

# M.Sc. Information Technology

## Syllabus

**AFFILIATED COLLEGES**

**Program Code: 36J**

**2026 – 2027 onwards**



**BHARATHIAR UNIVERSITY**

**(A State University, Accredited with “A++” Grade by NAAC,  
Ranked 21<sup>st</sup> among Indian Universities by MHRD-NIRF)**

**Coimbatore - 641 046, Tamil Nadu, India**

**Program Educational Objectives (PEOs)**

The M. Sc.IT program describe accomplishments that graduates are expected to attain within five to seven years after graduation

|      |                                                                                                                                                       |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| PEO1 | Empower students to critically analyze current trends and learn future issues from a system perspective at multiple levels of detail and abstraction. |
| PEO2 | Acquire higher degree of technical skills in problem solving and application development                                                              |
| PEO3 | Exhibit continuous learning and research for the societal upliftment with human values and ethics                                                     |



| <b>Program Specific Outcomes (PSOs)</b>                                           |                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| After the successful completion of M.Sc. IT program, the students are expected to |                                                                                                                                                                                                                               |
| PSO1                                                                              | Able to work out effective and efficient real time solutions using acquired knowledge in the computer science domain including theory, programming, algorithms, databases and web development.                                |
| PSO2                                                                              | Motivate students to pursue lifelong learning and to do research as computing experts and scientists to meet the requirement of corporate world and Industry standard to provide solutions to industry, society and business. |
| PSO3                                                                              | Acquire professional skills in software design process and practical competence in a broad range of open-source programming languages to withstand technological change and provide solutions to new ideas and innovations.   |
| PSO4                                                                              | Acquire the knowledge of advanced programming skills and distributed environmental needs for sustainable development.                                                                                                         |
| PSO5                                                                              | Able to pursue careers in IT industry/ consultancy/ research and development, teaching and allied areas related to Information Technology.                                                                                    |



| <b>Program Outcomes (POs)</b>                    |                                                                                                |
|--------------------------------------------------|------------------------------------------------------------------------------------------------|
| On successful completion of the M.Sc. IT program |                                                                                                |
| P01                                              | Develop creativity and problem-solving skills with the knowledge of computing and mathematics. |
| P02                                              | Ability to develop and carry out experiments, interpret and infer data                         |
| P03                                              | Design algorithms and develop software to aid solutions to industry and governments.           |
| P04                                              | Review the latest technology and tool handling mechanism.                                      |
| P05                                              | Analyze the outcome to solve global environment related issues.                                |
| P06                                              | Apply the knowledge in a lifelong learning journey to equip themselves.                        |
| P07                                              | Identify the perspective of business practices, risks and limitations.                         |
| P08                                              | Work with professional and ethical values.                                                     |
| P09                                              | Formulate the responsibilities of human rights and entrepreneurial spirit.                     |
| P010                                             | Understand the methods to communicate effectively and work collectively                        |



**BHARATHIAR UNIVERSITY, COIMBATORE 641 046**  
**M.Sc. INFORMATION TECHNOLOGY (Affiliated Colleges)**  
**REVISED SCHEME OF EXAMINATIONS – CBCS PATTERN**

*(For the students admitted during the academic year 2025 – 2026 onwards)*

| Course Code      | Title of the Course                                            | Credits | Hours  |           | Maximum Marks |     |       |
|------------------|----------------------------------------------------------------|---------|--------|-----------|---------------|-----|-------|
|                  |                                                                |         | Theory | Practical | CIA           | ESE | Total |
| FIRST SEMESTER   |                                                                |         |        |           |               |     |       |
| 13A              | Paper I: Object Oriented Analysis and Design                   | 4       | 5      | -         | 25            | 75  | 100   |
| 13B              | Paper II: Advanced Database Management Systems                 | 4       | 5      | -         | 25            | 75  | 100   |
| 13C              | Paper III: Advanced Java Programming                           | 4       | 5      | -         | 25            | 75  | 100   |
| 13D              | Paper IV: Python Programming                                   | 4       | 5      | -         | 25            | 75  | 100   |
| 13P              | Practical I: Advanced Java Lab                                 | 4       |        | 5         | 40            | 60  | 100   |
| 13Q              | Practical II: Python Programming Lab                           | 4       |        | 5         | 40            | 60  | 100   |
|                  | Total                                                          | 24      | 20     | 10        |               |     | 600   |
| SECOND SEMESTER  |                                                                |         |        |           |               |     |       |
| 23A              | Paper V: Data Mining and Warehousing                           | 4       | 4      | -         | 25            | 75  | 100   |
| 23B              | Paper VI: Cryptography and Network Security                    | 4       | 4      | -         | 25            | 75  | 100   |
| 23C              | Paper VII: Artificial Intelligence and Machine Learning        | 4       | 4      | -         | 25            | 75  | 100   |
| 23D              | Paper VIII: Internet of Things                                 | 4       | 4      | -         | 25            | 75  | 100   |
| 2EA/2EB /2EC/2ED | Elective I                                                     | 4       | 4      | -         | 25            | 75  | 100   |
| 23P              | Practical III: Data Mining using R                             | 4       | -      | 5         | 40            | 60  | 100   |
| 23Q              | Practical IV: Artificial Intelligence and Machine Learning Lab | 4       | -      | 5         | 40            | 60  | 100   |
|                  | Total                                                          | 28      | 20     | 10        |               |     | 700   |
| THIRD SEMESTER   |                                                                |         |        |           |               |     |       |
| 33A              | Paper IX: Digital Image Processing                             | 4       | 4      | -         | 25            | 75  | 100   |
| 33B              | Paper X: Big Data Analytics                                    | 4       | 4      | -         | 25            | 75  | 100   |
| 33C              | Paper XI: Cloud Computing                                      | 4       | 4      | -         | 25            | 75  | 100   |
| 33D              | Paper XII: Web Technologies                                    | 4       | 4      | -         | 25            | 75  | 100   |

|                                                                |                                                      |           |           |           |     |     |             |
|----------------------------------------------------------------|------------------------------------------------------|-----------|-----------|-----------|-----|-----|-------------|
| 3EA/3EB<br>/3EC/3ED                                            | Elective II                                          | 4         | 4         | -         | 25  | 75  | 100         |
| 33P                                                            | Practical V: Digital Image Processing Lab            | 4         | -         | 4         | 40  | 60  | 100         |
| 33Q                                                            | Practical VI: Big Data Analytics Lab                 | 4         | -         | 3         | 40  | 60  | 100         |
| 33R                                                            | Practical VII: Web Application development & hosting | 1         | -         | 2         | 25  | 25  | 50          |
|                                                                | Health and Wellness                                  | 1         | -         | 1         | 100 | -   | 100         |
|                                                                | <b>Total</b>                                         | <b>30</b> | <b>20</b> | <b>10</b> |     |     | <b>850</b>  |
| <b>FOURTH SEMESTER</b>                                         |                                                      |           |           |           |     |     |             |
| 47V                                                            | Project and Viva-voce*                               | 8         | -         | -         | 50  | 150 | 200         |
|                                                                | <b>Total</b>                                         | <b>8</b>  |           |           |     |     | <b>200</b>  |
|                                                                | <b>Grand Total</b>                                   | <b>90</b> |           |           |     |     | <b>2350</b> |
| * Project evaluation – 100 marks   Viva-voce – 50 marks in ESE |                                                      |           |           |           |     |     |             |

### # During II or III Semester (Optional)

#### List of Electives -ELECTIVE – I

| E.No. | Sub. Code | Name of the Elective Course     |
|-------|-----------|---------------------------------|
| 1.1   | 2EA       | Multimedia and its Applications |
| 1.2   | 2EB       | Mobile Application Development  |
| 1.3   | 2EC       | Quantum Computing               |
| 1.4   | 2ED       | Web Services                    |

#### ELECTIVE – II

| E.No. | Sub. Code | Name of the Elective Course                            |
|-------|-----------|--------------------------------------------------------|
| 2.1   | 3EA       | Soft Computing                                         |
| 2.2   | 3EB       | Embedded systems                                       |
| 2.3   | 3EC       | Block Chain Technology                                 |
| 2.4   | 3ED       | Critical Thinking, Design Thinking and Problem Solving |

#### HEALTH AND WELLNESS- Split up for CIA Marks 100

| DESCRIPTION                              | MARKS |
|------------------------------------------|-------|
| Report                                   | 40    |
| Attendance                               | 20    |
| Activities (Observation During Practice) | 40    |



# **First Semester**

|                                                                                                                                                                                                                                       |                                                                                      |                                                     |                         |          |                |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------------|----------|----------------|-----------------|
| <b>Course code</b>                                                                                                                                                                                                                    | <b>13A</b>                                                                           | <b>PAPER I: OBJECT ORIENTED ANALYSIS AND DESIGN</b> | <b>L</b>                | <b>T</b> | <b>P</b>       | <b>C</b>        |
| <b>Core/Elective/Supportive</b>                                                                                                                                                                                                       |                                                                                      | <b>Core</b>                                         | 5                       | 5        |                | 4               |
| <b>Pre-requisite</b>                                                                                                                                                                                                                  | Able to understand the basis of programming languages, paradigms and designing tools |                                                     | <b>Syllabus Version</b> |          | <b>2021-22</b> |                 |
| <b>Course Objectives:</b>                                                                                                                                                                                                             |                                                                                      |                                                     |                         |          |                |                 |
| The main objectives of this course are to:                                                                                                                                                                                            |                                                                                      |                                                     |                         |          |                |                 |
| 1. Presents the object model, classes and objects, object orientation, machine view and model management view.                                                                                                                        |                                                                                      |                                                     |                         |          |                |                 |
| 2. Enable the students to learn the basic functions, principles and concepts of object-oriented analysis and design.                                                                                                                  |                                                                                      |                                                     |                         |          |                |                 |
| 3. Enable the students to learn the UML design and diagrams and be exposed to the various testing techniques                                                                                                                          |                                                                                      |                                                     |                         |          |                |                 |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                      |                                                                                      |                                                     |                         |          |                |                 |
| On the successful completion of the course, student will be able to:                                                                                                                                                                  |                                                                                      |                                                     |                         |          |                |                 |
| 1                                                                                                                                                                                                                                     | Remember the basic knowledge on design technique                                     |                                                     |                         |          |                | K1,K2           |
| 2                                                                                                                                                                                                                                     | Understand the object-oriented system development and case models                    |                                                     |                         |          |                | K2,K3           |
| 3                                                                                                                                                                                                                                     | Analyze on class diagrams used for UML.                                              |                                                     |                         |          |                | K4,K5           |
| 4                                                                                                                                                                                                                                     | Apply and analyze different testing techniques for various applications              |                                                     |                         |          |                | K3,K4           |
| 5                                                                                                                                                                                                                                     | Analyze Design and Implement projects using OO Concepts                              |                                                     |                         |          |                | K5,K6           |
| <b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create                                                                                                        |                                                                                      |                                                     |                         |          |                |                 |
| <b>Unit:1</b>                                                                                                                                                                                                                         | <b>INTRODUCTION OF OBJECTS</b>                                                       |                                                     |                         |          |                | <b>15 hours</b> |
| Object Orientation – System Development – Review of Objects – Inheritance – Object Relationships – Dynamic binding – OOSD life cycle – Process – Analysis- Design –Prototyping – Implementation – Testing – Overview of Methodologies |                                                                                      |                                                     |                         |          |                |                 |
| <b>Unit:2</b>                                                                                                                                                                                                                         | <b>METHODOLOGIES</b>                                                                 |                                                     |                         |          |                | <b>15 hours</b> |
| OMT – Booch methodology, Jacobson – Methodology – patterns – Unified approach – UML – Class Diagrams – Dynamic Modeling                                                                                                               |                                                                                      |                                                     |                         |          |                |                 |
| <b>Unit:3</b>                                                                                                                                                                                                                         | <b>CASE MODELS</b>                                                                   |                                                     |                         |          |                | <b>15 hours</b> |
| Using Case model – Creation of classes – Noun Phrase approach – responsibilities – Collaborators and relationships – Super – Sub class – Aggregation                                                                                  |                                                                                      |                                                     |                         |          |                |                 |
| <b>Unit:4</b>                                                                                                                                                                                                                         | <b>CLASS</b>                                                                         |                                                     |                         |          |                | <b>15 hours</b> |
| OO Design axioms – Class visibility – refining attributes- Methods – Access layer – OODBMS – Class mapping view layer                                                                                                                 |                                                                                      |                                                     |                         |          |                |                 |
| <b>Unit:5</b>                                                                                                                                                                                                                         | <b>TESTING</b>                                                                       |                                                     |                         |          |                | <b>13 hours</b> |
| Quality Assurance testing – Inheritance and testing - Test Plan – Usability testing – User Satisfaction testing                                                                                                                       |                                                                                      |                                                     |                         |          |                |                 |

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| <b>Unit:6</b>                                                       |                                                                                                                                                                                                                   | <b>CONTEMPORARY ISSUES</b> | <b>2 hours</b>  |
| Expert lectures, online seminars – webinars                         |                                                                                                                                                                                                                   |                            |                 |
|                                                                     |                                                                                                                                                                                                                   |                            |                 |
|                                                                     |                                                                                                                                                                                                                   | <b>Total Lecture hours</b> | <b>75 hours</b> |
| <b>Text Book(s)</b>                                                 |                                                                                                                                                                                                                   |                            |                 |
| 1                                                                   | Ali Brahmi , “Object Oriented System Development” , TMH IntlEdition. 2 Grady Booch, “Object-Oriented Analysis and Design”, Addison –Wesley                                                                        |                            |                 |
| 2                                                                   | Ali Brahmi , “Object Oriented System Development” , TMH IntlEdition. 2 Grady Booch, “Object-Oriented Analysis and Design”, Addison –Wesley                                                                        |                            |                 |
| <b>Reference Books :EBooks</b>                                      |                                                                                                                                                                                                                   |                            |                 |
| 1                                                                   | James Rumbaugh ,MichealBlaha, “Object Oriented Modeling and Design”, Prentice Hall                                                                                                                                |                            |                 |
| 2                                                                   | David Hows , Peter Membrey , EelcoPlugge , Timm Hawkins , <b>“The Definitive Guide to MongoDB”</b> , 3 <sup>rd</sup> Edition, Apress, 2015.                                                                       |                            |                 |
| 3                                                                   | GauravVaish , <b>“Getting Started with NoSQL”</b> Packt Publishing, 2013.                                                                                                                                         |                            |                 |
| 4                                                                   | Ian Robinson, Jim Webber & Emil Eifrem, “Graph Databases New Opportunities for Connected Data”,2 <sup>nd</sup> Edition, O’Reilly publication.                                                                     |                            |                 |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b> |                                                                                                                                                                                                                   |                            |                 |
| 1                                                                   | <a href="https://onlinecourses.nptel.ac.in/noc19_cs48/preview">https://onlinecourses.nptel.ac.in/noc19_cs48/preview</a>                                                                                           |                            |                 |
| 2                                                                   | <a href="https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/">https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/</a> 3                                                                                     |                            |                 |
| 3                                                                   | <a href="https://www.tutorialspoint.com/object_oriented_analysis_design/oodad_object_oriented_analysis.htm">https://www.tutorialspoint.com/object_oriented_analysis_design/oodad_object_oriented_analysis.htm</a> |                            |                 |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | M          | M          | M          | L          | M          | M          | M          | S          | L          | M           |
| <b>C02</b>                               | S          | S          | S          | M          | S          | M          | M          | M          | M          | S           |
| <b>C03</b>                               | M          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C05</b>                               | M          | S          | S          | S          | S          | S          | S          | S          | S          | S           |

