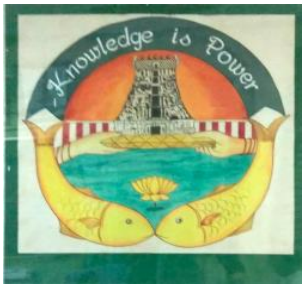
SRI MEENAKSHI GOVT. ARTS COLLEGE FOR WOMEN (AUTONOMOUS) MADURAI – 625 002.

DEPARTMENT OF COMPUTER SCIENCE



M.Sc. COMPUTER SCIENCE

SYLLABUS TO BE INTRODUCED FROM THE ACADEMIC YEAR 2019 – 2020 (UNDER C.B.C.S)

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

DEPARTMENT OF COMPUTER SCIENCE

M.SC COMPUTER SCIENCE

TITLE OF THE PAPERS AND DISTRIBUTION OF CREDITS & MARKS

Subject Code	*Study Components*	*Title of paper*	*Lect. Hrs/ week*	*Exam Hrs*	*No. of Credit*	*Int. Marks*	*Ext Marks*	*Total*
I-Semester								
SA1	Core-1	Discrete Mathematical Structures	5	3	4	25	75	100
SA2	Core-2	Advanced JAVA Programming	5	3	4	25	75	100
SA3	Core-3	Data Structures and Algorithms	5	3	4	25	75	100
ESA1 ESA2 ESA3	Elective-1	1.Advanced Software Engineering 2.Object Oriented Analysis and Design 3.Software Architecture	5	3	5	25	75	100
SL1	Core-4	Lab 1: Advanced JAVA Programming	5	3	3	40	60	100
SL2	Core-5	Lab2: Data Structures and Algorithms	5	3	3	40	60	100
	Total		30		23			600
II-Semester								
SB1	Core-6	Python Programming	5	3	4	25	75	100
SB2	Core-7	Compiler Design	5	3	4	25	75	100
SB3	Core-8	Operating System Design Principles	5	3	4	25	75	100
ESB1 ESB2 ESB3	Elective-2	1.TCP/IP Protocols and Network Security 2.Distributed Computing 3. Cloud Computing	5	3	4	25	75	100
SL3	Core-9	Lab 3: Python Programming	5	3	3	40	60	100
SL4	Core-10	Lab 4: Operating System	5	3	3	40	60	100
		Total	30		22			600

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Subject Code	*Study Components*	*Title of paper*	*Lect. Hrs/ week*	*Exam Hrs*	*No. of Credit*	*Int. Marks*	*Ext Marks*	*Total*
III-Semester								
SC1	Core-11	Digital Image Processing	5	3	4	25	75	100
SC2	Core-12	Soft Computing	6	3	4	25	75	100
ESC1 ESC2 ESC3	Elective-3	1.Internet of Things 2. Wireless Sensor Networks 3.Mobile Computing	5	3	5	25	75	100
NMPS	NME	Biometrics	2	3	2	25	75	100
SL5	Core-13	Lab 5: Image Processing	6	3	3	40	60	100
SL6	Core-14	Lab 6: Soft Computing	6	3	3	40	60	100
		Total	30		21			600
SEMESTER –IV								
SD1	Core-15	Data Mining and Data Warehousing	5	3	4	25	75	100
ESD1 ESD2 ESD3	Elective-4	1. Artificial Intelligence and Expert Systems 2.Information Retrieval 3.Big Data Analytics	5	3	5	25	75	100
SL7	Core-16	Lab 7: Data Analytics with R and Technical Documentation	5	3	3	40	60	100
SPW	Core-17	Project Work and Viva Voce	15	3	12	40	60	100
		Total	30		24			400

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DEPARTMENT OF COMPUTER SCIENCE

M.SC COMPUTER SCIENCE

DISTRIBUTION OF CREDITS & MARKS

TOTAL CREDITS = 90 **TOTAL MARKS = 2200**

	I	II	III	IV	CREDITS
Core	18	18	14	7	57
Electives	5	4	5	5	19
NME			2		2
Core Project				12	12
Total	23	22	21	24	90

Core Papers : 17

Elective : 4

Non Major Elective : 1

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 = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

SRI MEENAKSHI GOVT. ARTS COLLEGE FOR WOMEN (A)

MADURAI – 625 002.

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	Either or Type 5 Questions – One from each Unit (6 Marks each)	30
Section B	3/5 (15 Marks each)	45
	Total	75

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MADURAI – 625 002.

DEPARTMENT OF COMPUTER SCIENCE

M.SC COMPUTER SCIENCE

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
INTERNAL& EXTERNAL TOGETHER : 50%

Project Paper :

Internal	40
External - Viva-Voce	60
Total	100

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

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

Sub. Code : SA1 | **Credits : 4**

TITLE OF THE PAPER: DISCRETE MATHEMATICAL STRUCTURES

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

PREAMBLE:

To impart the knowledge on the basic concepts of mathematical logic, Sets and Lattices, and Boolean Algebra, which are applications in major research area of computer Science.

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 WFF	**15**
UNIT 2	**CO2:**Understand counting principles, binomial coefficients, permutations	**15**
UNIT 3	**CO3:** Understand the properties of integers	**15**
UNIT 4	**CO4:**Understand the sets and lattices	**15**
UNIT 5	**CO5:** Discuss the Boolean algebra and study about finite automata	**15**

Programme :M. Sc Computer Science	**Part III :Core**
Semester : I	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : SA1	**Credits : 4**

TITLE OF THE PAPER: DISCRETE MATHEMATICAL STRUCTURES

UNIT 1: **Mathematical Logic**
Statements and notations – Connectives: Negation, conjunction, disjunction, statement formulas & truth tables, conditional and bi-conditional,well-formed formula, tautologies, equivalence of formulas, duality law, tautological implications, formulas with distinct truth tables, functionally complete sets of connectives and other connectives.

UNIT II:**Counting**
Counting: Introduction – Basic Counting principles – Factorial Notation – Binomial coefficients – Permutations – Combinations.The Pigeonhole Principle.

UNIT III: **Properties of the Integers**
Introduction – Order and inequalities, Absolute Value – Mathematical Induction – Division Algorithm – Divisibility, Primes – Greatest Common Divisor, Euclidean Algorithm – Fundamental theorem of arithmetic.

UNIT IV: **Sets and Lattices**
Ordered pairs n-tuples, Cartesian product – Relations and Ordering: Relations, properties of binary relation, relation matrix and graph of relation, partition and covering of set equivalence and compatibility relation, composition of binary relations partial ordering, partial ordered set. Lattices as partially ordered sets.

UNIT V: **Boolean Algebra**
Boolean algebra – Boolean functions. Finite state machines: Introductory sequential circuits, equivalence of finite state machines.

TEXT BOOK(S):

1. Discrete Mathematical structures with Applications to Computer Science. By J.P. Tremblay & R. Manohar, Tata McGraw Hill, Publishing Company Ltd. (35th Reprint 2008).

2. Schaum's Outlines – Discrete Mathematics by Seymour Lipschutz, Marc Lars Lipson, III-
Edition Tata McGraw Hill , Education Pvt. Ltd., New Delhi. 5th Reprint 2012.

