E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI -14.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)
(Re –accredited (3rd cycle) with Grade A+ and CGPA 3.51 by NAAC)

DEPARTMENT OF COMPUTER SCIENCE - UG
TANSCHE-CBCS with OBE
COURSE STRUCTURE
(w.e.f. 2023 – 2024 Batch onwards)

Semester	Part	Course Code	Title of the Course	Teaching hrs (per week)	Duration of Exam	CIA	SE	Total	Credits
I	I	23OU1TA1/ 23OU1HIN1/ 23OU1FR1	**Part-I** Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN1	**Part II:** General English - I	6	3	25	75	100	3
	III	23OUCS11	**CC 1:** Programming in C	5	3	25	75	100	5
	III	23OUCS1P	**CC 2:** Programming in C Lab	5	3	40	60	100	5
	III	23OUCSGEMA1	**GEC 1:** Mathematics – I Numerical Methods	4	3	25	75	100	3
	IV	23OUCSSECN1	**SEC 1 (NME):** Fundamentals of Information Technology	2	3	25	75	100	2
	IV	23OUCSFC1	**FC:** Problem Solving Techniques	2	3	25	75	100	2
II	I	23OU1TA2/ 23OU1HIN2/ 23OU1FR2	**Part–I** Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN2	**Part II:** General English - II	6	3	25	75	100	3
	III	23OUCS21	**CC 3:** Data Structures and Algorithms	5	3	25	75	100	5
	III	23OUCS2P	**CC 4:** Data Structures and Algorithms Lab (C++)	5	3	40	60	100	5
	III	23OUCSGEMA2	**GEC 2:** Mathematics – II Discrete Mathematics	4	3	25	75	100	3
	IV	23OUCSSECN2	**SEC 2 (NME):** Office Automation	2	3	25	75	100	2
		23OUCSSEC3P	**SEC 3:** Advanced Excel Lab	2	3	40	60	100	2
III	I	23OU1TA3/ 23OU1HIN3/ 23OU1FR3	**Part-I** Tamil/Hindi/French	6	3	25	75	100	3
	II	23OU2EN3	**Part II:** General English - III	6	3	25	75	100	3
	III	23OUCS31	**CC 5:** Python Programming	5	3	25	75	100	5
	III	23OUCS3P	**CC 6:** Python Programming Lab	5	3	40	60	100	5
	III	23OUCSGEMA3	**GEC 3:** Mathematics III Statistical Methods and its Application	4	3	25	75	100	3
	IV	23OUCSSEC31	**SEC 4:** Multimedia Systems	2	3	25	75	100	2
	IV	23OUCSSEC32	**SEC 5:** PHP Programming	1	3	25	75	100	1
	IV		Environmental Studies	1	-	-	-	-	-
	I	23OU1TA4/ 23OU1HIN4/ 23OU1FR4	**Part–I** Tamil/Hindi/French	6	3	25	75	100	3

IV	II	23OU2EN4	**Part II:** General English - IV	6	3	25	75	100	3
	III	**23OUCS41**	**CC 7:** Java Programming	5	3	25	75	100	5
	III	**23OUCS4P**	**CC 8:** Java Programming Lab	4	3	40	60	100	5
	III	**23OUCSGEMA4**	**GEC 4:** Mathematics IV Resource Management Techniques	4	3	25	75	100	3
	IV	**23OUCSSEC41**	**SEC 6:** Web Designing	2	3	25	75	100	2
	IV	**23OUCSSEC42**	**SEC 7:** Software Testing	2	3	25	75	100	2
	IV	**23OU4EV4**	Environmental Studies	1	3	25	75	100	2
V	III	**23OUCS51**	**CC 9:** Software Engineering	5	3	25	75	100	4
	III	**23OUCS52**	**CC 10:** Database Management System	5	3	25	75	100	4
	III	**23OUCS5P**	**CC 11:** Database Management System Lab	5	3	40	60	100	4
	III		**DSEC I**	4	3	25	75	100	3
	III		**DSEC II**	4	3	25	75	100	3
	III	**23OUCSPR5**	**CC 12:** Project with Viva voce	5	3	20	80	100	4
	IV	**23OU4VE5**	Value Education	2	3	25	75	100	2
	IV	**23OUCSIN5**	Internship / Industrial Training	-	-	-	-	-	2
VI	III	**23OUCS61**	**CC 13:** Computer Networks	6	3	25	75	100	4
	III	**23OUCS62**	**CC 14:** .NET Programming	6	3	25	75	100	4
	III	**23OUCS6P**	**CC 15:** .NET Programming Lab	6	3	40	60	100	4
	III		**DSEC III**	5	3	25	75	100	3
	III		**DSEC IV**	5	3	25	75	100	3
	IV	**23OUCSSEC6P**	**SEC 8:** Data Analytics using R Lab	2	3	40	60	100	2
	V	**23OU5PE6 / 23OU5NS6**	Extension Activities Physical Education / NSS	-	-	-	-	-	1
			TOTAL	**180**					**140**

GEC - Generic Elective Course

SEC - Skill Enhancement Course

DSEC - Discipline Specific Elective Course

Semester – V (DSEC – I & II Choose any two)

    1. Operating Systems   - 23OUCSDSE5A

    2. Big Data Analytics   - 23OUCSDSE5B

    3. Internet of Things and its Applications   - 23OUCSDSE5C

    4. Cryptography   - 23OUCSDSE5D

Semester – VI (DSEC – III & IV Choose any two)

    1. Introduction to Data Science   - 23OUCSDSE6A

    2. Artificial Intelligence   - 23OUCSDSE6B

    3. Image Processing   - 23OUCSDSE6C

    4. Cloud Computing   - 23OUCSDSE6D

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
V	Core	23OUCS51	Software Engineering	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	**Entrepreneurship oriented**
✓		

Course Objectives:

1. Gain basic knowledge of analysis and design of systems.
2. Ability to apply software engineering principles and techniques.
3. Model a reliable and cost-effective software system.
4. Ability to design an effective model of the system.
5. Perform Testing at various levels and produce an efficient system.

Course Content:

Unit – I

Introduction: The software engineering discipline - programs vs. software products- why study software engineering- emergence of software engineering- computer systems engineering. **Software Life Cycle Models**: Why use a life cycle model -Classical waterfall model- iterative waterfall model- prototyping model- evolutionary model- spiral model- comparison of different life cycle models.

Unit – II

Requirements Analysis and Specification: Requirements gathering and analysis- Software requirements specification (SRS). **Software Design**: Good software design-cohesion and coupling- software design approaches- object- oriented vs function-oriented design.

Unit – III

Function-Oriented Software Design: Overview of SA/SD methodology- structured analysis- data flow diagrams (DFD's)- structured design. **User-Interface design:** Characteristics of a good interface- basic concepts- types of user interfaces- component based GUI development- a user interface methodology.

Unit – IV

Coding and Testing: Coding- code review- testing-testing in the large vs testing in the small- unit testing- black-box testing- white-box testing- debugging- program analysis tools- integration testing- system testing- some general issues associated with testing. **Software Reliability and Quality Management:** Software reliability- statistical testing- software quality- software quality management system- SEI capability maturity model- personal software process.

Unit – V

Computer Aided Software Engineering: CASE and its scope- CASE environment- CASE support in software life cycle- other characteristics of CASE tools- towards second generation CASE tool- architecture of a CASE environment. **Software Maintenance:** Characteristic of software maintenance- software reverse engineering-software maintenance process models-estimation of maintenance cost.

Book for Study:

Rajib Mall (2018), Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India.

Chapters:

Unit – I	: 1.1, 1.2.1, 1.3.2, 1.4 , 1.6, 2.1, 2.2.1, 2.2.2, 2.2.4, 2.2.6, 2.5, 2.6
Unit – II	: 4.1, 4.2, 5.2 ,5.3,5.5
Unit – III	: 6.1, 6.2, 6.4, 6.5, 9
Unit – IV	: 10.1, 10.2, 10.4 to 10.10, 10.12, 10.13, 11.1 to 11.4, 11.6, 11.7
Unit – V	: 12, 13

Books for Reference:

1. Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997.

2. Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.

3. James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: To make the students to understanding of the working knowledge of the Techniques for estimation, design, testing and quality management of large software development projects.

Activities to be given: Students shall be practiced with the goal is to identify and understand the needs and requirements for the software being developed.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Gain basic knowledge of analysis and design of systems.	K1 to K3
CLO2	Ability to apply software engineering principles and techniques.	K1 to K3
CLO3	Model a reliable and cost-effective software system.	K1 to K4
CLO4	Ability to design an effective model of the system.	K1 to K3
CLO5	Perform Testing at various levels and produce an efficient system.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	3	2	2	3
CLO2	3	2	2	2	1	2
CLO3	3	3	3	2	3	2
CLO4	3	3	3	2	2	2
CLO5	3	3	3	2	2	2

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Introduction**: The software engineering discipline- programs vs. software products, why study software engineering- emergence of software engineering- computer systems engineering. **Software Life Cycle Models**: Why use a life cycle model- Classical waterfall model- iterative waterfall model- prototyping model- evolutionary model- spiral model- comparison of different life cycle models.	15	Chalk and Talk, PPT, quiz, on the spot test

II	**Requirements Analysis and Specification:** Requirements gathering and analysis- Software requirements specification (SRS). **Software Design**: Good software design- cohesion and coupling- software design approaches- object- oriented vs function-oriented design.	15	Chalk and Talk, quiz, on the spot test
III	**Function-Oriented Software Design:** Overview of SA/SD methodology- structured analysis- data flow diagrams (DFD's)- structured design. **User-Interface design:** Characteristics of a good interface- basic concepts- types of user interfaces- component based GUI development- a user interface methodology.	15	Chalk and Talk, PPT, group discussion and You tube Links
IV	**Coding and Testing:** Coding- code review- testing-testing in the large vs testing in the small- unit testing- black-box testing- white-box testing debugging- program analysis tools- integration testing- system testing- some general issues associated with testing. **Software Reliability and Quality Management:** Software reliability- statistical testing-software quality- software quality management system- SEI capability maturity model-personal software process.	15	Chalk and Talk, PPT, quiz
V	**Computer Aided Software Engineering:** CASE and its scope- CASE environment- CASE support in software life cycle- other characteristics of CASE tools- towards second generation CASE tool- architecture of a CASE environment. **Software Maintenance:** Characteristic of software maintenance- software reverse engineering- software maintenance process models- estimation of maintenance cost.	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs. N. Kavitha

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
V	Core	23OUCS52	Database Management System	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.

2. To understand the concepts of data base management system, design simple Database models.

3. To learn and understand to write queries using SQL, PL/SQL.

4. To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.

5. To understand the concepts of data base management system, design simple Database models.

Course Content:

Unit – I

　　Database Concepts: Database Systems: Data vs Information – Introducing the Database – File System – Problems with File System – Database Systems. **Data Models:** Importance – Basic Building Blocks – Evolution of Data models – Degrees of Data Abstraction.

Unit – II

　　Design Concepts: Relational Database Model: Logical View of Data – Keys – Integrity Rules – Relational Set Operators – Relationships – Indexes – Codd's Rules. Entity Relationship Model.

Unit – III

　　Normalization of Database Tables: Database Tables and Normalization – The Need for Normalization – The Normalization Process – Higher-Level Normal Forms. **Introduction to SQL:** Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.

Unit – IV

Advanced SQL: Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS. **SQL Join Operators:** Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Joins. **Sub Queries and Correlated Queries:** WHERE – IN – HAVING – ANY and ALL – FROM. **SQL Functions:** Date and Time Function – Numeric Function – String Function – Conversion Function.

Unit – V

PL/SQL: A ProgrammingLanguage: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment Operation – Arithmetic Operators. **Control Structures and Embedded SQL:** Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control Statements. **PL/SQL Cursors and Exceptions:** Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.

Book for Study:

1. Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition.

Chapters:

Unit – I	: 1.2, 1.3, 1.5 to 1.7, 2.2, 2.3, 2.5, 2.6
Unit – II	: 3.1 to 3.4,3.6, 3.8, 3.9, 4.1
Unit – III	: 6.1 to 6.3, 6.6, 7.1 to 7.6, 7.8
Unit – IV	: 8.1.1 to 8.1.4, 8.2.1 to 8.2.5, 8.3.1 to 8.3.5, 8.4.1 to 8.4.4

2. Nilesh Shah (2016), "Database Systems Using Oracle", Pearson Education India, 2nd Edition.

Chapters:

| Unit – V | : 10, 11, 12 |

Books for Reference:

1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", McGraw Hill International Publication, 6th Edition.

2. Shio Kumar Singh, "Database Systems", Pearson publications, 2nd Edition.

3. Elmasri Ramez, Navathe Shamkant(2017), "Fundamentals of Database System", Pearson Education, 7th Edition.

Web Resources / E-Books:

1. Web resources from NDL Library, E-content from open-source libraries.

2. https://www.geeksforgeeks.org/dbms/

3. https://www.linkedin.com/posts/upasana-b0a9b222a_dbms-notespdf-activity-7261035984694173696-AXNp

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: Students learn about database fundamentals, data modelling (like ER diagrams), relational schemas, and normalization.

Activities to be given: Students shall be practiced with SQL coding exercises, database design projects, and exploring real-world database systems.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	K1 to K3
CLO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity- Relationship Model.	K1 to K3
CLO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML).	K1 to K4
CLO4	Classify the different functions and various join Operations and enhance the knowledge of handling multiple tables.	K1 to K3
CLO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	1	2	1	2
CLO2	3	3	2	2	3	3
CLO3	3	3	2	3	3	2
CLO4	3	2	3	2	2	3
CLO5	3	2	2	2	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Database Concepts: Database Systems:** Data vs Information – Introducing the database – File system – Problems with file system – Database systems. **Data Models:** Importance – Basic Building Blocks – Evolution of Data models – Degrees of Data Abstraction.	15	Chalk and Talk, PPT, quiz, on the spot test
II	**Design Concepts: Relational database model:** Logical view of data – Keys – Integrity rules – Relational Set Operators – Relationships – Indexes – Codd's Rules. Entity Relationship Model.	15	Chalk and Talk, quiz, on the spot test
III	**Normalization of Database Tables:** Database Tables and Normalization – The Need for Normalization – The Normalization Process – Higher-Level Normal Forms. **Introduction to SQL:** Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.	15	Chalk and Talk, PPT, group discussion and You tube Links
IV	**Advanced SQL: Relational SET Operators:** UNION – UNION ALL – INTERSECT - MINUS. **SQL Join Operators:** Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Joins. **Sub Queries and Correlated Queries:** WHERE – IN – HAVING – ANY and ALL – FROM. **SQL Functions:** Date and Time Function – Numeric Function – String Function – Conversion Function.	15	Chalk and Talk, PPT, quiz
V	**PL/SQL: A Programming Language:** History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators. **Control Structures and Embedded SQL:** Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. **PL/SQL Cursors and Exceptions:** Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs. R.Chinthamani

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
V	Core	23OUCS5P	Database Management System Lab	4	5	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

PROGRAM LIST

SQL

1. DDL Commands

2. DML Commands

3. TCL Commands

PL/SQL

4. Fibonacci Series

5. Factorial

6. String Reverse

7. Sum of Series

8. Trigger

CURSOR

9. Student Mark Analysis Using Cursor

APPLICATION

10. Library Management System

11. Student Mark Analysis

Books for Reference:

1. Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", 9th Edition.

2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", McGraw Hill International Publication, 6th Edition.

3. Shio Kumar Singh, "Database Systems", Pearson publications, 2nd Edition.

Web Resources / E-Books:

1. Web resources from NDL Library, E-content from open-source libraries.

2. https://www.w3schools.com/mysql/mysql_rdbms.asp

3. https://www.hcoe.edu.np/uploads/attachments/r96oytechsacgzi4.pdf

Pedagogy

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

LESSON PLAN FOR PRACTICAL: TOTAL HOURS (75 HRS)

Cycle	Description	Hrs	Mode
1	**SQL** 1. DDL Commands 2. DML Commands 3. TCL Commands	15	Writing and executing the program in a system
2	**PL/SQL** 1. Fibonacci Series 2. Factorial 3. String Reverse	15	Writing and executing the program in a system
3	**PL/SQL** 1. Sum of Series 2. Trigger	15	Writing and executing the program in a system
4	**CURSOR** 1. Student Mark Analysis Using Cursor	15	Writing and executing the program in a system
5	**APPLICATION** 1. Library Management System 2. Student Mark Analysis	15	Writing and executing the program in a system

Course Designer

Mrs. R.Chinthamani

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
V	Discipline Specific Elective Course	23OUCSDSE5A	Operating Systems	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. Understanding the design of the Operating System.

2. Imparting knowledge on CPU scheduling, Process and Memory Management.

3. To code specialized programs for managing overall resources and operations of the computer.

4. Explain the Job and processor scheduling

5. To understand the Virtual Memory organization.

Course Content:

Unit – I

Introduction: operating system - Operating System Environments - Operating System Components and Goals. **Process concepts:** Definition of process - process States-Life cycle of a process - process management - process state transitions - process control block(PCB) - process operations - suspend and resume - context switching - Interrupts -Interrupt processing - interrupt classes - Interprocess communication –signals - message passing.

Unit – II

Asynchronous concurrent processes: mutual exclusion- critical section - mutual exclusion primitives - implementing mutual exclusion primitives - Peterson's algorithm - software solutions to the mutual Exclusion Problem - Semaphores – Mutual exclusion with Semaphores - thread synchronization with semaphores - counting semaphores - implementing semaphores - **Concurrent programming:** monitors - message passing.

Unit – III

Deadlock and indefinite postponement: Resource concepts - four necessary conditions for deadlock - deadlock prevention - deadlock avoidance and Dijkstra‟s Banker‟s algorithm - deadlock detection - deadlock recovery.

Unit – IV

   Processor scheduling: scheduling levels - scheduling objectives - scheduling criteria - preemptive vs non-preemptive scheduling – priorities - scheduling algorithms - FIFO scheduling - RR scheduling - quantum size - SJF scheduling - SRT scheduling - HRN scheduling - multilevel feedback queues - Fair share scheduling.

Unit – V

   Real Memory organization and Management: Memory organization, Memory management, Memory management strategies. **Virtual Memory organization:** virtual memory basic concepts - multilevel storage organization - block mapping, paging basic concepts - segmentation - paging. **Virtual Memory Management:** Demand Paging - Page replacement.

Book for Study:

   H.M. Deitel (2011), Operating Systems, Third Edition, Pearson Education Asia.

Chapters:

   Unit – I **:** 1.1 ,1.2,1.11,1.12,3.1-3.5

   Unit – II **:** 5.1 to 5.6, 6.1 , 6.2

   Unit – III **:** 7.1 – 7.10

   Unit – IV **:** 8.1 to 8.7

   Unit – V **:** 9.1-9.5,10.1 -10.4,11.1-11.5

Books for Reference:

1. William Stallings, Operating System: Internals and Design Principles, Seventh Edition, Prentice-Hall of India, 2012.

2. A. Silberschatz, and P.B. Galvin., Operating Systems Concepts, Nineth Edition, John Wiley &Sons(ASIA) Pte Ltd.,2012.

3. Milan MilenKovic, *Operating System-Concepts and Design,* Tata McGraw Hill Education, India, 2nd Edition, 2001.

Web Resources / E-Books:

1. https://www.guru99.com/operating-system-tutorial.html

2. https://www.mygreatlearning.com/blog/what

3. https://en.wikipedia.org/wiki/Operating_system

Pedagogy:

   Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: To make the students to track, develop, and utilize the skills of their workforce to drive innovation and success.

Activities to be given: The activity was given to students to enhance their knowledge on the devices.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Define the fundamentals of OS and identify the concepts relevant to process, process life cycle, Scheduling Algorithms, Deadlock and Memory management.	K1 to K3
CLO2	Know the critical analysis of process involving various algorithms, an exposure to threads and semaphores.	K1 to K3
CLO3	Have a complete study about Deadlock and its impact over OS. Knowledge of handling Deadlock with respective algorithms and measures to retrieve from deadlock.	K1 to K4
CLO4	Have complete knowledge of Scheduling Algorithms and its types.	K1 to K3
CLO5	Understand memory organization and management.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	3	3	2
CLO2	3	3	2	3	3	2
CLO3	3	3	3	3	3	2
CLO4	3	3	2	3	3	2
CLO5	3	3	2	3	3	2

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Introduction:** operating system, distributed computing, parallel computation. **Process concepts:** definition of process, process states-Life cycle of a process, process management- process state transitions, process control block(PCB), process operations , suspend and resume, context switching, Interrupts - Interrupt processing, interrupt classes, Inter process communication-signals, message passing.	12	Chalk and Talk, PPT, quiz, on the spot test

II	**Asynchronous concurrent processes:** mutual exclusion-critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson's algorithm, software solutions to the mutual Exclusion Problem. Semaphores – Mutual exclusion with Semaphores, thread synchronization with semaphores, counting semaphores, implementing semaphores. **Concurrent programming:** monitors, message passing.	12	Chalk and Talk, quiz, on the spot test
III	**Deadlock and indefinite postponement:** Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra's Banker's algorithm, deadlock detection, deadlock recovery.	12	Chalk and Talk, PPT, group discussion and You tube Links
IV	**Job and processor scheduling:** scheduling levels, scheduling objectives, scheduling criteria, preemptive vs non-preemptive scheduling, priorities, scheduling algorithms- FIFO scheduling, RR scheduling, quantum size, SJF scheduling, SRT scheduling, HRN scheduling, multilevel feedback queues, Fair share scheduling.	12	Chalk and Talk, PPT, quiz
V	**Real Memory organization and Management:** Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous vs non-contiguous memory allocation, single user contiguous memory allocation, fixed partition multiprogramming, variable partition multiprogramming, Memory swapping **Virtual Memory organization:** virtual memory basic concepts, multilevel storage organization, block mapping, paging basic concepts, segmentation, paging/segmentation systems. **Virtual Memory Management:** Demand Paging, Page replacement strategies.	12	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs. V. Jayavani

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
V	Discipline Specific Elective Course	23OUCSDSE5B	Big Data Analytics	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. Understand the Big Data Platform and its Use cases, Map Reduce Jobs.
2. To identify and understand the basics of cluster and decision tree.
3. To study about the Association Rules, Recommendation System.
4. To learn about the concept of stream.
5. Understand the concepts of NoSQL Databases.

Course Content:

Unit – I

Evolution of Big data — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — Map Reduce and YARN — Map Reduce Programming Model.

Unit – II

Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes Theorem — Naïve Bayes Classifier.

Unit – III

Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules —

Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.

Unit – IV

Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis - Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics.

Unit – V

NoSQL Databases: Schema-less Models : Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs.

Book for Study:

Anand Rajaraman and Jeffrey David Ullman (2012), "Mining of Massive Datasets", Cambridge University Press.

Books for Reference:

1. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.

2. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.

3. Tom White, "Hadoop: The Definitive Guide", O"Reilly Publications, 2011.

Web Resources / E-Books:

1. https://www.simplilearn.com

2. https://www.sas.com/en_us/insights/analytics/big-data-analytics.html

3. https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: Learn Big Data concepts, storage, and processing, practice data analysis methods, use recommendation systems, handle real-time and streaming data.

Activities to be given: Big Data and MapReduce, do simple clustering and classification, find hidden patterns, try real-time data work, and use NoSQL databases for handling Big Data.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Work with big data tools and its analysis techniques.	K1 to K3
CLO2	Analyze data by utilizing clustering and classification algorithms.	K1 to K3
CLO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	K1 to K4
CLO4	Perform analytics on data streams.	K1 to K3
CLO5	Learn NoSQL databases and management.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	3	3	3
CLO2	3	3	2	3	3	3
CLO3	3	3	3	3	3	2
CLO4	3	3	2	3	3	3
CLO5	3	3	2	3	3	2

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	Evolution of Big data — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — Map Reduce and YARN — Map Reduce Programming Model.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes Theorem — Naïve Bayes Classifier.	12	Chalk and Talk, quiz, on the spot test

III	Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Recommendation System: Collaborative Recommendation-Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches	12	Chalk and Talk, PPT, group discussion and You tube Links
IV	Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis - Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics.	12	Chalk and Talk, PPT, quiz
V	NoSQL Databases : Schema-less Models : Increasing Flexibility for Data Manipulation-Key Value Stores-Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs.	12	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer

Ms. K. Shalini

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
V	Discipline Specific Elective Course	23OUCSDSE5C	Internet of Things and its Applications	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	**Entrepreneurship oriented**
✓		

Course Objectives:

1. Use of Devices, Gateways and Data Management in IoT.

2. Design IoT applications in different domain and be able to analyze their performance.

3. Implement basic IoT applications on embedded platform.

4. To gain knowledge on Industry Internet of Things.

5. To Learn about the privacy and Security issues in IoT.

Course Content:

Unit – I

IoT& Web Technology - The Internet of Things Today - Towards the IoT Universe- - IoT Strategic Research and Innovation Directions - IoT Applications- Future Internet Technologies – Networks and Communication.

Unit – II

M2M to IoT – A Basic Perspective– Introduction, Some Definitions - M2M Value Chains - IoT Value Chains - M2M to IoT-An Architectural Overview– Building an architecture - Main design principles and needed capabilities - An IoT architecture outline - standards considerations.

Unit – III

IoT Architecture -State of the Art – Introduction - State of the art - Architecture. Reference Model- Introduction - Reference Model and architecture- IoT reference Model - IoT Reference Architecture- Introduction - Functional View - Information View - Deployment and Operational View.

Unit – IV

IoT Applications for Value Creations Introduction - IoT applications for industry: Future Factory Concepts, Brownfield IoT - Smart Objects, Smart Applications - Four Aspects in your Business to Master IoT - IoT For Oil and GasIndustry .

Unit – V

Internet of Things Privacy - Security and Governance Introduction - Overview of Governance - Privacy and Security Issues - Contribution from FP7 Projects – Security - Privacy and Trust in IoT-Data-Platforms for Smart Cities - First Steps Towards a Secure Platform, Smartie Approach.

Book for Study:

Vijay Madisetti and ArshdeepBahga, "Internet of Things: (A Hands-on Approach)", Universities Press (INDIA) Private Limited 2014, 1st Edition.

Books for Reference:

1. Michael Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", kindle version.

2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications 2013, 1st Edition,

3. WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4..CunoPfister, "Getting Started with the Internet of Things", O"Reilly Media 2011.

Web Resources / E-Books:

1. https://www.simplilearn.com
2. https://www.javatpoint.com
3. https://www.w3schools.com

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:
Knowledge and Skill: To make the students to know the basic concepts of IOT Applications.

Activities to be given: Students shall be accomplished with IOT Applications concepts.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Work with big data tools and its analysis techniques.	K1 to K3
CLO2	Analyze data by utilizing clustering and classification algorithms.	K1 to K3
CLO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	K1 to K4
CLO4	Perform analytics on data streams.	K1 to K3
CLO5	Learn NoSQL databases and management.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	3	3	3
CLO2	3	2	2	3	3	3
CLO3	3	2	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	3	2	3	3	2

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	IoT& Web Technology - The Internet of Things Today - Towards the IoT Universe- - IoT Strategic Research and Innovation Directions - IoT Applications- Future Internet Technologies – Networks and Communication.	12	Chalk and Talk, PPT, quiz, on the spot test
II	M2M to IoT – A Basic Perspective– Introduction, Some Definitions - M2M Value Chains - IoT Value Chains - M2M to IoT-An Architectural Overview– Building an architecture - Main design principles and needed capabilities - An IoT architecture outline - standards considerations.	12	Chalk and Talk, quiz, on the spot test
III	IoT Architecture -State of the Art – Introduction - State of the art - Architecture. Reference Model- Introduction - Reference Model and architecture- IoT reference Model - IoT Reference Architecture- Introduction - Functional View - Information View - Deployment and Operational View.	12	Chalk and Talk, PPT, group discussion and You tube Links

IV	IoT Applications for Value Creations Introduction - IoT applications for industry: Future Factory Concepts, Brownfield IoT - Smart Objects, Smart Applications - Four Aspects in your Business to Master IoT - IoT For Oil and GasIndustry	12	Chalk and Talk, PPT, quiz
V	Internet of Things Privacy - Security and Governance Introduction - Overview of Governance - Privacy and Security Issues - Contribution from FP7 Projects – Security - Privacy and Trust in IoT-Data-Platforms for Smart Cities - First Steps Towards a Secure Platform, Smartie Approach.	12	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer

Mrs.P.Ruby Stella Mary

	Department of Computer Science			Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
V	Discipline Specific Elective Course	23OUCSDSE5D	Cryptography	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	**Entrepreneurship oriented**
✓		

Course Objectives:

1. To understand the fundamentals of Cryptography
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
3. To understand the various key distribution and management schemes.
4. To understand how to deploy encryption techniques to secure data in transit across data networks
5. To design security applications in the field of Information technology

Course Content:

Unit – I

Introduction: The OSI security Architecture – Security Attacks – Security Services Security Mechanisms – A model for network Security.

Unit – II

Classical Encryption Techniques: Symmetric cipher model – **Substitution Techniques:** Caesar Cipher – Mono alphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography.

Unit – III

Block Cipher and DES: Block Cipher Principles – DES – The Strength of DES –**RSA:** The RSA algorithm.

Unit – IV

Network Security Practices: IP Security overview - IP Security architecture – **Web Security:** Secure Socket Layer and Transport Layer Security.

Unit – V

Intruders – Malicious software – Firewalls.

Book for Study:

William Stallings, "Cryptography and Network Security Principles and Practices".

Chapters:

Unit –I   : 1.2 – 1.6

Unit –II : 2.1- 2.3, 2.5

Unit –III : 3.1 , 3.2, 3.4 ,9.2

Unit –IV : 16.1-16.3 , 19

Unit –V : 20,21,22

Books for Reference:

1. Behrouz A. Foruzan, "Cryptography and Network Security", Tata McGraw-Hill, 2007.

2. AtulKahate, "Cryptography and Network Security", Second Edition, 2003,TMH.

3. M.V. Arun Kumar, "Network Security", 2011, First Edition,USP..

Web Resources / E-Books:

1. https://www.tutorialspoint.com/cryptography/

2. https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography

3. https://www.geeksforgeeks.org/computer-networks/cryptography-tutorial/

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: Learn about different types of Security Attacks and Understand the Network Security Model: Sender, Receiver, Transmission Medium, Security Transformations.

Activities to be given: Apply theoretical knowledge to practical scenarios.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	K1 to K3
CLO2	Apply the different cryptographic operations of symmetric cryptographic algorithms	K1 to K3
CLO3	Apply the different cryptographic operations of public key cryptography	K1 to K4
CLO4	Apply the various Authentication schemes to simulate different applications.	K1 to K3

CLO5	Understand various Security practices and System security standards	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	3	3	3
CLO2	3	2	2	3	3	3
CLO3	3	2	3	3	3	3
CLO4	3	3	2	3	3	3
CLO5	3	3	2	3	3	2

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Introduction:** The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.	12	Chalk and Talk, PPT, quiz, on the spot test
II	**Classical Encryption Techniques:** Symmetric cipher model – **Substitution Techniques:** Caesar Cipher – Mono alphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography.	12	Chalk and Talk, quiz, on the spot test
III	**Block Cipher and DES:** Block Cipher Principles – DES – The Strength of DES – **RSA:** The RSA algorithm.	12	Chalk and Talk, PPT, group discussion and You tube Links
IV	**Network Security Practices:** IP Security overview - IP Security architecture – Authentication Header. **Web Security:** Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction.	12	Chalk and Talk, PPT, quiz
V	Intruders – Malicious software – Firewalls.	12	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer

Mrs. P. Krishna Geetha

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
V	Core	23OUCSPR5	Project with Viva voce	4	5	20	80	100

The students are allowed to develop the in project within our campus with the help of the internal staff members.

In the first review the students submit their title of the project and synopsis, and also submit the determination of the modules.

In the second review 50% of the project is completed and demonstrate the project.

In the final review the students prepare the PowerPoint Presentation. The oral is must for the completion of the project.

This report will be evaluated 80 marks for external examiner and 20 marks for internal examiner.

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
VI	Core	23OUCS61	Computer Networks	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To learn the basic concepts of Data communication and Computer network.
2. To learn about wireless Transmission.
3. To learn about networking and data link layer.
4. To study about Network communication.
5. To learn the concept of Transport layer.

Course Content:

Unit – I

Introduction: Uses of Computer Networks – Network Hardware – Network Software – Reference Models. **Physical Layer:** The Theoretical Basis for Data Communication - Guided Transmission Media

Unit – II

Wireless Transmission – The Public Switched Telephone Network- **The Data Link Layer:** Data Link Layer Design Issues – Error Detection and Correction.

Unit – III

Elementary Data Link Protocols - Sliding Window Protocols – **The Medium Access Control SubLayer** – The Channel Allocation Problem – Multiple Access Protocols – Bluetooth.

Unit – IV

The Network Layer – Network Layer Design Issues - Routing Algorithms - Congestion Control Algorithms –Internetworking - The Network Layer in the Internet.

Unit – V

The Transport Layer – The Transport Services – Elements of Transport Protocols – The Internet Transport Protocols: UDP - The Internet Transport Protocols: TCP -**Network Security:** Cryptography.

Book for Study:

A. S. Tanenbaum (2008), "Computer Networks", 4th Edition, Prentice-Hall of India.

Chapters:

Unit I : 1.1 – 1.4, 2.1 ,2.2

Unit II: 2.3, 2.5, 3.1, 3.2

Unit III: 3.3, 3.4, 4.1, 4.2, 4.6

Unit IV: 5.1 - 5.3,5.5

Unit V:6.1, 6.2, 6.4, 6.5, 8.1

Books for Reference:

1. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2017.

2. F. Halsall, "Data Communications,   Computer Networks and Open Systems", Pearson Education, 2008.

3. D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.

Web Resources / E-Books:

1. https://en.wikipedia.org/wiki/Computer_network

2. https://citationsy.com/styles/computer-networks

3. https://www.tutorialspoint.com/data_communication_computer_network/index.htm

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: The students will acquire knowledge on the importance of computer use in business, important concepts of telecommunications as well as understanding computer network communications.

Activities to be given: Students shall be practiced with networking lab**.**

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models.	K1 to K3
CLO2	To gain knowledge on Telephone systems using wireless network.	K1 to K3
CLO3	To understand the concept of MAC.	K1 to K4

CLO4	To analyze the characteristics of Routing and Congestion control algorithms.	K1 to K3
CLO5	To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	2	3
CLO2	3	2	2	2	2	2
CLO3	3	2	3	3	2	3
CLO4	3	2	2	2	2	2
CLO5	3	2	2	2	2	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (90 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Introduction**: Uses of Computer Networks – Network Hardware – Network Software – Reference Models. **Physical Layer:** The Theoretical Basis for Data Communication - Guided Transmission Media.	18	Chalk and Talk, PPT, quiz, on the spot test
II	Wireless Transmission – The Public Switched Telephone Network- **The Data Link Layer:** Data Link Layer Design Issues – Error Detection and Correction.	18	Chalk and Talk, quiz, on the spot test
III	Elementary Data Link Protocols - Sliding Window Protocols – **The Medium Access Control SubLayer** – The Channel Allocation Problem – Multiple Access Protocols – Bluetooth.	18	Chalk and Talk, PPT, group discussion and You tube Links
IV	**The Network Layer** – Network Layer Design Issues - Routing Algorithms - Congestion Control Algorithms –Internetworking - The Network Layer in the Internet.	18	Chalk and Talk, PPT, quiz
V	**The Transport Layer** – The Transport Services – Elements of Transport Protocols –The Internet Transport Protocols: UDP - The Internet Transport Protocols: TCP -**Network Security:** Cryptography	18	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs. N. Kavitha

Department of Computer Science					Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
VI	Core	23OUCS62	.NET Programming	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language.
2. To develop ASP.NET Web application using standard controls.
3. To implement file handling operations.
4. To handles SQL Server Database using ADO.NET.
5. Understand the Grid view control and XML classes.

Course Content:

Unit – I

Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements -Looping statements – Creating and using Objects – Arrays – String operations.

Unit – II

Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls -List Controls: Properties and its events.

Unit – III

Rich Controls: Properties and its events – validation controls: Properties and its events– File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deleting files – File uploading.

Unit – IV

ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controls and its Properties – Data Binding.

Unit – V

Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form

to manipulate XML files - Website Security - Authentication - Authorization – Creating a Web application.

Book for Study:

1. Svetlin Nakov, Veselin Kolev & Co (2019), Fundamentals of Computer Programming with C#, Faber publication.
2. Mathew, Mac Donald (2015), The Complete Reference ASP.NET, Tata McGraw-Hill.

Books for Reference:

1. Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017..
2. Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtechpres,2013..
3. Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc.2016.

Web Resources / E-Books:

1. https://www.geeksforgeeks.org/introduction-to-net-framework/
2. https://www.javatpoint.com/net-framework
3. https://www.scribd.com/document/811080320/Dot-Net-Programming-Notes

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: .NET programming include proficiency in C#, OOP concepts, ASP.NET, databases, web services, debugging, deployment, and collaborative development using modern tools and frameworks.

Activities to be given: Practice basic C# programs, design ASP.NET web forms with controls and validation, work with file handling, create database applications using ADO.NET, and build web apps with GridView and XML handling.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Develop working knowledge of C# programming constructs and the .NET Framework.	K1 to K3
CLO2	To develop a software to solve real-world problems using ASP.NET	K1 to K3
CLO3	To Work On Various Controls Files	K1 to K4
CLO4	To create a web application using Microsoft ADO.NET.	K1 to K3

CLO5	To develop web applications using XML	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	3	3	2	3
CLO2	3	2	2	3	3	3
CLO3	3	3	3	2	3	3
CLO4	2	2	1	3	3	2
CLO5	3	3	3	3	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (90 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements - Looping statements – Creating and using Objects – Arrays – String operations.	18	Chalk and Talk, PPT, quiz, on the spot test
II	Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls -List Controls: Properties and its events.	18	Chalk and Talk, quiz, on the spot test
III	Rich Controls: Properties and its events – validation controls: Properties and its events– File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deletingfiles – File uploading.	18	Chalk and Talk, PPT, group discussion and You tube Links
IV	ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controls and its Properties – Data Binding	18	Chalk and Talk, PPT, quiz
V	Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating a Web application.	18	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs. R. Chinthamani

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
VI	Core	23OUCS6P	.NET Programming Lab	4	6	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

PROGRAM LIST

1. Create an exposure of Web applications and tools
2. Implement the Html Controls
3. Implement the Server Controls
4. Web application using Web controls.
5. Web application using List controls.
6. Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts.
7. Web application using Data Controls.
8. Data binding with Web controls
9. Data binding with Data Controls.
10. Database application to perform insert, update and delete operations.
11. Database application using Data Controls to perform insert, delete, edit, paging and sorting operation.
12. Implement the Xml classes.
13. Implement Authentication – Authorization.
14. Ticket reservation using ASP.NET controls.
15. Online examination using ASP.NET controls

Books for Reference:

1. Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.
2. Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres,2013.
3. Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc.2016..

Web Resources / E-Books:

1. Web resources from NDL Library, E-content from open-source libraries.

2. https://www.geeksforgeeks.org/introduction-to-net-framework/

3. https://www.javatpoint.com/net-framework

Pedagogy

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

LESSON PLAN FOR PRACTICAL: TOTAL HOURS (90 HRS)

Cycle	Description	Hrs	Mode
1	1. Create an exposure of Web applications and tools 2. Implement the Html Controls 3. Implement the Server Controls	18	Writing and executing the program in a system
2	4. Web application using Web controls. 5. Web application using List controls. 6. Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts.	18	Writing and executing the program in a system
3	7. Web application using Data Controls. 8. Data binding with Web controls 9. Data binding with Data Controls.	18	Writing and executing the program in a system
4	10. Database application to perform insert, update and delete operations. 11. Database application using Data Controls to perform insert, delete, edit, paging and sorting operation. 12. Implement the Xml classes.	18	Writing and executing the program in a system
5	13. Implement Authentication – Authorization. 14. Ticket reservation using ASP.NET controls. 15. Online examination using ASP.NET controls	18	Writing and executing the program in a system

Course Designer

Mrs. R. Chinthamani

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
VI	Discipline Specific Elective Course	23OUCSDSE6A	Introduction to Data Science	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	**Entrepreneurship oriented**
✓		

Course Objectives:

1. To learn about basics of Data Science and Big data.
2. To learn about overview and building process of Data Science.
3. To learn about various Algorithms in Data Science.
4. To learn about Hadoop Framework.
5. To learn about case study about Data Science.

Course Content:

Unit – I

   Introduction: Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science.

Unit – II

   The Data science process: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building.

Unit – III

   Algorithms : Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised.

Unit – IV

   Introduction to Hadoop : Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types.

Unit – V

   Case Study: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation.

Book for Study:

Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning publications 2016.

Books for Reference:

1. Roger Peng, "The Art of Data Science", lulu.com 2016.

2. MurtazaHaider, "Getting Started with Data Science – Making Sense of Data with Analytics", IBM press, E-book.

3. Davy Cielen, Arno D.B. Meysman, Mohamed Ali,"Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools", Dreamtech Press 2016..

Web Resources / E-Books:

1. https://www.w3schools.com/datascience/

2. https://en.wikipedia.org/wiki/Data_science

3. http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: To make the students to know the basic concepts of Data science and analytics.

Activities to be given: students will demonstrate proficiency with statistical analysis of data.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Understand the basics in Data Science and Big data.	K1 to K3
CLO2	Understand overview and building process in Data Science.	K1 to K3
CLO3	Understand various Algorithms in Data Science.	K1 to K4
CLO4	Understand Hadoop Framework in Data Science.	K1 to K3
CLO5	Case study in Data Science.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	3	2	2
CLO2	3	3	2	3	2	2
CLO3	3	3	3	3	2	2
CLO4	3	3	2	3	2	2
CLO5	3	3	2	3	3	2

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Introduction:** Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science.	15	Chalk and Talk, PPT, quiz, on the spot test
II	**The Data science process**: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building.	15	Chalk and Talk, quiz, on the spot test
III	**Algorithms** :Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised.	15	Chalk and Talk, PPT, group discussion and You tube Links
IV	**Introduction to Hadoop** :Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types.	15	Chalk and Talk, PPT, quiz
V	**Case Study**: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation.	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer

Mrs.V.Jayavani

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
VI	Discipline Specific Elective Course	23OUCSDSE6B	Artificial Intelligence	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To learn various concepts of AI Techniques.

2. To learn various Search Algorithm in AI.

3. To learn probabilistic reasoning and models in AI.

4. To learn about Markov Decision Process.

5. To learn various type of Reinforcement learning.

Course Content:

Unit – I

Introduction: Concept of AI- history – scope- agents- environments- Problem Formulations- Review of tree and graph structures- State space representation- Search graph and Search tree.

Unit – II

Search Algorithms: Random search- Search with closed and open list- Depth first and Breadth first search- Heuristic search- Best first search- A* algorithm- Game Search.

Unit – III

Probabilistic Reasoning: Probability-conditional probability- Bayes Rule- Bayesian Networks- representation- construction and inference- temporal model- hidden Markov model.

Unit – IV

Markov Decision process: MDP formulation- utility theory- utility functions- value iteration-policy iteration and partially observable MDPs.

Unit – V

Reinforcement Learning: Passive reinforcement learning - adaptive dynamic programming-temporal difference learning- active reinforcement learning- Q learning.

Book for Study:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall.

2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill.

Books for Reference:

1. Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.

2. SarojKaushik, "Artificial Intelligence", Cengage Learning India, 2011

3. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.

Web Resources / E-Books:

1. https://github.com/dair-ai/ML-Course-Notes

2. https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html

3. https://www.toolify.ai/?gclid=CjwKCAjwvdajBhBEEiwAeMh1U6tlqU1LXlRFbcgh LMZVwICm_4PkIRcDRE-VYq_wTDcuaQeq_bCHnhoCcm4QAvD_BwE

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: To make the students with foundational knowledge of AI concepts and practical skills to design intelligent, learning-based systems for real-world problem-solving.

Activities to be given: Provide activities like algorithm implementation, problem modeling, simulations, case analysis, and interactive sessions to build AI knowledge and practical skills.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Understand the various concepts of AI Techniques.	K1 to K3
CLO2	Understand various Search Algorithm in AI.	K1 to K3
CLO3	Understand probabilistic reasoning and models in AI.	K1 to K4
CLO4	Understand Markov Decision Process.	K1 to K3
CLO5	Understand various type of Reinforcement learning Techniques.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	1	2	1	2
CLO2	3	3	2	2	3	3
CLO3	3	3	2	3	3	2
CLO4	3	2	3	2	2	3
CLO5	3	2	2	2	3	3

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	Introduction: Concept of AI- history- current status- scope- agents- environments- Problem Formulations- Review of tree and graph structures- State space representation- Search graph and Search tree.	15	Chalk and Talk, PPT, quiz, on the spot test
II	Search Algorithms : Random search- Search with closed and open list- Depth first and Breadth first search- Heuristic search- Best first search-A* algorithm,-Game Search.	15	Chalk and Talk, quiz, on the spot test
III	Probabilistic Reasoning : Probability-conditional probability- Bayes Rule- Bayesian Networks- representation- construction and inference- temporal model- hidden Markov model.	15	Chalk and Talk, PPT, group discussion and You tube Links
IV	Markov Decision process : MDP formulation- utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.	15	Chalk and Talk, PPT, quiz
V	Reinforcement Learning : Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer

Ms. K. Shalini

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
VI	Discipline Specific Elective Course	23OUCSDSE6C	Image Processing	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To learn fundamentals of digital image processing.
2. To learn about various 2D Image transformations
3. To learn about various image enhancement processing methods and filters
4. To learn about various classification of Image segmentation techniques
5. To learn about various image compression techniques.

Course Content:

Unit – I

Digital Image Fundamentals: Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis.

Unit – II

2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition.

Unit – III

Image Enhancement: Spatial domain methods- Point processing- Intensity transformations - Histogram processing- Spatial filtering- smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter.

Unit – IV

Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.

Unit – V

Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression - Transform based compression.

Book for Study:

1. S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015.

2. Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009.

Books for Reference:

1. Jain Anil K , Fundamentals of digital image processing: , PHI,1988

2. Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003

3. Pratt William K , Digital Image Processing: , John Wiley,4/e,2007.

Web Resources / E-Books:

1. https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf

2. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%20 3rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf

3. https://dl.acm.org/doi/10.5555/559707

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: To make the students understand image processing concepts and develop practical skills to enhance, transform, segment, and compress digital images.

Activities to be given: Students will demonstrate the use of Python or MATLAB to edit images, apply filters, enhance image quality, detect edges, and perform image compression through small projects.**Course learning Outcomes (CLO's):**

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Understand the fundamental concepts of digital image processing.	K1 to K3
CLO2	Understand various 2D Image transformations	K1 to K3

CLO3	Understand image enhancement processing techniques and filters	K1 to K4
CLO4	Understand the classification of Image segmentation techniques	K1 to K3
CLO5	Understand various image compression techniques	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	3	2	2
CLO2	3	3	2	3	2	2
CLO3	3	3	3	3	2	2
CLO4	3	3	2	3	2	2
CLO5	3	3	2	3	2	2

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Digital Image Fundamentals:** Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis.	15	Chalk and Talk, PPT, quiz, on the spot test
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform-Karhunen-Loeve Transform -Singular Value Decomposition.	15	Chalk and Talk, quiz, on the spot test
III	Image Enhancement: Spatial domain methods- Point processing-Intensity transformations - Histogram processing- Spatial filtering-smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter.	15	Chalk and Talk, PPT, group discussion and You tube Links
IV	Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.	15	Chalk and Talk, PPT, quiz
V	Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding-Dictionary based compression -Transform based compression,	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer

Mrs. P. Ruby Stella Mary

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
VI	Discipline Specific Elective Course	23OUCSDSE6D	Cloud Computing	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	**Entrepreneurship oriented**
✓		

Course Objectives:

1. Learning fundamental concepts and Technologies of Cloud Computing.

2. Learning various cloud service types and their uses and pitfalls.

3. To learn about Cloud Architecture and Application design.

4. To know the various aspects of application design, benchmarking and security on the Cloud.

5. To learn the various Case Studies in Cloud Computing.

Course Content:

Unit – I

Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. **Cloud Concepts and Technologies:** Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – Map Reduce – Identity and Access Management – Service Level Agreements – Billing.

Unit – II

Cloud Services: Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines **Storage Services:** Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage. **Database Services:** Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service. **Application Services:** Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services. **Content Delivery Services:** Amazon Cloud Front -

Windows Azure Content Delivery Network. **Analytics Services:** Amazon Elastic Map Reduce - Google Map Reduce Service - Google Big Query - Windows Azure HD Insight. **Deployment and Management Services:** Amazon Elastic Bean stack - Amazon Cloud Formation. **Identity and Access Management Services:** Amazon Identify and Access Management - Windows Azure Active Directory. **Open Source Private Cloud Software:** Cloud Stack – Eucalyptus – Open Stack.

Unit – III

Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL)..

Unit – IV

Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. **Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.

Unit – V

Cloud for Industry, Healthcare & Education: Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.

Book for Study:

ArshdeepBahga, Vijay Madisetti, Cloud Computing – A Hands On Approach, Universities Press (India) Pvt. Ltd., 2018

Chapters:

Unit I	**:** 1,2
Unit II	**:** 3
Unit III	**:** 5
Unit IV	**:** 11, 12
Unit V	**:** 13

Books for Reference:

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-Hill, 2013.

2. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., 2013.

3. David Crookes, Cloud Computing in Easy Steps, Tata McGraw Hill, 2015.

Web Resources / E-Books:

1. https://en.wikipedia.org/wiki/Cloud_computing

2. https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7

3. https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf

Pedagogy:

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

Rationale for nature of Course:

Knowledge and Skill: This course helps students understand core cloud concepts and services while building skills to design, deploy, secure, and manage cloud-based applications across various domains.

Activities to be given: Assign activities like creating virtual machines, deploying cloud apps, using storage and database services, testing cloud performance, and exploring real-world case studies.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Understand the fundamental concepts and Technologies in Cloud Computing.	K1 to K3
CLO2	Able to understand various cloud service types and their uses and pitfalls.	K1 to K3
CLO3	Able to understand Cloud Architecture and Application design.	K1 to K4
CLO4	Understand the various aspects of application design, benchmarking and security in the Cloud.	K1 to K3
CLO5	Understand various Case Studies in Cloud Computing.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	3	3	2
CLO2	3	3	2	3	3	2
CLO3	3	3	3	3	3	2
CLO4	3	3	2	3	3	2
CLO5	3	3	2	3	3	2

1-Basic Level   2- Intermediate Level   3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.	15	Chalk and Talk, PPT, quiz, on the spot test
II	Cloud Services: Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage. Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service. Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services. Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network. Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight. Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation. Identity and Access Management Services: Amazon Identiy and Access Management - Windows Azure Active Directory. Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack	15	Chalk and Talk, quiz, on the spot test
III	**Cloud Application Design:** Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: RelationalApproach (SQL), Non-RelationalApproach (NoSQL).	15	Chalk and Talk, PPT, group discussion and You tube Links

IV	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – WorkloadCharacteristics – Application Performance Metrics – Design Consideration for BenchmarkingMethodology – Benchmarking Tools and Types of Tests – DeploymentPrototyping. **Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data atrest, securing data in motion – Key Management – Auditing.	15	Chalk and Talk, PPT, quiz
V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing for EnergySystems - Cloud Computing for Transportation Systems - Cloud Computing for ManufacturingIndustry - Cloud Computing for Education.	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer

Mrs. P. Krishna Geetha

Department of Computer Science				Class: III B.Sc.,				
Sem	Category	Course Code	Course Title	Credits	Contact Hours/ Week	CIA	SE	Total
VI	Skill Enhancement Course	23OUCSSEC6P	Data Analytics using R Lab	2	2	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

PROGRAM LIST

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.

2. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.

3. Write a program to find list of even numbers from 1 to n using R-Loops.

4. Create a function to print squares of numbers in sequence.

5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.

6. Implement different String Manipulation functions in R.

7. Implement different data structures in R (Vectors, Lists, Data Frames)

8. Write a program to read a csv file and analyze the data in the file in R.

9. Create pie chart and bar chart using R.

10. Create a data set and do statistical analysis on the data using R.

11. Program to find factorial of the given number using recursive function

12. Write a R program to count the number of even and odd numbers from array of N numbers.

Books for Reference:

1. Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations", 1st Edition, 2014.

2. Venables ,W.N.,andRipley,"S programming", Springer, 2000.Shio Kumar Singh, "Database Systems", Pearson publications, 2nd Edition.

3. Roger D. Peng," R Programming for Data Science ", 2012.

Web Resources / E-Books:

1. https://www.simplilearn.com

2. https://mrcet.com/pdf/Lab%20Manuals/CSEDS/R%20PROGRAMMING%20LAB.pdf

3. https://www.scribd.com/document/803487479/Data-Analytics-With-R-BDS306C-LAB-Full

Pedagogy

Chalk and Talk, PPT, group discussion, quiz, ICT tools and Peer Teaching.

LESSON PLAN FOR PRACTICAL: TOTAL HOURS (30 HRS)

Cycle	Description	Hrs	Mode
1	1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice. 2. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user. 3. Write a program to find list of even numbers from 1 to n using R-Loops.	6	Writing and executing the program in a system
2	4. Create a function to print squares of numbers in sequence. 5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R. 6. Implement different String Manipulation functions in R.	6	Writing and executing the program in a system
3	7. Implement different data structures in R (Vectors, Lists, Data Frames) 8. Write a program to read a csv file and analyze the data in the file in R.	6	Writing and executing the program in a system
4	9. Create pie chart and bar chart using R. 10. Create a data set and do statistical analysis on the data using R.	6	Writing and executing the program in a system
5	11. Program to find factorial of the given number using recursive function 12. Write a R program to count the number of even and odd numbers from array of N numbers.	6	Writing and executing the program in a system

Course Designer
Mrs. N. Kavitha