\*S-Strong; M-Medium; L-Low

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                |                                                                                    |                         |          |                  |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------|----------|------------------|----------|
| <b>Course code</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>13B</b>                                                                                     | <b>PAPER II: ADVANCED DATABASE MANAGEMENT SYSTEMS</b>                              | <b>L</b>                | <b>T</b> | <b>P</b>         | <b>C</b> |
| <b>Core/Elective/Supportive</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                | <b>Core</b>                                                                        | <b>5</b>                | <b>5</b> |                  | <b>4</b> |
| <b>Pre-requisite</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                | Students should have a basic understanding of RDBMS, SQL querying, database design | <b>Syllabus Version</b> |          | <b>2025-2026</b> |          |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                |                                                                                    |                         |          |                  |          |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                |                                                                                    |                         |          |                  |          |
| 1. To understand the concepts of DBMS, Data Model and Normal forms.<br>2. To understand the concepts of concurrency control and Recovery.<br>3. To understand basics of SQL and NoSQL databases.<br>4. To understand and apply MongoDB (NoSQL) for Data Analysis using CURD and User Management, and to impart knowledge on Graph Databases                                                                                                                                                                                |                                                                                                |                                                                                    |                         |          |                  |          |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                |                                                                                    |                         |          |                  |          |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                |                                                                                    |                         |          |                  |          |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Understand the structure and model of the relational database management systems.              |                                                                                    |                         |          |                  | K2       |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Understand the concepts of transaction management and SQL, NoSQL database models               |                                                                                    |                         |          |                  | K3       |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Understand and create database models using MongoDB and Graph Database                         |                                                                                    |                         |          |                  | K4       |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Apply MongoDB operators to retrieve data from document data stores                             |                                                                                    |                         |          |                  | K3       |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Understand and apply concepts of data management indexing techniques for specific applications |                                                                                    |                         |          |                  | K5, K6   |
| <b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create</b>                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                |                                                                                    |                         |          |                  |          |
| <b>Unit:1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>DATABASE OVERVIEW</b>                                                                       |                                                                                    |                         |          | <b>10 hours</b>  |          |
| Introduction - Database concepts, Basic components of DBMS, sources of data - data models – hierarchical – network – XML and Stores - Relational Database Design: Anomalies in a Database– Functional Dependency – Lossless Join and Dependency – Preserving Decomposition – Third Normal Form– Boyce Codd Normal Form – Multi-valued Dependency – Fourth Normal Form – Join Dependency – Project Join Normal Form–Domain Key Normal Form - SQL: Data Definition – Data Manipulation – Integrity Constraints–Views–PL/SQL. |                                                                                                |                                                                                    |                         |          |                  |          |
| <b>Unit:2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>NOSQL</b>                                                                                   |                                                                                    |                         |          | <b>12 hours</b>  |          |
| Indexing and Hashing – Query Processing – Transaction Processing – Concurrency Control and Recovery - Advanced Database Concepts and Emerging Applications: Distributed Databases – Object Oriented Databases - Object Relational Databases- SQL–NoSQL Tradeoffs–CAP Theorem– Eventual Consistency - NoSQL–database types – Document Oriented – Columnar – Graph – Key-Value Pair - NoSQL database, design for performance / quality parameters, documents and information retrieval.                                      |                                                                                                |                                                                                    |                         |          |                  |          |
| <b>Unit:3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>MONGODB INTRODUCTION</b>                                                                    |                                                                                    |                         |          | <b>12 hours</b>  |          |
| MongoDB- Introduction – MongoDB – Need – MongoDB Vs. RDBMS – MongoDB - MongoDB Server Configuration – Import and Export -- Data Extraction Fundamentals - Intro to Tabular Formats - Parsing CSV - Parsing XLS with XLRD-Parsing XML - Intro to JSON - MongoDB-CURD Operations – MongoDB Operators - Query Document - Pipeline - Aggregation Operators -                                                                                                                                                                   |                                                                                                |                                                                                    |                         |          |                  |          |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------|
| <b>Unit:4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>ADVANCED MONGODB</b>                                                                                                                        | <b>12 hours</b>   |                 |
| User Management – MongoDB Data Replication in Servers – Data Sharding – MongoDB Indexes – Create – Find – Drop – Backup – MongoDB – Relationships – Analyzing Queries – MongoDB Objectid – Advanced MongoDB: MapReduce – MongoDB - Text Processing - Regular Expression.                                                                                                                                                                                                                                                                                              |                                                                                                                                                |                   |                 |
| <b>Unit: 5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>GRAPH DATABASE</b>                                                                                                                          | <b>12 hours</b>   |                 |
| Introduction to graphs – Graph Database – Indexes – Graph – Nodes – Properties –Relationships – Traversal – Path - Graph Compute Engines – The power of graph databases –Performance – Flexibility – Agility - Graph Data Modeling – Types of Graphs – Non directed graphs – Directed Graphs – Weighted Graphs - Labeled Property - Graph Model – Querying Graphs – Cypher – Comparison of Relational and Graph Modeling – Building graph database application –Graph storage databases – Graph store -: Neo4j – Hyperbase – DB – InfoGrid -Graphs in the real world. |                                                                                                                                                |                   |                 |
| <b>Unit:6</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>CONTEMPORARY ISSUES</b>                                                                                                                     | <b>2 hours</b>    |                 |
| Expert lectures, online seminars – webinars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                |                   |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Total Lecture hours</b>                                                                                                                     | <b>60-- hours</b> |                 |
| <b>Text Book(s)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                |                   |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Abraham Silberchatz, Henry K.Forth, Sudharshan, “ <b>Database system Concepts</b> ”, 7 <sup>th</sup> edition, McGraw Hill, 2020.               |                   |                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Prabu C.S.R, “ <b>Object-Oriented Database Systems: Approaches and Architectures</b> ” 3 <sup>rd</sup> Edition, PHI, 2011.                     |                   |                 |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Kristina Chodorow , “ <b>MongoDB: The Definitive Guide</b> ”, 3 <sup>rd</sup> Edition , O'Reilly Media, ISBN: 9781491954461, 2019.             |                   |                 |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Guy Harrison, “ <b>Next Generation Databases: NoSQL, NewSQL, and Big Data</b> ”,Apress, 2016.                                                  |                   |                 |
| <b>Reference Books :EBooks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                |                   |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ShamkantB.Navathe, RamezElamsri " <b>Fundamentals of Database Systems</b> ", 7 <sup>th</sup> Edition, Pearson Education Limited, 2017.         |                   |                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | David Hows , Peter Membrey , EelcoPlugge , Timm Hawkins , “ <b>The Definitive Guide to MongoDB</b> ”, 3 <sup>rd</sup> Edition, Apress, 2015.   |                   |                 |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | GauravVaish ,“ <b>Getting Started with NoSQL</b> ”Packt Publishing, 2013.                                                                      |                   |                 |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Ian Robinson, Jim Webber & Emil Eifrem, “Graph Databases New Opportunities for Connected Data”, 2 <sup>nd</sup> Edition, O'Reilly publication. |                   |                 |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                |                   |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Course Title</b>                                                                                                                            | <b>Duration</b>   | <b>Provider</b> |
| 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Database Management System                                                                                                                     | 12 Weeks          | Swayam          |
| 2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Database Management System                                                                                                                     | 8 Weeks           | NPTEL           |
| 3.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | NoSQL Systems                                                                                                                                  | 4 Weeks           | Coursera        |
| 4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Introduction to MongoDB                                                                                                                        | 3 Weeks           | Coursera        |
| Page 10 of 63                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                |                   |                 |

|                                                                                                                    |  |  |
|--------------------------------------------------------------------------------------------------------------------|--|--|
| <b>Web link</b>                                                                                                    |  |  |
| 1. <a href="https://www.w3schools.in/dbms/">https://www.w3schools.in/dbms/</a>                                     |  |  |
| 2. <a href="https://www.guru99.com/nosql-tutorial.html">https://www.guru99.com/nosql-tutorial.html</a>             |  |  |
| 3. <a href="https://www.tutorialspoint.com/mongodb/index.htm">https://www.tutorialspoint.com/mongodb/index.htm</a> |  |  |
| Course Designed by:                                                                                                |  |  |

| Mapping with Programme Outcomes |     |     |     |     |     |     |     |     |     |      |
|---------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| COs                             | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1                             | S   | M   | M   | S   | M   | M   | M   | M   | L   | S    |
| CO3                             | S   | M   | M   | S   | M   | M   | L   | M   | L   | M    |
| CO3                             | S   | M   | M   | S   | M   | M   | L   | M   | L   | M    |
| CO4                             | S   | M   | S   | S   | M   | S   | L   | M   | L   | S    |
| CO5                             | S   | M   | S   | M   | M   | M   | M   | M   | L   | S    |

\*S-Strong; M-Medium; L-Low



|                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                           |                                                                                                 |                     |         |                 |       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------|---------|-----------------|-------|
| Course code                                                                                                                                                                                                                                                                                                                                                                                     | 13C                                                                                       | PAPER III: ADVANCED JAVA PROGRAMMING                                                            | L                   | T       | P               | C     |
| Core/Elective/<br>Supportive                                                                                                                                                                                                                                                                                                                                                                    |                                                                                           | Core                                                                                            | 5                   | 5       |                 | 4     |
| Pre-requisite                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                           | Students should able to know the concept of Java Fundamentals, Applet, Swings, JDBC, JavaBeans. | Syllabus<br>Version | 2021-22 |                 |       |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                                                                       |                                                                                           |                                                                                                 |                     |         |                 |       |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                                                                      |                                                                                           |                                                                                                 |                     |         |                 |       |
| 1. Enable the students to learn the basic functions, principles and concepts of advanced java programming.                                                                                                                                                                                                                                                                                      |                                                                                           |                                                                                                 |                     |         |                 |       |
| 2. Provide knowledge on concepts needed for distributed Application Architecture.                                                                                                                                                                                                                                                                                                               |                                                                                           |                                                                                                 |                     |         |                 |       |
| 3. Learn JDBC, Servlet packages, JQuery, Java Server Pages and JAR file format                                                                                                                                                                                                                                                                                                                  |                                                                                           |                                                                                                 |                     |         |                 |       |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                                                                                                                                                                |                                                                                           |                                                                                                 |                     |         |                 |       |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                                                                            |                                                                                           |                                                                                                 |                     |         |                 |       |
| 1                                                                                                                                                                                                                                                                                                                                                                                               | Understand the advanced concepts of Java Programming                                      |                                                                                                 |                     |         |                 | K1,K2 |
| 2                                                                                                                                                                                                                                                                                                                                                                                               | Understand JDBC and RMI concepts                                                          |                                                                                                 |                     |         |                 | K2,K3 |
| 3                                                                                                                                                                                                                                                                                                                                                                                               | Apply and analyze Java in Database                                                        |                                                                                                 |                     |         |                 | K3,K4 |
| 4                                                                                                                                                                                                                                                                                                                                                                                               | Handle different event in java using the delegation event model, event listener and class |                                                                                                 |                     |         |                 | K4,K5 |
| 5                                                                                                                                                                                                                                                                                                                                                                                               | Design interactive applications using Java Servlet, JSP and JDBC                          |                                                                                                 |                     |         |                 | K5,K6 |
| <b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create                                                                                                                                                                                                                                                                  |                                                                                           |                                                                                                 |                     |         |                 |       |
| <b>Unit:1</b>                                                                                                                                                                                                                                                                                                                                                                                   | <b>BASICS OF JAVA</b>                                                                     |                                                                                                 |                     |         | <b>15 hours</b> |       |
| Java Basics Review: Components and event handling – Threading concepts – Networking features – Media techniques                                                                                                                                                                                                                                                                                 |                                                                                           |                                                                                                 |                     |         |                 |       |
| <b>Unit:2</b>                                                                                                                                                                                                                                                                                                                                                                                   | <b>REMOTE METHOD INVOCATION</b>                                                           |                                                                                                 |                     |         | <b>15 hours</b> |       |
| Remote Method Invocation-Distributed Application Architecture- Creating stubs and skeletons- Defining Remote objects- Remote Object Activation-Object Serialization-Java Spaces                                                                                                                                                                                                                 |                                                                                           |                                                                                                 |                     |         |                 |       |
| <b>Unit:3</b>                                                                                                                                                                                                                                                                                                                                                                                   | <b>DATABASE</b>                                                                           |                                                                                                 |                     |         | <b>15 hours</b> |       |
| Java in Databases- JDBC principles – database access- Interacting- database search – Creating multimedia databases – Database support in web applications                                                                                                                                                                                                                                       |                                                                                           |                                                                                                 |                     |         |                 |       |
| <b>Unit:4</b>                                                                                                                                                                                                                                                                                                                                                                                   | <b>SERVLETS</b>                                                                           |                                                                                                 |                     |         | <b>15 hours</b> |       |
| Java Servlets: Java Servlet and CGI programming- A simple java Servlet-Anatomy of a java Servlet-Reading data from a client-Reading http request header-sending data to a client and writing the http response header-working with cookies.<br>Java Server Pages: JSP Overview-Installation-JSP tags-Components of a JSP page-Expressions-Scriptlets-Directives-Declarations-A complete example |                                                                                           |                                                                                                 |                     |         |                 |       |
| <b>Unit:5</b>                                                                                                                                                                                                                                                                                                                                                                                   | <b>ADVANCED CONCEPTS</b>                                                                  |                                                                                                 |                     |         | <b>13 hours</b> |       |
| JAR file format creation – Internationalization – Swing Programming – Advanced java techniques                                                                                                                                                                                                                                                                                                  |                                                                                           |                                                                                                 |                     |         |                 |       |

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|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------|--|-----------------|--|
| <b>Unit:6</b>                                                       |                                                                                                                         | <b>CONTEMPORARY ISSUES</b> |  | <b>2 hours</b>  |  |
| Expert lectures, online seminars – webinars                         |                                                                                                                         |                            |  |                 |  |
|                                                                     |                                                                                                                         |                            |  |                 |  |
|                                                                     |                                                                                                                         | <b>Total Lecture hours</b> |  | <b>75 hours</b> |  |
|                                                                     |                                                                                                                         |                            |  |                 |  |
| <b>Text Books</b>                                                   |                                                                                                                         |                            |  |                 |  |
| 1                                                                   | Jamie Jaworski, “Java Unleashed”, SAMS Techmedia Publications,1999.                                                     |                            |  |                 |  |
| 2                                                                   | Campione, Walrath and Huml, “The Java Tutorial”, AddisonWesley,1999.                                                    |                            |  |                 |  |
| 3                                                                   | Jim Keogh,” The Complete Reference J2EE”, Tata McGrawHill Publishing Company Ltd,2010.                                  |                            |  |                 |  |
| <b>Reference Books</b>                                              |                                                                                                                         |                            |  |                 |  |
| 1                                                                   | David Sawyer McFarland, “JavaScript And JQuery- The Missing Manual”, Oreilly Publications, 3rd Edition,2011.            |                            |  |                 |  |
| 2                                                                   | Deitel and Deitel, “Java How to Program”, Third Edition, PHI/Pearson Education Asia.                                    |                            |  |                 |  |
|                                                                     |                                                                                                                         |                            |  |                 |  |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b> |                                                                                                                         |                            |  |                 |  |
| 1                                                                   | <a href="https://www.javatpoint.com/servlet-tutorial">https://www.javatpoint.com/servlet-tutorial</a>                   |                            |  |                 |  |
| 2                                                                   | <a href="https://www.tutorialspoint.com/java/index.htm">https://www.tutorialspoint.com/java/index.htm</a>               |                            |  |                 |  |
| 3                                                                   | <a href="https://onlinecourses.nptel.ac.in/noc19_cs84/preview">https://onlinecourses.nptel.ac.in/noc19_cs84/preview</a> |                            |  |                 |  |
|                                                                     |                                                                                                                         |                            |  |                 |  |
| Course Designed By:                                                 |                                                                                                                         |                            |  |                 |  |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | S          | S          | S          | S          | S          | S          | M          | M          | M          | S           |
| <b>C02</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | S           |
| <b>C03</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | S           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | S           |

\*S-Strong; M-Medium; L-Low



|                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                     |                              |                  |   |          |       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------------------------------|------------------|---|----------|-------|
| Course code                                                                                                                                                                                                                                                                                                                                                                                                                                               | 13D                                                 | PAPER IV: PYTHON PROGRAMMING | L                | T | P        | C     |
| Core/Elective/Supportive                                                                                                                                                                                                                                                                                                                                                                                                                                  | Core                                                |                              | 5                | 5 |          | 4     |
| Pre-requisite                                                                                                                                                                                                                                                                                                                                                                                                                                             | Able to understand the concept of C, C++ and Java   |                              | Syllabus Version |   | 2021-22  |       |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                     |                              |                  |   |          |       |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                                                                                                                                |                                                     |                              |                  |   |          |       |
| 1. Presents an introduction to Python, creation of web applications, network applications and working in the clouds<br>2. Use functions for structuring Python programs<br>3. Understand different Data Structures of Python<br>4. Represent compound data using Python lists, tuples and dictionaries                                                                                                                                                    |                                                     |                              |                  |   |          |       |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                     |                              |                  |   |          |       |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                                                                                                                                      |                                                     |                              |                  |   |          |       |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Understand the basic concepts of Python Programming |                              |                  |   |          | K1,K2 |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Understand File operations, Classes and Objects     |                              |                  |   |          | K2,K3 |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Acquire Object Oriented Skills in Python            |                              |                  |   |          | K3,K4 |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Develop web applications using Python               |                              |                  |   |          | K5    |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Develop Client Server Networking applications       |                              |                  |   |          | K5,K6 |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6- Create                                                                                                                                                                                                                                                                                                                                                                       |                                                     |                              |                  |   |          |       |
| Unit:1                                                                                                                                                                                                                                                                                                                                                                                                                                                    | INTRODUCTION                                        |                              |                  |   | 15 hours |       |
| <b>Python:</b> Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries – Sets– Comparison.                                                                                                                                                                                                                                                                                                                                           |                                                     |                              |                  |   |          |       |
| Unit:2                                                                                                                                                                                                                                                                                                                                                                                                                                                    | CONTROL STRUCTURES                                  |                              |                  |   | 15 hours |       |
| <b>Code Structures:</b> if, elif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.                                                                                                                                                                                                                                    |                                                     |                              |                  |   |          |       |
| Unit:3                                                                                                                                                                                                                                                                                                                                                                                                                                                    | CLASSES, MODULES AND PACKAGES                       |                              |                  |   | 15 hours |       |
| <b>Modules, Packages, and Programs:</b> Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. <b>Objects and Classes:</b> Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition. |                                                     |                              |                  |   |          |       |
| Unit:4                                                                                                                                                                                                                                                                                                                                                                                                                                                    | DATA, FILES AND WEB                                 |                              |                  |   | 13 hours |       |
| <b>Data Types:</b> Text Strings – Binary Data. <b>Storing and Retrieving Data:</b> File Input/output – Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores. <b>Web:</b> Web Clients – Web Servers – Web Services and Automation                                                                                                                                                                                    |                                                     |                              |                  |   |          |       |