UNITI :1-Chapter 1- section 1.1, 1.2
UNITII :2-Chapter 6-Section 6.1-6.6
UNITIII:2-Chapter 11- Section 11.1-11.7
UNITIV:1-Chapter 2-Section 2.1.8, 2.1.9, 2.3.1-2.3.9, 4.1.1-4.1.5
UNITV :1-Chapter 4-Section 4.2-4.3, 4.6

REFERENCE BOOK(S):

1. Discrete mathematics by G.Balaji, II-ed., G.Balaji Publishers.

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

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

Sub. Code : SA1 **Credits : 4**

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	2	Lecture
4.	Tautologies, equivalence of formulas	2	Lecture
5.	Solving additional problems	1	Tutorial
6.	Duality law, tautological implications	2	Lecture
7.	Formulas with distinct truth tables	2	Lecture
8.	Functionally complete sets of connectives and other connectives	2	Lecture
9.	Summary of UNIT I	1	Peer teaching
	UNIT II		
10.	Counting: Introduction	1	Lecture
11.	Basic Counting principles	2	Lecture
12.	Factorial Notation	2	Lecture
13.	Solving problems on factorial notations	2	Tutorial
14.	Binomial coefficients	2	Lecture
15.	Solving problems on binomial coefficients	1	Group Discussion
16.	Permutations	1	Lecture
17.	Solving problems on permutations	1	Lecture
18.	Combinations.The Pigeonhole Principle.	2	Tutorial
19.	Overview of Unit II	1	Peer Teaching
	UNIT III		
20.	Introduction – Order and inequalities	1	Lecture
21.	Absolute Value	1	Lecture
22.	Mathematical Induction	1	ICT (NPTEL Notes)
23.	Solving problems on inductions	1	Tutorial
24.	Division Algorithm – Divisibility	2	Lecture
25.	Solving related problems on divisibility	1	Tutorial

26.	Primes, Greatest Common Divisor	1	Lecture
27.	Solving problems on primes	2	Lecture
28.	Euclidean Algorithm	2	Tutorial
29.	Fundamental theorem of arithmetic	2	Lecture
30.	Summary of UNIT III	1	Lecture
UNIT IV			
31.	Ordered pairs :n-tuples	1	Lecture
32.	Cartesian product	2	Lecture
33.	Relations and Ordering: Relations	2	Lecture
34.	Properties of binary relation	1	Tutorial
35.	Relation matrix and graph of relation	2	Lecture
36.	Partition and covering of set equivalence and compatibility relation	2	Lecture
37.	Composition of binary relations partial ordering	2	Tutorial
38.	Partial ordered set	1	Lecture
39.	Lattices as partially ordered sets	1	Lecture
40.	Summary of UNIT IV	1	Lecture
UNIT V			
41.	Boolean algebra – Boolean functions	2	Lecture
42.	Finite state machines: Introductory sequential circuits	3	Lecture
43.	Demonstration of exercise problems	3	Lecture
44.	Equivalence of finite state machines.	1	Lecture
45.	Demonstration of problems relating to Finate State Machine	3	Tutorial
46.	Overview of Finite state machine	1	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	PSO5	
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 : Core**

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

Sub. Code : SA2 | **Credits : 4**

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.	**10**
UNIT 2	**CO2:** Discuss about Networking in java and Java database connectivity.	**15**
UNIT 3	**CO3:** Understand the concept Servlets.	**20**
UNIT 4	**CO4:** Understand the concepts JSP and HTTP.	**20**
UNIT 5	**CO5:** Discuss about the Web programming on client side and serverside.	**10**

Programme : M. Sc Computer Science	**Part III : Core**
Semester : II	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : SA2	**Credits : 4**

TITLE OF THE PAPER: ADVANCED JAVA PROGRAMMING

UNIT I : Applets : Applet Fundamentals - Applet Class - Applet Life Cycle – Steps for developing an Applet Program – Passing values through Parameters - Graphics in an Applet – Event handling

GUI Applications: Graphical User Interface - Creating Windows - Dialog Boxes – Layout Managers - AWT Component classes - Swing Component classes – Event handling – Other AWT Components – AWT graphics classes – Other Swing controls

UNIT II : Networking: Basics - Networking in Java -Socket Programming using TCP/IP – Socket Programming using UDP – URL and InetAddress 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 - Working with Database metadata

UNIT III : Servlets : - Basics – Advantages - Servlet alternatives – strengths - Architecture - Servlet Life Cycle - Generic Servlet - HTTP Servlet- Passing parameters – Retrieving parameters – server side include - Cookies –Filters

UNIT IV : Java Server Pages : Overview - JSP and HTTP – JSP Engines - Working of JSP – Anatomy of JSP – JSP Syntax – Creating simple JSP page - Components of JSP -Implicit Objects

UNIT V : Web Programming – Client Side Programming: Client Side Programming technologies – Form design with HTML and CSS – Client side Validation using JavaScript - Content Structuring using XML – Adding interactivity with AJAX

Web Programming - Server Side Programming: Web Servers - Handling Request and Response - Database Access- Session Management

TEXT BOOK(S):

1. Java Programming for Core and Advanced Learners - Sagayaraj, Denis , Karthik and Gajalakshmi , University Press, 2018

Unit I	:	Chapters 12,13 and 14
Unit II	:	Chapters 15 and 16
Unit III	:	Chapter 19
Unit IV	:	Chapter 20
Unit V	:	Chapters 21 and 22

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

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

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

Sub. Code : SA2 **Credits : 4**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	Applets : Applet Fundamentals , Applet Class , Applet Life Cycle	2	Lecture
2.	Steps for developing an Applet Program , Passing values through Parameters , Graphics in an Applet , Event handling	2	Lecture
3.	GUI Applications: Graphical User Interface ,Creating Windows , Dialog Boxes ,Layout Managers	2	Lecture
4.	AWT Component classes ,Swing Component classes , Event handling ,Other AWT Components ,AWT graphics classes , Other Swing controls	3	Lecture
5.	Discussion	1	Group Discussion
	UNIT 11		
6.	Networking: Basics , Networking in Java	1	Lecture
7.	Socket Programming using TCP/IP,	1	Lecture
8.	Socket Programming using UDP	2	Lecture
9.	URL and InetAddress Classes	1	Lecture
10.	Java Database Connectivity: Types of drivers	1	Group Discussion
11.	JDBC Architecture	1	Peer Teaching
12	JDBC Classes and Interfaces	1	Lecture
13.	Basic steps in developing JDBC applications	2	Tutorial
14.	Creating a new database and table with JDBC	2	Lecture
15.	Working with Database metadata	1	Lecture
16.	Exercise Problems	1	Lecture
17.	Overview of Unit II	1	ICT (NPTEL Videos)
	UNIT III		
18.	Servlets : Basics	1	Lecture
19.	Advantages of servlet	1	Lecture
20.	Servlet alternatives , strengths ,Architecture	2	Lecture

21.	Servlet Life Cycle , Generic Servlet	1	Tutorial
22.	HTTP Servlet	2	Lecture
23.	Passing parameters	2	Tutorial
24.	Retrieving parameters	2	Lecture
25.	server side include	3	Lecture
26.	Cookies	1	ICT (NPTEL Notes)
27.	Filters Implementing Interfaces	2	Lecture
28.	Exercise Problems	2	Lecture
29.	Applications	1	Group Discussion
UNIT IV			
30.	Java Server Pages **:** Overview	1	Lecture
31.	JSP and HTTP	2	Lecture
32.	JSP Engines	3	Lecture
33.	Exercise Problems	1	Tutorial
34.	Working of JSP , Anatomy of JSP –	2	Lecture
35.	JSP Syntax	1	Lecture
36.	Exercise Problems	1	Tutorial
37.	Creating simple JSP page	3	Lecture
38.	Components of JSP	2	Lecture
39.	Implicit Objects	2	Lecture
41.	Exercise problems	1	ICT (NPTEL Notes)
42..	Applications	1	Group Discussion
UNIT V			
43.	Web Programming – Client Side Programming**:** Client Side Programming technologies	1	Lecture
44.	Form design with HTML and CSS, Client side Validation using JavaScript	2	Lecture
45.	Content Structuring using XML , Adding interactivity with AJAX	2	Lecture
46.	Web Programming - Server Side Programming**:** Web Servers , Handling Request and Response	2	Peer Teaching
47.	Database Access, Session Managemen	1	Lecture
48.	Exercise Problem on Web programming	1	Lecture
49.	Discussion	1	Peer 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	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 / Department of Computer Science.

