Annexure- 7a

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)

TANSCHE - CBCS with OBE

DEPARTMENT OF COMPUTER SCIENCE (Data Science and Analytics) – UG

COURSE STRUCTURE

(w.e.f. 2023 – 2024 Batch onwards)

Semester	Part	Course Code	Title of the Course	Teaching hrs (per week))	Duration of Exam (hrs.)	Marks Allotted			
						CIA	SE	Total	Credits
I	I	**23OU1TA1/23OU 1HIN1/23OU1FR1**	**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	**23OUCSD11**	**CC 1:** Python Programming	5	3	25	75	100	5
	III	**23OUCSD1P**	**CC 2:**Python Programming Lab	5	3	40	60	100	5
	III	**23OUCSDGEMA1**	**GEC 1:** Mathematics – I Statistics – I	4	3	25	75	100	3
	IV	**23OUCSDSECN1**	**SEC 1(NME) :**Fundamentals of Information Technology	2	3	25	75	100	2
	IV	**23OUCSDFC1**	**FC:** Problem Solving Techniques	2	3	25	75	100	2
II	I	**23OU1TA2/23OU 1HIN2/23OU1FR2**	**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	**23OUCSD21**	**CC 3:**Data Structures and Algorithms	5	3	25	75	100	5
	III	**23OUCSD2P**	**CC 4:**Data Structures and Algorithms Lab	5	3	40	60	100	5
	III	**23OUCSDGEMA2**	**GEC 2:** Mathematics – II Statistics – II	4	3	25	75	100	3
	IV	**23OUCSDSECN2**	**SEC 2 (NME) :** Computer Fundamentals	2	3	25	75	100	2
	IV	**23OUCSDSEC3P**	**SEC 3:** Open Source Software Technologies Lab	2	3	40	60	100	2
III	I	**23OU1TA3/23OU 1HIN3/23OU1FR3**	**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	**23OUCSD31**	**CC 5:** Data Science	5	3	25	75	100	5
	III	**23OUCSD3P**	**CC 6:** Data Science Lab	5	3	40	60	100	5
	III	**23OUCSDGEMA3**	**GEC 3** : Mathematics – III Discrete Mathematics – I	4	3	25	75	100	3
	IV	**23OUCSDSEC31**	**SEC 4:** E-Commerce	2	3	25	75	100	2
	IV	**23OUCSDSEC32**	**SEC 5:** Software Testing	1	3	25	75	100	1
	IV		Environmental Studies	1	-	-	-	-	-
	I	**23OU1TA4/23OU 1HIN4/23OU1FR4**	**Part–I** Tamil/Hindi/French	6	3	25	75	100	3
	II	**23OU2EN4**	**Part II:** General English - IV	6	3	25	75	100	3
	III	**23OUCSD41**	**CC 7 :** Object Oriented Programming with Java	5	3	25	75	100	5

IV	III	**23OUCSD4P**	**CC 8:** Object Oriented Programming with Java Lab	4	3	40	60	100	5
	III	**23OUCSDGEMA4**	**GEC 4:** Mathematics – IV Discrete Mathematics – II	4	3	25	75	100	3
	IV	**23OUCSDSEC41**	**SEC 6 :** Data Mining and Warehousing	2	3	25	75	100	2
	IV	**23OUCSDSEC42**	**SEC 7 :**Robotics and its Applications	2	3	25	75	100	2
	IV	**23OU4EV4**	Environmental Studies	1	3	25	75	100	2
V	III	**23OUCSD51**	**CC 9:** Relational Database Management System	5	3	25	75	100	4
	III	**23OUCSD5P**	**CC 10:** RDBMS Lab using ORACLE	5	3	40	60	100	4
	III	**23OUCSD52**	**CC 11:**Machine Learning	5	3	25	75	100	4
	III	**23OUCSDPR5**	**CC 12:** Project with Viva voce	5	3	20	80	100	4
	III		**DSEC I**	4	3	25	75	100	3
	III		**DSEC II**	4	3	25	75	100	3
	IV	**23OU4VE5**	Value Education	2	3	25	75	100	2
	IV	**23OUCSDIN5**	Internship / Industrial Training	-	-	-	-	-	2
VI	III	**23OUCSD61**	**CC 13:** IoT and Cloud Technologies	6	3	25	75	100	4
	III	**23OUCSD6P**	**CC 14:** IoT and Cloud Technologies Lab	6	3	40	60	100	4
	III	**23OUCSD62**	**CC15:** Artificial Intelligence	6	3	20	80	100	4
	III		**DSEC III**	5	3	25	75	100	3
	III		**DSEC IV**	5	3	25	75	100	3
	IV	**23OUCSDSEC6**	**SEC 8:** Quantitative Aptitude	2	3	25	75	100	2
	V	**23OU5PE6 / 23OU5NS6**	Extension Activities Physical Education / NSS	-	-	-	-	-	1
			TOTAL	**180**					**140**

CC – Core Course
GEC- Generic Elective Course
SEC- Skill Enhancement Course
DSEC- Discipline Specific Elective Course
FC – Foundation Course

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

1. Data Communication and Computer Networks - 23OUCSDDSE5A
2. Software Engineering - 23OUCSDDSE5B
3. Cryptography - 23OUCSDDSE5C
4. Computing Intelligence - 23OUCSDDSE5D

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

1. Operating System - 23OUCSDDSE6A
2. Financial Analytics - 23OUCSDDSE6B
3. Big Data Analytics - 23OUCSDDSE6C
4. Information Security - 23OUCSDDSE6D

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
V	Core	23OUCSD51	Relational Database Management System	4	5	25	75	100

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

Course Objectives:

1. To understand the different issues involved in the design ad implementation of a database system.
2. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
3. To understand and use data manipulation language to query, update, and manage a database
4. To develop an understanding of essential DBMS concepts such as: database security, integrity, and concurrency.
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Course Content:

Unit – I

Introduction: Database System-Characteristics of Database Management Systems-Architecture of Database Management Systems-Database Models-System Development Life Cycle-Entity Relationship Model.

Unit – II

Relational Database Model: Structure of Relational Model-Types of keys. Relational Algebra: Unary operations-Set operations-Join operations. Normalization: Functional Dependency- First Normal form-Second Normal Form-Third Normal form- Boyce-Codd Normal Form-Fourth Normal Form.

Unit – III

SQL: Introduction. Data Definition Language: Create, alter, drop, rename and truncate statements. Data Manipulation Language: Insert, Update and Delete Statements. Data Retrieval Language: Select statement. Transaction Control Language: Commit, Rollback and Savepoint statements. Single row functions using dual: Date, Numeric and Character functions. Group/Aggregate functions: count, max, min, avg and sum functions. Set Functions: Union, union all, intersect and minus. Subquery: Scalar, Multiple and Correlated subquery. Joins: Inner and outer joins. Defining Constraints: Primary Key, Foreign Key, Unique, Check, Not Null.

Unit – IV

PL/SQL: Introduction-PL/SQL Basic-Character Set- PL/SQL Structure-SQL Cursor-Subprograms-Functions-Procedures.

Unit – V

Exception Handling: Introduction-Predefined Exception-User Defined Exception-Triggers-Implicit and Explicit Cursors-Loops in Explicit Cursor.