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|                                                                                                                                                                                                        |                                                                                                                             |                                      |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------|
| <b>Unit:5</b>                                                                                                                                                                                          |                                                                                                                             | <b>SYSTEMS, THREADS AND NETWORKS</b> | <b>15 hours</b> |
| <b>Systems:</b> Files –Directories – Programs and Processes – Calendars and Clocks.                                                                                                                    |                                                                                                                             |                                      |                 |
| <b>Concurrency:</b> Queues – Processes – Threads – Green Threads and gevent – twisted – Redis.                                                                                                         |                                                                                                                             |                                      |                 |
| <b>Networks: Patterns</b> – The Publish-Subscribe Model – TCP/IP – Sockets – ZeroMQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce Working in the Clouds. |                                                                                                                             |                                      |                 |
|                                                                                                                                                                                                        |                                                                                                                             |                                      |                 |
| <b>Unit:6</b>                                                                                                                                                                                          |                                                                                                                             | <b>CONTEMPORARY ISSUES</b>           | <b>2 hours</b>  |
| Expert lectures, online seminars – webinars                                                                                                                                                            |                                                                                                                             |                                      |                 |
|                                                                                                                                                                                                        |                                                                                                                             |                                      |                 |
|                                                                                                                                                                                                        |                                                                                                                             | <b>Total Lecture hours</b>           | <b>75 hours</b> |
|                                                                                                                                                                                                        |                                                                                                                             |                                      |                 |
| <b>Text Books</b>                                                                                                                                                                                      |                                                                                                                             |                                      |                 |
| 1                                                                                                                                                                                                      | Bill Lubanovic, “Introducing Python”, O’Reilly, First Edition-Second Release, 2014.                                         |                                      |                 |
| 2                                                                                                                                                                                                      | Mark Lutz, “Learning Python”, O’Reilly, Fifth Edition, 2013.                                                                |                                      |                 |
| <b>Reference Books</b>                                                                                                                                                                                 |                                                                                                                             |                                      |                 |
| 1                                                                                                                                                                                                      | David M. Beazley,“Python Essential Reference”, Developer’s Fourth Edition,2009. Library                                     |                                      |                 |
| 2                                                                                                                                                                                                      | SheetalTaneja,Naveen Kumar, ”Python Programming-A Modular Approach”,PearsonPublications.                                    |                                      |                 |
|                                                                                                                                                                                                        |                                                                                                                             |                                      |                 |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                                                                                                                    |                                                                                                                             |                                      |                 |
| 1                                                                                                                                                                                                      | <a href="https://www.programiz.com/python-programming/">https://www.programiz.com/python-programming/</a>                   |                                      |                 |
| 2                                                                                                                                                                                                      | <a href="https://www.tutorialspoint.com/python/index.htm">https://www.tutorialspoint.com/python/index.htm</a>               |                                      |                 |
| 3                                                                                                                                                                                                      | <a href="https://onlinecourses.swayam2.ac.in/aic20_sp33/preview">https://onlinecourses.swayam2.ac.in/aic20_sp33/preview</a> |                                      |                 |
|                                                                                                                                                                                                        |                                                                                                                             |                                      |                 |
| Course Designed By:                                                                                                                                                                                    |                                                                                                                             |                                      |                 |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | S          | S          | M          | S          | S          | S          | M          | M          | S          | M           |
| <b>C02</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | M           |
| <b>C03</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | M           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | M           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | M           |

\*S-Strong; M-Medium; L-Low



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                          |                                |                  |   |                 |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------|------------------|---|-----------------|---|
| Course code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 13P                                                                      | PRACTICAL I: ADVANCED JAVA LAB | L                | T | P               | C |
| Core/Elective/Supportive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Core                                                                     |                                | 5                |   | 5               | 4 |
| Pre-requisite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | The basic understanding of core java, JSP and HTML.                      |                                | Syllabus Version |   | 2021-22         |   |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                          |                                |                  |   |                 |   |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                          |                                |                  |   |                 |   |
| 1. To Enable the students to implement the simple programs using JSP,JAR<br>2. To Provide knowledge on using Servlets<br>3. To Introduce JDBC and navigation of records<br>4. To Understand the RMI & its implementation, Introduce Socket Programming                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                          |                                |                  |   |                 |   |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                          |                                |                  |   |                 |   |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                          |                                |                  |   |                 |   |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Understand to the implement concepts of Java using HTML forms, JSP & JAR |                                |                  |   | K1,K2           |   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Must be capable of implementing JDBC and RMI concepts                    |                                |                  |   | K3,K4           |   |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Able to write Applets with Event handling mechanism                      |                                |                  |   | K4,K5           |   |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | To Create interactive web-based applications using servlets and JSP      |                                |                  |   | K5,K6           |   |
| <b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                          |                                |                  |   |                 |   |
| <b>LIST OF PROGRAMS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                          |                                |                  |   | <b>75 hours</b> |   |
| 1. Display a welcome message using Servlet.<br>2. Design a Purchase Order form using Html form and Servlet.<br>3. Develop a program for calculating the percentage of marks of a student usingJSP.<br>4. Design a Purchase Order form using Html form andJSP.<br>5. Prepare a Employee pay slip usingJSP.<br>6. Write a program using JDBC for creating a table, Inserting, Deleting records and listout therecords.<br>7. Write a program using Java servlet to handle form data.<br>8. Write a simple Servlet program to create a table of all the headers it receives along with theirassociatedvalues.<br>9. Write a program in JSP by using session object.<br>10. Write a program to build a simple Client Server application usingRMI. |                                                                          |                                |                  |   |                 |   |
| Expert lectures, online seminars – webinars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                          |                                |                  |   |                 |   |
| <b>Total Lecture hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                          |                                |                  |   | <b>75 hours</b> |   |

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| Text Books                                                   |                                                                                                                         |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| 1                                                            | Jamie Jaworski, "Java Unleashed", SAMS Techmedia Publications,1999.                                                     |
| 2                                                            | Campione, Walrath and Huml, "The Java Tutorial", AddisonWesley,1999.                                                    |
| Reference Books                                              |                                                                                                                         |
| 1                                                            | Jim Keogh," The Complete Reference J2EE", Tata McGrawHill Publishing Company Ltd,2010.                                  |
| 2                                                            | David Sawyer McFarland, "JavaScript And JQuery- The Missing Manual", Oreilly Publications, 3rd Edition,2011.            |
| Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] |                                                                                                                         |
| 1                                                            | <a href="https://www.javatpoint.com/servlet-tutorial">https://www.javatpoint.com/servlet-tutorial</a>                   |
| 2                                                            | <a href="https://www.tutorialspoint.com/java/index.htm">https://www.tutorialspoint.com/java/index.htm</a>               |
| 3                                                            | <a href="https://onlinecourses.nptel.ac.in/noc19_cs84/preview">https://onlinecourses.nptel.ac.in/noc19_cs84/preview</a> |
| Course Designed By:                                          |                                                                                                                         |

| Mapping with Programming Outcomes |     |     |     |     |     |     |     |     |     |      |
|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Cos                               | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 |
| C01                               | S   | S   | M   | S   | S   | S   | M   | M   | S   | S    |
| C02                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    |
| C03                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | M    |
| C04                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    |

\*S-Strong; M-Medium; L-Low

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                         |                  |   |       |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------|---|-------|-----------------|
| Course code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 13Q                                                                                                                 | PRACTICAL II: PYTHON<br>PROGRAMMING LAB | L                | T | P     | C               |
| Core/Elective/Supportive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Core Lab                                                                                                            |                                         | 5                |   | 5     | 4               |
| Pre-requisite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Students must comfortable with variables, linear equations, graphs of functions, histograms, and statistical means. |                                         | Syllabus Version |   | 21-22 |                 |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                     |                                         |                  |   |       |                 |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                     |                                         |                  |   |       |                 |
| <ol style="list-style-type: none"> <li>1. This course presents an overview of elementary data items, lists, dictionaries, sets and tuples</li> <li>2. To understand and write simple Python programs</li> <li>3. To Understand the OOPS concepts of Python</li> <li>4. To develop web applications using Python</li> </ol>                                                                                                                                                                                                                                                                 |                                                                                                                     |                                         |                  |   |       |                 |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                     |                                         |                  |   |       |                 |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                     |                                         |                  |   |       |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Able to write programs in Python using OOPS concepts                                                                |                                         |                  |   | K1,K2 |                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | To understand the concepts of File operations and Modules in Python                                                 |                                         |                  |   | K2,K3 |                 |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Implementation of lists, dictionaries, sets and tuples as programs                                                  |                                         |                  |   | K3,K4 |                 |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | To develop web applications using Python                                                                            |                                         |                  |   | K5,K6 |                 |
| <b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> – Create                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                     |                                         |                  |   |       |                 |
| <b>LIST OF PROGRAMS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                     |                                         |                  |   |       | <b>75 hours</b> |
| Implement the following in Python: <ol style="list-style-type: none"> <li>1. Programs using elementary data items, lists, dictionaries and tuples</li> <li>2. Programs using conditional branches,</li> <li>3. Programs using loops.</li> <li>4. Programs using functions</li> <li>5. Programs using exception handling</li> <li>6. Programs using inheritance</li> <li>7. Programs using polymorphism</li> <li>8. Programs to implement file operations.</li> <li>9. Programs using modules.</li> <li>10. Programs for creating dynamic and interactive web pages using forms.</li> </ol> |                                                                                                                     |                                         |                  |   |       |                 |
| <b>Total Lecture hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                     |                                         |                  |   |       | <b>75 hours</b> |
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                     |                                         |                  |   |       |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Bill Lubanovic, "Introducing Python", O'Reilly, First Edition-Second Release, 2014.                                 |                                         |                  |   |       |                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Mark Lutz, "Learning Python", O'Reilly, Fifth Edition, 2013.                                                        |                                         |                  |   |       |                 |

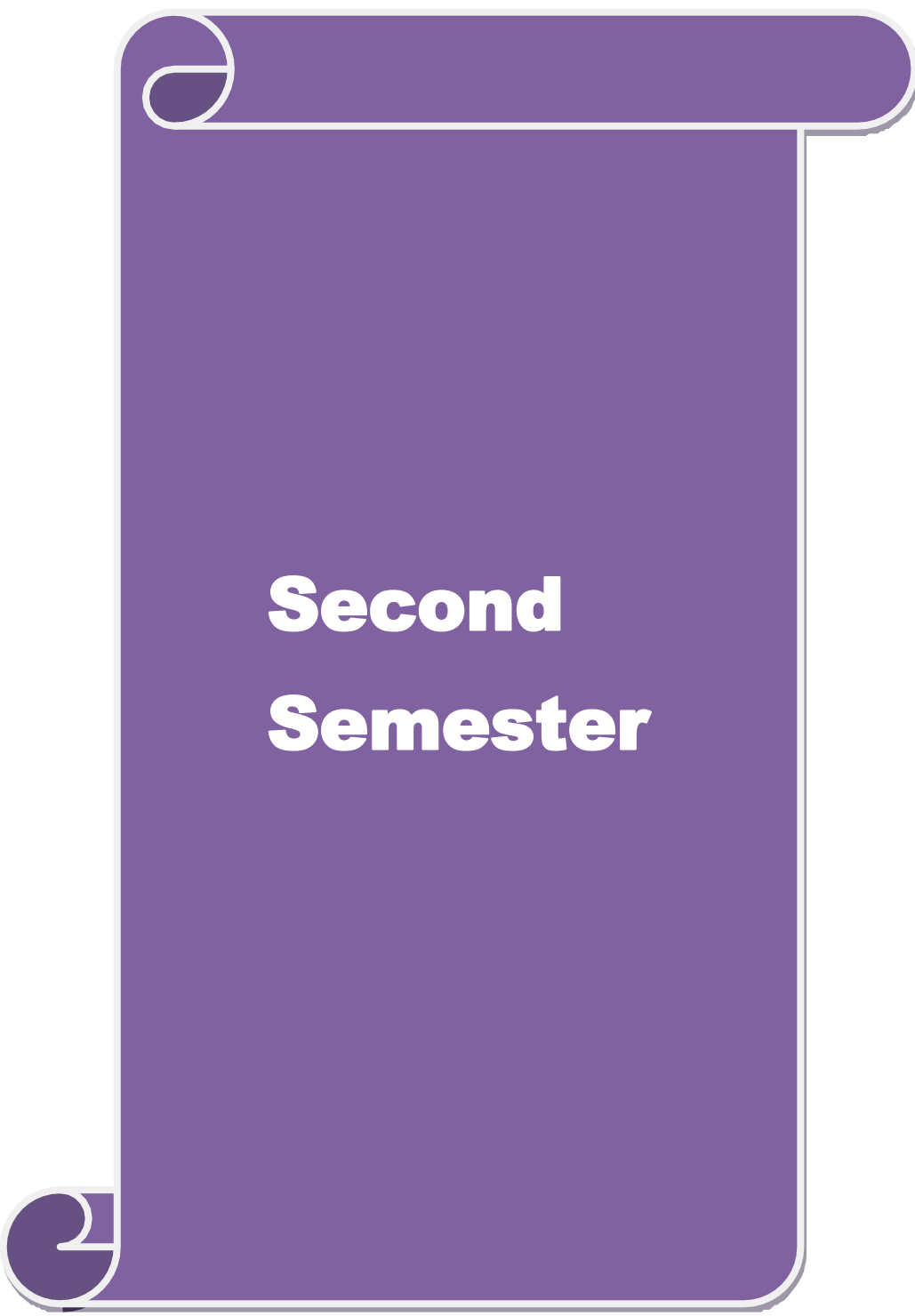
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| Reference Books                                              |                                                                                                                             |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 1                                                            | David M. Beazley, "Python Essential Reference", Developer's Library Fourth Edition, 2009.                                   |
| 2                                                            | SheetalTaneja, Naveen Kumar, "Python Programming-A Modular Approach", Pearson Publications.                                 |
| Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] |                                                                                                                             |
| 1                                                            | <a href="https://www.programiz.com/python-programming/">https://www.programiz.com/python-programming/</a>                   |
| 2                                                            | <a href="https://www.tutorialspoint.com/python/index.htm">https://www.tutorialspoint.com/python/index.htm</a>               |
| 3                                                            | <a href="https://onlinecourses.swayam2.ac.in/aic20_sp33/preview">https://onlinecourses.swayam2.ac.in/aic20_sp33/preview</a> |
| Course Designed By:                                          |                                                                                                                             |

| Mapping with Programming Outcomes |     |     |     |     |     |     |     |     |     |      |
|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Cos                               | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 |
| C01                               | S   | S   | M   | S   | S   | S   | M   | M   | S   | S    |
| C02                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | M    |
| C03                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    |
| C04                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    |

\*S-Strong; M-Medium; L-Low





# **Second Semester**

|                                                                                                                                                                                                                              |                                                                                                                               |                                     |                  |   |         |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------|---|---------|---|
| Course code                                                                                                                                                                                                                  | 23A                                                                                                                           | PAPER V:DATA MINING AND WAREHOUSING | L                | T | P       | C |
| Core/Elective/Supportive                                                                                                                                                                                                     | Core                                                                                                                          |                                     | 4                | 4 |         | 4 |
| Pre-requisite                                                                                                                                                                                                                | Able to know extract useful data from a sea of un-amassed data and the understanding of data analysis.                        |                                     | Syllabus Version |   | 2021-22 |   |
| Course Objectives:                                                                                                                                                                                                           |                                                                                                                               |                                     |                  |   |         |   |
| The main objectives of this course are to:                                                                                                                                                                                   |                                                                                                                               |                                     |                  |   |         |   |
| 1. Enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing.                                                                                                               |                                                                                                                               |                                     |                  |   |         |   |
| 2. Develop skills of using recent data mining software for solving practical problems.                                                                                                                                       |                                                                                                                               |                                     |                  |   |         |   |
| 3. Develop and apply critical thinking, problem-solving, and decision-making skills.                                                                                                                                         |                                                                                                                               |                                     |                  |   |         |   |
| Expected Course Outcomes:                                                                                                                                                                                                    |                                                                                                                               |                                     |                  |   |         |   |
| On the successful completion of the course, student will be able to:                                                                                                                                                         |                                                                                                                               |                                     |                  |   |         |   |
| 1                                                                                                                                                                                                                            | Understand the basic data mining techniques and algorithms                                                                    |                                     |                  |   | K1,K2   |   |
| 2                                                                                                                                                                                                                            | Understand the Association rules, Clustering techniques and Data warehousing Contents                                         |                                     |                  |   | K2,K3   |   |
| 3                                                                                                                                                                                                                            | Compare and evaluate different data mining techniques like classification, prediction, Clustering and association rule mining |                                     |                  |   | K4,K5   |   |
| 4                                                                                                                                                                                                                            | Design data warehouse with dimensional modeling and apply OLAP operations                                                     |                                     |                  |   | K5      |   |
| 5                                                                                                                                                                                                                            | Identify appropriate data mining algorithms to solve real world problems                                                      |                                     |                  |   | K5,K6   |   |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6– Create                                                                                                                                          |                                                                                                                               |                                     |                  |   |         |   |
| Unit:1                                                                                                                                                                                                                       |                                                                                                                               |                                     |                  |   |         |   |
| INTRODUCTION                                                                                                                                                                                                                 |                                                                                                                               |                                     |                  |   |         |   |
| 12 hours                                                                                                                                                                                                                     |                                                                                                                               |                                     |                  |   |         |   |
| Basic data mining tasks – data mining versus knowledge discovery in databases – data mining issues – data mining metrics – social implications of data mining – data mining from a database perspective.                     |                                                                                                                               |                                     |                  |   |         |   |
| Data mining techniques: Introduction – a statistical perspective on data mining – similarity measures – decision trees – neural networks – genetic algorithms.                                                               |                                                                                                                               |                                     |                  |   |         |   |
| Unit:2                                                                                                                                                                                                                       |                                                                                                                               |                                     |                  |   |         |   |
| CLASSIFICATION                                                                                                                                                                                                               |                                                                                                                               |                                     |                  |   |         |   |
| 12 hours                                                                                                                                                                                                                     |                                                                                                                               |                                     |                  |   |         |   |
| Classification: Introduction – Statistical – based algorithms - distance – based algorithms- decision tree - based algorithms - neural network – based algorithms –rule - based algorithms – combining techniques.           |                                                                                                                               |                                     |                  |   |         |   |
| Unit:3                                                                                                                                                                                                                       |                                                                                                                               |                                     |                  |   |         |   |
| CLUSTERING                                                                                                                                                                                                                   |                                                                                                                               |                                     |                  |   |         |   |
| 12 hours                                                                                                                                                                                                                     |                                                                                                                               |                                     |                  |   |         |   |
| Clustering: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms- Partitional Algorithms.                                                                                                    |                                                                                                                               |                                     |                  |   |         |   |
| Association rules: Introduction - large item sets - basic algorithms – parallel & distributed algorithms – comparing approaches- incremental rules – advanced association rules techniques – measuring the quality of rules. |                                                                                                                               |                                     |                  |   |         |   |
| Page 21 of 63                                                                                                                                                                                                                |                                                                                                                               |                                     |                  |   |         |   |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                         |                                       |            |            |            |            |            |            |                 |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------------|------------|------------|------------|------------|------------|-----------------|-------------|
| <b>Unit:4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                         | <b>DATA WAREHOUSING</b>               |            |            |            |            |            |            | <b>12 hours</b> |             |
| Data warehousing: an introduction - characteristics of a data warehouse – data marts – other aspects of data mart. Online analytical processing: introduction - OLTP & OLAP systems - Datamodelling –star schema for multidimensional view –data modelling – multifactstar schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.                                                                                                              |                                                                                                                                                                                                                                                                                                                                                         |                                       |            |            |            |            |            |            |                 |             |
| <b>Unit:5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                         | <b>APPLICATIONS OF DATA WAREHOUSE</b> |            |            |            |            |            |            | <b>12 hours</b> |             |
| Developing a data WAREHOUSE: why and how to build a data warehouse –data warehouse architectural strategies and organization issues - design consideration – data content – metadata distribution of data – tools for data warehousing – performance considerations – crucial decisions in designing a data warehouse.<br>Applications of data warehousing and data mining in government: Introduction - national data warehouses – other areas for data warehousing and data mining. |                                                                                                                                                                                                                                                                                                                                                         |                                       |            |            |            |            |            |            |                 |             |
| <b>Unit:6</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                         | <b>CONTEMPORARY ISSUES</b>            |            |            |            |            |            |            | <b>2 hours</b>  |             |
| Expert lectures, online seminars – webinars                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                         |                                       |            |            |            |            |            |            |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                         | <b>Total Lecture hours</b>            |            |            |            |            |            |            | <b>60 hours</b> |             |
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                         |                                       |            |            |            |            |            |            |                 |             |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Margaret H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson education,2003.                                                                                                                                                                                                                                                            |                                       |            |            |            |            |            |            |                 |             |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | C.S.R. Prabhu, “Data Warehousing Concepts, Techniques, Products and Applications”, PHI, Second Edition.                                                                                                                                                                                                                                                 |                                       |            |            |            |            |            |            |                 |             |
| <b>Reference Books</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                         |                                       |            |            |            |            |            |            |                 |             |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ArunK.Pujari, “Data Mining Techniques”, Universities Press (India) Pvt. Ltd.,2003.                                                                                                                                                                                                                                                                      |                                       |            |            |            |            |            |            |                 |             |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Alex Berson, Stephen J. Smith, “Data Warehousing, Data Mining and OLAP”, TMCH, 2001.                                                                                                                                                                                                                                                                    |                                       |            |            |            |            |            |            |                 |             |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Jiawei Han&MichelineKamber, “Data Mining Concepts & Techniques”, 2001, Academicpress.                                                                                                                                                                                                                                                                   |                                       |            |            |            |            |            |            |                 |             |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                         |                                       |            |            |            |            |            |            |                 |             |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <a href="https://www.javatpoint.com/data-warehouse">https://www.javatpoint.com/data-warehouse</a>                                                                                                                                                                                                                                                       |                                       |            |            |            |            |            |            |                 |             |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <a href="https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/">https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/</a>                                                                                                                                                                                                                             |                                       |            |            |            |            |            |            |                 |             |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <a href="https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html">https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html</a> |                                       |            |            |            |            |            |            |                 |             |
| Course Designed By:                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                         |                                       |            |            |            |            |            |            |                 |             |
| <b>Mapping with Programming Outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                         |                                       |            |            |            |            |            |            |                 |             |
| <b>Cos</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>P01</b>                                                                                                                                                                                                                                                                                                                                              | <b>P02</b>                            | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b>      | <b>P010</b> |
| <b>C01</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | S                                                                                                                                                                                                                                                                                                                                                       | M                                     | S          | S          | S          | S          | M          | M          | M               | M           |
| <b>C02</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | S                                                                                                                                                                                                                                                                                                                                                       | S                                     | S          | S          | S          | S          | S          | M          | S               | S           |
| <b>C03</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | S                                                                                                                                                                                                                                                                                                                                                       | S                                     | S          | S          | S          | S          | S          | M          | S               | S           |
| <b>C04</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | S                                                                                                                                                                                                                                                                                                                                                       | S                                     | S          | S          | S          | S          | S          | M          | S               | S           |
| <b>C05</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | S                                                                                                                                                                                                                                                                                                                                                       | S                                     | S          | S          | S          | S          | S          | M          | S               | S           |

\*S-Strong; M-Medium; L-Low



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|                                                                                                             |                                                                                                                                                 |         |
|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Unit:6                                                                                                      | CONTEMPORARY ISSUES                                                                                                                             | 4 Hours |
| Discussion on case study - Expert lectures - Online seminars – Webinars – Workshops on Cyber Security/tools |                                                                                                                                                 |         |
| Text Books                                                                                                  |                                                                                                                                                 |         |
| 1                                                                                                           | V.K.Pachghare, Cryptography and Information Security, PHI, 2015.                                                                                |         |
| 2                                                                                                           | Cisco Network Academy, CCNA–Routing and Switching Module, Cisco Press                                                                           |         |
| Reference Books                                                                                             |                                                                                                                                                 |         |
| 1                                                                                                           | William Stalling, Cryptography and Network Security, 4 <sup>th</sup> Edition, PHI, 2005.                                                        |         |
| 2                                                                                                           | Schneier and Bruce, Applied Cryptography: Protocols & Algorithms, 1 <sup>st</sup> Edition, MGH, 2011.                                           |         |
| Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]                                                |                                                                                                                                                 |         |
| 1                                                                                                           | <a href="https://medium.com/@vixentael/how-to-start-learning-cryptography">https://medium.com/@vixentael/how-to-start-learning-cryptography</a> |         |
| 2                                                                                                           | <a href="https://www.geeksforgeeks.org/cryptography-introduction/">https://www.geeksforgeeks.org/cryptography-introduction/</a>                 |         |
| 3                                                                                                           | <a href="https://www.tutorialspoint.com/cryptography/index.htm">https://www.tutorialspoint.com/cryptography/index.htm</a>                       |         |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | S          | M          | S          | M          | L          | S          | M          | S          | M          | S           |
| <b>C02</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C03</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |

\*S-Strong; M-Medium; L-Low

|                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                       |                                                       |                  |   |                 |        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------|---|-----------------|--------|
| Coursecode                                                                                                                                                                                                                                                                                                                                        | 23C                                                                                                                                   | PAPER VII: ARTIFICIAL INTELLIGENCE & MACHINE LEARNING | L                | T | P               | C      |
| Core/Elective/Supportive                                                                                                                                                                                                                                                                                                                          | Core                                                                                                                                  |                                                       | 4                | 4 |                 | 4      |
| Pre-requisite                                                                                                                                                                                                                                                                                                                                     | Basics of AI & Introduction about ML                                                                                                  |                                                       | Syllabus Version |   | 2025-26         |        |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                         |                                                                                                                                       |                                                       |                  |   |                 |        |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                        |                                                                                                                                       |                                                       |                  |   |                 |        |
| 1. Enable the students to learn the basic functions of AI, Heuristic Search Techniques.                                                                                                                                                                                                                                                           |                                                                                                                                       |                                                       |                  |   |                 |        |
| 2. Provide knowledge on concepts of Representations and Mappings and Predicate Logic.                                                                                                                                                                                                                                                             |                                                                                                                                       |                                                       |                  |   |                 |        |
| 3. Introduce Machine Learning with respect Data Mining, Big Data and Cloud.                                                                                                                                                                                                                                                                       |                                                                                                                                       |                                                       |                  |   |                 |        |
| 4. Study about Applications & Impact of ML.                                                                                                                                                                                                                                                                                                       |                                                                                                                                       |                                                       |                  |   |                 |        |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                                                                                                                  |                                                                                                                                       |                                                       |                  |   |                 |        |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                              |                                                                                                                                       |                                                       |                  |   |                 |        |
| 1                                                                                                                                                                                                                                                                                                                                                 | Demonstrate AI problems and techniques                                                                                                |                                                       |                  |   |                 | K1, K2 |
| 2                                                                                                                                                                                                                                                                                                                                                 | Understand machine learning concepts                                                                                                  |                                                       |                  |   |                 | K2, K3 |
| 3                                                                                                                                                                                                                                                                                                                                                 | Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning |                                                       |                  |   |                 | K3, K4 |
| 4                                                                                                                                                                                                                                                                                                                                                 | Analyze the impact of machine learning on applications                                                                                |                                                       |                  |   |                 | K4, K5 |
| 5                                                                                                                                                                                                                                                                                                                                                 | Analyze and design world problem for implementation and understand the dynamic behavior of a system                                   |                                                       |                  |   |                 | K5, K6 |
| K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create                                                                                                                                                                                                                                                                          |                                                                                                                                       |                                                       |                  |   |                 |        |
| <b>Unit:1</b>                                                                                                                                                                                                                                                                                                                                     | <b>INTRODUCTION</b>                                                                                                                   |                                                       |                  |   | <b>12 hours</b> |        |
| Introduction: AI Problems - AI techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search.                                                                                                                                               |                                                                                                                                       |                                                       |                  |   |                 |        |
| <b>Unit:2</b>                                                                                                                                                                                                                                                                                                                                     | <b>SEARCH TECHNIQUES</b>                                                                                                              |                                                       |                  |   | <b>12 hours</b> |        |
| Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings - Approaches to Knowledge representations - Issues in Knowledge representations - Frame Problem.                                        |                                                                                                                                       |                                                       |                  |   |                 |        |
| <b>Unit:3</b>                                                                                                                                                                                                                                                                                                                                     | <b>PREDICATE LOGIC</b>                                                                                                                |                                                       |                  |   | <b>12 hours</b> |        |
| Using Predicate logic: Representing simple facts in logic - Representing Instance and Is-a relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge - Logic programming - Forward Vs Backward reasoning - Matching - Control knowledge.      |                                                                                                                                       |                                                       |                  |   |                 |        |
| <b>Unit:4</b>                                                                                                                                                                                                                                                                                                                                     | <b>MACHINE LEARNING</b>                                                                                                               |                                                       |                  |   | <b>12 hours</b> |        |
| Understanding Machine Learning: What Is Machine Learning? - Defining Big Data - Big Data in Context with Machine Learning - The Importance of the Hybrid Cloud - Leveraging the Power of Machine Learning - The Roles of Statistics and Data Mining with Machine Learning - Putting Machine Learning in Context - Approaches to Machine Learning. |                                                                                                                                       |                                                       |                  |   |                 |        |

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|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------|
| <b>Unit:5</b>                                                                                                              |                                                                                                                                       | <b>APPLICATIONS OF MACHINE LEARNING</b> | <b>10 hours</b> |
| Looking Inside Machine Learning:TheImpact of Machine Learning on Applications-Data Preparation-The Machine Learning Cycle. |                                                                                                                                       |                                         |                 |
|                                                                                                                            |                                                                                                                                       |                                         |                 |
| <b>Unit:6</b>                                                                                                              |                                                                                                                                       | <b>CONTEMPORARY ISSUES</b>              | <b>2 hours</b>  |
| Expert lectures, online seminars–webinars                                                                                  |                                                                                                                                       |                                         |                 |
|                                                                                                                            |                                                                                                                                       |                                         |                 |
|                                                                                                                            |                                                                                                                                       | <b>Total Lecture hours</b>              | <b>60 hours</b> |
|                                                                                                                            |                                                                                                                                       |                                         |                 |
| <b>Text Books</b>                                                                                                          |                                                                                                                                       |                                         |                 |
| 1                                                                                                                          | Elaine Richand KevinKnight,"Artificial Intelligence",TataMcGrawHill Publishers company Pvt Ltd, Second Edition, 1991.                 |                                         |                 |
| 2                                                                                                                          | GeorgeFLuger,"ArtificialIntelligence",4thEdition,Pearson Education Publ, 2002.                                                        |                                         |                 |
| <b>Reference Books</b>                                                                                                     |                                                                                                                                       |                                         |                 |
| 1                                                                                                                          | Machine Learning For Dummies®,IBM Limited Edition by Judith Hurwitz, DanielKirsch.                                                    |                                         |                 |
|                                                                                                                            |                                                                                                                                       |                                         |                 |
| <b>Related Online Contents [MOOC,SWAYAM,NPTEL,Websitesetc.]</b>                                                            |                                                                                                                                       |                                         |                 |
| 1                                                                                                                          | <a href="https://www.ibm.com/downloads/cas/GB8ZMQZ3">https://www.ibm.com/downloads/cas/GB8ZMQZ3</a>                                   |                                         |                 |
| 2                                                                                                                          | <a href="https://www.javatpoint.com/artificial-intelligence-tutorial">https://www.javatpoint.com/artificial-intelligence-tutorial</a> |                                         |                 |
| 3                                                                                                                          | <a href="https://nptel.ac.in/courses/106/105/106105077/">https://nptel.ac.in/courses/106/105/106105077/</a>                           |                                         |                 |
|                                                                                                                            |                                                                                                                                       |                                         |                 |
| Course Designed By:                                                                                                        |                                                                                                                                       |                                         |                 |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>COs</b>                               | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> |
| <b>C01</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | M          | S           |
| <b>C02</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | S           |
| <b>C03</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | S           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | S           |

|                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                            |                                       |                         |          |                |                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------|----------|----------------|-----------------|
| <b>Course code</b>                                                                                                                                                                                                                                                                                                                                                                 | 23D                                                                                                        | <b>PAPER VIII: INTERNET OF THINGS</b> | <b>L</b>                | <b>T</b> | <b>P</b>       | <b>C</b>        |
| <b>Core/Elective/Supportive</b>                                                                                                                                                                                                                                                                                                                                                    | <b>Core</b>                                                                                                |                                       | 4                       | 4        |                | 4               |
| <b>Pre-requisite</b>                                                                                                                                                                                                                                                                                                                                                               | Aware to know the Machine learning concepts and able to collect, analyze and handling huge amount of data. |                                       | <b>Syllabus Version</b> |          | <b>2021-22</b> |                 |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                                                          |                                                                                                            |                                       |                         |          |                |                 |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                                                         |                                                                                                            |                                       |                         |          |                |                 |
| 1. About Internet of Things where various communicating entities are controlled and managed for decision making in the application domain.<br>2. Enable students to learn the Architecture of IoT and IoT Technologies<br>3. Developing IoT applications and Security in IoT, Basic Electronics for IoT, Arduino IDE, Sensors and Actuators Programming NODEMCU using Arduino IDE. |                                                                                                            |                                       |                         |          |                |                 |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                                                                                                                                                   |                                                                                                            |                                       |                         |          |                |                 |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                                                               |                                                                                                            |                                       |                         |          |                |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                  | Understand about IoT, its Architecture and its Applications                                                |                                       |                         |          |                | K1,K2           |
| 2                                                                                                                                                                                                                                                                                                                                                                                  | Understand basic electronics used in IoT& its role                                                         |                                       |                         |          |                | K2,K3           |
| 3                                                                                                                                                                                                                                                                                                                                                                                  | Develop applications with C using Arduino IDE                                                              |                                       |                         |          |                | K4              |
| 4                                                                                                                                                                                                                                                                                                                                                                                  | Analyze about sensors and actuators                                                                        |                                       |                         |          |                | K5,K6           |
| 5                                                                                                                                                                                                                                                                                                                                                                                  | Design IoT in real time applications using today's internet & wireless technologies                        |                                       |                         |          |                | K6              |
| <b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6- Create</b>                                                                                                                                                                                                                                                                                         |                                                                                                            |                                       |                         |          |                |                 |
| <b>Unit:1</b>                                                                                                                                                                                                                                                                                                                                                                      | <b>INTRODUCTION</b>                                                                                        |                                       |                         |          |                | <b>12 hours</b> |
| Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT – Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – Security in IoT                                                                                                                                                                    |                                                                                                            |                                       |                         |          |                |                 |
| <b>Unit:2</b>                                                                                                                                                                                                                                                                                                                                                                      | <b>ELECTRONICS FOR IoT</b>                                                                                 |                                       |                         |          |                | <b>12 hours</b> |
| Basic Electronics for IoT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation.                                                                                                                                                |                                                                                                            |                                       |                         |          |                |                 |
| <b>Unit:3</b>                                                                                                                                                                                                                                                                                                                                                                      | <b>FUNDAMENTALS OF PROGRAMMING</b>                                                                         |                                       |                         |          |                | <b>12 hours</b> |
| Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.                                                       |                                                                                                            |                                       |                         |          |                |                 |
| <b>Unit:4</b>                                                                                                                                                                                                                                                                                                                                                                      | <b>SENSORS AND ACTUATORS</b>                                                                               |                                       |                         |          |                | <b>10 hours</b> |
| Sensors and Actuators: Analog and Digital Sensors – Interfacing temperature sensor, ultrasound sensor and infrared (IR) sensor with Arduino – Interfacing LED and Buzzer with Arduino.                                                                                                                                                                                             |                                                                                                            |                                       |                         |          |                |                 |