Programme : M. Sc Computer Science | **Component :Core**

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

Sub. Code : SA3 | **Credits : 4**

TITLE OF THE PAPER: DATA STRUCTURES AND ALGORITHMS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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:** Describe the dynamic structures – trees and graphs and discuss the application of these structures in finding simplified solutions	**16**
UNIT 2	**CO2:** Describe hash and priority queues and its application	**13**
UNIT 3	**CO3:** Implement binary search tree, balanced tree and multi-way indexed tree	**12**
UNIT 4	**CO4:** Solve problems using dynamic programming and apply traversal techniques of trees and graphs	**16**
UNIT 5	**CO5:** Analyse and solve problems using backtracking and branch-and-bound technique.	**18**

Programme : M. Sc Computer Science	**Component :Core**
Semester : II	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : SA3	**Credits : 4**

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 Mehta – University 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 **Component :Core**

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

Sub. Code : SA3 **Credits : 4**

TITLE OF THE PAPER: DATA STRUCTURES AND ALGORITHMS

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.	Describe static and dynamic data structures and motivate by highlighting the vast applications of data structures in computing in various discipline	1	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	1	Lecture
7.	Describe the application of graphs. Explain minimum cost spanning tree	1	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 11			
11.	Discuss the role of hashing in improving performance and the relative merits and demerits of applying hashing	1	Lecture
12.	Static and dynamic hashing	2	Lecture
13.	Bloom filters	1	Lecture
14.	Single and double ended priority queue	2	Lecture
15.	Binomial and Fibonacci heap	2	Lecture
16.	Min-max and Interval heap	2	Lecture

17.	Analyse the complexity, efficiency and advantages of different methods	1	Group discussion
18.	Exercise problems	2	Group discussion
UNIT III			
19.	Discuss different tree forms and optimal binary search tree	1	Lecture
20.	AVL tree	2	Lecture
21.	Red-black tree	2	Lecture
22.	Splay tree	1	Lecture
23.	Multi-way search, B-Tree	2	Lecture
24.	B+-Tree	2	Lecture
25.	Exercise problems	2	Group discussion
UNIT IV			
26.	Explain dynamic programming. Describe the problems that could be best solved using dynamic programming	1	Lecture
27.	Multi-stage graph	1	Lecture
28.	Single source shortest path	1	Lecture
29.	All pairs shortest path	1	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 discussion and Peer teaching
UNIT V			
38.	Describe backtracking technique	1	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	1	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	PSO1	PSO2	PSO3	PSO4	PSO5	
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 / Department of Computer Science.

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

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

Sub. Code : ESA1 | **Credits : 5**

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:** Describe the basics of software engineering and plan the organizational and development process	**10**
UNIT 2	**CO2:** Analyze Structuring Information and validation	**15**
UNIT 3	**CO3:** Understand the Cost Estimation and Project Scheduling	**20**
UNIT 4	**CO4:** Analyze various software design methodology	**20**
UNIT 5	**CO5:** Discuss about the various Testing approaches , verification and validation techniques	**10**

Programme : M. Sc Computer Science	**Part III : Elective**
Semester : I	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : ESA1	**Credits : 5**

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 : Elective**

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

Sub. Code : ESA1 **Credits : 5**

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
21.	Raleigh Curve	1	Lecture
23.	Team structure	1	Lecture

.	Exercise	2	Group Discussion
24.	Software configuration Management configuration identification	2	Lecture
25.	software configuration and management	2	Lecture
26.	Quality assurance plans	1	Lecture
27.	Project monitoring plans	1	Lecture
28.	Risk Management	1	Lecture
29.	Risk Identification	1	Peer teaching
30.	Applications	1	Group Discussion
UNIT IV			
31.	Design Principles	2	Lecture
32.	Design Partitioning	2	Lecture
33.	Problem Partitioning	2	Lecture
34.	Abstraction, Top-Down and Bottom-Up strategies	3	Tutorial
35.	Coupling and Cohesion	3	Lecture
36.	Structure Chart	1	Lecture
37.	Design Methodology	2	Tutorial
38.	Design Reviews	2	Lecture
39.	Automated Cross-Checking.	2	Lecture
40.	Exercise Problems	1	Group Discussion
UNIT V			
41.	Testing Fundamentals	1	Lecture
42.	Top-Down and Bottom–Up Approaches	2	Lecture
43.	Instrumentation for structural testing	2	Lecture
44.	Test case Specification and Test case	2	Peer Teaching
45.	Error Removal Efficiency	1	Lecture
46.	Error Report on a given problem.	1	Lecture
47.	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	PSO5	
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 / Department of Computer Science.

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

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

Sub. Code :ESA2 **Credits :5**

TITLE OF THE PAPER: OBJECT ORIENTED ANALYSIS AND DESIGN

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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:** Describe the basics of Object Oriented concepts	**5**
UNIT 2	**CO2:** Analyze the functioning methodologies provided by Booch and Jacobson; Introduction on unified approach.	**10**
UNIT 3	**CO3:**Illustration of UML diagrams applicable to various phases of software development.	**20**
UNIT 4	**CO4:**Study on Relationship between various objects in the application and various ways of their reorientations	**20**
UNIT 5	**CO5:**Impart knowledge on packaging classes, distributing them among layers. Introducing the object-oriented databases.	**20**

Programme :M.Sc. Computer Science	**Part III :Elective**
Semester : I	**Hours : 5 P/W 75Hrs P/S**
Sub. Code :ESA2	**Credits :5**

TITLE OF THE PAPER: OBJECT ORIENTED ANALYSIS AND DESIGN

UNIT - I : Introduction – Two Orthogonal views – object oriented Systems development Methodoloy – Object orientation – unified approach – Object Basics – object oriented philosophy – objects – classes – attributes – behaviour 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 :Elective**

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

Sub. Code :ESA2 **Credits :5**

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

	transactions - activity, sequence and collaboration.		
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	1	Lecture
39.	Object oriented design process	1	Lecture
40.	Object oriented design axioms	1	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	1	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	1	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	PSO5	
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 / Department of Computer Science.

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

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

Sub. Code : ESA3 | **Credits : 5**

TITLE OF THE PAPER: SOFTWARE ARCHITECTURE

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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:** Describe the Software Architecture and Software Architecture Reference Models.	**13**
UNIT 2	**CO2:** Understand the Functionalities and Create a New Software Architectural Patterns.	**18**
UNIT 3	**CO3:** Discuss the Different Life Cycle and Create a Skeleton System.	**16**
UNIT 4	**CO4:** Analyze the Software Architecture with Different Analysis Method.	**13**
UNIT 5	**CO5:** Discuss about the Reusability of Software architectures with Different Case Studies.	**15**

Programme : M. Sc Computer Science	**Part III : Elective**
Semester : I	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : ESA3	**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 : Elective**

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

Sub. Code : ESA3 **Credits : 5**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT I		
1.	Visualizing the need of Software Architecture	1	Lecture
2.	Role of Software Processes	1	Lecture
3.	Discussing about Architecture Business Cycle with real time examples	2	Lecture
4.	How to build a Good Architecture? What is Software Architecture?	1	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	1	Lecture
8.	Architectural Structures and Views	2	Lecture
9.	Case study in utilizing Architectural Structures	1	Peer Teaching
10.	Overview of Unit I	1	ICT (NPTEL Videos)
	UNIT II		
11.	Introduction on creating an Architecture	1	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	1	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	2	Lecture
26.	How to Implement a Skeletal System?	2	Lecture
27.	Exercise Problem	1	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	1	Group Discussion
31.	Overview of Unit III	1	ICT (NPTEL Notes)
UNIT IV			
32.	How to Analyze Architectures?	1	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	1	Group Discussion
39.	Overview of Unit IV	1	ICT (NPTEL Notes)
UNIT V			
40.	Why to Reuse Architecture?	1	Lecture
41.	Study on Software Product Line	2	Lecture
42.	Case Study in Product Line Development	2	Lecture
43.	The World Wide Web	1	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	PSO5	
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 / Department of Computer Science.

Programme : M. Sc Computer Science	**Part III : Core**
Semester : I	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : SL1	**Credits : 3**

TITLE OF THE PAPER : ADVANCED JAVA PROGRAMMING LAB

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 : 5 P/W 75Hrs P/S**
Sub. Code : SL2	**Credits : 3**

TITLE OF THE PAPER : 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 : Core**

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

Sub. Code : SB1 | **Credits : 4**

TITLE OF THE PAPER: PYTHON PROGRAMMING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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:** Describe the basic concepts of python programming, Functions and control structures.	**10**
UNIT 2	**CO2:** Understand Strings, Mutable and immutable objects.	**15**
UNIT 3	**CO3:** Understand Recursion and Files and exception.	**20**
UNIT 4	**CO4:** Discuss classes, objects, polymorphism, encapsulation and inheritance.	**15**
UNIT 5	**CO5:** Apply python for collecting information from twitter, sharing data using sockets, managing database, and mobile application for android.	**15**

Programme :M. Sc Computer Science	**Part III : Core**
Semester : II	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : SB1	**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 : 5 P/W 75Hrs P/S**

Sub. Code : SB1 **Credits : 4**

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	2	Lecture
3.	Assignment Statements, Keywords, Script Mode. **Functions -** Built-in Functions, Function Definition and Call, Importing User-defined Module**,** Assert Statement	2	Lecture
4.	Command Line Arguments. **Control Structures -** if Conditional Statement, Iteration (for and while Statements).	3	Lecture
5.	Discussion	1	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**	1	Lecture
9.	Lists	3	Lecture
10.	Sets	2	Group Discussion
11	Tuples	2	Lecture
12.	Dictionary	2	Tutorial
13.	Discussion	1	ICT (NPTEL Videos)
	UNIT III		
14.	**Recursion -** Recursive Solutions for Problems on Numeric Data	3	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.	1	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	1	ICT (NPTEL Notes)
22.	Applications	1	Group Discussion
	UNIT IV		
23.	**Classes I -** Classes and Objects, Person: An Example of Class.	1	Lecture
24.	Class as Abstract Data Type, Date Class.	1	Lecture
25.	**Classes II -** Polymorphism, Encapsulation	2	Lecture
26.	Data Hiding	2	Tutorial
27.	Data Abstraction	2	Lecture
28.	Modifier and Accessor Methods	1	Lecture
29.	Static Method	1	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	1	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	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	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 / Department of Computer Science

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

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

Sub. Code : SB2 | **Credits : 4**

TITLE OF THE PAPER: COMPILER DESIGN

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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:** Describe the basics of Compiler Structure	**5**
UNIT 2	**CO2:** Analyze the functioning of Lexical Analyzer and implementation using Finite Automata.	**20**
UNIT 3	**CO3:** Understand the role of Context Free Grammar and Parsing Techniques	**20**
UNIT 4	**CO4:** Analyze the working methodology of LR Parsers and Representation of Intermediate Code Generation Phase	**20**
UNIT 5	**CO5:** Discuss about the Data Structures used by Compiler, various Code Optimization Sources and apply the techniques	**10**

Programme : M. Sc Computer Science	**Part III : Core**
Semester : II	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : SB2	**Credits : 4**

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 : Core**

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

Sub. Code : SB2 **Credits : 4**

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-	1	Lecture
3.	Intermediate Code Generation-Optimization-Code Generation	1	Lecture
4.	Book Keeping-Error Handling- Compiler-Writing Tools, Getting started	1	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	1	Group Discussion
11.	Exercise Problems	1	Peer Teaching
12	From regular expression to finite automata	3	Lecture
13.	Exercise Problems	1	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	1	Tutorial

22.	Parsers-Shift-reduce Parsing	2	Lecture
23.	Exercise Problems	1	Tutorial
24.	Operator-precedence parsing : Precedence Relations	2	Lecture
25.	Operator-precedence parsing : Using Operator Grammar	2	Lecture
26.	Exercise Problems	1	ICT (NPTEL Notes)
27.	Top-down parsing	2	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	1	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	1	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 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	1	Lecture
47.	Representing Scope information	1	Lecture
	Applications for Symbol Table	1	Peer Teaching
48.	Code Optimization	1	Lecture
49.	The principal sources of optimization	1	Lecture
50.	Loop optimization	1	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	PSO5	
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 / Department of Computer Science

Programme : M. Sc. Computer Science **Component :Core**

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

Sub. Code : SB3 **Credits : 4**

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:** Describe the computer organization, operating system function and explain about the relation between underlying hardware and operating system software. Discuss the evolution of various types of operating system	**11**
UNIT 2	**CO2:** Describe the process management and process synchronization. Discuss about unicore and multicore processors , microkernel	**18**
UNIT 3	**CO3:** Describe deadlock and memory management	**17**
UNIT 4	**CO4:** Describe processor and process scheduling algorithms. Select appropriate algorithm in different types of operating system	**11**
UNIT 5	**CO5:** Describe I/O management and disk scheduling algorithms. Discuss file system organization and security features of Linux and Windows	**18**

Programme : M. Sc. Computer Science	**Component :Core**
Semester : II	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : SB3	**Credits : 4**

TITLE OF THE PAPER: OPERATING SYSTEM DESIGN PRINCIPLES

UNIT I :

Computer system overview - basic elements - processor registers - instruction execution - interrupts - memory hierarchy - cache memory - I/O communication techniques. Operating system overview - operating system objectives and functions - evolution of operating systems - major achievements - developments leading to modern operating systems - Microsoft windows overview.

UNIT II:

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 - windows vista thread and SMP management. Concurrency: Mutual exclusion and Synchronization - Principles of concurrency -mutual exclusion: hardware support - semaphores - monitors - message passing - reader/writer problem.

UNIT III:

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

UNIT IV:

Uni processor scheduling - types of scheduling - scheduling algorithms. Multiprocessor and Real time scheduling - multiprocessor scheduling - real time scheduling - windows vista scheduling.

UNIT V:

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 - windows vista I/O. File management - overview - file organization and access - file directories - file sharing - record blocking -secondary storage management - file system security - windows vista file system.

TEXT BOOK(S):

1.Operating Systems - Internals and Design Principles, William Stallings, Sixth Edition,

Pearson Education Ltd, 2014

UNIT I : Chapter 1.1 to 1.7, 2.1 to 2.5
UNIT II :Chapter 3.1 to 3.6, 4.1 to 4.4, 5.1 to 5.6
UNIT III:Chapter 6.1 to 6.6, 6.10, 7.1 to 7.5, 8.1, 8.2, 8.5
UNIT IV :Chapter 9.1, 9.2, 10.1, 10.2, 10.5
UNIT V :Chapter 11.1 to 11.7, 11.10, 12.1 to 12.7, 12.10

REFERENCE BOOK(S):

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

Programme : M. Sc. Computer Science **Component :Core**

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

Sub. Code : SB3 **Credits : 4**

TITLE OF THE PAPER: OPERATING SYSTEM DESIGN PRINCIPLES

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	Describe computer system basic elements, processor registers	2	Lecture
2.	Instruction execution and interrupt handling	2	Lecture
3.	Memory hierarchy and caching	2	Lecture
4.	Describe operating system overview, objectives and functions	2	Lecture
5.	Discuss the history and evolution of various types of operating system	2	Lecture
6.	Case study on Microsoft windows	1	Group discussion
	UNIT 11		
7.	Define process and process states.	1	Lecture
8.	Describe the process control block	2	Lecture
9.	Process creation and execution, concept of parent and child process	1	Lecture
10.	Tutorial on implementing paent-child processes and pipes	1	Tutorial
11.	Process control modes – user mode and kernel mode	2	Lecture
12.	Thread concept – user, kernel and hybrid threads	1	Lecture
13.	Discuss security issues in process management	1	Lecture
14.	Symmetric multiprocessing and microkernel	1	Lecture
15.	Problem of concurrency and process synchronization	2	Lecture
16.	Synchronization hardware and software	1	Lecture
17.	Discuss synchronization problems	2	Lecture
18.	Exercise problems	2	Group discussion
19.	Case study on windows file system	1	Group discussion

UNIT III			
20..	Describe deadlock and causes.	1	Lecture
21.	Describe deadlock handling strategies	1	Lecture
22.	Dead lock prevention	1	Lecture
23.	Dead lock avoidance	2	Lecture
24.	Dead lock detection and recovery	2	Lecture
25.	Memory management	1	Lecture
26.	Memory managing hardware and control structures	1	Lecture
27.	Concept of virtual memory	1	Lecture
28.	Paging	2	Lecture
29.	Segmentation	2	Lecture
30.	Problems on assessing page-fault rate with different algorithms and analysing the performance of virtual memory implementation in different scenario.	2	Group discussion, Peer teaching
31.	Case study on windows vista file system	1	Group discussion
UNIT IV			
33.	Describe pre-emptive and non pre-emptive process scheduling	1	Lecture
34.	Discuss process scheduling algorithms	3	Lecture
35.	Real time scheduling	1	Lecture
36.	Multiprocessor scheduling	2	Lecture
37.	Tutorial on implementing scheduling algorithms	2	Tutorial
38.	Case study on Linux and Windows vista file system	2	Group Discussion
UNIT V			
39.	I/O Management	1	Lecture
40.	I/O device types and organization	1	Lecture
41.	Operating system design issues in managing I/O	1	Lecture
42.	Buffering and blocking	1	Lecture
43.	RAID technology for file storage security and consistency	1	Lecture
44.	Disk scheduling algorithms	2	Lecture
45.	File system management	1	Lecture
46.	File organization and access methods	1	Lecture
47.	Describe directory structure	2	Lecture
48.	Secondary storage management	1	Lecture

49.	Tutorial on Linux commands to work with files and file system, shell programming	4	Tutorial
50.	Exercise problems on file sharing and locking	1	Peer teaching
51.	Case study on Linux and Windows file system	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	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 / Department of Computer Science.

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

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

Sub. Code : ESB1 | **Credits : 4**

TITLE OF THE PAPER: TCP/IP PROTOCOLS AND NETWORK SECURITY

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

PREAMBLE:

To learn about the protocols underlying principles, 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:** Describe the basics of Internet and protocols	**5**
UNIT 2	**CO2:** Analyze various ICMP and UDP Services	**15**
UNIT 3	**CO3:** Understand in detail about TCP	**15**
UNIT 4	**CO4:** Analyze various security concepts	**20**
UNIT 5	**CO5:** Discuss about various cryptography algorithms	**20**

Programme : M. Sc Computer Science	**Part III : Elective**
Semester : II	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : ESB1	**Credits : 4**

TITLE OF THE PAPER: TCP/IP PROTOCOLS AND NETWORK SECURITY

Objective: To learn about the protocols underlying principles, essential of network security and security mechanisms.

UNIT – I: The TCP/IP 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 Address – Loopback Addresses –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 – II: A Virtual Network – Internet Architecture And Philosophy – Purpose Of The Internet Protocol – Internet Datagram Options – Delivery – Forwarding – Fragmentation – Options – ICMP Messages: - UDP Services – Process – to – Process Communications – Connectionless Services – Flow Control – Error Control – Congestion Control – Encapsulation and Decapsulation.

UNIT – III: TCP Services – TCP Features – Segment – A TCP Connection – Windows In TCP – Flow Control – Error Control – Congestion Control – TCP Timers – Introduction – Telnet – FTP: Connections – Communicaation – File transfer – Simple Mail Transfer Protocol(SMTP).

UNIT – IV: Introduction: Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms – A Model for Network Security – Symmetric Encryption And Message Confidentiality: Symmetric Encryption Principles – Symmetric Block Encryption Algorithms – Stream Ciphers and RC4 – Cipher Block Modes of Operation.

UNIT – V: Public – Key Cryptography and Message Authentication : Approaches to Message Authentication – Secure Hash Functions – Message Authentication Codes – Public – Key Cryptography Algorithms – Digital Signatures – Symmetric Key Distribution Using Symmetric Encryption – Kerberos – X.509 Certificates.

TEXT BOOK(S):

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.
3. Network Security Essentials Applications and standards William Stallings – Fourth Edition.

UNIT I

Internetworking with TCP/IP – Principles, protocols and Architecture Douglas E. comer PHI – Fifth Edition.

CHAPTER 1: 1.2-1.4
CHAPTER 3: 3.2,3.3,3.5,3.6
CHAPTER 4: 4.2,4.3,4.5,4.9,4.12
CHAPTER 10:10.2-10.4,10.7,10.8,10.11

UNIT II

Internetworking with TCP/IP – Principles, protocols and Architecture Douglas E. comer PHI – Fifth Edition.

CHAPTER 6: 6.2,6.3,6.6,6.8

TCP/IP Protocol Suite Behrouz A. Forouzan – Fourth Edition.

CHAPTER 6: 6.1,6.2,7.3,7.4
CHAPTER 9: 9.1,9.2
CHAPTER 14: 14.3

UNIT III

TCP/IP Protocol Suite Behrouz A. Forouzan – Fourth Edition.

CHAPTER 15: 15.1-15.4,15.6-15.10
CHAPTER 20: 20.1
CHAPTER 21: 21.1
CHAPTER 23:23.3

UNIT IV & V

Network Security Essentials Aplications and Standarda William Stallings – Fourth Eddition.

CHAPTER 1:1.6-1.6
CHAPTER 2:2.1,2.2,2.4,2.5
CHAPTER 3: 3.1-3.3,3.5,3.6
CHAPTER 4: 4.1,4.2,4.4

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

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

Sub. Code : ESB1 **Credits : 4**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	Internet Services	1	Lecture
2.	Internet Architecture	1	Lecture
3.	Universal Identifiers	1	Lecture
4.	Functionality Of The Layers	1	Lecture
5.	Multiplexing And Demultiplexing	1	Lecture
	UNIT 11		
6.	Purpose Of The Internet Protocol	1	Lecture
7.	ICMP Messages	2	Lecture
8.	Process-to-Process Communications	2	Lecture
9.	Connectionless Services	2	Lecture
10.	Flow Control	2	Lecture
11.	Error Control	2	Lecture
12.	Congestion Control	2	Lecture
13.	Encapsulation and Decapsulation.	1	Lecture
14.	Discussion	1	Group Discussion
	UNIT-III		
15.	TCP Features	1	Lecture
16.	Windows In TCP	1	Lecture
17.	Flow Control	2	Lecture
18.	Error Control	2	ICT (NPTEL Notes)
19.	Congestion Control	2	Lecture
20.	TCP Timers	1	Lecture
21.	Telnet	1	Lecture
22.	FTP	1	Lecture
23.	File transfer	2	ICT (NPTEL Notes)
24.	Simple Mail Transfer protocol (SMTP	1	Lecture
25.	Discussion	1	Discussion
	UNIT IV		

26.	The OSI Security Architecture	1	Lecture
27.	Security Attacks	2	Lecture
28.	Security Services, Security Mechanisms	3	Lecture
29.	Symmetric Encryption And Message Confidentiality	3	Lecture
30.	Symmetric Block Encryption Algorithms-DES	2	Tutorial
31.	Symmetric Block Encryption Algorithms-AES	2	Lecture
32.	Stream Ciphers and RC4	3	Lecture
33.	Block Modes of Operation.	3	Lecture
34.	Exercise Problems	1	Group Discussion
UNIT V			
33.	Public-Key Cryptography and Message Authentication	1	Lecture
34.	Secure Hash Functions	2	Lecture
35.	SHA Secure Hash functions	2	Lecture
36.	Authentication Codes	2	Lecture
37.	Public-Key Cryptography Algorithms-RSA	2	Lecture
38.	Diffie-Hellman Key Exchange Algorithm	2	Lecture
39	Digital Signatures	2	Lecture
40.	Symmetric Key Distribution Using Symmetric Encryption	1	Lecture
41.	Kerberos	3	Lecture
42.	X.509 Certificates	2	Lecture
43.	Discussion	1	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	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: **Dr. N.SUJATHA**
Assistant Professor / Department of Computer Science.

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

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

Subject Code : ESB2 **Credits : 4**

TITLE OF THE PAPER: DISTRIBUTED COMPUTING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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:** Describe the introductory concepts of Distributed Systems, Types of Communication	**15**
UNIT 2	**CO2:** Explain the Types of Processes and entities	**15**
UNIT 3	**CO3:** Discuss Synchronization and Consultancy of Distributed Systems	**20**
UNIT 4	**CO4:** Describe Fault Tolerance and Security Issues of Distributed Systems	**15**
UNIT 5	**CO5:** Summarize Distributed File System and Case Study	**10**

Programme : M. Sc Computer Science	**Part III : Elective**
Semester : II	**Hours : 5/W 75 Hrs/S**
Subject Code : ESB2	**Credits : 4**

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 : Elective**

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

Subject Code : ESB2 **Credits : 4**

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	3	ICT(PPT)
3.	Examples of distributed systems.	3	ICT(PPT)
4.	**Communication:** Layered protocols, Remote procedures call, Remote object invocation	3	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	2	ICT(PPT)
8.	**Naming:** Naming entities	4	ICT(PPT)
9.	Locating mobile entities	3	ICT(PPT)
10.	Removing un-referenced entities.	2	ICT(PPT)
11.	Discussion of UNIT II	1	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	3	ICT(PPT)
15.	Data centric consistency models, Client centric consistency models	3	ICT(PPT)
16.	Distribution protocols, Consistency protocols	3	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	2	ICT (PPT)
21.	**Security:** Introduction, Secure channels, Access	2	ICT (PPT)

	control		
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.	1	ICT (PPT)
26.	**Case Study:** CORBA, Distributed COM, Globe	2	ICT (PPT)
27.	Comparison of CORBA, DCOM, and Globe	2	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	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**
Assistant Professor / Department of Computer Science.

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

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

Sub. Code : ESB3 | **Credits : 4**

TITLE OF THE PAPER: CLOUD COMPUTING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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:** Describe the Cloud Architecture and Model.	**15**
UNIT 2	**CO2:** Analyze the basics and applications of Virtualization.	**15**
UNIT 3	**CO3:** Understand the different Cloud Infrastructure.	**15**
UNIT 4	**CO4:** Understand different programming model.	**15**
UNIT 5	**CO5:** Discuss the Cloud Security Challenges and Risks.	**15**

Programme : M. Sc Computer Science	**Part III : Elective**
Semester : II	**Hours : 5 P/W 75 Hrs P/S**
Sub. Code : ESB3	**Credits : 4**

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 : Elective**

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

Sub. Code : ESB3 **Credits : 4**

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	1	Lecture
6.	Cloud Services	1	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	1	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	1	ICT (Lecture Videos)
18.	Virtualization Structures	1	Lecture
19.	Tools and Mechanisms	1	Lecture
20.	Virtualization of CPU, Memory, I/O Devices	2	Lecture
21.	Virtual Clusters and Resource management	1	Group Discussion
22.	Virtual Clusters and Resource management	1	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	1	ICT (NPTEL Videos)
28.	Layered Cloud Architecture Development	3	Lecture
29.	Design Challenges	1	Tutorial
25.	Inter Cloud Resource Management	2	Lecture
26.	Resource Provisioning and Platform Deployment	1	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	1	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	1	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	1	Lecture
47.	Software-as-a-Service Security	1	Lecture
48.	Security Issues	1	Video
49.	Security Governance	1	Lecture
50.	Risk Management	1	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	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 : Core**
Semester : II	**Hours : 5 P/W 75 Hrs P/S**
Sub. Code : SL3	**Credits : 3**

TITLE OF THE PAPER : PYTHON PROGRAMMING LAB

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 : 5 P/W 75 Hrs P/S**
Sub. Code : SL4	**Credits : 3**

TITLE OF THE PAPER : OPERATING SYSTEM LAB

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 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.

Example for exercises 12 & 13:

Free space is maintained as a linked list of nodes with each node having the starting byte address and the ending byte address of a free block. Each memory request consists of the process-id and the amount of storage space required in bytes. Allocated memory space is again maintained as a linked list of nodes with each node having the process-id, starting byte address and the ending byte address of the allocated space. When a process finishes (taken as input) the appropriate node from the allocated list should be deleted and this free space should be added to the free space list (care should be taken to merge contiguous free blocks into one single block. This results in deleting more than one node from the free space list and changing the start and end address in the appropriate node). For allocation use first fit, worst

fit and best fit.

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 : III | **Hours : 5 P/W 75Hrs P/S**

Sub. Code : SC1 | **Credits : 4**

TITLE OF THE PAPER: DIGITAL IMAGE PROCESSING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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	**15**
UNIT 2	**CO2:** To analyze the attitude of image processing arithmetic operations and image transformation techniques.	**10**
UNIT 3	**CO3:** Discuss about the image need for image enhancement and use of image restoration.	**15**
UNIT 4	**CO4:** To understand the concept of image compression models , measures and algorithms.	**15**
UNIT 5	**CO5:** Understand the role of image segmentation , various color models and color image transformation	**20**

Programme : M. Sc Computer Science	**Part III : Core**
Semester : III	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : SC1	**Credits : 4**

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 : 5 P/W 75Hrs P/S**

Sub. Code : SC1 **Credits : 4**

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	2	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	2	Lecture
5.	Biological Aspects of Image Acquisition - Human Visual System - Properties of Human Visual System - Monochrome and Colour Image	2	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	1	Lecture
13	Concepts and need of digital image transformation	2	Lecture
14	Fourier Transform - Discrete Fourier Transform - Fast Fourier Transform - Discrete Cosine Transform	2	Lecture
15	Applications of image transformation	1	Peer Teaching
	UNIT III		
16	Image Quality Factors - Image Quality Assessment	2	Lecture

	Tool Image Quality Metrics - Image Enhancement operations - Image Enhancement in Spatial Domain		
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	2	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	2	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 -	2	Lecture
26.	Coding Redundancy - Inter pixel Redundancy - Psycho visual Redundancy - Chromatic Redundancy	2	Lecture
27.	Basic Compression methods	1	Tutorial
28.	Lossless Compression Algorithms - Run - length Coding - Huffman Coding - Bit plane Coding - Arithmetic Coding	2	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	1	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.	1	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	1	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-12**

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

Subject Code : SC2 | **Credits : 4**

TITLE OF THE PAPER: SOFT COMPUTING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	4	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-12**
Semester : III	**Hours : 6/W 90 Hrs/S**
Subject Code : SC2	**Credits : 4**

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.

UNITIV :

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 Optimisation.

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-12**

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

Subject Code : SC2 **Credits : 4**

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 : Elective**

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

Sub. Code : ESC1 | **Credits : 5**

TITLE OF THE PAPER: INTERNET OF THINGS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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.	**9**
UNIT 2	**CO2:** Analyze IoT , M2M and SDN and NFV for IoT.	**16**
UNIT 3	**CO3:** Understand the IoT platform design methodology and logical design using python.	**20**
UNIT 4	**CO4:** Understand IoT physical devices and physical servers.	**20**
UNIT 5	**CO5:** Apply IOT Design in various domains and Data analytics for IoT.	**10**

Programme :M. Sc Computer Science	**Part III : Elective**
Semester : III	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : ESC1	**Credits : 5**

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 : elective**

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

Sub. Code : ESC1 **Credits : 5**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	Introduction: Physical Design of IoT – Logical Design of IoT	2	Lecture
2.	IoT Enabling Technologies, IoT & Deployment Templates. .	2	Lecture
3.	**Domain Specific IoTs:** Introduction – Home Automation .	2	Lecture
4.	Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry , Health & Life style.	2	Lecture
5.	Discussion	1	Group Discussion
	UNIT 11		
6.	**IoT and M2M :** Introduction : M2M**,** Difference between IoT and M2M	3	Lecture
7.	SDN and NFV for IoT.	2	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 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	2	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	3	Lecture
17.	Control Flow, Functions	3	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	2	Tutorial
27.	**IoT Physical Servers & Cloud Offerings :** Introduction to Cloud Storage Models & Communication APIs	2	Lecture
28.	WAMP, AutoBahn for IoT, Xively Cloud for IoT	3	Lecture
29.	Python Web application Framework-Django	2	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	1	Lecture
35.	Cities, Environment, Agriculture	2	Lecture
36.	Productivity applications	2	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 : Core**

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

Sub. Code : ESC2 **Credits : 5**

TITLE OF THE PAPER: WIRELESS SENSOR NETWORKS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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	**5**
UNIT 2	**CO2:** Analyze the Localization, synchronization issues and approaches	**20**
UNIT 3	**CO3:** Understand the wireless characteristics, MAC protocols and contention free protocols	**20**
UNIT 4	**CO4:** Construct topology for connectivity, coverage and routing techniques.	**20**
UNIT 5	**CO5:** Discuss about the data centric routing and Reliability and congestion control	**10**

Programme :M. Sc Computer Science	**Part III : Core**
Semester : III	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : ESC2	**Credits : 5**

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 : Core**

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

Sub. Code : ESC2 **Credits : 5**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	Introduction: the vision, Networked wireless sensor devices	1	Lecture
2.	Applications, Key design challenges.	1	Lecture
3.	Network deployment: Structured versus randomized deployment, Network topology	1	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,	3	Lecture
8.	Network - wide localization,	2	Lecture
9.	Theoretical analysis of localization techniques.	3	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.	2	Lecture
16.	Radio energy considerations, SINR capture model for interference.	3	Lecture
17.	Medium-access and sleep scheduling: Traditional MAC protocols	3	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	2	Lecture
25.	Constructing topologies for connectivity, constructing topologies for coverage	2	Lecture
26.	Set K-cover algorithms.	2	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	1	Lecture
36.	Data-gathering with compression	1	Lecture
37.	Querying, Data-centric storage and retrieval	2	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 : Elective**

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

Subject Code : ESC3 | **Credits : 5**

TITLE OF THE PAPER: MOBILE COMPUTING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	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	**15**
UNIT 2	**CO2:** Describe the mobile computing architecture and applications. Describe the wireless technology standards and services.- GSM, GPRS, UMTS	**15**
UNIT 3	**CO3:** Analyze the mobile application related protocols of IEEE, MAC, Mobile IP and transport layer	**15**
UNIT 4	**CO4:** Describe the concept of Mobile Ad-hoc network and wireless sensor network	**15**
UNIT 5	**CO5:** Understand the Wireless Transport Layer functions and Wireless Application Protocols.	**15**

Programme : M. Sc Computer Science	**Part III : Elective**
Semester: III	**Hours : 5 P/W 75 Hrs P/S**
Subject Code : ESC3	**Credits : 5**

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 : Elective**

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

Subject Code : ESC3 **Credits : 5**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
	UNIT 1		
1.	INTRODUCTION: Mobile Computing	2	Lecture
2.	Medium access control – Motivation for a specialized MAC	2	Lecture
3.	SDMA, FDMA	2	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	2	Lecture
8.	Mobile services, System architecture,	2	ICT (NPTEL Notes)
9.	Radio Interface, Protocols	3	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 -	4	Lecture
14.	IEEE 802.11 – System architecture, Protocol architecture, Physical Layer,	2	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,	2	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	1	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 : B. Sc Computer Science | **Part III : NME**

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

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

TITLE OF THE PAPER: BIO METRICS

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 : B. Sc Computer Science	**Part III : NME**
Semester : III	**Hours : 2 P/W 30Hrs P/S**
Sub. Code : NMPS	**Credits : 2**

TITLE OF THE PAPER: BIO METRICS

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 : B. Sc Computer Science **Part III : NME**

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

Sub. Code : NMPS **Credits : 2**

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 : III	**Hours : 6 P/W 90 Hrs P/S**
Sub. Code : SL5	**Credits : 3**

TITLE OF THE PAPER: IMAGE PROCESSING LAB

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 P/W 90 Hrs P/S**
Sub. Code : SL6	**Credits : 3**

TITLE OF THE PAPER: SOFT COMPUTING LAB

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 λ = 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 $Y = 2.33.846(1 - \exp(-0.006042x)) + ||$
    Where $||$ 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 : CORE-15**

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

Subject Code : SD1 **Credits : 4**

TITLE OF THE PAPER: DATA MINING AND WAREHOUSING

Pedagogy	**Hours**	**Lecture**	**Peer Teaching**	**GD/VIDOES/TUTORIAL**	**ICT**
	5	**4**	**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	**10**
UNIT 2	**CO2:** Explain the methods of Preprocessing, Data Cleaning and implementation of Data Warehouse	**15**
UNIT 3	**CO3:** Demonstrate the methods of Mining Frequent Patterns, Associations and Correlations	**15**
UNIT 4	**CO4:** Design and evaluate Classification algorithms.	**18**
UNIT 5	**CO5:** Summarize Cluster Analysis and categorize the Cluster Methods.	**17**

Total 75

Programme : M. Sc Computer Science	**Part III : CORE-15**
Semester : IV	**Hours : 5/W 75 Hrs/S**
Subject Code : SD1	**Credits : 4**

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 of Clustering.

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-15**
Semester : IV **Hours : 5/W 75 Hrs/S**
Subject Code : SD1 **Credits : 4**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.	Introduction - Why Data Mining? - What is Data Mining?	2	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?	2	Lecture
3.	Major Issues in Data Mining. Getting to Know Your Data: Data Objects and Attribute Types -	2	Lecture
4.	Basic Statistical Descriptions of Data - Data Visualization	2	Peer Teaching
5.	Measuring Data Similarity and Dissimilarity.	2	Lecture
UNIT 11			
6.	Data Preprocessing : Data Preprocessing An Overview	3	Lecture
7.	Data Cleaning	2	Lecture
8.	Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts - Data Warehouse Modeling: Data Cube and OLAP	4	Lecture
9.	Data Warehouse Design and Usage	3	Lecture
10.	Data Generalization by Attribute - Oriented Induction	2	ICT(Videos)
11.	Discussion of UNIT II	1	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	3	Lecture
21.	Rule-Based Classification-	3	Lecture
22.	Model Evaluation and Selection - Techniques to Improve Classification Accuracy	3	ICT (PPT)
23.	Evaluation	3	Tutorial
UNIT V			
24.	Cluster Analysis Basic Concepts and Methods: Cluster Analysis	3	Lecture
25.	Partitioning Methods	3	Lecture
26.	Hierarchical Methods	3	Lecture
27.	Density Based Methods	4	Lecture
28.	Grid Based Methods - Evaluation of Clustering.	2	ICT (PPT, Videos)
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	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 :Elective**

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

Sub. Code :ESD1 **Credits :5**

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 :Elective**
Semester :IV	**Hours : 5 P/W 75Hrs P/S**
Sub. Code :ESD1	**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 :Elective**

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

Sub. Code :ESD1 **Credits :5**

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 : Elective**

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

Sub. Code : ESD2 | **Credits : 5**

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 : Elective**
Semester : IV	**Hours : 5 P/W 75 Hrs P/S**
Sub. Code : ESD2	**Credits : 5**

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 : Elective**

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

Sub. Code : ESD2 **Credits : 5**

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 : Core**

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

Sub. Code : ESD3 | **Credits : 5**

TITLE OF THE PAPER: BIGDATA ANALYTICS

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

PREAMBLE:

To expose the knowledge in Big data , Data analytics 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:** Describe the basics of Big Data, Types of Data and Data Warehouse Environment	**11**
UNIT 2	**CO2:** Understand the Data Analytics, Evolution, Importance, Tools, Technology and Data Science.	**16**
UNIT 3	**CO3:** Analyze the technologies and comparison of No SQL,RDMS, Hadoop ,and YARN	**18**
UNIT 4	**CO4:** Analyze the working methodology of Map Reduce and Hive Query Language	**18**
UNIT 5	**CO5:** Implement the machine learning Algorithms	**12**

Programme : M. Sc Computer Science	**Part III : Core**
Semester : IV	**Hours : 5 P/W 75Hrs P/S**
Sub. Code : ESD3	**Credits : 5**

TITLE OF THE PAPER: BIGDATA ANALYTICS

UNIT I: Introduction to Big Data: Types of Digital Data: Classification of Digital Data, Introduction to Big Data: Characteristics of data-Evolution of Big data-Challenges of Big data-Other Characteristics of Data Which are not Definitional Traits of Big Data-Why Big Data?-Are we Just an Information Consumer or Do we also produce Information?-Traditional Business Intelligence (BI) versus Big Data – A Typical Data Warehouse Environment – A Typical Hadoop Environment – What is New Today? – What is changing in the Realms of Big Data?

UNIT II: Analytics Basics:Big Data Analytics: Where do we Begin? – What is Big Data Analytics? – What Big Data Analytics Isn't? – Why this Sudden Hype Around Big Data Analytics? – Classification of Analytics – Greatest Challenges that Prevent Business from capitalizing on Big Data – Top Challenges Facing Big Data – why is Big Data Analytics Important? – What kind of Technologies are we looking Toward to Help Meet the Challenges Posed by Big Data? – Data Science – Data Scientist… Your New Best Friend – Terminologies Used in Big Data Environments – Basically available Soft State Eventual Consistency (BASE) – Few Top Analytics Tools.

UNIT III: Big Data Technologies:The Big Data Technology Landscape: NoSQL (Not Only SQL) – Hadoop, Introduction to Hadoop: Introducing Hadoop – Why Hadoop? – Why not RDBMS? – RDBMS versus Hadoop – Distributed Computing Challenges – History of Hadoop – Hadoop Overview – Use Case of Hadoop – Hadoop Distributors – HDFS(Hadoop Distributed File System) – Processing Data with Hadoop – Managing Resources and Applications with Hadoop YARN(Yet another Resource Negotiator) – Interacting with Hadoop Ecosystem.

UNIT IV: Introduction to MAPREDUCE Programming: Introduction – Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression, Introduction to Hive: What is Hive? – Hive Architecture – Hive Data Types – Hive File Format – Hive Query Language (HQL) – RCFile Implementation – SerDe – User – Defined Function (UDF).

UNIT V: Analytical Algorithms: Introduction to Machine Learning – Machine Learning Algorithms.

TEXT BOOK(S)::

1. Big Data and Analytics, SeemeAcharya, and SubhashiniChellappan, Wiley India Pvt.Ltd. First Edition-2015.

UNIT I : Chapters-1, 2
UNIT II:Chapter 3
UNITIII:Chapter 4, 5
UNIT IV:Chapter 8, 9

UNIT V: Chapter12

REFERENCE BOOK(S):

1. Big Data – Principles and best practices of scalable real-time data systems, Nathan Marz, and James Warren, Manning Publication cp., USA-2015.

2. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Bart Baesens, Wiley India Pvt.Ltd-2015.

3.Big Data, Data Mining and Machine Learning, Jared Deamn, Willey India Pvt.Ltd - 2015.

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

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

Sub. Code : ESD3 **Credits : 5**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.	Introduction to Big Data: Types of Digital Data: Classification of Digital Data, Introduction to Big Data:	2	Lecture
2.	Characteristics of data Evolution of Big data- Challenges of Big data-	2	Lecture
3.	Other Characteristics of Data Which are not Definitional Traits of Big Data	2	
4.	Why Big Data?-Are we Just an Information Consumer or Do we also produce Information?-Traditional Business Intelligence (BI) versus Big Data	2	Lecture
5.	A Typical Hadoop Environment – What is New Today? – What is changing in the Realms of Big Data?	1	Lecture
6.	A Typical Data Warehouse Environment	1	
7.	Google Class Room	1	Group Discussion
UNIT 11			
8.	Analytics Basics: Big Data Analytics: Where do we Begin? – What is Big Data Analytics?	2	Lecture
9.	What Big Data Analytics Isn't? – Why this Sudden Hype Around Big Data Analytics?	2	Lecture
10.	Classification of Analytics – Greatest Challenges that Prevent Business from capitalizing on Big Data	2	Lecture
11.	Top Challenges Facing Big Data – why is Big Data Analytics Important? –	2	Lecture
12.	What kind of Technologies are we looking Toward to Help Meet the Challenges Posed by Big Data?	2	Lecture
13.	Data Science – Data Scientist… Your New Best Friend – Terminologies Used in Big Data Environments –	2	Lecture
14.	Basically available Soft State Eventual Consistency (BASE) – Few Top Analytics Tools.	2	Lecture
15.	Implementing Analytical Tool	2	Peer Teaching
UNIT III			

16.	Big Data Technologies:The Big Data Technology Landscape: NoSQL (Not Only SQL)	2	Lecture
17.	Hadoop, Introduction to Hadoop: Introducing Hadoop – Why Hadoop? – Why not RDBMS	2	Lecture
18.	RDBMS versus Hadoop – Distributed Computing Challenges – History of Hadoop – Hadoop Overview – Use Case of Hadoop	3	Lecture
19.	Hadoop Distributors – HDFS(Hadoop Distributed File System) –	2	Tutorial
20.	Processing Data with Hadoop	2	Lecture
21.	Exercise Programs	1	Tutorial
22.	Managing Resources and Applications with Hadoop	2	Lecture
23.	YARN(Yet another Resource Negotiator)	2	Lecture
24.	Interacting with Hadoop Ecosystem	1	ICT (NPTEL Notes)
25.	Exercise Program	1	Google Class Room
UNIT IV			
26.	Introduction to MAPREDUCE Programming: Introduction – Mapper – Reducer	2	Lecture
27.	Combiner – Partitioner – Searching – Sorting – Compression	3	Lecture
28.	Introduction to Hive: What is Hive? – Hive Architecture – Hive Data Types	3	Lecture
29.	Hive File Format – Hive Query Language (HQL)	3	Tutorial
30.	RCFile Implementation – SerDe – User – Defined Function (UDF	3	Lecture
31.	Implementing the Program in R Tool	3	Lecture
32.	Overview of unit IV	1	ICT(Slide show)
UNIT V			
33.	Analytical Algorithms	2	Lecture
34.	Introduction to Machine Learning	2	Lecture
35.	Machine Learning Algorithms.	2	Lecture
36.	Example Programs	2	Lecture
37.	Association rule mining	1	Lecture
38.	Clustering and Classification Algorithms	2	Lecture
39.	Overview of unit V	1	Group Discussion

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
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. A. PREMA**
Assistant 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 : SL7	**Credits : 3**

TITLE OF THE PAPER : **DATA ANALYTICS WITH R AND TECHNICAL DOCUMENTATION LAB**

1. Creation of base tables and views.
2. Data Manipulation INSERT, DELETE and UPDATE in Tables. SELECT, Sub Queries and JOIN
3. Data Control Commands
4. High level language extensions – PL/SQL. Or Transact SQL – Packages
5. Use of Cursors, Procedures and Functions
6. Embedded SQL or Database Connectivity.
7. Oracle or SQL Server Triggers – Block Level – Form Level Triggers
8. Working with Forms, Menus and Report Writers for a application project in any domain
9. Front-end tools – Visual Basic.

Using weka tool

1. Demonstration of preprocessing on dataset student.arff
2. Demonstration of preprocessing on dataset labor.arff
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm
8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means
10. Demonstration of clustering rule process on dataset student.arff using simple k- means

Using R-Tool :

1. Find Sum, Mean and Product of Vector in R
2. R Program to sample from a Population
3. R Program to Sort a Vector.
4. To combine the matrix using rbind and cbind methods.
5. Use seq() to create sequence.
6. Write a program to convert the table data into data frame.
7. Calculate student mark list and output it in data frame.

8. R Program to Check Prime Number
9. R Program to Check for Leap Year.
10. R Program to Check if a Number is Odd or Even in R
11. R Program to Find the Sum of Natural Numbers
12. Convert Decimal into Binary using Recursion in R
13. R program to Find the Factorial of a Number Using Recursion
14. R Program to Make a Simple Calculator
15. Write a R Program to import CSV data into R.
16. Write a R Program to move the result data from R to CSV.
17. Draw the Line Graph for Student Data.
18. Draw the Pie-Chart for Employee Data.
19. Create a Table from the existing data set in R and draw the chart.
20. Apply K-Means Algorithm for IRIS data set and output it in graph
21. Get some input from mtcar data set and perform analysis.

Reference Books :

1. R Programming – An approach to Data Analytics – Dr. Sudhamathy & Dr. Jothi Venkateshwaran, MJP Publishers, 2018
2. Statistical Programming in R - K G Srinivasa , G M Siddesh, Chetan Shety, B.J Sowmya, - Oxford University Press, 2017
3. 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 exercises based on their requirements and the current technology