Book for Study:

Pranab Kumar Das Gupta and P. Radha Krishnan, "Database Management System Oracle SQL and PL/SQL", Second Edition, 2013, PHI Learning Private Limited

Books for Reference:

1. RamezElmasri and Shamkant B. Navathe, "*Fundamentals of Database Systems*", Seventh Edition, Pearson Publications.
2. Abraham Silberschatz, Henry Korth, S. Sudarshan, "*Database System Concepts*", Seventh Edition, TMH.

Web Resources / E-Books:

1. http://www.amazon.in/DATABASE-MANAGEMENT-SYSTEM-ORACLE-SQLebook/dp/B00LPGBWZ0#reader_B00LPGBWZ0
2. http:// www.vssut.ac.in ›
3. https://r.search.yahoo.com/_ylt=AwrKGDzxZ3docBcXKCPnHgx

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 modeling (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	To demonstrate the characteristics of Database Management Systems. To study about the concepts and models of database. To impart the concepts of System Development Life Cycle and E-R Model.	K1 to K3
CLO2	To classify the keys and the concepts of Relational Algebra. To impart the applications of various Normal Forms Classification of Dependency.	K1 to K3
CLO3	To elaborate the different types of Functions and Joins and their applications. Introduction of Views, Sequence, Index and Procedure.	K1 to K4
CLO4	Representation of PL-SQL Structure. To impart the knowledge of Sub Programs, Functions and Procedures.	K1 to K3
CLO5	Representation of Exception and Pre-Defined Exception. To Point out the Importance of Triggers, Implicit and Explicit Cursors.	K1 to K4

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

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	3	3	3
CO 4	2	3	3	3	3	3
CO 5	3	3	3	3	3	3

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

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Introduction:** Database System-Characteristics of Database Management Systems- Architecture of Database Management Systems-Database Models-System Development Life Cycle-Entity Relationship Model.	15	Chalk and Talk, PPT, quiz, on the spot test

II	**Relational Database Model:** Structure of Relational Model-Types of keys. Relational Algebra: Unary operations-Set operations-Join operations. Normalization: Functional Dependency- First Normal form-Second Normal Form-Third Normal form- Boyce-Codd Normal Form-Fourth Normal Form.	15	Chalk and Talk, quiz, on the spot test
III	**SQL:** Introduction. Data Definition Language: Create, alter, drop, rename and truncate statements. Data Manipulation Language: Insert, Update and Delete Statements. Data Retrieval Language: Select statement. Transaction Control Language: Commit, Rollback and Save point statements. Single row functions using dual: Date, Numeric and Character functions. Group/Aggregate functions: count, max, min, avg and sum functions. Set Functions: Union, union all, intersect and minus. Subquery: Scalar, Multiple and Correlated subquery. Joins: Inner and Outer joins. Defining Constraints: Primary Key, Foreign Key, Unique, Check, Not Null.	15	Chalk and Talk, PPT, group discussion and You tube Links
IV	**PL/SQL:** Introduction-PL/SQL Basic-Character Set-PL/SQL Structure-SQL Cursor-Subprograms-Functions-Procedures.	15	Chalk and Talk, PPT, quiz
V	**Exception Handling:** Introduction-Predefined Exception-User Defined Exception-Triggers-Implicit and Explicit Cursors-Loops in Explicit Cursor	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.N.Kavitha

Annexure- 7a

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/ Week**	**CIA**	**SE**	**Total**
V	Core	23OUCSD5P	RDBMS Lab using ORACLE	4	5	40	60	100

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

PROGRAM LIST

SQL

1. DDL commands.
2. Specifying constraints-Primary Key, Foreign Key, Unique, Check, Not Null.
3. DML commands.
4. Set Operations.
5. Joins.
6. Sub-queries.

PL/SQL

7. Control Constructs.
8. Exception Handlers.
9. Implicit Cursor.
10. Explicit Cursor.
11. Procedures.
12. Functions.
13. Triggers.
14. TCL Commands usage (Commit, Rollback, Save point)

CURSOR

15. Student Mark Analysis Using Cursor

APPLICATION

16. Library Management System
17. Student Mark Analysis

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. Specifying constraints-Primary Key, Foreign Key, Unique, Check, Not Null. 3. DML commands. 4. Set Operations. 5. Joins. 6. Sub-queries.	15	Writing and executing the program in a system
2	**PL/SQL** 7. Control Constructs. 8. Exception Handlers. 9. Implicit Cursor. 10. Explicit Cursor.	15	Writing and executing the program in a system
3	**PL/SQL** 11. Procedures. 12. Functions. 13. Triggers. 14. TCL Commands usage (Commit, Rollback, Save point)	15	Writing and executing the program in a system
4	**CURSOR** 15. Student Mark Analysis Using Cursor	15	Writing and executing the program in a system
5	**APPLICATION** 16. Library Management System 17. Student Mark Analysis	15	Writing and executing the program in a system

Course Designer

Mrs. R.Chinthamani

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
V	Core	23OUCSD52	Machine Learning	4	5	25	75	100

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

Course Objectives:

1. To Learn about Machine Intelligence and Machine Learning applications.
2. To implement and apply machine learning algorithms to real-world applications.
3. To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems.
4. To create instant based learning.
5. To apply advanced learning.

Course Content:

Unit – I

Introduction Machine Learning - Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbour, support vector machines

Unit – II

Neural networks and genetic algorithms Neural Network Representation – Problems – Perceptions – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

Unit – III

Bayesian and computational learning Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm –

Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

Unit – IV

Instant based learning K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

Unit – V

Advanced learning Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.

Book for Study:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press.

Books for Reference:

1. EthemAlpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
3. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy (2020),Fundamentals of Machine Learning for Predictive Data Analytics, The MIT Press

Web Resources / E-Books:

1. https://www.geeksforgeeks.org/machine-learning/machine-learning/
2. https://www.techtarget.com/searchenterpriseai/definition/machine-learning-ML
3. https://www.ibm.com/think/topics/machine-learning

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 Machine Learning.

Activities to be given: Students shall be practiced with Algorithm examples**.**

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Appreciate the importance of visualization in the data analytics solution	K1 to K3
CLO2	Apply structured thinking to unstructured problems	K1 to K3
CLO3	Understand a very broad collection of machine learning algorithms and problems	K1 to K4
CLO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory	K1 to K3
CLO5	Develop an appreciation for what is involved in learning from data.	K1 to K4

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

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2

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

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Introduction Machine Learning** - Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbour, support vector machines.	15	Chalk and Talk, PPT, quiz, on the spot test
II	**Neural networks and genetic algorithms** Neural Network Representation – Problems – Perceptions – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.	15	Chalk and Talk, quiz, on the spot test

III	**Bayesian and computational learning** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	15	Chalk and Talk, PPT, group discussion and You tube Links
IV	**Instant based learning** K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.	15	Chalk and Talk, PPT, quiz
V	**Advanced learning** Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.V.Jayavani

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/ Week**	**CIA**	**SE**	**Total**
V	Core	23OUCSDPR5	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.

Annexure- 7a

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
V	Discipline Specific Elective Course	23OUCSDDSE5A	Data Communication and Computer Networks	3	4	25	75	100

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

Course Objectives:

1. To introduce the fundamental network architecture concepts and their core principle issues in the emerging communication / data networks.
2. To have a complete picture of the data and computer networks systematically
3. To provide a strong foundation in networking concepts and technology
4. To know the significance of various Flow control and Congestion control Mechanisms
5. To know the Functioning of various Application layer Protocols.

Course Content:

Unit – I

Data Communications: Introduction– Networks – The Internet – Protocols and Standards- Network Models: OSI model – TCP/IP protocol suite – Transmission Media: Guided media – Unguided Media.

Unit – II

Data Link Layer: Error Detection and Correction: Introduction- Block coding – Linear block codes – Cyclic Codes – Checksum. Framing – Flow and Error Control: Protocols –Noiseless Channels: Stop- and –Wait – Noisy Channel: Stop-and Wait Automatic Repeat Request-Go-Back.

Unit – III

Medium Access and Network Layer: Multiple Access: Random Access – Controlled access- Channelization. Network Layer Logical addressing: IPv4 addresses – IPv6 addresses.

Transport Layer: Process to Process delivery: UDP – TCP. Congestion Control – Quality of Service.

Unit – IV

Application Layer: Domain Naming System: Name Space - Domain Name Space - Distribution of Name Space - DNS in the INTERNET - Resolution–Remote logging – E-mail – FTP.

Unit – V

Wireless Networks: Wireless Communications – Principles and Fundamentals. WLANs – WPAN- Satellite Networks - Ad-hoc Networks

Book for Study:

1. Forouzan, A. Behrouz. (2006), Data Communications & Networking, Fourth Edition, Tata McGraw Hill Educatio
2. Nicopolitidis, Petros, Mohammad SalamehObaidat, G. L. Papadimitriou(2018), Wireless Networks, John Wiley & Sons.

Books for Reference:

1. Fred Halsall(1996), Data Communications Computer Networks and Open Systems, Fourth Edition, Addison Wesley.
2. Ajit Pal (2013), Data Communication and Computer Networks, 1st Edition, PHI Learning.
3. Prakash C. Gupta, "Data Communications and Computer Networks", 2nd Edition, PHI Learning.

Web Resources / E-Books:

1. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
2. https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/
3. https://en.wikipedia.org/wiki/Computer_network

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	Understand the basics of data communication, networking, internet and their importance.	K1 to K3
CLO2	Analyze the services and features of various protocol layers in data networks.	K1 to K3
CLO3	Differentiate wired and wireless computer networks	K1 to K4
CLO4	Analyze TCP/IP and their protocols.	K1 to K3
CLO5	Recognize the different internet devices and their functions.	K1 to K4

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

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2

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

LESSON PLAN: TOTAL HOURS (60 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Data Communications:** Introduction– Networks – The Internet – Protocols and Standards- Network Models: OSI model – TCP/IP protocol suite – Transmission Media: Guided media – Unguided Media.	12	Chalk and Talk, PPT, quiz, on the spot test
II	**Data Link Layer:** Error Detection and Correction: Introduction- Block coding – Linear block codes – Cyclic Codes – Checksum. Framing – Flow and Error Control: Protocols –Noiseless Channels: Stop- and –Wait – Noisy Channel: Stop-and Wait Automatic Repeat Request-Go-Back –N.	12	Chalk and Talk, quiz, on the spot test
III	**Medium Access and Network Layer:** Multiple Access: Random Access – Controlled access- Channelization. Network Layer Logical addressing: IPv4 addresses – IPv6 addresses. Transport Layer: Process to Process delivery: UDP – TCP. Congestion Control – Quality of Service	12	Chalk and Talk, PPT, group discussion and You tube Links

IV	**Application Layer:** Domain Naming System: Name Space - Domain Name Space - Distribution of Name Space - DNS in the INTERNET - Resolution–Remote logging – E-mail – FTP.	12	Chalk and Talk, PPT, quiz
V	**Wireless Networks:** Wireless Communications – Principles and Fundamentals. WLANs – WPAN- Satellite Networks - Ad-hoc Networks.	12	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.K.Shalini

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
V	Discipline Specific Elective Course	23OUCSDDSE5B	Software Engineering	3	4	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, Notable changes in software development practices, computer systems engineering.

Unit – II

Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS). **Software Design**: Good software design, cohesion and coupling, neat arrangement, 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, detailed design.

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

Unit – V

Software Maintenance: Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost;

Book for Study:

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

Chapters:

Unit – I	**:**	1.1, 1.2.1, 1.3.2, 1.4, 1.5, 1.6
Unit – II	**:**	4.1, 4.2, 5.2to 5.5
Unit – III	**:**	6.1 to 6.5
Unit – IV	**:**	10.1, 10.2,10.4,10.4.4, 10.5 to 10.10, 10.12, 10.13
Unit – V	**:**	13.1 to 13.4

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.

Web Resources / E-Books:

1. https://www.scribd.com/document/797049592/Fundamentals-of-Software-Engineering-5th-Edition-Rajib-Mall-2024-scribd-download
2. https://archive.org/details/softwareengineer0000rich
3. https://spada.uns.ac.id/pluginfile.php/77566/mod_resource/content/1/RPL-7th_ed_software_engineering_a_practitioners_approach_by_roger_s._pressman_.pdf

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)

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	2
CO 2	2	2	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	2	3	3	3	2	3
CO 5	3	2	3	3	3	3

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

LESSON PLAN: TOTAL HOURS (60 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Introduction:** The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering.	12	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, neat arrangement, software design approaches, object- oriented vs function-oriented design.	12	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, detailed design.	12	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	12	Chalk and Talk, PPT, quiz
V	**Software Maintenance:** Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost;	12	Chalk and Talk, PPT, group discussion, quiz, open book test

CourseDesigner
Mrs.P.Ruby Stella Mary

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
V	Discipline Specific Elective Course	23OUCSDDSE5C	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 (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
V	Discipline Specific Elective Course	23OUCSDDSE5D	Computing Intelligence	3	4	25	75	100

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

Course Objectives:

1. To provide strong foundation on fundamental concepts in Computing Intelligence
2. To apply basic principles of Artificial Intelligence and solutions that require problem solving, influence, perception, knowledge representation and learning

Course Content:

Unit – I

Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.

Unit – II

Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – fuzzy rule-based classifier.

Unit – III

Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

Unit – IV

Artificial Neural Networks: Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.

Unit – V

Genetic Algorithm: Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm.

Book for Study:

1. S.N. Sivanandam and S.N. Deepa, "Principles of Soft Computing", 2nd Edition, Wiley India Pvt. Ltd.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach", 2nd Edition, Pearson Education in Asia.
3. S. Rajasekaran, G. A. Vijayalakshmi, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications", PHI.

Books for Reference:

1. F. Martin, Mc neill, and Ellen Thro, "Fuzzy Logic: A Practical approach", AP Professional, 2000. Chin Teng Lin, C. S. George Lee," Neuro-Fuzzy Systems", PHP.
2. Chin Teng Lin, C. S. George Lee," Neuro-Fuzzy Systems", PHI.
3. Pasquale De Marco(2025), "Computing with Intelligence: The Journey from Concepts to Applications", Kindle Edition, PublishDrive

Web Resources / E-Books:

1. https://www.tutorialsduniya.com/notes/artificial-intelligence-notes/
2. https://mrcet.com/downloads/digital_notes/CSE/III%20Year/14082023/ARTIFICIAL%20INTELLIGENCE%20(R20A0513).pdf
3. https://ocw.mit.edu/courses/6-034-artificial-intelligence-spring-2005/pages/lecture-notes/

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	Describe the fundamentals of artificial intelligence concepts and searching techniques.	K1 to K3
CLO2	Develop the fuzzy logic sets and membership function and defuzzification techniques	K1 to K3
CLO3	Understand the concepts of Neural Network and analyze and apply the learning techniques	K1 to K4
CLO4	Understand the artificial neural networks and its applications	K1 to K3
CLO5	Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.	K1 to K4

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

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	3	3	3	3	3

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

LESSON PLAN: TOTAL HOURS (60 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.	12	Chalk and Talk, PPT, quiz, on the spot test
II	Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – fuzzy rule-based classifier.	12	Chalk and Talk, quiz, on the spot test
III	Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP)	12	Chalk and Talk, PPT, group

	Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.		discussion and You tube Links
IV	**Artificial Neural Networks:** Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.	12	Chalk and Talk, PPT, quiz
V	**Genetic Algorithm:** Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm.	12	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.M.Backiyalakshmi

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
VI	Core	23OUCSD61	IoT and Cloud Technologies	4	6	25	75	100

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

Course Objectives:

1. Learn basic concepts of Cloud Computing.
2. To get an overview of Map Reduce Concepts.
3. To learn about infrastructure security, Data Security and Privacy.
4. To understand access based on access management in data security
5. To generate security and privacy access for the end user

Course Content:

Unit – I

IoT Introduction: Introduction to IoT – IoT definition – Characteristics – IoT Complete Architectural Stack – IoT enabling Technologies – IoT Challenges. Sensors and Hardware for IoT – Hardware Platforms – Arduino, Raspberry Pi, Node MCU - Protocols for IoT.

Unit – II

Introduction to Cloud Computing Cloud Computing – Definition – SPI Framework – Software Model – Cloud Services Delivery Model – Deployment Models – Key drivers – Impact on Users – Governance in the cloud – Barriers to Cloud Computing Adoption in the enterprise. Examples of Cloud Service Providers: Amazon Web services – Google – Microsoft Azure Services Platform – Sun Open Cloud Platform.

Unit – III

Virtual Machines Provisioning and Migration Services Introduction and Inspiration -Background and Related Work- Virtual Machines Provisioning and Manageability-Virtual Machine Migration Services- VM Provisioning and Migration in Action -Provisioning in the Cloud Context - Future Research Directions- The Anatomy of Cloud Infrastructures -

Distributed Management of Virtual Infrastructures- Scheduling Techniques for Advance Reservation of Capacity- Capacity Management to meet SLA Commitments.

Unit – IV

Data Security, Identity and Access Management Data security and storage: Aspects of Data Security -Data Security Mitigation -Provider Data and Its Security. Identity and Access Management: Trust Boundaries and IAM -Why IAM? - IAM Challenges- IAM Definitions- IAM Architecture and Practice-Getting Ready for the Cloud - Relevant IAM Standards and Protocols for Cloud Services - IAM Practices in the Cloud-Cloud Authorization Management- Cloud Service Provider IAM Practice.

Unit – V

Security and Privacy Security Management: Standards – Security Management in the Cloud – Availability Management – Access Control. Privacy: What is Privacy – Data Life Cycle – Key Privacy Concerns – Who is responsible for protecting Privacy – Privacy Risk Management – Legal and Regulatory Implications. IoT and Cloud Integration: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment.

Book for Study:

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman ,CRC Press.
2. Adrian McEwen, Designing the Internet of Things, Wiley, 2013.
3. Tim Mather, Subra Kumaraswamy, ShahedLatif (2010), Cloud Security and Privacy, OREILLY Media.
4. RajkumarBuyya, James Broberg, AndrzejGoscinski(2011),CLOUD COMPUTING Principles and Paradigms, John Wiley & Sons, Inc., Hoboken, New Jersey

Books for Reference:

1. Ronald L. Krutz and Russell Dean Vines(2010), Cloud Security, Wiley – India
2. Kamal Kant Hiran, Dr Kamlesh Lakhwani, Dr Hemant Kumar Gianey(2020), Internet of Things (IoT), Kindle Edition, BPB Publications
3. Elmer wright (2025), “Cloud Computing With Aws Boto3 And Aws Sdk For Developers” Kindle Edition

Web Resources / E-Books:

1. http://repo.darmajaya.ac.id/4467/1/The%20Internet%20of%20things%20_%20enabling%20technologies%2C%20platforms%2C%20and%20use%20cases%20%28%20PDFDrive%20%29.pdf
2. https://madsg.com/wp-content/uploads/2015/12/Designing_the_Internet_of_Things.pdf
3. https://csit.ust.edu.sd/files/2018/09/security3.pdf

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	Design an IoT system with cloud infrastructure.	K1 to K3
CLO2	Implement the M2M Communication protocols in a prototype	K1 to K3
CLO3	Understand the basic concepts of the main sensors used in electromechanical systems	K1 to K4
CLO4	Understand/implement computer models of common engineering information types.	K1 to K3
CLO5	Understand storage mechanisms / analysis algorithms for data management in distributed & data intensive applications	K1 to K4

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

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	2
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3

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

Annexure- 7a

LESSON PLAN: TOTAL HOURS (90 HRS)

NIT	DESCRIPTION	HRS	MODE
I	**IoT Introduction:** Introduction to IoT – IoT definition – Characteristics – IoT Complete Architectural Stack – IoT enabling Technologies – IoT Challenges. Sensors and Hardware for IoT – Hardware Platforms – Arduino, Raspberry Pi, Node MCU - Protocols for IoT.	18	Chalk and Talk, PPT, quiz, on the spot test
II	**Introduction to Cloud Computing** Cloud Computing – Definition – SPI Framework – Software Model – Cloud Services Delivery Model – Deployment Models – Key drivers – Impact on Users – Governance in the cloud – Barriers to Cloud Computing Adoption in the enterprise. Examples of Cloud Service Providers: Amazon Web services – Google – Microsoft Azure Services Platform – Sun Open Cloud Platform.	18	Chalk and Talk, quiz, on the spot test
III	**Virtual Machines Provisioning and Migration Services** Introduction and Inspiration -Background and Related Work- Virtual Machines Provisioning and Manageability-Virtual Machine Migration Services- VM Provisioning and Migration in Action -Provisioning in the Cloud Context - Future Research Directions- The Anatomy of Cloud Infrastructures -Distributed Management of Virtual Infrastructures- Scheduling Techniques for Advance Reservation of Capacity- Capacity Management to meet SLA Commitments.	18	Chalk and Talk, PPT, group discussion and You tube Links
IV	**Data Security, Identity and Access Management Data security and storage:** Aspects of Data Security -Data Security Mitigation -Provider Data and Its Security. Identity and Access Management: Trust Boundaries and IAM -Why IAM? - IAM Challenges- IAM Definitions- IAM Architecture and Practice- Getting Ready for the Cloud - Relevant IAM Standards and Protocols for Cloud Services - IAM Practices in the Cloud- Cloud Authorization Management- Cloud Service Provider IAM Practice.	18	Chalk and Talk, PPT, quiz

V	**Security and Privacy Security Management: Standards** – Security Management in the Cloud – Availability Management – Access Control. Privacy: What is Privacy – Data Life Cycle – Key Privacy Concerns – Who is responsible for protecting Privacy – Privacy Risk Management – Legal and Regulatory Implications. IoT and Cloud Integration: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment.	18	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.S.Banumathi

Annexure- 7a

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/ Week**	**CIA**	**SE**	**Total**
VI	Core	23OUCSD6P	IoT and Cloud Technologies Lab	4	6	40	60	100

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

PROGRAM LIST

LIST OF PROGRAMS

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smart phone using Bluetooth.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when “1”/”0” is received from smart phone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thing speak cloud.
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thing speak cloud.
11. To install MySQL database on Raspberry Pi and perform basic SQL queries.
12. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.

13. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
14. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
15. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

Web Resources / E-Books:

1. https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT
2. https://en.wikipedia.org/wiki/Internet_of_things
3. https://www.geeksforgeeks.org/computer-networks/introduction-to-internet-of-things-iot-set-1/

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. Familiarization with Arduino/Raspberry Pi and perform necessary software installation. 2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds. 3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.	18	Writing and executing the program in a system
2	4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings. 5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed. 6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.	18	Writing and executing the program in a system
3	7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smart phone using Bluetooth. 8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when “1”/”0” is received from smart phone using Bluetooth. 9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thing speak cloud.	18	Writing and executing the program in a system

4	10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thing speak cloud. 11. To install MySQL database on Raspberry Pi and perform basic SQL queries. 12. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.	18	Writing and executing the program in a system
5	13. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it. 14. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested. 15. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.	18	Writing and executing the program in a system

Course Designer

Mrs. N.Kavitha

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
VI	Core	23OUCSD62	Artificial Intelligence	4	6	25	75	100

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

Course Objectives:

1. Describe the concepts of Artificial Intelligence
2. Understand the method of solving problems using Artificial Intelligence
3. Understand natural language processing
4. Introduce the concept of Expert system, Fuzzy logic
5. Understand about operating system and their uses

Course Content:

Unit – I

Introduction to Artificial Intelligence: What is Artificial Intelligence? AI Technique, Representation of a problem as State space search, production systems, Problem characteristics, Production System characteristics – Issues in the design of search programs, Heuristic Search Techniques - Generate & Test Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means-End Analysis

Unit – II

Knowledge Representation Approaches and issues in knowledge representation – Using Predicate Logic – Representing simple facts in logic – Representing Instance and ISA relationship – Computable functions and predicates – resolution – Natural deduction - Representing knowledge using rules –Procedural versus declarative knowledge – Logic programming - Forward versus backward reasoning – Matching – Control Knowledge - Symbolic reasoning under uncertainty - Logics for Nonmonotonic reasoning – Implementation Issues – Augmenting a problem solver – Implementation: Depth first search, Breadth first search

Unit – III

Statistical Reasoning Probability and Bayes‟ Theorem - Certainty factors and rule-based systems- Bayesian networks – Dempster - Shafer Theory - Weak slot-filler structure - Semantic nets – frames. Strong slot-filler structure- Conceptual dependency – Scripts – CYC – Syntatic – Semantic spectrum of Representation – Logic and slot-and-filler structure – Other representational Techniques

Unit – IV

Game Playing, Planning & NLP Minimax search procedure-Adding alpha-beta cutoffs- Additional Refinements – Iterative Deepening – Reference on specific games Planning - Components of a Planning system – Goal stack planning – Nonlinear planning using constraint posting- Hierarchical planning – Reactive systems. Natural Language Processing - Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing – Statistical Natural Language processing

Unit – V

Learning & Advanced Topics in AI What is learning? – Rote learning – Learning by taking advice – Learning in problem solving – Learning from examples: Induction – Explanation based learning – Discovery – Analogy – Formal learning theory - Neural Net learning and Genetic learning - Expert System: Representation-Expert System shells-Knowledge Acquisition. Fuzzy logic system – Crisp sets – Fuzzy sets – Fuzzy terminology – Fuzzy logic control – Sugeno style of Fuzzy inference processing – Fuzzy Hedges – Neuro Fuzzy systems.

Book for Study:

Elaine Rich, Kevin Knight (2008), Shivsankar B Nair, Artificial Intelligence, Third Edition, Tata McGraw Hill Publication

Chapters:

Unit – I **:** 1.3, 2.2 to 2.5, 3.1 to 3.6

Unit – II **:** 4.2, 4.3, 5.1 to 5.5, 6.1 to 6.5, 7.2 to 7.6

Unit – III **:** 8.1 to 8.4, 9.1,9.2, 10.1 to 10.3, 11.1 to 11.3

Unit – IV **:** 12.1 to 12.6, 13.3 to 13.7, 15.2 to 15.5

Unit – V **:** 17.1 to 17.10, 20.2, 20.4, 22.6, 22.7,22.9

Books for Reference:

1. Russel S, Norvig P (2010), Artificial Intelligence : A Modern approach,Third Edition, Pearson Education
2. Dan W Patterson (2007), Introduction to Artificial Intelligence and Expert System, Second Edition, Pearson Education Inc.
3. Jones M(2006), Artificial Intelligence application Programming, Second Edition, Dreamtech Press

Web Resources / E-Books:

1. https://en.wikipedia.org/wiki/Artifical intelligence
2. https://www.techtarget.com/searchenterpriseai/definition/artifical intelligence
3. https://mrcet.com/downloads/digital_notes/IT/(R17A1204)%20Artificial%20Intelligence.pdf

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	Design user interfaces to improve human–AI interaction and real-time decision-making. Evaluate the advantages, disadvantages, challenges, and ramifications of human–AI augmentation.	K1 to K3
CLO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	K1 to K3
CLO3	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.	K1 to K4
CLO4	Extract information from text automatically using concepts and	K1 to K3

	methods from natural language processing (NLP), including stemming, n-grams, POS tagging, and parsing	
CLO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness. Determine the framework in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments.	K1 to K4

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

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	2	3	3	2	3
CO 5	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	**Introduction to Artificial Intelligence** What is Artificial Intelligence? AI Technique, Representation of a problem as State space search, production systems, Problem characteristics, Production System characteristics – Issues in the design of search programs, Heuristic Search Techniques - Generate & Test Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means-End Analysis	18	Chalk and Talk, PPT, quiz, on the spot test
II	**Knowledge Representation** Approaches and issues in knowledge representation –Using Predicate Logic – Representing simple facts in logic – Representing Instance and ISA relationship – Computable functions and predicates – resolution – Natural deduction - Representing knowledge using rules –Procedural versus declarative knowledge – Logic programming - Forward versus backward reasoning – Matching – Control Knowledge - Symbolic reasoning under uncertainty - Logics for Nonmonotonic reasoning – Implementation Issues – Augmenting a problem solver – Implementation: Depth first search, Breadth first search	18	Chalk and Talk, quiz, on the spot test

III	**Statistical Reasoning** Probability and Bayes‟ Theorem - Certainty factors and rule-based systems- Bayesian networks – Dempster - Shafer Theory - Weak slot-filler structure - Semantic nets – frames. Strong slot-filler structure- Conceptual dependency – Scripts – CYC – Syntatic – Semantic spectrum of Representation – Logic and slot-and-filler structure – Other representational Techniques	18	Chalk and Talk, PPT, group discussion and You tube Links
IV	**Game Playing, Planning & NLP** Minimax search procedure- Adding alpha-beta cutoffs- Additional Refinements – Iterative Deepening – Reference on specific games Planning - Components of a Planning system – Goal stack planning – Nonlinear planning using constraint posting- Hierarchical planning – Reactive systems. Natural Language Processing - Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing – Statistical Natural Language processing	18	Chalk and Talk, PPT, quiz
V	**Learning & Advanced Topics in AI** What is learning? – Rote learning – Learning by taking advice – Learning in problem solving – Learning from examples: Induction – Explanation based learning – Discovery – Analogy – Formal learning theory - Neural Net learning and Genetic learning - Expert System: Representation-Expert System shells-Knowledge Acquisition. Fuzzy logic system – Crisp sets – Fuzzy sets – Fuzzy terminology – Fuzzy logic control – Sugeno style of Fuzzy inference processing – Fuzzy Hedges – Neuro Fuzzy systems.	18	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.R.Chinthamani

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
VI	Discipline Specific Elective Course	23OUCSDDSE6A	Operating System	3	5	25	75	100

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

Course Objectives:

1. To understand the fundamental concepts and role of Operating System.
2. To learn the Process Management and Scheduling Algorithms.
3. To understand the Memory Management policies.
4. To gain insight on I/O and File management techniques.
5. Analyze resource management techniques

Course Content:

Unit – I

Introduction- views and goals – Operating System Services - User and Operating System interface - System Call- Types of System Calls – Operating System Design and Implementation - Operating System Structure. **Process Management:** Process concept- Process Scheduling - Operations on Processes- Inter-process Communication. **Threads:** Types of threads.

Unit – II

Process Scheduling: Basic Concepts-Scheduling Criteria Scheduling Algorithm Multiple Processor Scheduling CPU Scheduling. **Synchronization:** The Critical-Section Problem Synchronization Hardware – Semaphores- Classic Problem of Synchronization.

Unit – III

Deadlocks: Deadlock Characterization - Methods for Handling Deadlocks- Deadlock Prevention- Deadlock Avoidance - Deadlock Detection- Recovery from Deadlock.

Unit – IV

Memory-Management Strategies: Swapping - Contiguous Memory Allocation Segmentation- Paging - Structure of the Page Table. **Virtual-Memory Management:** Demand Paging - Page Replacement - Allocation of Frames -Thrashing.

Unit – V

Storage Management: File System- File Concept - Access Methods- Directory and Disk Structure -File Sharing- Protection. Allocation Methods - Free- Space Management - Efficiency and Performance – Recovery.

Book for Study:

A. SilberschatzP.B.Galvin, Gange. "Operating System Concepts", Ninth Edition, 2013, Addison WesleyPublishing Co..

Chapters:

Unit – I	**:**	1.1, 2.1 to 2.4, 2.6, 2.7, 3.1 to 3.4
Unit – II	**:**	5.2, 5.4, 5.6, 5.7, 6.1 to 6.3, 6.5, 6.6
Unit – III	**:**	7.2 to 7.7
Unit – IV	**:**	8.2 to 8.6, 9.2, 9.4 to 9.6
Unit – V	**:**	11.1 to 11.3, 11.5,11.6,12.4 to 12.7

Books for Reference:

1. Anderw S Tanenbaum, Albert S. Woodhull, " Operating System Design and Impletation", prentice-Hall India Publication.
2. William Stallings, "Operating Systems Internals and Design Principles", Pearson, 2018, 9th Edition.
3. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition

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 OS with its view and goals and services rented by it . Deign of Operating System with its structure. Message through Inter process communication	K1 to K3
CLO2	Describe the allocation of process through scheduling algorithms. Define critical section problems and its usage. Prevention of multiple process executing through the concept of semaphores.	K1 to K3
CLO3	Describe the concept of Mutual exclusion, Deadlock detection and agreement protocols for deadlock prevention and its avoidance.	K1 to K4
CLO4	Analyze the strategies of Memory management schemes and the usage of Virtual memory. Apply Replacement algorithms to avoid thrashing.	K1 to K3
CLO5	Brief study of storage management. Categorize the methods to allocate files for proper protection	K1 to K4

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

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	3	3	3	3	3

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

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Introduction**- views and goals – Operating System Services - User and Operating System interface - System Call- Types of System Calls – Operating System Design and Implementation - Operating System Structure. **Process Management**: Process concept- Process Scheduling - Operations on Processes- Interprocess Communication. **Threads**: Types of threads	15	Chalk and Talk, PPT, quiz, on the spot test

II	**Process Scheduling**: Basic Concepts-Scheduling Criteria Scheduling Algorithm Multiple Processor Scheduling CPU Scheduling. **Synchronization**: The Critical-Section Problem Synchronization Hardware – Semaphores- Classic Problem of Synchronization.	15	Chalk and Talk, quiz, on the spot test
III	**Deadlocks:** Deadlock Characterization - Methods for Handling Deadlocks-Deadlock Prevention- Deadlock Avoidance - Deadlock Detection- Recovery from Deadlock.	15	Chalk and Talk, PPT, group discussion and You tube Links
IV	**Memory**-Management Strategies: Swapping - Contiguous Memory Allocation Segmentation- Paging - Structure of the Page Table. **Virtual-Memory Management**: Demand Paging - Page Replacement - Allocation of Frames -Thrashing.	15	Chalk and Talk, PPT, quiz
V	**Storage Management:** File System- File Concept - Access Methods- Directory and Disk Structure -File Sharing- Protection. Allocation Methods - Free- Space Management - Efficiency and Performance – Recovery.	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.V.Jayavani

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
VI	Discipline Specific Elective Course	23OUCSDDSE6B	Financial Analytics	3	5	25	75	100

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

Course Objectives:

1. To analyze and model financial data.
2. To construct and optimize asset portfolios.
3. To evaluate and model Risk on various financial assets.
4. To use the most powerful and sophisticated routines in R for analytical finance.
5. To acquire logical & analytical skills in financial analytics.

Course Content:

Unit – I

Financial Analytics: Introduction: Meaning-Importance of Financial Analytics uses-Features-Documents used in Financial Analytics: Balance Sheet, Income Statement, Cash flow statement-Elements of Financial Health: Liquidity, Leverage, Profitability. Financial Securities: Bond and Stock investments - Housing and Euro crisis - Securities Datasets and Visualization - Plotting multiple series.

Unit – II

Descriptive Analytics: Data Exploration, Dimension Reduction and Data Clustering Geographical Mapping, Market Basket Analysis. Predictive Analytics, Fraud Detection, Churn Analysis, Crime Mapping, Content Analytics, Sentiment Analysis. Analyzing financial data and implement financial models. Process of Data analytics: obtaining publicly available data, refining such data, implement the models and generate typical output, Prices and individual security returns, Portfolio returns, Risks, Factor Models.

Unit – III

Forecasting Analytics: Estimating Demand Curves and Optimize Price, Price Bundling, Non Linear Pricing and Price Skimming, Forecasting, Simple Regression and Correlation Multiple Regression to forecast sales. Modeling Trend and Seasonality Ratio to Moving Average Method, Winter's Method.

Unit – IV

Business Intelligence &Tableau: Definition of BI – A Brief History of BI – The Architecture of BI. The origin and Drivers of BI. Successful BI Implementation – Analytics Overview – Descriptive, Predictive and Perspective Analytics. Business reporting and Visualization – components - A brief history of data visualization – Different types of charts and graphs – The emergence of data visualization and visual analytics – Performance dashboards – Dashboard design – Best practices in dashboarddesign – Business performance management – Balanced Scorecards – Six sigma as a performance measurement system.

Unit – V

Visualizations: Using Tableau to Summarize Data, Slicing and Dicing Financial Data, Charts to Summarize Marketing Data. Functions to Summarize Data, Pricing Analytics, Risk based pricing, Fraud Detection and Prediction, Recovery Management, Loss Risk Forecasting, Risk Profiling, Portfolio Stress Testing.

Book for Study:

1. Analysis of Economic Data, Gary Koop, (4th Edition), Wiley.
2. Statistics and Data Analysis for Financial Engineering: with R examples; David Ruppert, David S. Matteson, Springers

Books for Reference:

1. Analyzing Financial Data and Implementing Financial Models Using „R", Ang Clifford, Springers
2. Microsoft Excel 2013: Data Analysis and Business Modeling, Wayne L. Winston, Microsoft Publishing
3. Pitabas Mohanty(2023), Financial Analytics, Kindle Edition, Wiley

Web Resources / E-Books:

1. https://www.techtarget.com/searcherp/definition/financial-analytics
2. https://www.teradata.com/Glossary/What-is-Finance-Analytics

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill: students learn about Financial Analytics.

Activities to be given: students shall be practiced with Case Study Analysis and Trend & Seasonality

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Interpret and discuss the outputs of given financial models and create their own models.	K1 to K3
CLO2	Design and create visualizations that clearly communicate financial data insights.	K1 to K3
CLO3	Gain essential knowledge and hands-on experience in the data analysis process, including data scraping, manipulation, and exploratory data analysis.	K1 to K4
CLO4	Be prepared for more advanced applied financial modeling courses.	K1 to K3
CLO5	Improve leadership, teamwork and critical thinking skills for financial decision making.	K1 to K4

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

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	3	3	3	3	3

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

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Financial Analytics:** Introduction: Meaning-Importance of Financial Analytics uses-Features-Documents used in Financial Analytics: Balance Sheet, Income Statement, Cash flow statement-Elements of Financial Health: Liquidity, Leverage, Profitability. Financial Securities: Bond and Stock investments - Housing and Euro crisis - Securities Datasets and Visualization - Plotting multiple series.	15	Chalk and Talk, PPT, quiz, on the spot test

II	**Descriptive Analytics:** Data Exploration, Dimension Reduction and Data Clustering Geographical Mapping, Market Basket Analysis. Predictive Analytics, Fraud Detection, Churn Analysis, Crime Mapping, Content Analytics, Sentiment Analysis. Analyzing financial data and implement financial models. Process of Data analytics: obtaining publicly available data, refining such data, implement the models and generate typical output, Prices and individual security returns, Portfolio returns, Risks, Factor Models.	15	Chalk and Talk, quiz, on the spot test
III	**Forecasting Analytics:** Estimating Demand Curves and Optimize Price, Price Bundling, Non Linear Pricing and Price Skimming, Forecasting, Simple Regression and Correlation Multiple Regression to forecast sales. Modeling Trend and Seasonality Ratio to Moving Average Method, Winter's Method.	15	Chalk and Talk, PPT, group discussion and You tube Links
IV	**Business Intelligence &Tableau:** Definition of BI – A Brief History of BI – The Architecture of BI. The origin and Drivers of BI. Successful BI Implementation – Analytics Overview – Descriptive, Predictive and Perspective Analytics. Business reporting and Visualization – components - A brief history of data visualization – Different types of charts and graphs – The emergence of data visualization and visual analytics – Performance dashboards – Dashboard design – Best practices in dashboard design – Business performance management – Balanced Scorecards – Six sigma as a performance measurement system.	15	Chalk and Talk, PPT, quiz
V	**Visualizations:** Using Tableau to Summarize Data, Slicing and Dicing Financial Data, Charts to Summarize Marketing Data. Functions to Summarize Data, Pricing Analytics, Risk based pricing, Fraud Detection and Prediction, Recovery Management, Loss Risk Forecasting, Risk Profiling, Portfolio Stress Testing.	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.K.Shalini

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
VI	Discipline Specific Elective Course	23OUCSDDSE6C	Big Data Analytics	3	5	25	75	100

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

Course Objectives:

1. To know the fundamental concepts of big data and analytics.
2. To explore tools and practices for working with Big data
3. To learn about stream computing.
4. To know about the research that requires the integration of large amounts of data
5. To analyze data by utilizing clustering and classification algorithms.

Course Content:

Unit – I

Big data Introduction : Big Data introduction - definition and taxonomy - Big data value for the enterprise - The Hadoop ecosystem - Introduction to Distributed computing- Hadoop ecosystem – Hadoop Distributed File System (HDFS) Architecture - HDFS commands for loading/getting data - Accessing HDFS through Java program.

Unit – II

Map reduce : Introduction to Map Reduce frame work - Basic Map Reduce Programming: - Advanced Map Reduce programming: Basic template of the Map Reduce program, Word count problem- Streaming in Hadoop- Improving the performance using combiners- Chaining Map Reduce jobs- Joining data from different sources.

Unit – III

Pig and Hive: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - Fundamentals of HBase and ZooKeeper.

Unit – IV

Mongo DB : No SQL databases: Mongo DB: Introduction – Features - Data types - Mongo DB Query language - CRUD operations – Arrays - Functions: Count – Sort – Limit – Skip – Aggregate - Map Reduce. Cursors – Indexes - Mongo Import – Mongo Export.

Unit – V

Cassandra: Introduction – Features - Data types – CQLSH - Key spaces - CRUD operations – Collections – Counter – TTL - Alter commands - Import and Export - Querying System tables.

Book for Study:

1. JSeema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publication, 2015.
2. Ramesh Sharda, Dursun Delen, Efraim Turban (2018), Business Intelligence, Pearson Education Services Pvt Ltd.

Books for Reference:

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", John Wiley & Sons, Inc., 2013.
2. Tom White, "Hadoop: The Definitive Guide", O"Reilly Publications, 2011.
3. Kyle Banker, "Mongo DB in Action", Manning Publications Company, 2012.

Web Resources / E-Books:

1. https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics
2. https://www.ibm.com/think/topics/big-data-analytics
3. https://www.coursera.org/in/articles/big-data-analytics

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill: students ability to process, query, and manage big data using Hadoop, MapReduce, Pig, Hive, MongoDB, and Cassandra.

Activities to be given: students shall be practice HDFS commands and Java access, develop MapReduce programs, write Pig and Hive queries, perform MongoDB operations, and execute Cassandra CQL queries with keyspaces and tables.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Understand Big Data and its analytics in the real world	K1 to K3
CLO2	Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm.	K1 to K3
CLO3	Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics.	K1 to K4
CLO4	Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics.	K1 to K3
CLO5	Implement Big Data Activities using Hive.	K1 to K4

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	3	2
CO2	2	3	3	3	3	2
CO3	2	2	2	3	3	3
CO4	3	2	2	3	3	3
CO5	3	3	3	3	3	3

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

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	**Big data Introduction :** Big Data introduction - definition and taxonomy - Big data value for the enterprise - The Hadoop ecosystem - Introduction to Distributed computing- Hadoop ecosystem – Hadoop Distributed File System (HDFS) Architecture - HDFS commands for loading/getting data - Accessing HDFS through Java program.	15	Chalk and Talk, PPT, quiz, on the spot test
II	**Map reduce :** Introduction to Map Reduce frame work - Basic Map Reduce Programming: - Advanced Map Reduce programming: Basic template of the Map Reduce program, Word count problem- Streaming in Hadoop- Improving the performance using combiners- Chaining Map Reduce jobs- Joining data from different sources.	15	Chalk and Talk, quiz, on the spot test
III	**Pig and Hive :** Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - Fundamentals of HBase and ZooKeeper.	15	Chalk and Talk, PPT, group discussion and You tube Links

IV	**Mongo DB :** No SQL databases: Mongo DB: Introduction – Features - Data types - Mongo DB Query language - CRUD operations – Arrays - Functions: Count – Sort – Limit – Skip – Aggregate - Map Reduce. Cursors – Indexes - Mongo Import – Mongo Export.	15	Chalk and Talk, PPT, quiz
V	**Cassandra:** Introduction – Features - Data types – CQLSH - Key spaces - CRUD operations – Collections – Counter – TTL - Alter commands - Import and Export - Querying System tables.	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.P.Ruby Stella Mary

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
VI	Discipline Specific Elective Course	23OUCSDDSE6D	Information Security	3	5	25	75	100

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

Course Objectives:

1. To know the objectives of information security
2. Understand the importance and application of each of confidentiality, integrity, authentication and availability
3. Understand various cryptographic algorithms
4. Understand the basic categories of threats to computers and networks

Course Content:

Unit – I

Introduction to Information Security : Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms.

Unit – II

The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense. Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption

Unit – III

Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms .Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos.

Unit – IV

Program Security : Non-malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels. File protection Mechanisms, User Authentication Designing Trusted O.S: Security polices, models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples.

Unit – V

Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security. Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction.

Book for Study:

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2. Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson

Books for Reference:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, lst Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2"d Edition
3. Information Security, Principles and Practice: Mark Stamp, Wiley India.

Web Resources / E-Books:

1. https://www.geeksforgeeks.org/computer-networks/what-is-information-security/
2. https://en.wikipedia.org/wiki/Information_security
3. https://www.ibm.com/think/topics/information-security

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill: students learn about security fundamentals, cryptographic techniques (DES, AES, RSA), authentication, program and network threats, secure OS design, and web security protocols like SSL/TLS and SET.

Activities to be given: students shall be practice identifying threats, try simple encryption methods, test login security with hash and keys, find program errors, and learn how to protect networks and websites.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Understand network security threats, security services, and countermeasures	K1 to K3
CLO2	Understand vulnerability analysis of network security	K1 to K3
CLO3	Acquire background on hash functions; authentication; firewalls; intrusion detection techniques.	K1 to K4
CLO4	Gain hands-on experience with programming and simulation techniques for security protocols.	K1 to K3
CLO5	Apply methods for authentication, access control, intrusion detection and prevention.	K1 to K4

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	3	2
CO2	2	3	3	3	3	2
CO3	2	2	2	3	3	3
CO4	3	2	2	3	3	3
CO5	3	3	3	3	3	3

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

LESSON PLAN: TOTAL HOURS (75 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	Introduction to Information Security : Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms.	15	Chalk and Talk, PPT, quiz, on the spot test
II	The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense. Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption	15	Chalk and Talk, quiz, on the spot test
III	Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms .Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos.	15	Chalk and Talk, PPT, group discussion and You tube Links

IV	Program Security : Non-malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of-use Errors, Viruses, Trapdoors, Salami attack, Man-in-the-middle attacks, Covert channels. File protection Mechanisms, User Authentication Designing Trusted O.S: Security polices, models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples.	15	Chalk and Talk, PPT, quiz
V	Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security. Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction.	15	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.M.Backiyalakshmi

Annexure- 7a

Department of Computer Science (Data Science and Analytics)				Class: III B.Sc., CS (DS)				
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours/ Week**	**CIA**	**External Exam**	**Total**
VI	Discipline Specific Elective Course	23OUCSDSEC6	Quantitative Aptitude	2	2	25	75	100

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

Course Objectives:

1. To improve the quantitative skills of the students
2. To prepare the students for various competitive exams.

Course Content:

Unit – I

Numbers- HCF and LCM of numbers-Decimal fractions- Simplification- Square roots and cube roots- Average- problems on Numbers.

Unit – II

Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership- Chain rule.

Unit – III

Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area –Volume and surface area – races and Games of skill.

Unit – IV

Permutation and combination-probability – True Discount-Bankers Discount - Height and Distances-Odd man out & Series.

Unit – V

Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs-Pie charts – Line graphs.

Book for Study:

R.S.Aggarwal "Quantitative Aptitude", S.Chand & Company Ltd.

Books for Reference:

1. Cracku, CAT Quantitative aptitude,

Web Resources / E-Books:

1. Webresources: Authentic Web resources related to Competitive examinations

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill: Students can solve problems on numbers, interest, time, profit, and probability, and interpret data using graphs and tables. **Activities to be given:** Students can practice solving problems on numbers, percentages, time and work, profit and loss, probability, and interpret data using bar graphs, pie charts, and tables.

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	To gain knowledge on LCM and HCF and its related problems	K1 to K3
CLO2	To get an idea of age, profit and loss related problem solving.	K1 to K3
CLO3	Able to understand time series simple and compound interests.	K1 to K4
CLO4	Understanding the problem related to probability, and series.	K1 to K3
CLO5	Able to understand graphs, charts.	K1 to K4

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	2	3
CO2	3	3	3	3	3	3
CO3	3	2	2	2	3	3
CO4	3	3	2	3	3	3
CO5	3	3	3	3	3	3

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

Annexure- 7a

LESSON PLAN: TOTAL HOURS (30 HRS)

UNIT	DESCRIPTION	HRS	MODE
I	Numbers- HCF and LCM of numbers-Decimal fractions-Simplification- Square roots and cube roots- Average- problems on Numbers.	6	Chalk and Talk, PPT, quiz, on the spot test
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership-Chain rule.	6	Chalk and Talk, quiz, on the spot test
III	Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area –Volume and surface area –races and Games of skill.	6	Chalk and Talk, PPT, group discussion and You tube Links
IV	Permutation and combination - probability – True Discount – Bankers Discount Height and Distances – Odd man out & Series.	6	Chalk and Talk, PPT, quiz
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs- Pie charts-Line graphs.	6	Chalk and Talk, PPT, group discussion, quiz, open book test

Course Designer
Mrs.S.Banumathi