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Unit:5</b>                                                                                                                                                                                                                            | <b>SENSOR OVER INTERNET</b>                                                                                                           | <b>12 hours</b> |
| Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (ThingSpeak). |                                                                                                                                       |                 |
| <b>Unit:6</b>                                                                                                                                                                                                                            | <b>CONTEMPORARY ISSUES</b>                                                                                                            | <b>2 hours</b>  |
| Expert lectures, online seminars – webinars                                                                                                                                                                                              |                                                                                                                                       |                 |
|                                                                                                                                                                                                                                          | <b>Total Lecture hours</b>                                                                                                            | <b>60 hours</b> |
| <b>Text Books</b>                                                                                                                                                                                                                        |                                                                                                                                       |                 |
| 1                                                                                                                                                                                                                                        | ArshdeepBahga, Vijay Madiseti, “Internet of Things: A Hands-On Approach”, 2014. ISBN: 978-0996025515                                  |                 |
| 2                                                                                                                                                                                                                                        | Boris Adryan, DominikObermaier, Paul Fremantle, “The Technical Foundations of IoT”, Artech Houser Publishers, 2017.                   |                 |
| 3                                                                                                                                                                                                                                        | Michael Margolis, “Arduino Cookbook”, O“Reilly, 2011                                                                                  |                 |
| <b>Reference Books</b>                                                                                                                                                                                                                   |                                                                                                                                       |                 |
| 1                                                                                                                                                                                                                                        | Marco Schwartz, “Internet of Things with ESP8266”, Packt Publishing, 2016.                                                            |                 |
| 2                                                                                                                                                                                                                                        | DhivyaBala, “ESP8266: Step by Step Tutorial for ESP8266 IoT, Arduino NODEMCU Dev. Kit”, 2018.                                         |                 |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                                                                                                                                                      |                                                                                                                                       |                 |
| 1                                                                                                                                                                                                                                        | <a href="https://onlinecourses.nptel.ac.in/noc20_cs66/preview">https://onlinecourses.nptel.ac.in/noc20_cs66/preview</a>               |                 |
| 2                                                                                                                                                                                                                                        | <a href="https://www.javatpoint.com/iot-internet-of-things">https://www.javatpoint.com/iot-internet-of-things</a>                     |                 |
| 3                                                                                                                                                                                                                                        | <a href="https://www.tutorialspoint.com/internet_of_things/index.htm">https://www.tutorialspoint.com/internet_of_things/index.htm</a> |                 |
| Course Designed By:                                                                                                                                                                                                                      |                                                                                                                                       |                 |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | M          | M          | M          | S          | M          | S          | M          | M          | S          | M           |
| <b>C02</b>                               | M          | S          | M          | S          | M          | S          | M          | S          | S          | S           |
| <b>C03</b>                               | S          | S          | S          | S          | M          | S          | M          | S          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |

\*S-Strong; M-Medium; L-Low



|                                                                                                                                                                                                                                                                                                    |                                                                                                        |                                           |                         |          |                 |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------|----------|-----------------|----------|
| <b>Course code</b>                                                                                                                                                                                                                                                                                 | 23P                                                                                                    | <b>PRACTICAL III: DATA MINING USING R</b> | <b>L</b>                | <b>T</b> | <b>P</b>        | <b>C</b> |
| <b>Core/Elective/Supportive</b>                                                                                                                                                                                                                                                                    | <b>Core Lab</b>                                                                                        |                                           | 4                       |          | 4               | 4        |
| <b>Pre-requisite</b>                                                                                                                                                                                                                                                                               | Able to know extraction of data, statistical analysis of data, graphs for data representation.         |                                           | <b>Syllabus Version</b> |          | <b>2021-22</b>  |          |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                          |                                                                                                        |                                           |                         |          |                 |          |
| The main objectives of this course are to:                                                                                                                                                                                                                                                         |                                                                                                        |                                           |                         |          |                 |          |
| 1. To enable the students to learn the concepts of Data Mining algorithms namely classification, clustering, regression....<br>2. To understand & write programs using the algorithms<br>3. To apply statistical interpretations for the solutions<br>4. Able to use visualizations techniques     |                                                                                                        |                                           |                         |          |                 |          |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                                                                   |                                                                                                        |                                           |                         |          |                 |          |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                               |                                                                                                        |                                           |                         |          |                 |          |
| 1                                                                                                                                                                                                                                                                                                  | Able to write programs using R for Association rules, Clustering techniques                            |                                           |                         |          |                 | K1,K2    |
| 2                                                                                                                                                                                                                                                                                                  | To implement data mining techniques like classification, prediction                                    |                                           |                         |          |                 | K2,K3    |
| 3                                                                                                                                                                                                                                                                                                  | Able to use different visualizations techniques using R                                                |                                           |                         |          |                 | K4,K5    |
| 4                                                                                                                                                                                                                                                                                                  | To understand different data mining algorithms to solve real world Applications                        |                                           |                         |          |                 | K5,K6    |
| <b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create                                                                                                                                                                     |                                                                                                        |                                           |                         |          |                 |          |
| <b>LIST OF PROGRAMS</b>                                                                                                                                                                                                                                                                            |                                                                                                        |                                           | <b>75 hours</b>         |          |                 |          |
| 1. Implement Apriori algorithm to extract association rule of datamining.<br>2. Implement k-means clustering technique.<br>3. Implement any one Hierarchal Clustering.<br>4. Implement Classification algorithm.<br>5. Implement Decision Tree.<br>6. Linear Regression.<br>7. Data Visualization. |                                                                                                        |                                           |                         |          |                 |          |
| <b>Total Lecture hours</b>                                                                                                                                                                                                                                                                         |                                                                                                        |                                           |                         |          | <b>75 hours</b> |          |
| <b>Text Books</b>                                                                                                                                                                                                                                                                                  |                                                                                                        |                                           |                         |          |                 |          |
| 1                                                                                                                                                                                                                                                                                                  | Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson education, 2003.          |                                           |                         |          |                 |          |
| 2                                                                                                                                                                                                                                                                                                  | C.S.R. Prabhu, "Data Warehousing Concepts, Techniques, Products and Applications", PHI, Second Edition |                                           |                         |          |                 |          |
| <b>Reference Books</b>                                                                                                                                                                                                                                                                             |                                                                                                        |                                           |                         |          |                 |          |
| 1                                                                                                                                                                                                                                                                                                  | Arun K. Pujari, "Data Mining Techniques", Universities Press (India) Pvt. Ltd., 2003.                  |                                           |                         |          |                 |          |
| 2                                                                                                                                                                                                                                                                                                  | Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", TMCH, 2001.                   |                                           |                         |          |                 |          |

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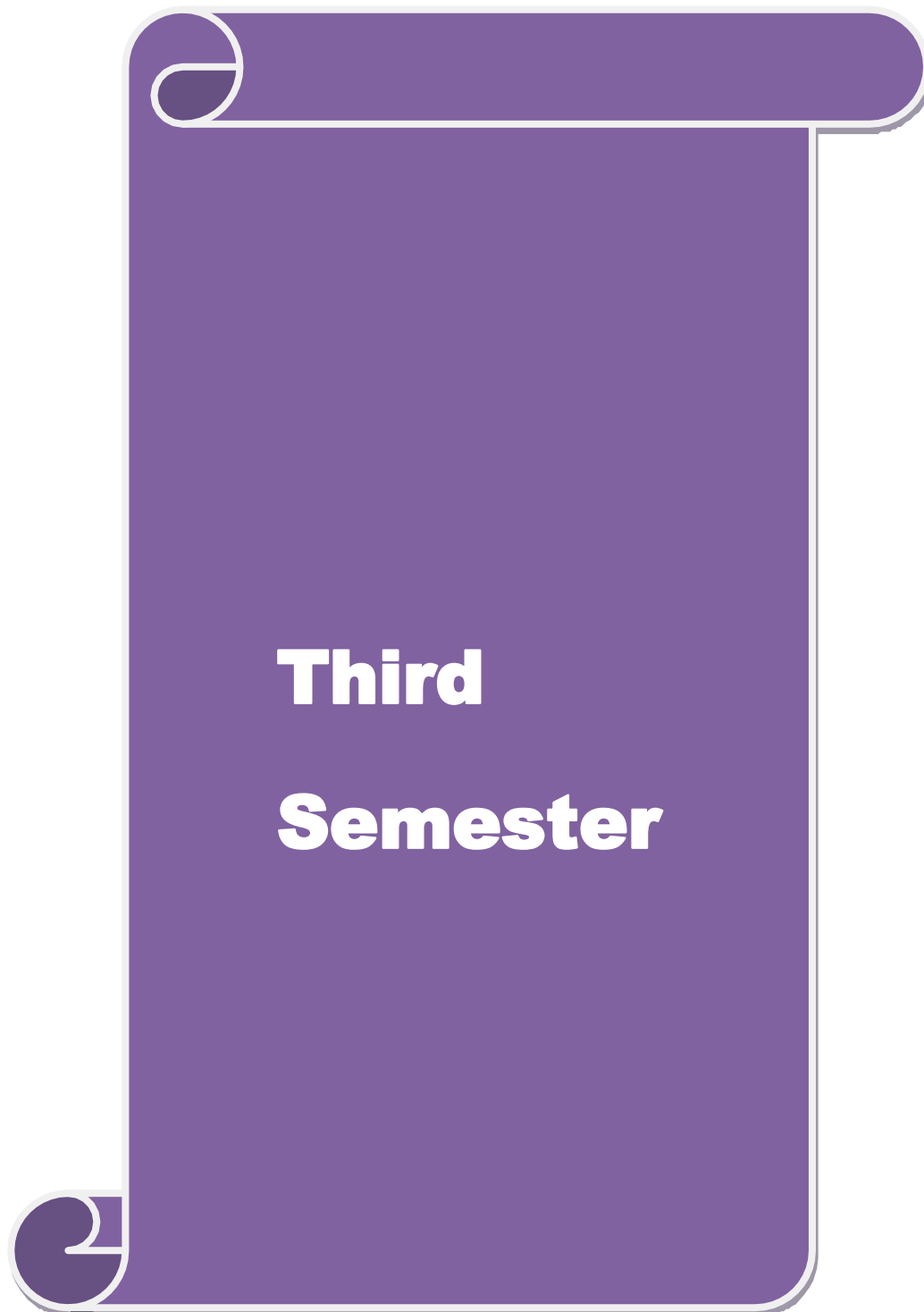
| Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] |                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                                            | <a href="https://www.javatpoint.com/data-warehouse">https://www.javatpoint.com/data-warehouse</a>                                                                                                                                                                                                                                                         |
| 2                                                            | <a href="https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/">https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/</a>                                                                                                                                                                                                                               |
| 3                                                            | <a href="https://www.btechguru.com/training--it--database-management-systems--file-structures-- introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html">https://www.btechguru.com/training--it--database-management-systems--file-structures-- introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html</a> |
| Course Designed By:                                          |                                                                                                                                                                                                                                                                                                                                                           |

| Mapping with Programming Outcomes |     |     |     |     |     |     |     |     |     |      |
|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Cos                               | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 |
| C01                               | S   | S   | M   | S   | S   | S   | M   | M   | S   | M    |
| C02                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | M    |
| C03                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | M    |
| C04                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | M    |

\*S-Strong; M-Medium; L-Low



|                                                                                                                       |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------|-----|-----|-----|------------------|-----|-----------|-----|------|
| Course code                                                                                                           | 23Q                                                                  | PRACTICAL IV: ARTIFICIAL INTELLIGENCE & MACHINE LEARNING LAB |     |     |     | L                | T   | P         | C   |      |
| Core/Elective/Supportive                                                                                              |                                                                      | Core                                                         |     |     |     | 4                |     | 4         | 4   |      |
| Pre-requisite                                                                                                         |                                                                      | Basics of Machine Learning                                   |     |     |     | Syllabus Version |     | 2025-2026 |     |      |
| Course Objectives:                                                                                                    |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| The main objectives of this course are to:                                                                            |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 1. Build models using classification algorithm for real world problems                                                |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 2. Build models using clustering algorithm for real world problems                                                    |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 3. Create classification and clustering models                                                                        |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 4. Test and evaluate the models                                                                                       |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| Expected Course Outcomes:                                                                                             |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| On the successful completion of the course,student will be able to:                                                   |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 1                                                                                                                     | Understand the various supervised learning techniques                |                                                              |     |     |     |                  |     | K2        |     |      |
| 2                                                                                                                     | Understand the theoretical concepts of linear methods                |                                                              |     |     |     |                  |     | K2        |     |      |
| 3                                                                                                                     | Apply Supervised,Unsupervised and Semi Supervised learning algorithm |                                                              |     |     |     |                  |     | K4        |     |      |
| 4                                                                                                                     | Understand and apply the concept of DeepLearning                     |                                                              |     |     |     |                  |     | K5,K6     |     |      |
| K1-Remember; K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate;K6 -Create                                                 |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| LIST OF PROGRAMS                                                                                                      |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| Implementthe following inPython:                                                                                      |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 1.Exercise to manipulate data using different queries.                                                                |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 2.Exercise to extract features from datasets.                                                                         |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 3.. Exercises to Build adatapipeline                                                                                  |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 4. Write a Program to Implement Tower of Hanoi                                                                        |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 5. Implement k-nearest neighbours classification                                                                      |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 6. Implement linear regression                                                                                        |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 7.Implement naive baye's theorem to classify the english text                                                         |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 8.Implement an algorithm to demonstrate the significance of genetic algorithm                                         |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 9. Implement the finite words classification system using Back-propagation algorithm                                  |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| Text Books                                                                                                            |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 1.Aurelien Géron, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, 3rd Edition, O'Reilly Media, 2022. |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| Reference Books                                                                                                       |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| 1.Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, 2021.            |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| Mapping with Programming Outcomes                                                                                     |                                                                      |                                                              |     |     |     |                  |     |           |     |      |
| Cos                                                                                                                   | P01                                                                  | P02                                                          | P03 | P04 | P05 | P06              | P07 | P08       | P09 | P010 |
| C01                                                                                                                   | S                                                                    | S                                                            | M   | S   | S   | S                | M   | M         | S   | M    |
| C02                                                                                                                   | S                                                                    | S                                                            | S   | S   | S   | S                | S   | M         | S   | M    |
| C03                                                                                                                   | S                                                                    | S                                                            | S   | S   | S   | S                | S   | M         | S   | M    |
| C04                                                                                                                   | S                                                                    | S                                                            | S   | S   | S   | S                | S   | M         | S   | M    |



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|                                                                                                                                                                                                                    |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|------------|------------|------------|------------|-----------------|------------|-------------|
| <b>Unit:4</b>                                                                                                                                                                                                      |                                                                                                                                         | <b>IMAGE COMPRESSION</b>   |            |            |            |            |            | <b>10 hours</b> |            |             |
| Image Compression: Fundamentals – Image compression models – Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.                                            |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
|                                                                                                                                                                                                                    |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
| <b>Unit:5</b>                                                                                                                                                                                                      |                                                                                                                                         | <b>IMAGE SEGMENTATION</b>  |            |            |            |            |            | <b>12 hours</b> |            |             |
| Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction – Thresholding – Region-Based segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation. |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
|                                                                                                                                                                                                                    |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
| <b>Unit:6</b>                                                                                                                                                                                                      |                                                                                                                                         | <b>CONTEMPORARY ISSUES</b> |            |            |            |            |            | <b>2 hours</b>  |            |             |
| Expert lectures, online seminars – webinars                                                                                                                                                                        |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
|                                                                                                                                                                                                                    |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
|                                                                                                                                                                                                                    |                                                                                                                                         | <b>Total Lecture hours</b> |            |            |            |            |            | <b>60 hours</b> |            |             |
| <b>Text Books</b>                                                                                                                                                                                                  |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
| 1                                                                                                                                                                                                                  | Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Second Edition, PHI/Pearson Education.                                |                            |            |            |            |            |            |                 |            |             |
| 2                                                                                                                                                                                                                  | B. Chanda, D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2003.                                                       |                            |            |            |            |            |            |                 |            |             |
| <b>Reference Books</b>                                                                                                                                                                                             |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
| 1                                                                                                                                                                                                                  | Nick Efford, “Digital Image Processing a practical introducing using Java”, Pearson Education, 2004.                                    |                            |            |            |            |            |            |                 |            |             |
|                                                                                                                                                                                                                    |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                                                                                                                                |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
| 1                                                                                                                                                                                                                  | <a href="https://nptel.ac.in/courses/117/105/117105135/">https://nptel.ac.in/courses/117/105/117105135/</a>                             |                            |            |            |            |            |            |                 |            |             |
| 2                                                                                                                                                                                                                  | <a href="https://www.tutorialspoint.com/dip/index.htm">https://www.tutorialspoint.com/dip/index.htm</a>                                 |                            |            |            |            |            |            |                 |            |             |
| 3                                                                                                                                                                                                                  | <a href="https://www.javatpoint.com/digital-image-processing-tutorial">https://www.javatpoint.com/digital-image-processing-tutorial</a> |                            |            |            |            |            |            |                 |            |             |
|                                                                                                                                                                                                                    |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
| Course Designed By:                                                                                                                                                                                                |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
| <b>Mapping with Programming Outcomes</b>                                                                                                                                                                           |                                                                                                                                         |                            |            |            |            |            |            |                 |            |             |
| <b>Cos</b>                                                                                                                                                                                                         | <b>P01</b>                                                                                                                              | <b>P02</b>                 | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b>      | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                                                                                                                                                                                                         | M                                                                                                                                       | S                          | S          | M          | M          | S          | M          | M               | S          | S           |
| <b>C02</b>                                                                                                                                                                                                         | M                                                                                                                                       | S                          | S          | M          | M          | S          | M          | S               | S          | S           |
| <b>C03</b>                                                                                                                                                                                                         | S                                                                                                                                       | S                          | S          | S          | M          | S          | S          | S               | S          | S           |
| <b>C04</b>                                                                                                                                                                                                         | S                                                                                                                                       | S                          | S          | S          | S          | S          | S          | S               | S          | S           |
| <b>C05</b>                                                                                                                                                                                                         | S                                                                                                                                       | S                          | S          | S          | S          | S          | S          | S               | S          | S           |

\*S-Strong; M-Medium; L-Low

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            |                                   |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------|
| Unit:5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                            | DATA VISUALIZATION USING POWER BI | 12 hours |
| Introduction to Data Visualization – Business Intelligence Concepts – Power BI Architecture and Components – Power BI Desktop – Data Import from Excel, CSV, SQL Server and Hadoop – Data Transformation using Power Query – Data Modeling and Relationships – DAX Fundamentals - Calculated Columns and Measures – Charts and Visualizations – Interactive Dashboards – Filters, Slicers and Drill-through Reports – Publishing Reports in Power BI Service – Data Gateway, Dataset Refresh and Row-Level Security – Business Analytics Applications. |                                                                                                                                                                                            |                                   |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            |                                   |          |
| Unit:6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                            | CONTEMPORARY ISSUES               | 2 hours  |
| Expert lectures, online seminars – webinars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                            |                                   |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            |                                   |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            | Total Lecture hours               | 60 hours |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            |                                   |          |
| Text Books                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                            |                                   |          |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Michael Minelli, Michele Chambers, AmbigaDhiraj, “BIG DATA BIG ANALYTICS”, Wiley Publications, Indian Reprint, 2014.                                                                       |                                   |          |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Alan Gates, “ <b>Programming Pig</b> ”, O'Reilly Media; 1st Edition,October, 2011                                                                                                          |                                   |          |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Alex Kolokolov and Maxim Zelensky</b> , <i>Data Visualization with Microsoft Power BI</i> , O'Reilly Media, First Edition, 2024.                                                        |                                   |          |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Brett Powell</b> , <i>Mastering Microsoft Power BI</i> , Packt Publishing, 2nd Edition, 2024.                                                                                           |                                   |          |
| Reference Books                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            |                                   |          |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | VigneshPrajapathi, “Big Data Analytics with R and Hadoop”, PACKT Publishing,2013.                                                                                                          |                                   |          |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Jack Hyman</b> , <i>Microsoft Power BI For Dummies</i> , Wiley, Second Edition, 2025.                                                                                                   |                                   |          |
| Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                            |                                   |          |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <a href="https://www.tutorialspoint.com/big_data_analytics/index.htm">https://www.tutorialspoint.com/big_data_analytics/index.htm</a>                                                      |                                   |          |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <a href="https://hadoop.apache.org/docs/r1.2.1/mapred_tutorial.html">https://hadoop.apache.org/docs/r1.2.1/mapred tutorial.html</a>                                                        |                                   |          |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <a href="https://learn.microsoft.com/power-bi/">Microsoft Learn – Power BI Documentation:</a><br><a href="https://learn.microsoft.com/power-bi/">https://learn.microsoft.com/power-bi/</a> |                                   |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            |                                   |          |
| Course Designed By:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                            |                                   |          |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | M          | M          | S          | S          | M          | S          | M          | S          | M          | S           |
| <b>C02</b>                               | M          | S          | S          | S          | M          | S          | M          | S          | M          | S           |
| <b>C03</b>                               | M          | M          | S          | S          | M          | S          | S          | S          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |

\*S-Strong; M-Medium; L-Low



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                      |                           |  |                  |   |         |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------|--|------------------|---|---------|---|
| Course code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 33C                                                                                  | PAPER XI: CLOUD COMPUTING |  | L                | T | P       | C |
| Core/Elective/Supportive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Core                                                                                 |                           |  | 4                | 4 |         | 4 |
| Pre-requisite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Basic Knowledge to store data with handling of operating systems.                    |                           |  | Syllabus Version |   | 2021-22 |   |
| Course Objectives:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                      |                           |  |                  |   |         |   |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                      |                           |  |                  |   |         |   |
| 1. Understand the cloud computing architectures, applications and challenges.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                      |                           |  |                  |   |         |   |
| 2. Know how the data is stored in the cloud and the various services offered by the cloud.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                      |                           |  |                  |   |         |   |
| 3. Develop the skills in Web Application Development using cloud technologies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                      |                           |  |                  |   |         |   |
| Expected Course Outcomes:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                      |                           |  |                  |   |         |   |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                      |                           |  |                  |   |         |   |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Understand the basic knowledge on virtualization                                     |                           |  |                  |   | K1,K2   |   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Understand the concept of cloud computing services and its business value            |                           |  |                  |   | K2,K3   |   |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Analyze various web based applications for collaborating everyone in cloud computing |                           |  |                  |   | K4,K5   |   |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Assess various industrial platforms for the developments                             |                           |  |                  |   | K5,K6   |   |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Analyze on cloud mobility and governance                                             |                           |  |                  |   | K6      |   |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6- Create                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                      |                           |  |                  |   |         |   |
| Unit:1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                      |                           |  |                  |   |         |   |
| INTRODUCTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                      |                           |  | 12 hours         |   |         |   |
| Introduction – Essentials – Benefits – Why cloud – Business and IT perspective – cloud and virtualization – cloud service requirements – dynamic cloud infrastructure – cloud computing characteristics – cloud adoption – cloud rudiments. Cloud deployment models: introduction – cloud characteristics – measured service accounting – cloud deployment models – security in a public cloud – public versus private clouds – cloud infrastructure self-service.                                                                                                                                                                    |                                                                                      |                           |  |                  |   |         |   |
| Unit:2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                      |                           |  |                  |   |         |   |
| SERVICES AND SOLUTIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                      |                           |  | 12 hours         |   |         |   |
| Cloud as a service: introduction – gamut of cloud solutions – principal technologies- cloud strategy – cloud design and implementation using SOA – conceptual cloud model – cloud service defined. Cloud solutions: introduction – cloud ecosystem – cloud business process management – cloud service management – on premise cloud orchestration and provisioning engine – computing on demand.                                                                                                                                                                                                                                     |                                                                                      |                           |  |                  |   |         |   |
| Unit:3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                      |                           |  |                  |   |         |   |
| VIRTUALIZATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                      |                           |  | 12 hours         |   |         |   |
| Cloud offerings: Introduction – introduction storage, retrieval archive and protection-cloud analytics – testing under cloud – information security – virtual desktop infrastructure-storage cloud. Cloud Management: Introduction – resiliency – provisioning – asset management-cloud governance – high availability and disaster recovery – charging models – usage reporting, and metering. Cloud Virtualization Technology: Introduction – virtualization demand – virtualization benefits – server virtualization – virtualization for x86 architecture – hypervisor management software – virtual infrastructure requirements. |                                                                                      |                           |  |                  |   |         |   |
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|                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                     |                            |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------|
| <b>Unit:4</b>                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                     | <b>INFRASTRUCTURE</b>      | <b>12 hours</b> |
| Cloud Infrastructure: Introduction – storage virtualization – storage area networks-network-attached storage – cloud server virtualization – networking essential to the cloud. Cloud and SOA: Introduction – SOA Journey to Infrastructure – SOA and the cloud – SOA Defined – SOA and infrastructure as a service – SOA based cloud infrastructure steps – SOA Business and IT services. |                                                                                                                                     |                            |                 |
| <b>Unit:5</b>                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                     | <b>MOBILITY</b>            | <b>10 hours</b> |
| Cloud Mobility: Introduction – the business problem – mobile enterprise application platforms – mobile application architecture overview. Cloud Governance: Introduction – service level agreement and compliance – data privacy and protection risks – enterprise governance – risk management – third party management – information management.                                         |                                                                                                                                     |                            |                 |
| <b>Unit:6</b>                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                     | <b>CONTEMPORARY ISSUES</b> | <b>2 hours</b>  |
| Expert lectures, online seminars – webinars                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                     |                            |                 |
|                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                     | <b>Total Lecture hours</b> | <b>60 hours</b> |
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                     |                            |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                          | Dr. Kumar Saurabh “Cloud Computing-Unleashing Next Gen Infrastructure to Application”, 3rd Edition, Wiley India Pvt Ltd, 2014.      |                            |                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                          | RajkumarBuyya, James Broberg, AndrzejGoscinski , “Cloud computing principles and paradigms”, Wiley India, 2014.                     |                            |                 |
| <b>Reference Books</b>                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                     |                            |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                          | Michael Miller, “Cloud computing web based application that change the way you work & collaborate online”, Pearson Education, 2013. |                            |                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                          | Kris Jamsa, “Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business”                                                           |                            |                 |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                                                                                                                                                                                                                                                                                                        |                                                                                                                                     |                            |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                          | <a href="https://nptel.ac.in/courses/106/105/106105167/">https://nptel.ac.in/courses/106/105/106105167/</a>                         |                            |                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                          | <a href="https://www.tutorialspoint.com/cloud_computing/index.htm">https://www.tutorialspoint.com/cloud_computing/index.htm</a>     |                            |                 |
| 3                                                                                                                                                                                                                                                                                                                                                                                          | <a href="https://www.javatpoint.com/cloud-computing-tutorial">https://www.javatpoint.com/cloud-computing-tutorial</a>               |                            |                 |
| Course Designed By:                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                     |                            |                 |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | L          | S          | M          | S          | M          | S          | M          | M          | M          | S           |
| <b>C02</b>                               | M          | S          | M          | S          | S          | S          | M          | M          | M          | S           |
| <b>C03</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C05</b>                               | M          | S          | S          | S          | S          | S          | S          | S          | S          | S           |

\*S-Strong; M-Medium; L-Low

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                           |                                    |                         |          |                 |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------|----------|-----------------|----------|
| <b>Course code</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 33D                                                                                                       | <b>PAPER XII: WEB TECHNOLOGIES</b> | <b>L</b>                | <b>T</b> | <b>P</b>        | <b>C</b> |
| <b>Core/Elective/Supportive</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Core Lab</b>                                                                                           |                                    | 4                       | 4        |                 | 4        |
| <b>Pre-requisite</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Basic knowledge of programming, HTML, CSS, JavaScript, and client-server basics.                          |                                    | <b>Syllabus Version</b> |          | <b>2025-26</b>  |          |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                           |                                    |                         |          |                 |          |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                           |                                    |                         |          |                 |          |
| 1. Learn the basics of web technologies like HTML5, CSS3, and JavaScript.                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                           |                                    |                         |          |                 |          |
| 2. Build dynamic websites using PHP, Java Servlets, and XML.                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                           |                                    |                         |          |                 |          |
| 3. Get introduced to modern tools like AngularJS, Node.js, Firebase, React, and Docker.                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                           |                                    |                         |          |                 |          |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                           |                                    |                         |          |                 |          |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                           |                                    |                         |          |                 |          |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Understand the fundamentals of web communication, HTML5 structure, and styling with CSS3 and Bootstrap.   |                                    |                         |          |                 | K1,K2    |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Apply client-side scripting using JavaScript and JSON to enhance web interactivity and data manipulation. |                                    |                         |          |                 | K2,K3    |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Develop dynamic server-side applications using PHP, Java Servlets, and connect them with databases.       |                                    |                         |          |                 | K3       |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Design, validate, and query XML documents using XML Schema, XPath, and XQuery.                            |                                    |                         |          |                 | K4,K5    |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Analyze modern web frameworks and build modular applications using AngularJS and other emerging tools.    |                                    |                         |          |                 | K4       |
| <b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6- Create</b>                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                           |                                    |                         |          |                 |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                           |                                    |                         |          |                 |          |
| <b>Unit:1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>WEBSITE BASICS</b>                                                                                     |                                    |                         |          | <b>12 hours</b> |          |
| Web Essentials : Clients, Servers and Communication - The Internet - World wide web - HTTP Request Message - HTTP Response Message - Web Clients - Web Servers - HTML5 - Tables - Lists - Image - HTML5 control elements - Drag and Drop - Audio - Video controls - CSS3 - Inline, embedded and external style sheets - Rule cascading - Inheritance - Backgrounds - Border Images - Colors - Shadows - Text - Transformations - Transitions - Animations. Bootstrap Framework. |                                                                                                           |                                    |                         |          |                 |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                           |                                    |                         |          |                 |          |
| <b>Unit:2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>CLIENT SIDE PROGRAMMING</b>                                                                            |                                    |                         |          | <b>12 hours</b> |          |
| Java Script : An introduction to JavaScript - JavaScript DOM Model - Exception Handling - Validation- Built-in objects - Event Handling - DHTML with JavaScript - JSON introduction - Syntax - Function Files.                                                                                                                                                                                                                                                                  |                                                                                                           |                                    |                         |          |                 |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                           |                                    |                         |          |                 |          |
| <b>Unit:3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>SERVER SIDE PROGRAMMING</b>                                                                            |                                    |                         |          | <b>12 hours</b> |          |
| Servlets : Java Servlet Architecture - Servlet Life Cycle - Form GET and POST actions - Session Handling and State Management - Servlet Filters and Listeners-Database Connectivity : JDBC                                                                                                                                                                                                                                                                                      |                                                                                                           |                                    |                         |          |                 |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                           |                                    |                         |          |                 |          |

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|                                                                                                                                                                                                                                                                                                           |                                                                                                                                           |                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Unit:4</b>                                                                                                                                                                                                                                                                                             | <b>PHP and XML</b>                                                                                                                        | <b>12 hours</b> |
| An introduction to PHP : PHP- Using PHP- Variables - Program control - Built-in functions - Form Validation. XML : Basic XML - Document Type Definition - XML Schema, XML Parsers and Validation, XSL.                                                                                                    |                                                                                                                                           |                 |
|                                                                                                                                                                                                                                                                                                           |                                                                                                                                           |                 |
| <b>Unit:5</b>                                                                                                                                                                                                                                                                                             | <b>INTRODUCTION TO ANGULAR and WEB APPLICATIONS FRAMEWORKS</b>                                                                            | <b>10 hours</b> |
| Introduction to AngularJS, MVC Architecture, Understanding ng attributes, Expressions and data binding, Conditional Directives, Style Directives, Controllers, Filters, Forms, Routers, Modules, Services; Web Applications Frameworks and Tools - Firebase- Docker - Node JS - React - Django - UI & UX. |                                                                                                                                           |                 |
|                                                                                                                                                                                                                                                                                                           |                                                                                                                                           |                 |
| <b>Unit:6</b>                                                                                                                                                                                                                                                                                             | <b>CONTEMPORARY ISSUES</b>                                                                                                                | <b>2 hours</b>  |
| Expert lectures, online seminars – webinars                                                                                                                                                                                                                                                               |                                                                                                                                           |                 |
|                                                                                                                                                                                                                                                                                                           | <b>Total Lecture hours</b>                                                                                                                | <b>60 hours</b> |
|                                                                                                                                                                                                                                                                                                           |                                                                                                                                           |                 |
| <b>Text Books</b>                                                                                                                                                                                                                                                                                         |                                                                                                                                           |                 |
| 1                                                                                                                                                                                                                                                                                                         | <b>Achyut Godbole &amp; Atul Kahate</b> , <i>Web Technologies: TCP/IP to Internet Application Architectures</i> , Tata McGraw Hill, 2011. |                 |
| 2                                                                                                                                                                                                                                                                                                         | <b>Jon Duckett</b> , <i>HTML and CSS: Design and Build Websites</i> , Wiley, 2011.                                                        |                 |
| <b>Reference Books</b>                                                                                                                                                                                                                                                                                    |                                                                                                                                           |                 |
| 1                                                                                                                                                                                                                                                                                                         | PHP6 and MySQL6 Bible – Steve Svehring.                                                                                                   |                 |
| 2                                                                                                                                                                                                                                                                                                         | <b>Robert W. Sebesta</b> , <i>Programming the World Wide Web</i> , Pearson Education, 7th Edition, 2014.                                  |                 |
|                                                                                                                                                                                                                                                                                                           |                                                                                                                                           |                 |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                                                                                                                                                                                                                       |                                                                                                                                           |                 |
| 1                                                                                                                                                                                                                                                                                                         | <a href="https://www.tutorialspoint.com/php/index.htm">https://www.tutorialspoint.com/php/index.htm</a>                                   |                 |
| 2                                                                                                                                                                                                                                                                                                         | <a href="https://www.javatpoint.com/php-tutorial">https://www.javatpoint.com/php-tutorial</a>                                             |                 |
| 3                                                                                                                                                                                                                                                                                                         | <a href="http://www.nptelvideos.com/video.php?id=2138&amp;c=27">http://www.nptelvideos.com/video.php?id=2138&amp;c=27</a>                 |                 |

#### Mapping with Programming Outcomes

| Cos        | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| <b>C01</b> | S   | S   | S   | M   | S   | M   | S   | S   | M   | S    |
| <b>C02</b> | S   | S   | M   | S   | S   | S   | S   | S   | S   | S    |
| <b>C03</b> | M   | S   | S   | M   | M   | M   | M   | S   | M   | M    |
| <b>C04</b> | S   | S   | S   | S   | S   | M   | S   | S   | S   | S    |
| <b>C05</b> | S   | M   | L   | M   | S   | S   | S   | M   | M   | S    |

\*S-Strong; M-Medium; L-Low

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| Reference Books                                              |                                                                                                                                         |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1                                                            | Nick Efford, "Digital Image Processing a practical introducing using Java", Pearson Education, 2004.                                    |
| Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.] |                                                                                                                                         |
| 1                                                            | <a href="https://nptel.ac.in/courses/117/105/117105135/">https://nptel.ac.in/courses/117/105/117105135/</a>                             |
| 2                                                            | <a href="https://www.tutorialspoint.com/dip/index.htm">https://www.tutorialspoint.com/dip/index.htm</a>                                 |
| 3                                                            | <a href="https://www.javatpoint.com/digital-image-processing-tutorial">https://www.javatpoint.com/digital-image-processing-tutorial</a> |
| Course Designed By:                                          |                                                                                                                                         |

| Mapping with Programming Outcomes |     |     |     |     |     |     |     |     |     |      |
|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Cos                               | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 |
| C01                               | S   | S   | M   | S   | S   | S   | M   | M   | S   | M    |
| C02                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | M    |
| C03                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | M    |
| C04                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | M    |

\*S-Strong; M-Medium; L-Low



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                  |                                       |                     |   |         |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------|---------------------|---|---------|---|
| Course code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 33Q                                                                              | PRACTICAL VI : BIG DATA ANALYTICS LAB | L                   | T | P       | C |
| Core/Elective/<br>Supportive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                  | Core Lab                              | 4                   |   | 4       | 4 |
| Pre-requisite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                  | Basics of Programming                 | Syllabus<br>Version |   | 2025-26 |   |
| Course Objectives:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                  |                                       |                     |   |         |   |
| The main objectives of this course are to:<br>Learn how to install and set up Hadoop and Pig in a Big Data environment.<br>Understand the basics of MapReduce programming for processing large data.<br>Write Pig scripts to sort, filter, join, and group data.<br>Work with structured and semi-structured data using Pig.<br>Learn how to import and export data between databases and Hadoop using Sqoop.                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                  |                                       |                     |   |         |   |
| Expected Course Outcomes:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                  |                                       |                     |   |         |   |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                  |                                       |                     |   |         |   |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Set up and use Hadoop and Pig for big data processing.                           |                                       |                     |   | K1,K2   |   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Write and run basic MapReduce programs like Word Count and Matrix Multiplication |                                       |                     |   | K2,K3   |   |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Create Pig Latin scripts to sort, filter, group, and join data.                  |                                       |                     |   | K3,K4   |   |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Import and export data between databases                                         |                                       |                     |   | K5,K6   |   |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6- Create                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                  |                                       |                     |   |         |   |
| LIST OF PROGRAMS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                  |                                       | 60 hours            |   |         |   |
| 1. Implement of Matrix Multiplication with Hadoop Map Reduce<br>2. Pig Latin scripts to sort, group, join for Sales Data<br>3. Pig Latin scripts to project, and filter your Sales data<br>4. Create a Bar Chart for sales analysis and arrange visuals into a dashboard.<br>5. Import a CSV Dataset and generate a report using Power BI.<br>6. Load a sales dataset and identify the available tables and columns and verify whether the imported data contains null or missing values.<br>7. Analyse business performance using DAX calculations and create visualizations based on calculated measures.<br>8. Using DAX in Power BI Desktop, work with Filter Context and Time Intelligence.<br>9. Create separate report pages for:<br>Sales Analysis<br><br>Profit Analysis<br><br>Regional Performance<br><br>Product Performance |                                                                                  |                                       |                     |   |         |   |

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|                                                                                                                   |                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 10. Navigate through different report pages in Power BI Service, apply filters and slicers while viewing reports. |                                                                                                         |
| 11. Configure user permissions for dashboards and reports. Assign Viewer, Member, and Admin roles in a workspace. |                                                                                                         |
| <b>Total Lecture hours</b>                                                                                        |                                                                                                         |
| <b>60 hours</b>                                                                                                   |                                                                                                         |
| <b>Text Books</b>                                                                                                 |                                                                                                         |
| 1                                                                                                                 | <b>Hadoop: The Definitive Guide</b> – Tom White, O'Reilly Media, 4th Edition                            |
| 2                                                                                                                 | <b>Programming Pig</b> – Alan Gates, O'Reilly Media                                                     |
| <b>Reference Books</b>                                                                                            |                                                                                                         |
| 3                                                                                                                 | <b>Hadoop in Practice</b> – Alex Holmes, Manning Publications                                           |
| 4                                                                                                                 | <b>MapReduce Design Patterns</b> – Donald Miner & Adam Shook, O'Reilly Media                            |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                               |                                                                                                         |
| 1                                                                                                                 | <a href="https://hadoop.apache.org/docs/">https://hadoop.apache.org/docs/</a>                           |
| 2                                                                                                                 | <a href="https://pig.apache.org/docs/r0.17.0/">https://pig.apache.org/docs/r0.17.0/</a>                 |
| 3                                                                                                                 | <a href="https://swayam.gov.in/nd2_cec20_cs10/preview">https://swayam.gov.in/nd2_cec20_cs10/preview</a> |
| Course Designed By:                                                                                               |                                                                                                         |

| Mapping with Programming Outcomes |     |     |     |     |     |     |     |     |     |      |
|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Cos                               | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 |
| <b>C01</b>                        | S   | S   | M   | S   | S   | S   | M   | M   | S   | S    |
| <b>C02</b>                        | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    |
| <b>C03</b>                        | S   | S   | S   | S   | S   | S   | S   | M   | S   | M    |
| <b>C04</b>                        | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    |

\*S-Strong; M-Medium; L-Low

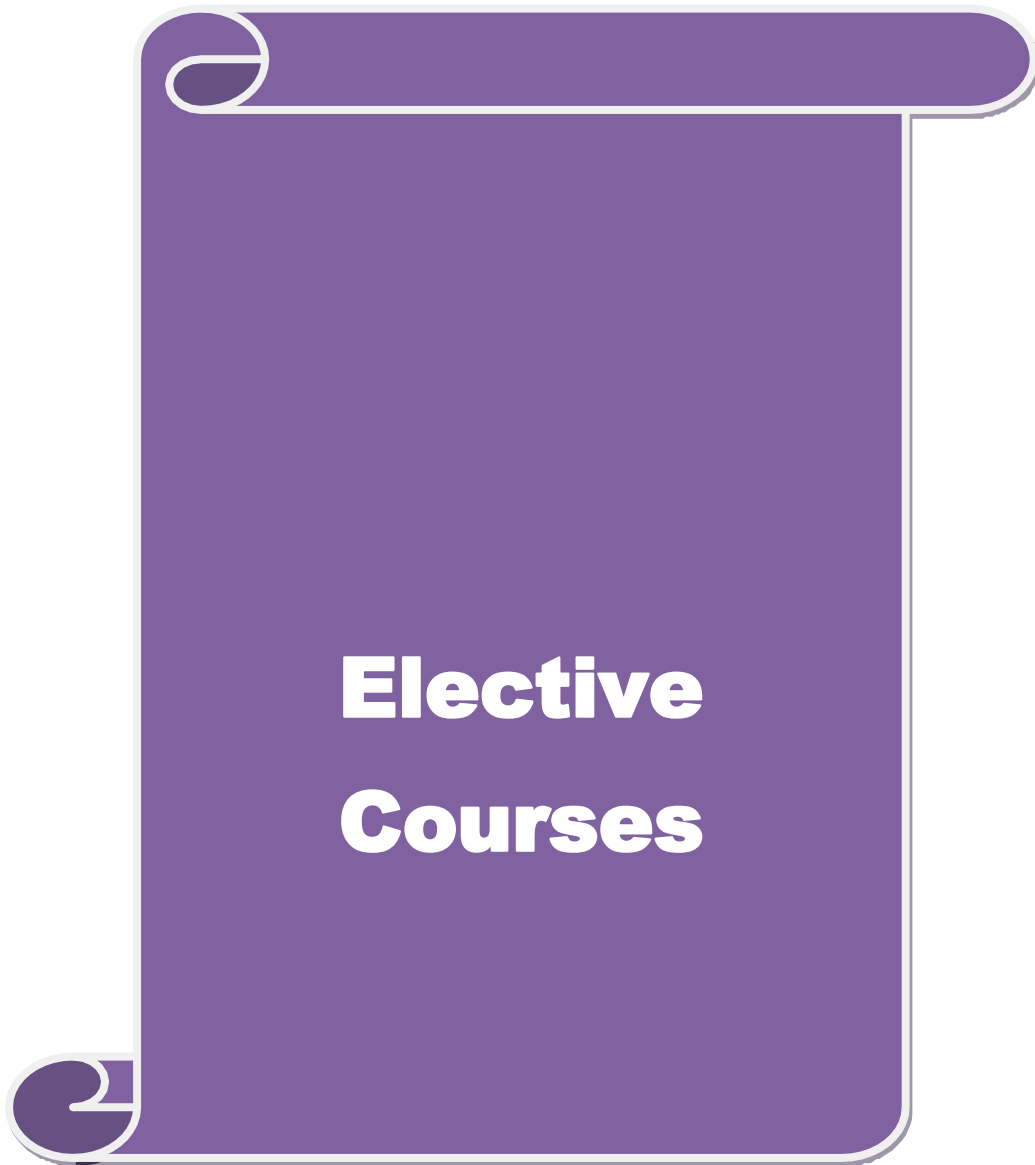
|                                                                                                                                                                                                                                                            |                                                                                |                                                        |                  |   |         |                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------|------------------|---|---------|-----------------|
| Course code                                                                                                                                                                                                                                                | 33R                                                                            | PRACTICAL VII: WEB APPLICATION DEVELOPMENT AND HOSTING | L                | T | P       | C               |
| Core/Elective/Supportive                                                                                                                                                                                                                                   | Core Lab                                                                       |                                                        | 2                |   | 2       | 2               |
| Pre-requisite                                                                                                                                                                                                                                              | Students should be able to know basic html, CSS and php concepts.              |                                                        | Syllabus Version |   | 2021-22 |                 |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                  |                                                                                |                                                        |                  |   |         |                 |
| The main objectives of this course are to:                                                                                                                                                                                                                 |                                                                                |                                                        |                  |   |         |                 |
| 1. Able to design a web page using HTML tags                                                                                                                                                                                                               |                                                                                |                                                        |                  |   |         |                 |
| 2. To enable the students to use Frame sets, hyper links and different formatting features of HTML tags                                                                                                                                                    |                                                                                |                                                        |                  |   |         |                 |
| 3. Enable the students to use Forms & other controls in a web page                                                                                                                                                                                         |                                                                                |                                                        |                  |   |         |                 |
| 4. To create interactive applications using PHP                                                                                                                                                                                                            |                                                                                |                                                        |                  |   |         |                 |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                           |                                                                                |                                                        |                  |   |         |                 |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                       |                                                                                |                                                        |                  |   |         |                 |
| 1                                                                                                                                                                                                                                                          | Understand & implement the basic HTML tags to create static web pages          |                                                        |                  |   | K1, K2  |                 |
| 2                                                                                                                                                                                                                                                          | Capable of using hyperlinks, frames, images, tables, in a web page             |                                                        |                  |   | K2, K3  |                 |
| 3                                                                                                                                                                                                                                                          | Able to write dynamic web applications using HTML forms                        |                                                        |                  |   | K4, K5  |                 |
| 4                                                                                                                                                                                                                                                          | Must be able to write dynamic web applications in PHP & HTML tags using XAMPP. |                                                        |                  |   | K5, K6  |                 |
| <b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>                                                                                                                                                                |                                                                                |                                                        |                  |   |         |                 |
| <b>LIST OF PROGRAMS</b>                                                                                                                                                                                                                                    |                                                                                |                                                        |                  |   |         |                 |
|                                                                                                                                                                                                                                                            |                                                                                |                                                        |                  |   |         | <b>30 hours</b> |
| 1. Develop a website for your college using advanced tags of HTML.                                                                                                                                                                                         |                                                                                |                                                        |                  |   |         |                 |
| 2. Write names of several countries in a paragraph and store it as an HTML document, world.html. Each country name must be a hot text. When you click India (for example), it must open india.html and it should provide a brief introduction about India. |                                                                                |                                                        |                  |   |         |                 |
| 3. Develop a HTML document to i) display Text with Bullets / Numbers - Using Lists ii) to display the Table Format Data.                                                                                                                                   |                                                                                |                                                        |                  |   |         |                 |
| 4. Develop a Complete Web Page using Frames and Frame sets which gives the Information about a Hospital using HTML.                                                                                                                                        |                                                                                |                                                        |                  |   |         |                 |
| 5. Develop a HTML document to print your Bio-Data in a neat format using several components                                                                                                                                                                |                                                                                |                                                        |                  |   |         |                 |
| 6. Develop a Registration Form for an inter-collegiate function and validate using Java Script.                                                                                                                                                            |                                                                                |                                                        |                  |   |         |                 |
| 7. Develop and display customer details using XML with XSL transformation and validate the document using DTD or XSD                                                                                                                                       |                                                                                |                                                        |                  |   |         |                 |
| 8. Develop and display student personal details in XML format.                                                                                                                                                                                             |                                                                                |                                                        |                  |   |         |                 |
| <b>Total Lecture hours</b>                                                                                                                                                                                                                                 |                                                                                |                                                        |                  |   |         | <b>30 hours</b> |

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| <b>Text Books</b>                                                   |                                                                                                                                                                           |
|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                                                   | Ivan Bayross, "Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP", BPB Publications, 4th Revised Edition, 2010.                       |
| <b>Reference Books</b>                                              |                                                                                                                                                                           |
| 2                                                                   | A.K.Saini and SumintTuli, "Mastering XML", First Edition, New Delhi, 2002.                                                                                                |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b> |                                                                                                                                                                           |
| 1                                                                   | <a href="https://www.tutorialspoint.com/xml/index.htm">https://www.tutorialspoint.com/xml/index.htm</a>                                                                   |
| 2                                                                   | <a href="https://www.tutorialspoint.com/internet_technologies/websites_development.htm">https://www.tutorialspoint.com/internet_technologies/websites_development.htm</a> |
| 3                                                                   | <a href="https://www.youtube.com/watch?v=PlxWf493en4">https://www.youtube.com/watch?v=PlxWf493en4</a>                                                                     |
| Course Designed By:                                                 |                                                                                                                                                                           |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | S          | S          | M          | S          | S          | S          | M          | M          | S          | S           |
| <b>C02</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | S           |
| <b>C03</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | M           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | M          | S          | S           |

\*S-Strong; M-Medium; L-Low



|                                                                                                                                                                                                                                                                                             |                                                                                                                            |                                        |                         |          |                 |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------------|----------|-----------------|----------|
| <b>Course code</b>                                                                                                                                                                                                                                                                          | 2EA                                                                                                                        | <b>MULTIMEDIA AND ITS APPLICATIONS</b> | <b>L</b>                | <b>T</b> | <b>P</b>        | <b>C</b> |
| <b>Core/Elective/Supportive</b>                                                                                                                                                                                                                                                             | <b>Elective-I</b>                                                                                                          |                                        | 4                       | 4        |                 | 4        |
| <b>Pre-requisite</b>                                                                                                                                                                                                                                                                        | Able to understand the basic hardware of keyboard, mouse, monitor, input, output, primary memory and secondary memory etc. |                                        | <b>Syllabus Version</b> |          | <b>2021-22</b>  |          |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                   |                                                                                                                            |                                        |                         |          |                 |          |
| The main objectives of this course are to:                                                                                                                                                                                                                                                  |                                                                                                                            |                                        |                         |          |                 |          |
| 1. To introduce the students the concepts of Multimedia, Images & Animation.<br>2. To introduce Multimedia authoring tools<br>3. To understand the role of Multimedia in Internet<br>4. To know about High Definition Television and Desktop Computing – Knowledge based Multimedia systems |                                                                                                                            |                                        |                         |          |                 |          |
| <b>Expected Course Outcomes:</b>                                                                                                                                                                                                                                                            |                                                                                                                            |                                        |                         |          |                 |          |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                        |                                                                                                                            |                                        |                         |          |                 |          |
| 1                                                                                                                                                                                                                                                                                           | Understand the basic concepts of Multimedia                                                                                |                                        |                         |          | K1,K2           |          |
| 2                                                                                                                                                                                                                                                                                           | Demonstrate Multimedia authoring tools                                                                                     |                                        |                         |          | K2,K3           |          |
| 3                                                                                                                                                                                                                                                                                           | Analyze the concepts of Sound, Images, Video & Animation                                                                   |                                        |                         |          | K3,K4           |          |
| 4                                                                                                                                                                                                                                                                                           | Apply and Analyze the role of Multimedia in Internet and real time Applications                                            |                                        |                         |          | K4,K5           |          |
| 5                                                                                                                                                                                                                                                                                           | Analyze multimedia applications using HDTV                                                                                 |                                        |                         |          | K6              |          |
| <b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6- Create</b>                                                                                                                                                                                                  |                                                                                                                            |                                        |                         |          |                 |          |
| <b>Unit:1</b>                                                                                                                                                                                                                                                                               | <b>INTRODUCTION</b>                                                                                                        |                                        |                         |          | <b>12 hours</b> |          |
| What is Multimedia? – Introduction to making Multimedia – Macintosh and Windows Production platforms – Basic Software tools.                                                                                                                                                                |                                                                                                                            |                                        |                         |          |                 |          |
| <b>Unit:2</b>                                                                                                                                                                                                                                                                               | <b>TOOLS OF MULTIMEDIA</b>                                                                                                 |                                        |                         |          | <b>12 hours</b> |          |
| Making Instant Multimedia – Multimedia authoring tools – Multimedia building blocks – Text – Sound.                                                                                                                                                                                         |                                                                                                                            |                                        |                         |          |                 |          |
| <b>Unit:3</b>                                                                                                                                                                                                                                                                               | <b>ANIMATION</b>                                                                                                           |                                        |                         |          | <b>12 hours</b> |          |
| Images – Animation – Video.                                                                                                                                                                                                                                                                 |                                                                                                                            |                                        |                         |          |                 |          |
| <b>Unit:4</b>                                                                                                                                                                                                                                                                               | <b>INTERNET</b>                                                                                                            |                                        |                         |          | <b>12 hours</b> |          |
| Multimedia and the Internet – The Internet and how it works – Tools for World Wide Web – Designing for the World Wide Web.                                                                                                                                                                  |                                                                                                                            |                                        |                         |          |                 |          |

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|                                                                                        |                                                                                                                                                                                                                       |          |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Unit:5                                                                                 | MULTIMEDIA SYSTEMS                                                                                                                                                                                                    | 10 hours |
| High Definition Television and Desktop Computing – Knowledge based Multimedia systems. |                                                                                                                                                                                                                       |          |
| Unit:6                                                                                 | CONTEMPORARY ISSUES                                                                                                                                                                                                   | 2 hours  |
| Expert lectures, online seminars – webinars                                            |                                                                                                                                                                                                                       |          |
|                                                                                        |                                                                                                                                                                                                                       |          |
|                                                                                        | Total Lecture hours                                                                                                                                                                                                   | 60 hours |
|                                                                                        |                                                                                                                                                                                                                       |          |
| Text Books                                                                             |                                                                                                                                                                                                                       |          |
| 1                                                                                      | Tay Vaughan, “Multimedia making it work”, Fifth Edition, Tata McGrawHill.                                                                                                                                             |          |
| 2                                                                                      | John F. KoegelBufford, “Multimedia Systems”, PearsonEducation.                                                                                                                                                        |          |
| Reference Books                                                                        |                                                                                                                                                                                                                       |          |
| 1                                                                                      | Judith Jeffloat, “Multimedia in Practice (Technology and Applications)”, PHI,2003.                                                                                                                                    |          |
|                                                                                        |                                                                                                                                                                                                                       |          |
| Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]                           |                                                                                                                                                                                                                       |          |
| 1                                                                                      | <a href="https://www.tutorialspoint.com/multimedia/index.htm">https://www.tutorialspoint.com/multimedia/index.htm</a>                                                                                                 |          |
| 2                                                                                      | <a href="https://www.tutorialspoint.com/basics_of_computer_science/basics_of_computer_science_multimedia.htm">https://www.tutorialspoint.com/basics_of_computer_science/basics_of_computer_science_multimedia.htm</a> |          |
| 3                                                                                      | <a href="https://nptel.ac.in/courses/117/105/117105083/">https://nptel.ac.in/courses/117/105/117105083/</a>                                                                                                           |          |
|                                                                                        |                                                                                                                                                                                                                       |          |
| Course Designed By:                                                                    |                                                                                                                                                                                                                       |          |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | S          | S          | S          | S          | M          | S          | M          | M          | M          | S           |
| <b>C02</b>                               | S          | S          | S          | S          | M          | S          | M          | S          | S          | S           |
| <b>C03</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |

\*S-Strong; M-Medium; L-Low

| Course code                                                                                                                                                                                                                                                                                                                                     | 2EB                                                          | MOBILE APPLICATION DEVELOPMENT                              | L                | T | P        | C  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|------------------|---|----------|----|
| Core/Elective/Supportive                                                                                                                                                                                                                                                                                                                        |                                                              | Elective-I                                                  | 4                | 4 | -        | 4  |
| Pre-requisite                                                                                                                                                                                                                                                                                                                                   |                                                              | Basics about the Networking, TCP/IP and Programming Skills  | Syllabus Version |   | 2025-26  |    |
| Course Objectives:                                                                                                                                                                                                                                                                                                                              |                                                              |                                                             |                  |   |          |    |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                      |                                                              |                                                             |                  |   |          |    |
| 1. To understand the User Interface Design, Back end databases, other services for mobile applications.                                                                                                                                                                                                                                         |                                                              |                                                             |                  |   |          |    |
| 2. To get a job using mobile application development skills                                                                                                                                                                                                                                                                                     |                                                              |                                                             |                  |   |          |    |
| 3. To get exposure to Android and IOS development environment                                                                                                                                                                                                                                                                                   |                                                              |                                                             |                  |   |          |    |
|                                                                                                                                                                                                                                                                                                                                                 |                                                              |                                                             |                  |   |          |    |
| Expected Course Outcomes:                                                                                                                                                                                                                                                                                                                       |                                                              |                                                             |                  |   |          |    |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                            |                                                              |                                                             |                  |   |          |    |
| 1                                                                                                                                                                                                                                                                                                                                               | Understand the principles of Mobile networks                 |                                                             |                  |   |          | K2 |
| 2                                                                                                                                                                                                                                                                                                                                               | Understand the different mobile network technology           |                                                             |                  |   |          | K2 |
| 3                                                                                                                                                                                                                                                                                                                                               | Get familiar with Android and IOS environment                |                                                             |                  |   |          | K3 |
| 4                                                                                                                                                                                                                                                                                                                                               | Design and develop Mobile application using Android and IOS. |                                                             |                  |   |          | K6 |
| 5                                                                                                                                                                                                                                                                                                                                               | Get a job with their own skills.                             |                                                             |                  |   |          | K6 |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create                                                                                                                                                                                                                                                            |                                                              |                                                             |                  |   |          |    |
|                                                                                                                                                                                                                                                                                                                                                 |                                                              |                                                             |                  |   |          |    |
| Unit:1                                                                                                                                                                                                                                                                                                                                          |                                                              | MOBILE COMMUNICATION AND TECHNOLOGY                         |                  |   | 12 HOURS |    |
| Mobile Communication - Mobile Computing - Mobile Computing Architecture<br>Mobile Communication and Technologies :GSM - CDMA - Bluetooth -ZigBee - IrDA - RFID - IEEE 802.11 - GPS - NFC                                                                                                                                                        |                                                              |                                                             |                  |   |          |    |
|                                                                                                                                                                                                                                                                                                                                                 |                                                              |                                                             |                  |   |          |    |
| Unit:2                                                                                                                                                                                                                                                                                                                                          |                                                              | 4G/5G COMMUNICATION TECHNOLOGY                              |                  |   | 12 HOURS |    |
| 4G – LTE - 5G System Concepts – 5G Architecture – Functional Architecture – Machine type Communication – Device to Device Communication - 4G to 5G upgradation                                                                                                                                                                                  |                                                              |                                                             |                  |   |          |    |
|                                                                                                                                                                                                                                                                                                                                                 |                                                              |                                                             |                  |   |          |    |
| Unit:3                                                                                                                                                                                                                                                                                                                                          |                                                              | USER INTERFACE DESIGN AND FILES/DIRECTORIES                 |                  |   | 12 HOURS |    |
| User Interface Design: Fundamental - Views - Layouts – Drawable Resources - Resolution and Density Independence - Creating and Using Menus- Intents – Adapters - Internet Resources - Dialogs<br>Files and Directories: Files - Saving – retrieving – file Management - Databases – SQLite - Cursors and Content –Values – Working with SQLite. |                                                              |                                                             |                  |   |          |    |
|                                                                                                                                                                                                                                                                                                                                                 |                                                              |                                                             |                  |   |          |    |
| Unit:4                                                                                                                                                                                                                                                                                                                                          |                                                              | NETWORKING, LOCATION-BASED SERVICES AND MULTIMEDIA SERVICES |                  |   | 12 HOURS |    |
| Networking and Emailing services - Maps – Geocoding – Location - Based Services – Alarm – service – Toast – Threads – using sensors – Graphics – Media Player – Camera – Video – Working with Bluetooth, NFC and WiFi – Handling Telephony and SMS – Email.                                                                                     |                                                              |                                                             |                  |   |          |    |
|                                                                                                                                                                                                                                                                                                                                                 |                                                              |                                                             |                  |   |          |    |
| Unit:5                                                                                                                                                                                                                                                                                                                                          |                                                              | ANDROID AND IOS                                             |                  |   | 10 HOURS |    |
| Android: Development Tools – Architecture - Manifest - Application Life Cycle - Application Priority and Process States                                                                                                                                                                                                                         |                                                              |                                                             |                  |   |          |    |

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|                                                                                                                                |                                                                                                                      |          |
|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------|
| IOS: iPhone Developer - Apple Developer Connection - Memory Management - Fundamental iPhone Design Patterns – Tables and Views |                                                                                                                      |          |
|                                                                                                                                |                                                                                                                      |          |
| Unit:6                                                                                                                         | CONTEMPORARY ISSUES                                                                                                  | 2 HOURS  |
| Expert lectures, online seminars – webinars                                                                                    |                                                                                                                      |          |
|                                                                                                                                |                                                                                                                      |          |
|                                                                                                                                | Total Lecture hours                                                                                                  | 60 HOURS |
| Text Book(s)                                                                                                                   |                                                                                                                      |          |
| 1                                                                                                                              | William Lee, Mobile Communications Engineering: Theory and Applications, Willey, 2017                                |          |
| 2                                                                                                                              | Ajit Singh 5G Simplified, SPD,299                                                                                    |          |
| 3                                                                                                                              | Neil Smith, Android Studio 3.0 Development Essentials - Android 8 Edition,Payload Media, Inc. 207                    |          |
| 4                                                                                                                              | Ahmad Sahar , Craig Clayton, iOS 15 Programming for Beginners - Sixth Edition, Packt 2021                            |          |
| 5                                                                                                                              | Afif Osseiran, Jose F. Monserrat, Pathick Marsch, 5G Mobile Wireless Communication, Cambridge University Press, 2016 |          |
|                                                                                                                                |                                                                                                                      |          |
| Reference Books                                                                                                                |                                                                                                                      |          |
| 1                                                                                                                              | Pradeep Kothari, “Android Application Development” Dream tech Press, 2015                                            |          |
| 2                                                                                                                              | Matt Neuburg, Programming IOS 13 : Dive Deep into Views, View Controllers and Frame works, Orelly, 2019.             |          |
|                                                                                                                                |                                                                                                                      |          |
| Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]                                                                   |                                                                                                                      |          |
| 1                                                                                                                              | <a href="https://onlinecourses.nptel.ac.in/noc16_cs13">https://onlinecourses.nptel.ac.in/noc16_cs13</a>              |          |
|                                                                                                                                |                                                                                                                      |          |
| Course Designed By: Dr. T. RAMESH.                                                                                             |                                                                                                                      |          |

| <b>Mapping with Programme Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>COs</b>                             | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                             | M          | M          | S          | L          | S          | S          | L          | S          | S          | M           |
| <b>C03</b>                             | L          | M          | S          | S          | S          | S          | L          | S          | S          | S           |
| <b>C03</b>                             | L          | L          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C04</b>                             | M          | M          | S          | S          | S          | S          | L          | M          | S          | S           |
| <b>C05</b>                             | M          | M          | S          | S          | S          | S          | M          | M          | S          | M           |
|                                        |            |            |            |            |            |            |            |            |            |             |

\*S-Strong; M-Medium; L-Low

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|                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------|------|-----|------|-----|-----|----------|------|
|                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
| Unit:5                                                                                                                                                                                                                                                        |                                                                                                                                                                   | THE VERSATILITY OF QUANTUM COMPUTING |      |      |     |      |     |     | 12 hours |      |
| Fundamental Equation in Quantum Mechanics - Quantum Entanglement - Teleportation - Superdense Coding - Quantum Algorithms - Physical Realization of Quantum Computer - Challenges in the Development of Quantum Computers - Applications of Quantum Computing |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
|                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
| Unit:6                                                                                                                                                                                                                                                        |                                                                                                                                                                   | CONTEMPORARY ISSUES                  |      |      |     |      |     |     | 2 hours  |      |
| Expert lectures, online seminars – webinars                                                                                                                                                                                                                   |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
|                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
|                                                                                                                                                                                                                                                               |                                                                                                                                                                   | Total Lecture hours                  |      |      |     |      |     |     | 60 hours |      |
|                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
| Text Books                                                                                                                                                                                                                                                    |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
| 1                                                                                                                                                                                                                                                             | Nikhil Ranjan Roy and Kuntal Mukherjee, <i>Introductory Quantum Computing – A Practical Approach Using Python</i> , S. Chand & Company Ltd., First Edition, 2024. |                                      |      |      |     |      |     |     |          |      |
| Reference Books                                                                                                                                                                                                                                               |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
| 1                                                                                                                                                                                                                                                             | Michael A. Nielsen and Isaac L. Chuang, <i>Quantum Computation and Quantum Information</i> , Cambridge University Press, Reprint 2025.                            |                                      |      |      |     |      |     |     |          |      |
| 2                                                                                                                                                                                                                                                             | Helmut Bez and Tony Croft, <i>Quantum Computation</i> , CRC Press, Reprint 2025.                                                                                  |                                      |      |      |     |      |     |     |          |      |
|                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
| Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]                                                                                                                                                                                                  |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
| 1                                                                                                                                                                                                                                                             | <a href="https://www.tutorialspoint.com/quantum_computing/index.htm">https://www.tutorialspoint.com/quantum_computing/index.htm</a>                               |                                      |      |      |     |      |     |     |          |      |
| 2                                                                                                                                                                                                                                                             | <a href="https://www.geeksforgeeks.org/blogs/introduction-quantum-computing/">https://www.geeksforgeeks.org/blogs/introduction-quantum-computing/</a>             |                                      |      |      |     |      |     |     |          |      |
|                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
| Course Designed By:                                                                                                                                                                                                                                           |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
| Mapping with Programming Outcomes                                                                                                                                                                                                                             |                                                                                                                                                                   |                                      |      |      |     |      |     |     |          |      |
| Cos                                                                                                                                                                                                                                                           | PO 1                                                                                                                                                              | PO 2                                 | PO 3 | PO 4 | PO5 | PO 6 | PO7 | PO8 | PO9      | PO10 |
| C01                                                                                                                                                                                                                                                           | L                                                                                                                                                                 | L                                    | L    | S    | M   | S    | S   | M   | M        | S    |
| C02                                                                                                                                                                                                                                                           | M                                                                                                                                                                 | M                                    | S    | S    | M   | S    | M   | S   | S        | S    |
| C03                                                                                                                                                                                                                                                           | M                                                                                                                                                                 | S                                    | S    | S    | S   | S    | S   | S   | S        | S    |
| C04                                                                                                                                                                                                                                                           | S                                                                                                                                                                 | S                                    | S    | S    | S   | S    | S   | S   | S        | S    |
| C05                                                                                                                                                                                                                                                           | S                                                                                                                                                                 | S                                    | S    | S    | S   | S    | S   | S   | S        | S    |

\*S-Strong; M-Medium; L-Low

|                                                                                                                                                                                                                                                                                                                         |                                                                       |              |                  |         |       |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|--------------|------------------|---------|-------|---|
| Course code                                                                                                                                                                                                                                                                                                             | 2ED                                                                   | WEB SERVICES | L                | T       | P     | C |
| Core/Elective/Supportive                                                                                                                                                                                                                                                                                                | Elective-I                                                            |              | 4                | 4       |       | 4 |
| Pre-requisite                                                                                                                                                                                                                                                                                                           | Able to know the request/response services of Client and Server.      |              | Syllabus Version | 2021-22 |       |   |
| Course Objectives:                                                                                                                                                                                                                                                                                                      |                                                                       |              |                  |         |       |   |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                              |                                                                       |              |                  |         |       |   |
| 1. Present the Web Services , Building real world Enterprise applications using Web Services with Technologies XML, SOAP , WSDL , UDDI                                                                                                                                                                                  |                                                                       |              |                  |         |       |   |
| 2. Get overview of Distributed Computing, XML, and its technologies                                                                                                                                                                                                                                                     |                                                                       |              |                  |         |       |   |
| 3. Update with QoS and its features                                                                                                                                                                                                                                                                                     |                                                                       |              |                  |         |       |   |
| 4. Develop Standards and future of Web Services                                                                                                                                                                                                                                                                         |                                                                       |              |                  |         |       |   |
| Expected Course Outcomes:                                                                                                                                                                                                                                                                                               |                                                                       |              |                  |         |       |   |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                    |                                                                       |              |                  |         |       |   |
| 1                                                                                                                                                                                                                                                                                                                       | Understand web services and its related technologies                  |              |                  |         | K1,K2 |   |
| 2                                                                                                                                                                                                                                                                                                                       | Understand XML concepts                                               |              |                  |         | K2,K3 |   |
| 3                                                                                                                                                                                                                                                                                                                       | Analyze on SOAP and UDDI model                                        |              |                  |         | K3,K4 |   |
| 4                                                                                                                                                                                                                                                                                                                       | Demonstrate the road map for the standards and future of web services |              |                  |         | K4,K5 |   |
| 5                                                                                                                                                                                                                                                                                                                       | Analyze QoS enabled applications in web services                      |              |                  |         | K6    |   |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6- Create                                                                                                                                                                                                                                     |                                                                       |              |                  |         |       |   |
| Unit:1                                                                                                                                                                                                                                                                                                                  |                                                                       |              |                  |         |       |   |
| INTRODUCTION                                                                                                                                                                                                                                                                                                            |                                                                       |              | 12 hours         |         |       |   |
| Introduction to web services – Overview of Distributed Computing- Evolution and importance of web services-Industry standards, Technologies and concepts underlying web services-Web services and enterprises-web services standards organization-web services platforms.                                               |                                                                       |              |                  |         |       |   |
| Unit:2                                                                                                                                                                                                                                                                                                                  |                                                                       |              |                  |         |       |   |
| XML FUNDAMENTALS                                                                                                                                                                                                                                                                                                        |                                                                       |              | 12 hours         |         |       |   |
| XML Fundamentals – XML documents - XML Namespaces- XML Schema –Processing XML.                                                                                                                                                                                                                                          |                                                                       |              |                  |         |       |   |
| Unit:3                                                                                                                                                                                                                                                                                                                  |                                                                       |              |                  |         |       |   |
| SOAP AND WSDL                                                                                                                                                                                                                                                                                                           |                                                                       |              | 12 hours         |         |       |   |
| SOAP: The SOAP model- SOAP messages-SOAP encoding- WSDL: WSDL structure-interfacedefinitions-bindings-services-Using SOAP and WSDL-UDDI: About UDDI- UDDI registrySpecification- Core data structures-Accessing UDDI                                                                                                    |                                                                       |              |                  |         |       |   |
| Unit:4                                                                                                                                                                                                                                                                                                                  |                                                                       |              |                  |         |       |   |
| ADVANCED TECHNOLOGIES                                                                                                                                                                                                                                                                                                   |                                                                       |              | 12 hours         |         |       |   |
| Advanced web services technologies and standards: Conversations overview-web services conversation language-WSCL interface components. Workflow: business process management-workflows and workflow management systems Security: Basics-data handling and forwarding- data storage-errors-Web services security issues. |                                                                       |              |                  |         |       |   |
| Page 54 of 63                                                                                                                                                                                                                                                                                                           |                                                                       |              |                  |         |       |   |

|                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                     |                            |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------|
| <b>Unit:5</b>                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                     | <b>QUALITY OF SERVICE</b>  | <b>10 hours</b> |
| Quality of Service: Importance of QoS for web services-QoS metrics-holes-design patterns-QoS-enabled web services-QoS enabled applications. Web services management-web services standards and future trends. |                                                                                                                                                                                                                                                                     |                            |                 |
| <b>Unit:6</b>                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                     | <b>CONTEMPORARY ISSUES</b> | <b>2 hours</b>  |
| Expert lectures, online seminars – webinars                                                                                                                                                                   |                                                                                                                                                                                                                                                                     |                            |                 |
|                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                     | <b>Total Lecture hours</b> | <b>60 hours</b> |
|                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                     |                            |                 |
| <b>Text Books</b>                                                                                                                                                                                             |                                                                                                                                                                                                                                                                     |                            |                 |
| 1                                                                                                                                                                                                             | