	**CO5:**Discuss the Optimization techniques Swam Intelligence and Ant colony optimization	**20**

Programme : M. Sc Computer Science	**Part III : Core**
Semester:III	**Hours : 6/W 90 Hrs/S**
Subject Code : P22CS11	**Credits : 5**

TITLE OF THE PAPER: SOFT COMPUTING

UNIT I :

Introduction to Soft Computing – Introduction , Artificial Intelligence, Artificial Neural Networks, Fuzzy Systems, Genetic Algorithm and Evolutionary Programming, Swarm Intelligent Systems, Expert Systems.

UNITII:

Artificial Neural Networks–First Generation - Introduction to Neural Networks, Biological Inspiration, Biological Neural Networks to Artificial Neural Networks, Classification of ANNs, First-generation Neural Networks.

UNIT III:

Fuzzy Logic - Introduction to Fuzzy Logic, Human Learning Ability, Imprecision, and Uncertainty, Undecidability, Probability Theory vs Possibility Theory, Classical Sets and Fuzzy Sets, Fuzzy Set Operations, Fuzzy Relations, Fuzzy Composition.

Fuzzy Logic Applications : Introduction to Fuzzy Logic Applications, Fuzzy controllers.

UNIT IV :

Genetic Algorithms and Evolutionary Programming - Introduction to Genetic Algorithms, Genetic Algorithms, Procedures of GAs, Genetic Representations, Selection, Genetic Operators, Mutation, Natural Inheritance Operators.

UNIT V:

Introduction to Swarm Intelligence - Background of Swarm Intelligent Systems, Ant Colony System, Ant Colony Optimization.

TEXT BOOK(S):

1. Soft computing with MATLAB programming, N.P.Padhy, S.P.Simon, Oxford University Press, First Edition, 2015

UNIT 1: Chapter 1 - 1.1 to 1.7 (except 1.8)

UNIT 2: Chapter 2 - 2.1 to 2.5 (except 2.6 to 2.8).

UNIT 3: Chapter 5 - 5.1 to 5.8 , chapter 6 (6.1, 6.2)

UNIT 4: Chapter 7 - 7.1 to 7.3.

UNIT 5: Chapter 8 - 8.1 to 8.5.

REFERENCE BOOK(S):

1. Principles of Soft computing, S.N.Sivanandam and S.N.Deepa, Wiley India Edition, 2nd Edition, 2013.
2. Neural Networks, Simon Haykin, Pearson Education, 2003.
3. Fuzzy Logic – Intelligence Control & Information , John Yen & Reza Langari, Pearson Education, New Delhi, 2003
4. Artificial Intelligence and Intelligent Systems , N.P.Padhy, Oxford University Press, 2013.

Programme : M. Sc Computer Science | **Part III : Core**

Semester:III | **Hours : 6/W 90 Hrs/S**

Subject Code : P22CS11 | **Credits : 5**

TITLE OF THE PAPER: SOFT COMPUTING

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1 : Introduction to Soft Computing			
1.	Introduction Artificial Intelligence	1	ICT(PPT)
2.	Artificial Neural Networks	2	ICT(PPT)
3.	Fuzzy Systems	2	ICT(PPT)
4.	Genetic Algorithm and Evolutionary Programming	2	ICT(PPT)
5.	Swarm Intelligent Systems	2	ICT(PPT)
6.	Review of Introduction	1	Group Discussion
UNIT 11 : Artificial Neural Networks–First Generation			
7.	Introduction to Neural Networks	3	ICT(PPT)
8.	Biological Inspiration, Biological Neural Networks to Artificial Neural Networks	4	ICT(PPT)
9.	Classification of ANN	6	ICT(PPT)
10.	First-generation Neural Networks	3	ICT(PPT)
11.	Data Generalization by Attribute - Oriented Induction	2	ICT(PPT)
12.	Evaluation of UNIT II	2	Tutorial
UNIT III : Fuzzy Logic			
13.	Introduction to Fuzzy Logic, Human Learning Ability, Imprecision, and Uncertainty, Undecidability	6	ICT(PPT)
14.	Probability Theory vs Possibility Theory	2	ICT(PPT)
15.	Classical Sets and Fuzzy Sets, Fuzzy Set Operations, Fuzzy Relations, Fuzzy Composition	8	ICT(PPT)
16.	**Fuzzy Logic Applications :** Introduction to Fuzzy Logic Applications, Fuzzy controllers.	2	ICT(PPT)
17.	Summarize UNIT III	2	Peer team Teaching
UNIT IV : Genetic Algorithms and Evolutionary Programming			
18.	Introduction to Genetic Algorithm	5	ICT (PPT)
19.	Genetic Algorithms	2	ICT (PPT)
20.	Procedures of GAs, Genetic Representations, Selection, Genetic Operators, Mutation, Natural Inheritance Operators	10	ICT (PPT)

21.	Evaluation	3	Tutorial
UNIT V : Introduction to Swarm Intelligence			
22.	Background of Swarm Intelligent Systems	3	ICT (PPT)
23.	Ant Colony System	6	ICT (PPT)
24.	Ant Colony Optimisation	6	ICT (PPT)
25.	Discussion	5	Peer team Teaching

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	4	4	2	3	3	4	4	4	4	3.4
CO2	3	2	4	4	4	4	4	4	4	4	3.7
CO3	4	4	4	5	4	4	4	4	4	5	4.2
CO4	4	4	4	4	4	4	4	5	4	4	4.1
CO5	4	3	3	5	4	4	4	4	4	5	4
Mean Overall Score											3.88

Result: The Score for this Course is 3.88 (High Relationship)

COURSE DESIGNER: **Dr. G.SUJATHA**
Associate Professor / Department of Computer Science

Programme : M. Sc Computer Science	**Part III : Core**
Semester III	**Hours : 5 P/W 75 Hrs P/S**
Sub. Code : P22CS12P	**Credits : 3**

TITLE OF THE PAPER: Lab 6: SOFT COMPUTING

Section - A (Fuzzy Logic)

1. a) Write a program (m.file) to calculate union, intersection, complement and difference of two fuzzy sets.
   b) Write a program (m.file) to calculate the Demorgan's Law.
2. Find whether the given matrix is (a) reflexive (b) tolerance and (c) transitivity matrix or not.
3. Find whether the given matrix is symmetry or not.
4. Find the fuzzy relation between two vectors *R* and *S*

   R =

   0.7 0.5

   0.8 0.4

   S =

   0.9 0.6 0.2

   0.1 0.7 0.5

   Using max–product and max-min method

5. a) Use command line commands to display the Gaussian membership function. Given x = 0–10 with increment of 0.1 and Gaussian function is defined between 0.5 and −5. b) Use command line commands to display the triangular membership function. Given x = 0–10 with increment of 0.2 triangular membership function is defined between [3 4 5]
6. Illustrate different types of generalized bell membership functions using a program
7. Using program find the crisp lambda cut set relations for $\lambda = 0.2$, the fuzzy matrix is given by

   R=

   0.2 0.7 0.8 1

   1 0.9 0.5 0.1

   0 0.8 1 0.6

   0. 0.4 1 0.3

8. Temperature control of the reactor where the error and change in error is given to the controller. Here the temperature of the reactor is controlled by the temperature bath around the reactor thus the temperature is controlled by controlling the flow of the coolant into the reactor. Form the membership function and the rule base using FIS editor.
9. Consider the water tank with following rules
   a) IF (level is okay) THEN (valve is no_change) (1)
   b) IF (level is low) THEN (valve is open_fast) (1)
   c) IF (level is high) THEN (valve is close_fast) (1)

   Using Mamdani method and max–min method for fuzzification and method of centroid for defuzzification method construct a FIS. Before editing that rules, membership functions must be defined with membership function editor.

10. a) Form a fuzzy system, which approximates function *f*, when $x \in [-10, 10]$.Repeat the same by adding random, normally distributed noise with zero mean and Unit variance.
    b) Simulate the output when the input is sin(*t*). Observe what happens to the signal shape at the output.
11. Use Fuzzy Logic Toolbox to model the tip given after a dinner for two, where the food can be disgusting, not good, bland, satisfying, good, or delightful, and the service can be poor, average, or good. To get started, you type fuzzy in a window. Then use the fuzzy inference system and membership function editors to define and tune your rules.

Section - B (Neural Network)

12. Design networks of McCulloch-Pitts neurons that implement logical NOT, AND and OR gates. Draw each network and label all the weight and threshold values.

13. Derive expressions for the weights and thresholds of a McCulloch-Pitts neuron that can compute the following input-output mappings:

in1	*in2*	*out*
0	0	1
0	1	0
1	0	0
1	1	0

    Write code for the above ANN.

14. Investigation the use of back-propagation learning using a sigmoidal nonlinearity to achieve one-to-one mapping, as described here:
    1. $f(x) = 1/x$’ $\quad 1 \leq x \leq 100$
    2. $f(x) = \log_{10}x$, $\quad 1 \leq x \leq 10$
    3. $f(x) = \exp(-x)$, $\quad 1 \leq x \leq 10$
    4. $f(x) = \sin x$, $\quad 0 \leq x \leq \pi/2$

    For each mapping, do the following:
    (a) Set up two sets of data, one for network training, and the other for testing.
    (b) Use the training data set compute the synaptic weights of the network, assumed to have a single hidden layer.
    (c) Evaluate the computation accuracy of the network by using the test data. Use a single layer but with a variable number of hidden neurons. Investigate how the network performance is affected by varying the size of the hidden layer.

15. The data presented in the Table P4.17 show the weights of eye lenses of wild Australian rabbits as a function of age. No simple analytical function can exactly interpolate these data, because we do not have a single valued function. Instead, we have a nonlinear least squares model of this data set, using a negative exponential, as described by $Y = 2.33.846(1 - \exp(-0.006042x)) + \varepsilon$
    Where ε is an error term.
    Using the back- propagation algorithm, design a multiplayer perceptron that provides a nonlinear least-squares approximation to this data set. Compare your result against the least-sequence model described.
    Table P4.17 Weights of Eye Lenses of Wild Australian Rabbits

Ages (days)	Weights (mg)	Ages (days)	Weights (mg)	Ages (days)	Weights (mg)	Ages (days)	Weights (mg)
15	21.66	75	94.6	218	174.18	338	203.23
15	22.75	82	92.5	218	173.03	347	188.38
15	22.3	85	105	219	173.54	354	189.7
18	31.25	91	101.7	224	178.86	357	195.31
28	44.79	91	102.9	225	177.68	375	202.63
29	40.55	97	110	227	173.73	394	224.82
37	50.25	98	104.3	232	159.98	513	203.3
37	46.88	25	134.9	232	161.29	535	209.7
44	52.03	142	130.68	237	187.07	554	233.9
50	63.47	142	140.58	26	176.13	591	234.7
50	61.13	147	155.3	258	183.4	648	244.3
60	81	147	152.2	276	186.26	660	231
61	73.09	150	144.5	285	189.66	705	242.4
64	79.09	159	142.15	300	186.09	723	230.77
65	79.51	165	139.81	301	186.7	756	242.57
65	65.31	183	153.22	305	186.8	768	232.12
72	71.9	192	145.72	312	195.1	860	246.7
75	86.1	195	161.1	317	216.41		

Section - C (Genetic Algorithm)

16. Write a program to implement Roulette wheel and ranking selection method.
17. Write a program to maximize a function

f(x,y)=xsin(4 x) + ysin(20 x) subject to -3.0 □ x □ 12.1

4.1 □ y □ 5.8

Reference Books :

Soft computing with Pprogramming, N.P.Padhy, S.P.Simon, Oxford University Press, First Edition, 2015

Note: The above are sample problems; Instructor can add more exercises based on their requirements and current technology

Programme : M. Sc Computer Science | **Part III : DSEC-III**

Semester III | **Hours : 6 P/W 90Hrs P/S**

Sub. Code : P22DSS3A | **Credits : 4**

TITLE OF THE PAPER: INTERNET OF THINGS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To introduce the concepts of Internet of Things and its application, IoT devices and implementation with Python.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Discuss about Design of IoT, deployment templates and Domain specific IoT.	**12**
UNIT 2	**CO2:** Analyze IoT , M2M and SDN and NFV for IoT.	**19**
UNIT 3	**CO3:** Understand the IoT platform design methodology and logical design using python.	**23**
UNIT 4	**CO4:** Understand IoT physical devices and physical servers.	**23**
UNIT 5	**CO5:** Apply IOT Design in various domains and Data analytics for IoT.	**13**

Programme :M. Sc Computer Science	**Part III : DSEC-III**
Semester III	**Hours : 6 P/W 90Hrs P/S**
Sub. Code : P22DSS3A	**Credits : 4**

TITLE OF THE PAPER: INTERNET OF THINGS.

UNIT I: Introduction to Internet of Things: Introduction – Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies – IoT & Deployment Templates. **Domain Specific IoTs:** Introduction – Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health & Life style.

UNIT II: IoT and M2M : Introduction : M2M – Difference between IoT and M2M – SDN and NFV for IoT.

IoT System Management with NETCONF-YANG : Need for IoT Systems Management – Simple Network Management Protocol (SNMP) – Network Operator Requirements – NETCONF- YANG – IoT Systems Management with NETCONF_YANG.

UNIT III: IoT Platforms Design Methodology: Introduction – IoT Design Methodology – Case Study on IoT System for Weather Monitoring – Motivation for using Python.
IoT Systems –Logical Design using Python: Introduction – Installing Python – Python Data types & Data Structures – Control Flow – Functions – Modules – Packages – File Handling – Date/Time Operations – Classes – Python packages of Interest for IoT.

UNIT IV: IoT Physical Devices & Endpoints: What is an IoT Device – Exemplary Device: Raspberry Pi – About the Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python – Other IoT devices.
IoT Physical Servers & Cloud Offerings : Introduction to Cloud Storage Models & Communication APIs – WAMP - AutoBahn for IoT– Xively Cloud for IoT – Python Web application Framework-Django – Designing a REST ful Web API – Amazon Web Services for IoT – SkynetIoT messaging platform.

UNIT V: Case Studies Illustrating IoT Design: Introduction – Home Automation – Cities – Environment – Agriculture – Productivity applications
Data Analytics for IoT : Introduction – Apache Hadoop – Using Hadoop MapReduce for Batch Data Analysis – Apache Oozier – Apache Spark – Apache Storm – Using Apache Storm for Real-time Data Analysis.

TEXT BOOK(S):

1. Internet of Things, Arshdeep Bahga, Vijay Madisetti, Universities Press (INDIA) Private Ltd., 2015.

REFERENCE BOOK(S):

1. Getting Started with the Internet of Things, CunoPfister, O'Relly, 2011.
2. Designing the Internet of Things, AdrianMcewen, HakinCassimally, Willey,2015.
3. The Internet of Things in the Cloud: A Middleware Perspective,Honbo Zhou, CRC Press, 2012.
4. Architecting the Internet of Things, Dieter Uckelmann; Mark Harrison; Florian Michahelles, (Eds.) Springer, 2011.
5. The Internet of Things , Key Applications and Protocols, Oliver Hersent, David Boswarthick, Omar Elloumi, Wiley , 2017

Programme : M. Sc Computer Science **Part III : DSEC-III**

Semester : III **Hours : 6P/W 90Hrs P/S**

Sub. Code : P22DSS3A **Credits : 4**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	Introduction: Physical Design of IoT – Logical Design of IoT	3	Lecture
2.	IoT Enabling Technologies, IoT & Deployment Templates. .	3	Lecture
3.	**Domain Specific IoTs:** Introduction – Home Automation .	2	Lecture
4.	Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry , Health & Life style.	3	Lecture
5.	Discussion	1	Group Discussion
	UNIT 11		
6.	**IoT and M2M :** Introduction : M2M**,** Difference between IoT and M2M	4	Lecture
7.	SDN and NFV for IoT.	4	Lecture
8.	**IoT System Management with NETCONF-YANG :** Need for IoT Systems Management –	3	Lecture
9.	Simple Network Management Protocol (SNMP) .	3	Lecture
10.	Network Operator Requirements	1	Group Discussion
11	NETCONF- YANG	2	Lecture
12..	IoT Systems Management with NETCONF_YANG	1	Tutorial
13..	Discussion	1	ICT (NPTEL Videos)
	UNIT III		
14.	**IoT Platforms Design Methodology:** Introduction , IoT Design Methodology	3	Lecture
15.	Case Study on IoT System for Weather Monitoring , Motivation for using Python.	3	Lecture
16..	**IoT Systems –Logical Design using Python:** Introduction , Installing Python ,Python Data types & Data Structures	4	Lecture
17.	Control Flow, Functions	4	Tutorial
18.	Modules , Packages , File Handling Date/Time Operations	3	Lecture
19.	Classes in python	1	Tutorial

20.	packages of Interest for IoT.	3	Lecture
21.	Exercise Problems	1	ICT (NPTEL Notes)
22.	Applications	1	Group Discussion
	UNIT IV		
23.	**IoT Physical Devices & Endpoints:** What is an IoT Device.	2	Lecture
24.	Exemplary Device: Raspberry Pi – About the Board	2	Lecture
25.	Linux on Raspberry Pi ,Raspberry Pi Interfaces	2	Lecture
26.	Programming Raspberry Pi with Python, Other IoT devices	3	Tutorial
27.	**IoT Physical Servers & Cloud Offerings :** Introduction to Cloud Storage Models & Communication APIs	3	Lecture
28.	WAMP, AutoBahn for IoT, Xively Cloud for IoT	3	Lecture
29.	Python Web application Framework-Django	3	Tutorial
30.	Designing a REST ful Web API	2	Lecture
31.	Amazon Web Services for IoT	1	Lecture
32.	SkynetIoT messaging platform	1	ICT (NPTEL Notes)
33.	Discussion	1	Group Discussion
	UNIT V		
34.	**Case Studies Illustrating IoT Design:** Introduction – Home Automation	2	Lecture
35.	Cities, Environment, Agriculture	3	Lecture
36.	Productivity applications	3	Lecture
37.	**Data Analytics for IoT :** Introduction – Apache Hadoop	1	Peer Teaching
38.	Using Hadoop MapReduce for Batch Data Analysis	1	Lecture
39.	Apache Oozier	1	Lecture
40.	Apache Spark	1	Lecture
41.	Apache Storm , Using Apache Storm for Real-time Data Analysis	1	Lecture

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	4	4	2	3	3	4	4	4	4	3.4
CO2	3	2	4	4	4	4	4	4	4	4	3.7
CO3	4	4	4	5	4	4	4	4	4	5	4.2
CO4	4	4	4	4	4	4	4	5	4	4	4.1
CO5	4	3	3	5	4	4	4	4	4	5	4
Mean Overall Score											3.88

Result: The Score for this Course is 3.88 (High Relationship)

COURSE DESIGNER: **Dr. P.PUNITHA PONMALAR**
Associate Professor / Department of Computer Science

Programme : M. Sc Computer Science | **Part III : DSEC-III**

Semester III | **Hours :6 P/W 90Hrs P/S**

Sub. Code : P22DSS3B | **Credits : 4**

TITLE OF THE PAPER: WIRELESS SENSOR NETWORKS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	5	0 / 1	0 / 1	0 / 1

PREAMBLE:

To enrich the knowledge about mobile communications, concepts of several media access scheme and different wireless communication systems.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Discuss about Networked wireless sensor devices, design challenges and topology	**8**
UNIT 2	**CO2:** Analyze the Localization, synchronization issues and approaches	**23**
UNIT 3	**CO3:** Understand the wireless characteristics, MAC protocols and contention free protocols	**23**
UNIT 4	**CO4:** Construct topology for connectivity, coverage and routing techniques.	**23**
UNIT 5	**CO5:** Discuss about the data centric routing and Reliability and congestion control	**13**

Programme :M. Sc Computer Science	**Part III : DSEC-III**
Semester III	**Hours : 6 P/W 90Hrs P/S**
Sub. Code : P22DSS3B	**Credits :4**

TITLE OF THE PAPER: WIRELESS SENSOR NETWORKS

UNIT I: Introduction: the vision, Networked wireless sensor devices, Applications, Key design challenges. Network deployment: Structured versus randomized deployment, Network topology, Connectivity, Connectivity using power control, Coverage metrics, Mobile deployment.

UNIT II: Localization: issues & approaches, Coarse-grained & Fine-grained node localization, Network - wide localization, Theoretical analysis of localization techniques. Synchronization: Issues & Traditional approaches, Fine-grained clock synchronization, and Coarse-grained data synchronization.

UNIT III: Wireless characteristics: Basics, Wireless link quality, Radio energy considerations, SINR capture model for interference. Medium-access and sleep scheduling: Traditional MAC protocols, Energy efficiency in MAC protocols, Asynchronous sleep techniques, Sleep - scheduled techniques, and Contention-free protocols.

UNIT IV: Sleep-based topology control: Constructing topologies for connectivity, constructing topologies for coverage, Set K-cover algorithms. Routing: Metric-based approaches, Routing with diversity, Multi-path routing, Lifetime-maximizing energy-aware routing techniques, Geographic routing, Routing to mobile sinks.

UNIT V: Data-centric networking: Data-centric routing, Data-gathering with compression, Querying, Data-centric storage and retrieval, the database perspective on sensor networks. Reliability and congestion control: Basic mechanisms and tunable parameters, Reliability guarantees, Congestion Control, Real-time scheduling.

TEXT BOOK(S):

1. Wireless Sensor Networks: Technology, Protocols, and Applications, KazemSohraby, Daniel Minoli, TaiebZnati, Wiley Inter Science, 2007.

UNIT I	:Chapters 1 and 2
UNIT II	:Chapters 3, 4 and 5
UNIT III	:Chapters 6 and 7
UNIT IV	:Chapters 8 and 9
UNIT V	:Chapters 10 & 11

Programme : M. Sc Computer Science **Part III : DSEC-III**

Semester III **Hours : 6 P/W 90Hrs P/S**

Sub. Code : P22DSS3B **Credits : 4**

TITLE OF THE PAPER: WIRELESS SENSOR NETWORKS

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	Introduction: the vision, Networked wireless sensor devices	2	Lecture
2.	Applications, Key design challenges.	2	Lecture
3.	Network deployment: Structured versus randomized deployment, Network topology	2	Lecture
4.	Introduction Connectivity using power control, Coverage metrics, Mobile deployment.	1	Lecture
5.	Discussion	1	Group Discussion
	UNIT 11		
6.	Localization: issues & approaches	3	Lecture
7.	Coarse-grained & Fine-grained node localization,	4	Lecture
8.	Network - wide localization,	3	Lecture
9.	Theoretical analysis of localization techniques.	4	Lecture
10.	Discussion	1	Peer Teaching
11.	Synchronization: Issues & Traditional approaches	3	Group Discussion
12	Fine-grained clock synchronization,	3	Lecture
13.	Coarse-grained data synchronization	1	Tutorial
14.	Discussion	1	ICT (NPTEL Videos)
	UNIT III		
15.	Wireless characteristics: Basics, Wireless link quality.	3	Lecture
16.	Radio energy considerations, SINR capture model for interference.	4	Lecture
17.	Medium-access and sleep scheduling: Traditional MAC protocols	4	Lecture
18.	Energy efficiency in MAC protocols, Asynchronous sleep techniques	3	Tutorial
19.	Sleep - scheduled techniques	3	Lecture
20.	Exercise Problems	1	Tutorial
21.	Contention-free protocols	3	Lecture
22.	Exercise Problems	1	ICT (NPTEL Notes)

23.	Applications	1	Group Discussion
UNIT IV			
24.	Sleep-based topology control	3	Lecture
25.	Constructing topologies for connectivity, constructing topologies for coverage	3	Lecture
26.	Set K-cover algorithms.	3	Lecture
27.	Routing: Metric-based approaches	2	Tutorial
28.	Routing with diversity	2	Lecture
29.	Multi-path routing	3	Lecture
30.	Lifetime-maximizing energy-aware routing techniques	2	Tutorial
31.	Geographic routing	2	Lecture
32.	Routing to mobile sinks	1	Lecture
33.	Challenges	1	ICT (NPTEL Notes)
34.	Applications	1	Group Discussion
UNIT V			
35.	Data-centric networking: Data-centric routing	2	Lecture
36.	Data-gathering with compression	2	Lecture
37.	Querying, Data-centric storage and retrieval	3	Lecture
38.	Database perspective on sensor networks.	1	Peer Teaching
39.	Reliability and congestion control: Basic mechanisms and tunable parameters	1	Lecture
40.	Reliability guarantees	1	Lecture
41.	Congestion Control	1	Lecture
42.	Real-time scheduling	1	Lecture
43.	Issues	1	Group Discussion

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	4	4	2	3	3	4	4	4	4	3.4
CO2	3	2	4	4	4	4	4	4	4	4	3.7
CO3	4	4	4	5	4	4	4	4	4	5	4.2
CO4	4	4	4	4	4	4	4	5	4	4	4.1
CO5	4	3	3	5	4	4	4	4	4	5	4
Mean Overall Score											3.88

Result: The Score for this Course is 3.88 (High Relationship)

COURSE DESIGNER: **Dr. P.PUNITHA PONMALAR**
Associate Professor / Department of Computer Science

Programme : M. Sc Computer Science | **Part III : DSEC-III**

Semester: III | **Hours : 6 P/W 90 Hrs P/S**

Subject Code : P22DSS3C | **Credits : 4**

TITLE OF THE PAPER: MOBILE COMPUTING

Pedagogy	**Hours**	**Lecture**	**Peer Teaching**	**GD/VIDOES/TUTORIAL**	**ICT**
	6	**5**	**0/ 1**	**0 / 1**	**0 / 1**

PREAMBLE:

To introduce the fundamentals of Wireless Communication and the protocols of Mobile Computing.

COURSE OUTCOME At the end of the Semester, the Students will be able to		**Hrs P/S**
UNIT 1	**CO1:** Explain the concepts of communication technologies, network architecture in general and wireless networking technology in particular	**18**
UNIT 2	**CO2:** Describe the mobile computing architecture and applications. Describe the wireless technology standards and services.- GSM, GPRS, UMTS	**18**
UNIT 3	**CO3:** Analyze the mobile application related protocols of IEEE, MAC, Mobile IP and transport layer	**18**
UNIT 4	**CO4:** Describe the concept of Mobile Ad-hoc network and wireless sensor network	**18**
UNIT 5	**CO5:** Understand the Wireless Transport Layer functions and Wireless Application Protocols.	**18**

Programme : M. Sc Computer Science	**Part III : DSEC-III**
Semester: III	**Hours : 6 P/W 90Hrs P/S**
Subject Code : P22DSS3C	**Credits : 4**

TITLE OF THE PAPER: MOBILE COMPUTING

UNIT I:
INTRODUCTION: Medium access control – Motivation for a specialized MAC, SDMA, FDMA, TDMA, CDMA, Satellite systems – History, Basics – GEO, LEO, MEO – Routing – Localization – Handover – Examples..

UNIT II:
Telecommunication Systems: GSM – Mobile services, System architecture, Radio Interface, Protocols, Localization and calling, Handover, Security, New data services, DECT – System architecture, Protocol architecture, TETRA.

UNIT III:
STANDARDS: Wireless LAN: Infra redVs radio transmission, Infrastructure and ad-hoc network - IEEE 802.11 – System architecture, Protocol architecture, Physical Layer, Medium Access Control Layer, MAC management, 802.11b, 802.11a.

UNIT IV:
Mobile Network Layer: Mobile IP – Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations, Reverse Tunneling, IPv6, IP micro-mobility support, Dynamic Host Configuration Protocol – Mobile Ad-Hoc networks – Routing, Destination sequence distance vector, Dynamic source routing, alternative metrics, overview of ad-hoc routing protocols.

UNIT V:
Mobile Transport Layer: Traditional TCP – Classical TCP Improvements – Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit / Fast Recovery, Transmission / Time – out freezing, Selective retransmission, Transaction-oriented TCP
Wireless Application Protocol: Architecture, Wireless Datagram Protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment.

TEXT BOOK(S):

1. Jochen Schiller, Mobile Communications, Second Edition, Addison Wesley, 2003 (Eleventh Impression, 2013)

UNIT I	:	Chapters 3,5
UNIT II	:	Chapters 4.1 – 4.3
UNIT III	:	Chapters 7.1 - 7.3
UNIT IV	:	Chapters 8
UNIT V	:	Chapters 9.1,9.2, 10.3.1-10.3.6

REFERENCE BOOK(S):

1. William C.Y.Lee, Mobile Communication Design Fundamentals, John Wiley.

Programme : M. Sc Computer Science | **Part III : DSEC-III**

Semester: III | **Hours : 6 P/W 90 Hrs P/S**

Subject Code : P22DSS3C | **Credits : 4**

TITLE OF THE PAPER: MOBILE COMPUTING

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	INTRODUCTION: Mobile Computing	3	Lecture
2.	Medium access control – Motivation for a specialized MAC	3	Lecture
3.	SDMA, FDMA	3	ICT (NPTEL Notes)
4.	TDMA, CDMA	3	Lecture (PPT)
5.	Satellite systems – History, Basics – GEO, LEO, MEO	2	Lecture
6.	Routing – Localization - Handover – Examples	3	Lecture
	Application Areas and Overview	1	Group Discussion
	UNIT 11		
7.	Telecommunication Systems: GSM	3	Lecture
8.	Mobile services, System architecture,	3	ICT (NPTEL Notes)
9.	Radio Interface, Protocols	4	Lecture
10.	Localization and calling, Handover	3	Lecture
11.	Security, New data services, DECT – System architecture, Protocol architecture, TETRA	4	Lecture
12.	Application Domains	1	Group Discussion
	UNIT III		
13.	STANDARDS: Wireless LAN: Infra redVs radio transmission, Infrastructure and ad-hoc network -	5	Lecture
14.	IEEE 802.11 – System architecture, Protocol architecture, Physical Layer,	4	ICT(Video)
15.	Medium Access Control Layer, MAC management,	5	Lecture
16.	802.11b, 802.11a.	3	Lecture (PPT)
17.	Summarize UNIT III	1	Peer Teaching
	UNIT IV		
18.	Mobile Network Layer: Mobile IP – Goals, assumptions and requirements, Entities and terminology,.	6	ICT (PPT)

19.	IP packet delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations, Reverse Tunneling,	5	ICT (Lecture Notes)
20.	IPv6, IP micro-mobility support, Dynamic Host Configuration Protocol – Mobile Ad-Hoc networks – Routing, Destination sequence distance vector, Dynamic source routing, alternative metrics, overview of ad-hoc routing protocols.	6	Lecture
21.	Exercise Problems	1	Tutorial
UNIT V			
22.	Mobile Transport Layer: Traditional TCP – Classical TCP Improvements – Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit / Fast Recovery, Transmission / Time – out freezing, Selective retransmission, Transaction-oriented TCP	6	Lecture
23.	Mobile Transport Layer : Issues	4	Tutorial
24.	Wireless Application Protocol: Architecture, Wireless Datagram Protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment.	6	Lecture
	Wireless transport Layer : Security Issues	1	ICT (Videos)
25.	Application Areas	1	Group Discussion

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	4	4	2	3	3	4	4	4	4	3.4
CO2	3	2	4	4	4	4	4	4	4	4	3.7
CO3	4	4	4	5	4	4	4	4	4	5	4.2
CO4	4	4	4	4	4	4	4	5	4	4	4.1
CO5	4	3	3	5	4	4	4	4	4	5	4
Mean Overall Score											3.88

Result: The Score for this Course is 3.88 (High Relationship)

COURSE DESIGNER: **Dr. S.SUGUNA**
Assistant Professor / Department of Computer Science

Programme : M. Sc Computer Science | **Part III : NMEC-I**

Semester III | **Hours : 2 P/W 30Hrs P/S**

Sub. Code : P22NMS1 | **Credits : 2**

TITLE OF THE PAPER: BIOMETRICS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	2	1	0 / 1	0 / 1	0 / 1

PREAMBLE:

To impart the understanding in Biometric and its Application.

	COURSE OUTCOME At the end of the Semester, the Students will be able to	**Hrs P/S**
UNIT 1	**CO1:** Discuss the basics of Biometrics , methods and Benefits	**4**
UNIT 2	**CO2:** Analyze the functioning of various metrics.	**6**
UNIT 3	**CO3:** Understanding the various types of scan , merit and demerits	**7**
UNIT 4	**CO4:** Analyze the facial scan methods	**7**
UNIT 5	**CO5:** Discuss the iris scan and working methodology	**6**

Programme : M. Sc Computer Science	**Part III : NMEC-I**
Semester III	**Hours : 2 P/W 30Hrs P/S**
Sub. Code : P22NMS1	**Credits : 2**

TITLE OF THE PAPER: BIOMETRICS

UNIT I:

Benefits of biometrics versus traditional: Authentication methods-Benefits of biometrics in Identification System – Key Biometric Terms and Processes – Definitions- How biometric matching works.

UNIT II:

Accuracy in Biometrics Systems: False Match Rate-False non Match Rate - Failure-to- Enroll (FTE) Rate-Derived metrics.

UNIT III:

Finger-Scan : Components-How Finger-Scan Technology Works-Competing Finger -Scan Technologies - Finger-Scan Deployments - Finger-Scan Strengths - Finger- Scan weaknesses.

UNITIV:

Facial-Scan: How facial-Scan Technology Works-Competing Facial-Scan Technologies-Facial-Scan Deployments -Facial-Scan Strengths - Facial-Scan weaknesses.

UNIT V:

Iris-Scan: How it Works – Deployments- Iris – Scan Strengths- Iris-Scan Weaknesses.

TEXT BOOK(S):

1. Biometrics, Samir Nanavati, Michael Thieme, Raj Nananvati, Wiley Publication, 2002.

UNIT I: Chapters 1, 2
UNIT II: Chapters 3
UNIT III:Chapters 4
UNIT IV:Chapters 5
UNIT V: Chapters 6

Programme : M. Sc Computer Science **Part III : NMEC-I**

Semester III **Hours : 2 P/W 30Hrs P/S**

Sub. Code : P22NMS1 **Credits : 2**

TITLE OF THE PAPER: BIOMETRICS

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.	Benefits of biometrics versus traditional:	1	Lecture
2.	Authentication methods-Benefits of biometrics in Identification	1	Lecture
3.	System – Key Biometric Terms and Processes-Definitions- How biometric matching works.	1	Lecture
4.	Discussion	1	Group Discussion
UNIT 11			
5.	Accuracy in Biometrics Systems: False Match Rate--	2	Lecture
6.	False non Match Rate	2	Lecture
7.	Failure-to- Enroll (FTE) Rate	1	Lecture
8.	Derived metrics	1	ICT(ppt)
UNIT III			
9.	Finger-Scan : Components-How Finger-Scan Technology Works-	1	Lecture
10.	Competing Finger -Scan Technologies	2	Lecture
11.	Finger-Scan Deployments	2	Lecture
12.	Finger-Scan Strengths - Finger- Scan weaknesses.	1	Lecture
13.	Applications	1	Group Discussion
UNIT IV			
14.	Facial-Scan: How facial-Scan Technology Works-	2	Lecture
15.	Competing Facial-Scan Technologies	2	Lecture
16.	Facial-Scan Deployments	2	Lecture
17.	Facial-Scan Strengths - Facial-Scan weaknesses.	1	Tutorial
UNIT V			

18.	Iris-Scan: How it Works	2	Lecture
19.	Deployments- Iris – Scan Strengths	2	Lecture
20.	Iris-Scan Weaknesses.	1	Lecture
21	Overview of unit V	1	Peer Teaching

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	4	4	3	3	4	3	2	3	4	3.3
CO2	4	3	2	3	2	3	3	2	3	3	2.8
CO3	3	3	4	3	4	4	4	4	3	4	3.6
CO4	3	4	4	3	4	4	4	4	3	4	3.7
CO5	3	3	4	3	4	4	4	4	3	4	3.6
Mean Overall Score											3.4

Result: The Score for this Course is 3.4(High Relationship)

COURSE DESIGNER: **Dr. A.PREMA**
Assistant Professor / Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : Core**

Semester IV | **Hours : 6 P/W 90 Hrs P/S**

Sub. Code : P22CS13 | **Credits : 5**

TITLE OF THE PAPER: BIG DATA ANALYTICS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	4	0 / 1	0 / 1	0 / 1

PREAMBLE:

To impart the knowledge on need of Big Data, Analytic techniques to drive useful outcomes, implications from underlying real time applications, scenario; Representing various representation of Problem Domain and operations.

COURSE OUTCOME At the end of the Semester, the Students will be able to		Hrs P/S
UNIT 1	**CO1:** To Discuss about the sources and impact of Data Explosion, need of Big Data & Technology and Outline the Classification algorithms, Regression techniques and Domain specific analytic techniques. Also associate Analytic with agricultural field and marketing area.	**15**
UNIT 2	**CO2:** To explain the Big Data Back bone systems and emergence of NOSQL	**20**
UNIT 3	**CO3:** To impart knowledge on issues on High Dimensional Data and Reduction Techniques. To describe the need of visualization, properties and techniques	**15**
UNIT 4	**CO4:** To demonstrate the statistical package R and its support on data analytics.	**20**
UNIT 5	**CO5:** To Demonstrate the need of MongoDB and its support on Big Data platform. To illustrate the interfacing mechanism of MongoDB with Statistical applications through interfacing techniques of R	**20**

Programme : M. Sc Computer Science	**Part III : Core**
Semester IV	**Hours : 6 P/W 90Hrs P/S**
Sub. Code : P22CS13	**Credits : 5**

TITLE OF THE PAPER: BIG DATA ANALYTICS

UNIT I:

Data Explosion and Big Data Analytics: An Overview: Introduction, Evolution of Database Technology and Big Data, Elements of Big Data, Big Data System Components, Big Data Analytics – Data Analytics. Types of Big Data Analytics, Applications of Big Data Technology, Challenges and Skills required with Big Data Technology.

Introduction about Classification Algorithms, Regression Techniques, Domain Specific Analytic Techniques: Time Series Analysis, In Database Analytics, Text Analytics.

Case Study: An Application of Analytics in Agriculture field and anticipating the Market Price.

UNIT II:

Real – Time Analysis: Introduction: Real-time System, Types of Real-time System, Types of Popular Real-time Operating systems - Advantages and Disadvantages of Real-time Operating Systems, Characteristics of Real-time Systems, Real-time Processing Systems for Big Data: Data Processing and Analytics, Big Data Engine-Hadoop, Real-time System Architecture, Real-time Platforms for Processing Big Data, Real-time Data Analytics.

Big Data: Hardware, Technology Foundations: Introduction, Big Data Stack, Virtualization and Big Data.

Understanding NoSQL and Hadoop Ecosystem: Introduction, NoSQL: CouchDB, MongoDB, Hadoop Ecosystem – HDFS, HBase, Yarn.

UNIT III:

High Dimensional Data: A Big Data Perspective: Introduction – What is Dimensionality?, Challenges in High Dimensional Data Handling – Curse of Dimensionality, Large Scale Optimization, Spurious Correlation – Endogenity, Dimensionality Reduction – Approaches for Dimensionality Reduction, Dimensionality Reduction Techniques.

Information Retrieval: B**ig Data Integration and Processing**: Big Data Integration and Processing: Introduction, Components of Information Retrieval System, User Interface and Visualization – Desirable Properties, Visualization Techniques, Text Operations, Query Operations, Indexing and Ranking.

UNIT IV:

R Programming: Introduction, Data Types, Data Structures and Operators – Basic Data Types in R, R Operators, Vectors, List, Factor, Arrays and Matrix, Data Frame, R Programming Structure – Control statements of R: if, if-else, if-else ladder, switch-case, return, Loops and Loop Control Statements, Input / Output: Import and Export Data, Handling Missing Values, Statistical Functions and Models of R, R Graphics and Data Visualization.

Case Study: Association Rule Mining Algorithm Implementations, K Means Clustering Algorithm Implementations, Decision Tree Algorithm Implementations, Naïve Bayes Classification Algorithm Implementation, Build the Regression Models, Construct Directed Graph using Adjacency Matrix.

UNIT V:

Mongo/DB with R Programming: Introduction – Document, Collections / Views / On-Demand Materialized Views, Key Features, Document Structure of MongoDB, Datatypes in MogoDB, MongoDB Curd Operations – Basics of MongoDB CURD Operations, Detailed Discussion of MongoDB CURD Operations with examples, MongoDB with R – Import/Export SCV/JSON file at MongoDB, Interfacing R and MongoDB, GridFS.

Case Study: Access GridFS files and show them using any front end support, Develop a solution using MongoDB and R for any application domain of your choice, Develop the coding to retrieve the content from GridFS.

TEXT BOOK:

1. Big Data Analytics – Concepts, Techniques, Tools and Technologies – First Edition, Thangaraj, S. Suguna, G. Sudha, PHI Learning Private Limited, Delhi,2022.

Unit I : Chapter 1, Chapter 2 (2.2.2. 2.2.4, 2.3)
Unit II : Chapter 3 (3.1 – 3.4)
Chapter 4 (4.1 – 4.3)
Chapter 5 (5.1, 5.2, 5.3.1 - 5.3.3)
Unit III : Chapter 6 & Chapter 7
Unit IV : Chapter 8
Unit V : Chapter 9

REFERENCE BOOKS:

1. Data Mining Concepts and Techniques – Jiawei Han, Micheline Kamber& Jain Pei, Morgan Kaufmann Publishers, Third edition 2012.
2. Introduction to Data Mining with Case Studies, G. K. Gupta, Easter Economy Edition, Prentice Hall of India, 2006.
3. DT Editorial Services, *Big Data Black Book: Covers Hadoop 2, MapReduce, Hive, Yarn, Pig, R and Data Visualization,* Publisher: Dreamtech Press India Pvt. Ltd, January 2016.
4. Ricardo Baeza – Yates, Berthier Riberio-Neto, *Modern Information Retrieval*, 1st Edition, Publisher: ACM Press, New York, Addison-Wesley, 1999.
5. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, *An Introduction to Information Retrieval*, 1st Edition, Publisher: Cambridge University Press, Cambridge, England, April 1, 2009.
6. Peter Ingwersen*, Information Retrieval Interaction* [www.db.dk/pi/iri], 1st Edition, Publisher: Taylor Graham Publishing, United Kingdom, USA (ISBN: 0 947568549), November 1992.
7. The MongoDB 4.2 Manual - *https://docs.mongodb.com › manual.*
8. R Programming – An approach to Data Analytics – Dr. Sudhamathy & Dr. Jothi Venkateshwaran, MJP Publishers, 2018.

Programme : M. Sc Computer Science **Part III : Core**

Semester IV **Hours : 6 P/W 90Hrs P/S**

Sub. Code : P22CS13 **Credits : 5**

TITLE OF THE PAPER: BIGDATA ANALYTICS

	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT I		
1.	An Overview: Introduction	2	Lecture
2.	Evolution of Database Technology and Big Data, Elements of Big Data, Big Data System Components	2	Lecture
3.	Big Data Analytics – Data Analytics, Types of Big Data Analytics	2	Lecture
4.	Applications of Big Data Technology, Challenges and Skills required with Big Data Technology	2	Lecture & Group Discussion
5.	Introduction about Classification Algorithms, Regression Techniques	2	Lecture
6.	Domain Specific Analytic Techniques: Time Series Analysis, In Database Analytics, Text Analytics.	2	Lecture
7.	Case Study: An Application of Analytics in Agriculture field and anticipating the Market Price	2	Group Discussion
	UNIT II		
8.	Real – Time Analysis:Introduction: Real-time System	1	ICT (UGC SWYAM Video)
9.	Types of Real-time System	1	Lecture
10.	Types of Popular Real-time Operating systems	1	Lecture
11.	Advantages and Disadvantages of Real-time Operating Systems	1	Tutorial
12.	Characteristics of Real-time Systems	1	Group discussion
13.	Real-time Processing Systems for Big Data	1	Lecture
14.	Real-time Data Analytics	1	Peer Teaching
15	Big Data: Hardware, Technology Foundations: Introduction	1	Lecture
16.	Big Data Stack	2	Lecture
17.	Virtualization and Big Data	1	Lecture
18.	Understanding NoSQL and Hadoop Ecosystem: Introduction	2	Lecture
19.	NoSQL	1	Tutorial
20.	Hadoop Ecosystem	1	Lecture
21.	HDFS	1	Lecture
22.	HBase	1	Lecture

23.	Yarn	1	Lecture
24.	Overview of Unit II	2	Presentation
	UNIT III		
25.	High Dimensional Data: A Big Data Perspective:Introduction – What is Dimensionality?	1	Group discussion
26.	Challenges in High Dimensional Data Handling	1	Lecture
27.	Curse of Dimensionality	1	Group Discussion
28.	Large Scale Optimization, Spurious Correlation	1	Tutorial
29.	Endogenity	1	Peer Teaching
30.	Dimensionality Reduction	1	Lecture
31.	Approaches for Dimensionality Reduction	1	Demonstration
32.	Dimensionality Reduction Techniques	1	Tutorial
33.	Information Retrieval: Big Data Integration and Processing: Big Data Integration and Processing	1	Group discussion
34.	Introduction, Components of Information Retrieval System	1	ICT – NPTEL Video
35.	User Interface and Visualization, Desirable Properties	1	Lecture
37.	Visualization Techniques	1	Lecture
38.	Text Operations	1	Tutorial
39.	Query Operations, Indexing and Ranking	1	Demonstration
41.	Summary of Unit-II	1	Lecture
	UNIT IV		
42.	**R Programming:** Introduction	1	Lecture
43.	Data Types, Data Structures and Operators	1	Group Discussion
44.	Basic Data Types in R, R Operators	1	Demonstration
45.	Vectors, List, Factor, Arrays and Matrix	1	Demonstration
46.	Data Frame	1	Demonstration
47.	R Programming Structure	1	Peer Teaching
48.	Control statements of R: if, if-else, if-else ladder, switch-case	1	Peer Teaching
49.	return, Loops and Loop Control Statements	1	Demonstration
50.	Input/ Output: Import and Export Data	1	Lecture
51.	Handling Missing Values	1	Tutorial
52.	Statistical Functions and Models of R	1	Demonstration
53.	R Graphics and Data Visualization.	1	Demonstration
54.	Case Study: K Means Clustering & Decision Tree Algorithms Implementations	2	Demonstration

55.	Association Rule Mining Algorithm Implementations	1	Tutorial
56.	Build the Regression models	2	Demonstration
57.	Construct Directed graph using Adjacency matrix	1	Demonstration
58.	Classification based on Rough Set theory	1	Demonstration
59.	Classification using Naive Bayes Algorithm Implementation	1	Demonstration
60.	Overview of Unit-IV	1	Group Discussion
UNIT V			
61.	**Mongo/db with R Programming:** Introduction – Document, Collections / Views / On-Demand Materialized Views	1	ICT-NPTEL Video
62.	Key Features	1	Lecture
63.	Document Structure of MongoDB	1	Peer Teaching
64.	Datatypes in MongoDB	1	Lecture
65.	MongoDB Curd Operations	2	Group discussion
66.	Basics of MongoDB CURD Operations	2	Lecture
67.	Detailed Discussion of MongoDB CURD Operations with examples	2	Demonstration
68.	MongoDB with R	2	Tutorial
69.	Import/Export SCV/JSON file at MongoDB	1	Demonstration
70.	Interfacing R and MongoDB	2	Demonstration
71.	GridFS	1	Demonstration
72.	Case Study: Access GridFS files and show them using any front-end support	1	Tutorial
73.	Develop a solution using MongoDB and R for any application domain of your choice	2	Peer teaching
74.	Develop the coding to retrieve the content from GridFS	1	Peer teaching

Course Outcomes (Cos)	Programme Outcomes (Pos)							Programme Specific Outcomes (PSOs)							Mean scores of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO1	3	4	3	3	5	3	3	2	4	4	3	3	3	3	3.24
CO2	2	3	3	2	3	2	2	2	2	3	3	3	2	3	3.54
CO3	3	2	2	3	3	3	3	2	3	3	2	3	2	3	3.43
CO4	2	3	3	3	3	2	2	3	2	3	2	3	2	2	3.32
CO5	2	3	2	3	2	3	2	3	2	3	3	3	2	2	3.43
Mean Overall Score															3.45

Result: The Score for this Course is 3.45 (High Relationship)

COURSE DESIGNERS:

Dr. S. SUGUNA, Assistant Professor / Department of Computer Science.

&

Ms. G. SUDHA, Assistant Professor / Department of Computer Science.

Programme : M. Sc Computer Science **Part III : Core**

Semester IV **Hours : 6/W 90 Hrs/S**

Subject Code : P22CS14 **Credits : 5**

TITLE OF THE PAPER: DATA MINING AND WAREHOUSING

Pedagogy	**Hours**	**Lecture**	**Peer Teaching**	**GD/VIDOES/TUTORIAL**	**ICT**
	6	**5**	**0/ 1**	**0 / 1**	**0 / 1**

PREAMBLE:

To introduce the basic concepts of Data Warehouse, Data Preprocessing and Data Mining Techniques

COURSE OUTCOME At the end of the Semester, the Students will be able to		**Hrs P/S**
UNIT 1	**CO1:** Describe the introductory concepts, issues and Types of attributes of Data Mining	**15**
UNIT 2	**CO2:** Explain the methods of Preprocessing, Data Cleaning and implementation of Data Warehouse	**20**
UNIT 3	**CO3:** Demonstrate the methods of Mining Frequent Patterns, Associations and Correlations	**15**
UNIT 4	**CO4:** Design and evaluate Classification algorithms.	**20**
UNIT 5	**CO5:** Summarize Cluster Analysis and categorize the Cluster Methods.	**20**
	Total	**90**

Programme : M. Sc Computer Science	**Part III : Core**
Semester IV	**Hours : 6/W 90 Hrs/S**
Subject Code : P22CS14	**Credits : 5**

TITLE OF THE PAPER: DATA MINING AND WAREHOUSING

UNIT I:

Introduction - Why Data Mining? - What is Data Mining? - What Kinds of Data Can Be Mined? - What Kinds of Patterns Can Be Mined? - Which Technologies Are Used? Which Kinds of Applications Are Targeted? Major Issues in Data Mining. Getting to Know Your Data: Data Objects and Attribute Types - Basic Statistical Descriptions of Data - Data Visualization – Measuring Data Similarity and Dissimilarity.

UNIT II:

Data Preprocessing : Data Preprocessing An Overview - Data Cleaning - Data Integration - Data Reduction - Data Transformation and Data Discretization. Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts - Data Warehouse Modeling: Data Cube and OLAP - Data Warehouse Design and Usage - Data Generalization by Attribute - Oriented Induction.

UNIT III:

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods - Frequent Item set Mining Methods - Which Pattern Are Interesting ? - Pattern Evaluation Methods.

UNIT IV:

Classification: Basic Concepts - Basic Concepts - Decision Tree Induction - Bayes Classification Methods - Rule-Based Classification- Model Evaluation and Selection - Techniques to Improve Classification Accuracy.

UNIT V:

Cluster Analysis Basic Concepts and Methods: Cluster Analysis - Partitioning Methods - Hierarchical Methods - Density Based Methods - Grid Based Methods - Evaluation ofClustering.

TEXT BOOK(S):

1. Data Mining Concepts and Techniques - Third Edition, Jiawei Han, MichelineKamber, Jian Pei

UNIT I:Chapters 1, 2
UNIT II: Chapters 3, 4 (Except 4.4)
UNIT III: Chapters 6
UNIT IV: Chapters 8
UNIT V: Chapters 10

REFERENCE BOOK(S):

1. Insight into Data mining Theory and Practice K.P. Soman, ShyamDiwakar and V. Ajay, Easter Economy Edition, Prentice Hall of India, 2006.

2. Introduction to Data Mining with Case Studies,G. K. Gupta, Easter Economy Edition, Prentice Hall of India, 2006.

3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2007.

4. Modern Data Warehousing, Mining, and Visualization, MARAKAS, GEORGE M, Pearson Education,2011.

Programme : M. Sc Computer Science **Part III : Core**
Semester IV **Hours : 6/W 90 Hrs/ P/S**
Subject Code : P22CS14 **Credits : 5**

TITLE OF THE PAPER: DATA MINING AND WAREHOUSING

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.	Introduction - Why Data Mining? - What is Data Mining?	3	Lecture
2.	What Kinds of Data Can Be Mined? - What Kinds of Patterns Can Be Mined? - Which Technologies Are Used? Which Kinds of Applications Are Targeted?	3	Lecture
3.	Major Issues in Data Mining. Getting to Know Your Data: Data Objects and Attribute Types -	3	Lecture
4.	Basic Statistical Descriptions of Data - Data Visualization	3	Peer Teaching
5.	Measuring Data Similarity and Dissimilarity.	3	Lecture
UNIT 11			
6.	Data Preprocessing : Data Preprocessing An Overview	3	Lecture
7.	Data Cleaning	3	Lecture
8.	Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts - Data Warehouse Modeling: Data Cube and OLAP	5	Lecture
9.	Data Warehouse Design and Usage	3	Lecture
10.	Data Generalization by Attribute - Oriented Induction	3	ICT(Videos)
11.	Discussion of UNIT II	3	Group Discussion
UNIT III			
12.	Mining Frequent Patterns	2	Lecture
13.	Associations, and Correlations	2	Lecture
14.	Basic Concepts and Methods	3	Lecture
15.	Frequent Item set Mining Methods	4	Lecture
16.	Which Pattern Are Interesting ? - Pattern Evaluation Methods.	3	ICT (PPT)
17.	Summarize UNIT III	1	Peer team Teaching
UNIT IV			
18.	Classification: Basic Concepts	3	Lecture

19.	Basic Concepts - Decision Tree Induction	3	Lecture
20.	Bayes Classification Methods	4	Lecture
21.	Rule-Based Classification-	3	Lecture
22.	Model Evaluation and Selection - Techniques to Improve Classification Accuracy	4	ICT (PPT)
23.	Evaluation	3	Tutorial
UNIT V			
24.	Cluster Analysis Basic Concepts and Methods: Cluster Analysis	4	Lecture
25.	Partitioning Methods	3	Lecture
26.	Hierarchical Methods	3	Lecture
27.	Density Based Methods	4	Lecture
28.	Grid Based Methods - Evaluation of Clustering.	3	ICT (PPT, Videos)
29.	Evaluation	3	Open Book Test

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	3	3	4	4	3	4	3	4	3.6
CO2	4	4	4	3	4	4	4	4	3	3	3.7
CO3	4	4	3	3	3	4	4	4	3	4	3.6
CO4	3	4	3	4	3	3	4	4	3	4	3.5
CO5	3	4	3	4	4	3	3	4	4	4	3.6
Mean Overall Score											3.6

Result: The Score for this Course is 3.6 (High Relationship)

COURSE DESIGNER: **Dr. G.SUJATHA**
Associate Professor, Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : Core**

Semester IV | **Hours : 5 P/W 75 Hrs P/S**

Sub. Code : P22CS15P | **Credits : 3**

TITLE OF THE PAPER: DATA ANALYTICS WITH R and MongoDB & TECHNICAL DOCUMENTATION LAB

Program List

1. **Data Analytics with R**
2. **MongoDB and Interfacing MongoDB with R**
3. **Technical Documentations with Latex**

I. Data Analytics with R

1. Check the Basic Data types in R
2. Handle Operators in R
3. Do Vector Operations in R
4. Do List Operations in R
5. Do Matrix Manipulations in R
6. Do operations with Factors in R
7. Do operations with Dataframe in R
8. Handle Control Statements in R
9. Perform String Pattern Matching Operations in R
10. Handle NA in R
11. Do the Statistical Functions: Mean, Median, Mode, Standard Deviation and Variance.
12. Show the results using the Visualization Tools in R: Line Graph, Bar chart, Box plot, Pie chart, Network model and Decision Tree.
13. Do the following Regression Analysis:
    i. Linear Regression
    ii. Multiple Linear Regression
14. Implement K-Means Clustering algorithm in R
15. Do Pearson Correlation Coefficient analysis in R
16. Do Pearson Covariance analysis in R
17. Do Spearman Correlation Coefficient analysis in R.
18. Do File Handling in R.
19. Implement Association Rule Mining algorithm in R.
20. Implement Naive Bayes Classification Algorithm in R.

II. MongoDB and Interfacing MongoDB with R

1. Show Databases & Show Collections.
2. Create a Database and Collection with Embedded Objects and Array of your choice.
3. Display the Collection documents in (Create the Collection as per the following requirement): List View - XML View - Grid View
4. Drop Database & Collection.
5. Do Insert Delete and Update.
6. Query the Collection**:** (Create the Collection as per the following requirements)
   - List all the documents.
   - List the document whose name is "Lilly".
   - List the documents whose salary is greater than 150000.
   - List the documents whose first name starts with "S".
   - Display the name and salary fields of documents whose name starts with "s" in ascending order of their salary.
   - Display the documents whose first name starts with "S" or "L".
   - Display the name and salary fields of documents in descending order whose name starts with S or salary is greater than 20000 using 'or' connector.
7. Aggregation and Pipeline: (Create the Collection as per the following requirements)
   - **Stage 1 :** find the documents whose salary is greater than 70000
     Stage 2: Sort the documents of stage 1 result set
   - **Stage 1:** find the documents whose salary is greater than 70000
     Stage 2: Add a new field to the documents of stage 1 result set
   - **Stage 1: D**isplay all the documents
     Stage 2: Group the documents based on some filed and apply aggregate function
     Stage 3: Sort the result set of stage 2.
8. Import CSV and Export CSV with MongoDB.
9. Read CSV and Write CSV & Visualize the CSV File in R Programming.
10. Interface R with MongoDB and do the following: (Create the Collection as per the following requirements)
    i. Display all the documents in collection.
    ii. Display the number of documents in the collection.
    iii. To display the documents whose salary is greater than 70000?
    iv. Sort the documents based on salary field.
    v. Insert a new document into collection& display the collection.

vi. Update the salary field as 89000 for the document with empid as 6 & display the updated collection documents.

III. Technical Documentations with Latex

1. Basic Operations: Line Spacing, intent, nointent, including space in the sentence after dot, single quote and double quote, dashes
2. Working with sample document (including centre alignment for title, .75cm after title, nointent for content, right alignment for displaying the content writer details)
3. Handling different Styles and Fonts in documents.
4. Handling different page numbering styles (alphabets, roman, Arabic), page style, set the length of line in the page, print the title and author details.
5. Working with documents: display table of contents, list of figures, list of tables, different heading levels (chapter, section, subsection, subsubsection, paragraph), list of items.
6. Working with Bibliography.
7. Working with Figures.
8. Working with simple form of Tables.
9. Working with Table of multiple columns
10. Working with Equations.

Reference Book (S):

1. Big Data Analytics – Concepts, Techniques, Tools and Technologies – First Edition, Thangaraj, S. Suguna, G. Sudha, PHI Learning Private Limited, Delhi,2022.
2. The MongoDB 4.2 Manual - *https://docs.mongodb.com › manual*
3. R Programming – An approach to Data Analytics – Dr. Sudhamathy & Dr. Jothi Venkateshwaran, MJP Publishers, 2018.
4. Statistical Programming in R - K G Srinivasa , G M Siddesh, Chetan Shety, B.J Sowmya, - Oxford University Press, 2017.
5. Design and Implementation of Data Mining Tools – M.Awad, Latifur Khan, Bhavani Thirissingham, Lei Wang – CRC Press, Taylor & Francis Group, 2015.

Note: The above are sample problems: Instructor can add more exercise based on their requirements and the current technology.

Programme :M. Sc Computer Science | **Part III :DSEC-IV**

Semester IV | **Hours : 5 P/W 75Hrs P/S**

Sub. Code : P22DSS4A | **Credits :4**

TITLE OF THE PAPER: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Pedagogy	**Hours**	**Lecture**	**Peer Teaching**	**GD/VIDOES/TUTORIAL**	**ICT**
	5	**4**	**0 / 1**	**0 / 1**	**0 / 1**

PREAMBLE:

To provide knowledge about how to make a computer to think and analyze according to the domain

COURSE OUTCOME At the end of the Semester, the Students will be able to		**Hrs P/S**
UNIT 1	**CO1:** Understand the problem domain, problem formulation and introducing intelligent agents	**10**
UNIT 2	**CO2:** Analyze the functioning of various searching methodologies in AI	**15**
UNIT 3	**CO3:** Impart knowledge on various reasoning methodologies	**20**
UNIT 4	**CO4:** Analyze the uncertain knowledge and ways to handling them	**20**
UNIT 5	**CO5: I**mpart knowledge on learning; To illustrate expert systems, its components and working methodology.	**10**

Programme :M. Sc Computer Science	**Part III :DSEC-IV**
Semester IV	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : P22DSS4A	**Credits :5**

TITLE OF THE PAPER: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

UNIT I: Introduction: Introduction to Artificial Intelligence, Intelligence Problems and AI techniques, Solving problems by searching, Problem Formulation. Intelligent Agents: Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent. Uninformed Search Techniques: DFS, BFS, Uniform cost search,

UNIT II: Depth Limited Search, Iterative Deepening, Bidirectional search, Comparing Different Techniques. Informed Search Methods: Heuristic functions, Hill Climbing, Simulated Annealing, Best First Search, A*, IDA*, SMA*, CryptoArithmetic Problem, Backtracking for CSP, Performance Evaluation. 6 Adversarial Search: Game Playing, Min-Max Search, Alpha Beta Pruning.

UNIT III: Knowledge and Reasoning: A Knowledge Based Agent, WUMPUS 08 WORLD Environment, Propositional Logic, First Order Predicate Logic, Forward and Backward Chaining, Resolution. , Introduction to PROLOG.

UNIT IV: Planning: Introduction to Planning, Planning with State Space Search, Partial Ordered planning, Hierarchical Planning, Conditional Planning, Planning with Operators. Uncertain Knowledge and Reasoning: Uncertainly, Representing Knowledge in an Uncertain Domain, Conditional Probability, Joint Probability, Bays theorem, Belief Networks, Simple Inference in Belief Networks.

UNIT V: Learning: Learning from Observation, General Model of Learning Agents, Inductive Learning, Learning Decision Trees, Rote Learning, Learning by Advice, Learning in Problem Solving, Explanation based Learning. Expert Systems: Representing and using Domain Knowledge, Expert System-shell, Explanation, Knowledge Acquisition

REFERENCE BOOK(S):

1. Elaine Rich, Kevin Knight, Shivshankar B Nair, Artificial Intelligence, McGraw Hill, 3rd Edition.
2. Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 2nd Edition. University of Mumbai, Information Technology)
3. George Lugar, .AI-Structures and Strategies for Complex Problem Solving., 4/e, 2002, Pearson Education.
4. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.
5. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson Education.
6. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Publication

Programme :M. Sc Computer Science **Part III :DSEC-IV**

Semester IV **Hours : 5 P/W 75Hrs P/S**

Sub. Code : P22DSS4A **Credits :4**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT I		
1.	Introduction to Artificial Intelligence, Intelligence Problems and AI techniques	1	Lecture
2.	Solving problems by searching	1	Lecture
3.	Problem Formulation and solving sample questions	1	Lecture
4.	Intelligent Agents: Structure of Intelligent agents, Types of Agents	2	Lecture
5.	Agent Environments PEAS representation for an Agent	1	Lecture
6.	Uninformed Search Techniques: DFS, BFS	2	Lecture
7.	Uniform cost search	1	Lecture
8.	Discussion	1	Group Discussion
	UNIT II		
9.	Depth Limited Search and illustration with example	1	Lecture
10.	Iterative Deepening	1	Lecture
11.	Bidirectional search, Comparing Different Techniques	2	Lecture
12.	Informed Search Methods: Heuristic functions	2	Lecture
13.	Hill Climbing, Simulated Annealing	1	Lecture
14.	Solving exercise problems on hill climbing and annealing	1	Peer Teaching
15.	Best First Search and illustration with example case	1	Lecture
16.	A*, IDA* Algorithms	2	Lecture
17.	SMA*	2	Lecture
18.	Cryptarithmetic Problem	1	Lecture
19.	Backtracking for CSP and Performance Evaluation.	1	Lecture
20.	Game Playing, Min-Max Search	1	ICT(NPTEL Videos)
21.	Alpha Beta Pruning with sample case study	2	Lecture
22.	Solving exercise problems on pruning techniques	1	Group Discussion

23.	Summary of UNIT II	1	Lecture
UNIT III			
24.	Knowledge and Reasoning: Introduction	1	Lecture
25.	A Knowledge Based Agent	2	Lecture
26.	WUMPUS 08 WORLD Environment	1	Lecture
27.	Propositional Logic	2	Lecture
28.	Solving exercise problems on proportional logic	2	Tutorial
29.	First Order Predicate Logic	2	Lecture
30.	Solving exercise problems on predicate logic	2	Demonstration
31.	Forward and Backward Chaining	2	Lecture
32.	Resolution	2	ICT (NPTEL Notes)
33.	Illustrating problem solving with resolution	2	Lecture
34.	Introduction to PROLOG	1	Lecture
35.	Summary of UNIT III	1	Group Discussion
UNIT IV			
36.	Introduction to Planning	1	Lecture
37.	Planning with State Space Search	1	Lecture
38.	Partial Ordered planning	1	Lecture
39.	Hierarchical Planning	1	Lecture
40.	Conditional Planning	1	Lecture
41.	Planning with Operators	2	Lecture
42.	Case Studies on each type of planning	3	Tutorial
43.	Uncertain Knowledge and Reasoning: Uncertainly	1	Lecture
44.	Representing Knowledge in an Uncertain Domain	2	ICT (NPTEL Video)
45.	Conditional Probability	1	Lecture
46.	Joint Probability	1	Lecture
47.	Bays theorem with a case study	2	Lecture
48.	Belief Networks	1	Lecture
49.	Simple Inference in Belief Networks	1	Lecture
50.	Summary of UNIT IV	1	Group Discussion
UNIT V			
51.	Learning: Learning from Observation	1	Lecture

52.	General Model of Learning Agents	1	Lecture
53.	Inductive Learning	1	Lecture
54.	Learning Decision Trees	1	Tutorial
55.	Rote Learning	1	Lecture
56.	Learning by Advice	1	Lecture
57.	Learning in Problem Solving	1	Lecture
58.	Explanation based Learning	1	Lecture
59.	Expert Systems: Representing and using Domain Knowledge	1	Lecture
60.	Expert SystemArchitecture - shell, rule matching logic and Knowledge Acquisition	1	Lecture

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	4	4	2	3	3	4	4	4	4	3.4
CO2	3	2	4	4	4	4	4	4	4	4	3.7
CO3	4	4	4	5	4	4	4	4	4	5	4.2
CO4	4	4	4	4	4	4	4	5	4	4	4.1
CO5	4	3	3	5	4	4	4	4	4	5	4
Mean Overall Score											3.88

Result: The Score for this Course is 3.88 (High Relationship)

COURSE DESIGNER: **Mrs.G.SUDHA**
Assistant Professor / Department of Computer Science.

Programme : M. Sc Computer Science | **Part III : DSEC-IV**

Semester IV | **Hours : 5 P/W 75 Hrs P/S**

Sub. Code : P22DSS4B | **Credits : 4**

TITLE OF THE PAPER: INFORMATION RETRIEVAL

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	0 / 1	0 / 1	0 / 1

PREAMBLE:

This course introduces the different Information Retrieval models and document indexing concepts.

COURSE OUTCOME At the end of the Semester, the Students will be able to		Hrs P/S
UNIT 1	**CO1:** Understand the basics of Information Retrieval System.	**15**
UNIT 2	**CO2:** Analyze the challenges such as indexing, scoring and ranking in Information Retrieval system.	**15**
UNIT 3	**CO3:** Discuss about various Classification algorithms for Information Retrieval Process (Eg. Naïve Bayes Algorithm, K-Nearest Neighbour).	**15**
UNIT 4	**CO4:** Understand the purpose of Support vector machines and machine learning on documents and Flat Clustering techniques for Information Retrieval.	**15**
UNIT 5	**CO5:** Discuss about various Clustering techniques used for Information Retrieval Process.	**15**

Programme : M. Sc Computer Science	**Part III : DSEC-IV**
Semester IV	**Hours : 5 P/W 75 Hrs P/S**
Sub. Code : P22DSS4B	**Credits : 4**

TITLE OF THE PAPER: INFORMATION RETRIEVAL

UNIT I: Boolean retrieval: An example information retrieval problem- A first take at building an inverted index- Processing Boolean queries- The extended Boolean model versus ranked retrieval. The term vocabulary and postings lists: Document delineation and character sequence decoding- Determining the vocabulary of terms- Faster postings list intersection via skip pointers- Positional postings and phrase queries. Dictionaries and tolerant retrieval: Search structures for dictionaries- Wildcard queries- Spelling correction- Phonetic correction.

UNIT II: Scoring, term weighting and the vector space model: Parametric and zone indexes- Term frequency and weighting- The vector space model for scoring- Variant tf-idf functions. Computing scores in a complete search system: Efficient scoring and ranking- Components of an information retrieval system- Vector space scoring and query operator interaction.

UNIT III: Text classification and Naive Bayes: The text classification problem- Naive Bayes text classification- The Bernoulli model- Feature selection- Evaluation of text classification. Vector space classification: Document representations and measures of relatedness in vector spaces- Rocchio classification-k nearest neighbour- Classification with more than two classes- The bias-variance tradeoff.

UNIT IV: Support vector machines and machine learning on documents: Support vector machines: The linearly separable case- Extensions to the SVM model- Issues in the classification of text documents- Machine learning methods in ad hoc information retrieval. Flat clustering: Clustering in information retrieval- Problem statement- Evaluation of clustering- K-means.

UNIT V: Hierarchical clustering: Hierarchical agglomerative clustering- Single-link and complete - link clustering- Group-average agglomerative clustering- Centroid clustering- Divisive clustering- Cluster labeling.

TEXT BOOK(S):

1. Introduction to Information Retrieval, Christopher D. Manning, PrabhakarRaghavan and HinrichSchutze, Cambridge University Press, 2014.

UNIT I : Chapters 1, 2, 3.
UNIT II : Chapters 6, 7
UNIT III : Chapters 13, 14
UNIT IV : Chapters 15, 16
UNIT V : Chapters 17

REFERENCE BOOK(S):

1. Information Retrieval- David A. Grossman and OphirFrieder, Springer, 2003.

2. Modern Information Retrieval- Ricardo Baeza-Yates, BerthierRibeiro-Neto, Pearson Edition-2003.

Programme : M. Sc Computer Science | **Part III : DSEC-IV**

Semester IV | **Hours : 5 P/W 75 Hrs P/S**

Sub. Code : P22DSS4B | **Credits : 4**

TITLE OF THE PAPER: INFORMATION RETRIEVAL

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	Boolean retrieval: Introduction	1	Lecturer
2.	An example information retrieval problem- A first take at building an inverted index	1	Lecturer
3.	Processing Boolean queries	1	Lecturer
4.	The extended Boolean model versus ranked retrieval	1	Tutorial
5.	The term vocabulary and postings lists: Introduction	1	Lecturer
6.	Document delineation and character sequence decoding	1	Lecturer
7.	Determining the vocabulary of terms	1	Lecturer
8.	Faster postings list intersection via skip pointers	1	Lecturer
9.	Positional postings and phrase queries	1	ICT (Lecture Videos)
10.	Dictionaries and tolerant retrieval: Introduction	1	Lecturer
11.	Search structures for dictionaries	1	Lecturer
12.	Wildcard queries	1	Lecturer
13.	Spelling correction	1	Lecturer
14.	Phonetic correction	1	Lecturer
15.	Applications of Information retrieval	1	Peer Teaching
	UNIT 11		
15.	Scoring, term weighting and the vector space model: Introduction	1	Peer Teaching
16.	Parametric and zone indexes	2	Lecture
17.	Term frequency and weighting	2	Lecture
18.	The vector space model for scoring	1	ICT (Lecture Notes)
	The vector space model for scoring	1	Lecture
19.	Variant tf-idf functions	2	Lecture

20.	Computing scores in a complete search system: Introduction	1	Lecture
21.	Efficient scoring and ranking	2	Peer Teaching
22.	Components of an information retrieval system	1	Lecture
23.	Vector space scoring and query operator interaction	1	Lecture
24.	Overview of Ranking, Scoring and Indexing Techniques	1	Group Discussion
UNIT III			
25.	Text classification and Naive Bayes: Introduction	1	Lecture
26.	The text classification problem	1	Lecture
27.	Naive Bayes text classification	1	ICT (NPTEL Videos)
28.	Naive Bayes text classification	2	Lecture
29.	The Bernoulli model	1	Lecture
30.	Feature selection	1	Lecture
31.	Evaluation of text classification	1	Group Discussion
32.	Vector space classification: Introduction	1	Lecture
33.	Document representations and measures of relatedness in vector spaces	1	Lecture
34.	Rocchio classification	2	Lecture
35.	K Nearest Neighbour- Classification with more than two classes	1	ICT (Lecture Notes)
36.	K Nearest Neighbour- Classification with more than two classes	1	Lecture
37.	The bias-variance tradeoff	1	Lecture
UNIT IV			
38.	Support vector machines: Introduction	1	Lecture
39.	The linearly separable case	2	Lecture
40.	Extensions to the SVM model	1	ICT (Lecture Notes)
41.	Issues in the classification of text documents-	1	Lecture
42.	Applications of SVM	1	ICT (Videos & PPT)
43.	Machine learning methods in ad hoc information retrieval	4	Lecture

44.	Applications of Machine Learning methods	1	Group Discussion
45.	Flat clustering: Introduction	1	Lecture
46.	Clustering in information retrieval	1	Lecture
47.	Problem statement- Evaluation of clustering-	1	Lecture
48.	K-means	1	Lecture
UNIT V			
46.	Hierarchical clustering: Introduction	1	ICT (Lecture Notes)
47.	Hierarchical agglomerative clustering	2	Lecture
48.	Single-link and complete - link clustering	2	Lecture
49.	Group-average agglomerative clustering	2	Lecture
51.	Centroid clustering	2	Lecture
52.	Divisive clustering	2	Lecture
53.	Cluster labeling	2	Lecture
54.	Clustering Techniques: Applications	1	Group Discussion
55.	Clustering Techniques: Exercise Problems	1	Tutorial

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	4	4	2	3	3	4	4	4	4	3.4
CO2	3	2	4	4	4	4	4	4	4	4	3.7
CO3	4	4	4	5	4	4	4	4	4	5	4.2
CO4	4	4	4	4	4	4	4	5	4	4	4.1
CO5	4	3	3	5	4	4	4	4	4	5	4
Mean Overall Score											3.88

Result: The Score for this Course is 3.88 (High Relationship)

COURSE DESIGNER: **Dr. S. SUGUNA**
Assistant Professor / Department of Computer Science.

Programme : M. Sc Computer Science **Part III : DSEC-IV**

Semester : IV **Hours : 5 P/W 75Hrs P/S**

Sub. Code : P22DSS4C **Credits : 4**

TITLE OF THE PAPER: ADVANCED SOFTWARE ENGINEERING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	0 / 1	0 / 1	0 / 1

PREAMBLE:

To teach the methodologies of Advanced Software Designing, Implementation and Testing.

COURSE OUTCOME At the end of the Semester, the Students will be able to		Hrs P/S
UNIT 1	**CO1:** Define the basics of software engineering and show the organizational and development process	**10**
UNIT 2	**CO2:** Explain Structuring Information and validation	**15**
UNIT 3	**CO3:** Classify the Cost Estimation and Project Scheduling	**20**
UNIT 4	**CO4:** List various software design methodology and Illustrate	**20**
UNIT 5	**CO5:** Make use of various Testing approaches , verification and validation techniques	**10**

Programme : M. Sc Computer Science | **Part III : DSEC-IV**

Semester : IV | **Hours : 5 P/W 75Hrs P/S**

Sub. Code : P22DSS4C | **Credits : 4**

TITLE OF THE PAPER: ADVANED SOFTWARE ENGINEERING

UNIT I: Phases in software development – Requirement Analysis – Software design – Coding – Testing– Maintenance – Effort Distribution with Phases – Error Distribution – Software Development Process Model: Waterfall model – Prototyping Interactive Enhancement – Spiral Model – Role of Management in Software Development, Metrics and Measurements – Software Requirements Specifications (SRS) – Role of SRS.

UNIT II: Problem Analysis: Structuring Information – Data flow Diagram and Data Dictionary – Structured Analysis – Prototyping Requirements Specification Characteristics of an SRS – Specification Languages Structure of Requirements Document – Validation: Reading – construction scenarios – Requirement Review Automated cross Referencing – Prototyping – Metrics: Function Points – Number of Errors found – Change request frequency.

UNIT III: Planning a Software project – Cost estimation – Uncertainties in cost estimation – Single variable Models: COCOMO Model – software size Estimation – Project Scheduling: Average Duration Estimation – Milestones, Staffing and Personnel planning – Raleigh Curve – Team structure – Software configuration Management configuration identification – configuration control – status accounting and auditing – software configuration and management – Quality assurance plans: verification and validation – Inspection and reviews – Output of a software development project – Project monitoring plans: Timesheets – Reviews – Cost – Schedule – Milestone Graph – Risk Management: Risk Management Activities – Risk Identification – Risk Analysis and Prioritization – Project planning and Risk management.

UNIT IV: System Design: Design Objectives, Design Partitioning – Problem Partitioning – Abstraction, Top-Down and Bottom-Up strategies, Module Level Concepts – Coupling and Cohesion, Design Methodology – Structured Design – Structure Charts – Design Methodology – Transaction Analysis, Design Specification, Verification – Design Reviews – Automated Cross-Checking.

UNIT V: Testing Fundamentals: Error Fault – Failures – Reliability – Levels of Testing – Test case and Test criteria – Test Oracle – Psychology of Testing – Top-Down and Bottom–Up Approaches– Functional Testing: Equivalence class portioning – Boundary value Analysis: case Effect Graphing – Test case Generations – Instrumentation for structural testing – Complexity Based Criteria – Mutation Testing – Combination Functional and structural Approaches, Testing Process – Test Plan – Test case Specification and Test case – Execution and Analysis, comparison of different V & V Techniques, Matrices, Reliability Assessment – Programmer Productivity – Error Removal Efficiency – Specifications for system testing – System Test Report – Error Report on a given problem.

TEXT BOOK(S):

1. An Integrated Approach to Software Engineering, PankajJalote, 2nd Edition, Narosa Publishing House, New Delhi 1997 .

REFERENCE BOOK(S):

1. Richard E. Fairley, “Software Engineering – A practitioner’s approach”, McGraw Hill 1982.

2. Martin L Shooman, “Software Engineering – Design, Reliability and Management” McGraw Hill 1983

Programme : M. Sc Computer Science **Part III : DSEC-IV**

Semester : IV **Hours : 5 P/W 75Hrs P/S**

Sub. Code : P22DSS4C **Credits : 4**

TITLE OF THE PAPER: ADVANED SOFTWARE ENGINEERING

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.	Phases in software development	1	Lecture
2.	Effort Distribution with Phases – Error Distribution	2	Lecture
3.	Waterfall model	2	Lecture
4.	Prototyping Interactive Enhancement	1	Lecture
5.	Spiral Model	1	Lecture
6.	Role of Management in Software Development, Metrics and Measurements	1	Lecture
7.	Role of SRS.	1	Lecture
8.	Discussion	1	Group Discussion
UNIT 11			
9.	Structuring Information	1	Lecture
10.	Data flow Diagram and Data Dictionary	2	Lecture
11.	Structured Analysis	2	Lecture
12	Prototyping and characteristics of SRS	1	Lecture
13.	Validations- Reading, construction scenarios	1	Lecture

14.	Requirement Review Automated cross Referencing	2	Lecture
15.	Prototyping	2	Lecture
16.	Function Points , Number of Errors found , Change request frequency.	3	Lecture
17.	Exercise Problems	1	Group Discussion
UNIT III			
18.	Cost estimation – Uncertainties in cost estimation	1	Lecture
19.	COCOMO Model	2	Lecture
20.	software size Estimation	1	Lecture
21.	Average Duration Estimation	1	Lecture
22.	Milestones, Staffing and Personnel planning	2	Lecture
23.	Raleigh Curve	1	Lecture
24.	Team structure	1	Lecture
. 25	Exercise	2	Group Discussion
26	Software configuration Management configuration identification	2	Lecture
27	software configuration and management	2	Lecture
28.	Quality assurance plans	1	Lecture
29.	Project monitoring plans	1	Lecture
30.	Risk Management	1	Lecture
31.	Risk Identification	1	Peer teaching

32.	Applications	1	Group Discussion
UNIT IV			
33	Design Principles	2	Lecture
34.	Design Partitioning	2	Lecture
35.	Problem Partitioning	2	Lecture
36.	Abstraction, Top-Down and Bottom-Up strategies	3	Tutorial
37.	Coupling and Cohesion	3	Lecture
38.	Structure Chart	1	Lecture
39.	Design Methodology	2	Tutorial
40.	Design Reviews	2	Lecture
41.	Automated Cross-Checking.	2	Lecture
42.	Exercise Problems	1	Group Discussion
UNIT V			
43.	Testing Fundamentals	1	Lecture
44.	Top-Down and Bottom–Up Approaches	2	Lecture
45.	Instrumentation for structural testing	2	Lecture
46.	Test case Specification and Test case	2	Peer Teaching
47.	Error Removal Efficiency	1	Lecture
48.	Error Report on a given problem.	1	Lecture

49.	Discussion	1	Lecture

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO 5	
CO1	3	4	3	3	3	3	4	4	3	3	3.30
CO2	3	4	4	3	3	4	4	4	3	4	3.60
CO3	3	4	4	3	2	4	3	4	3	4	3.4
CO4	3	4	4	3	2	4	4	4	3	4	3.6
CO5	3	4	4	3	3	4	3	3	4	4	3.6
Mean Overall Score											3.5

Result: The Score for this Course is 3.5 (High Relationship)

COURSE DESIGNER: **Dr. N.SUJATHA**
Assistant Professor / PG and Research Department of Computer Science.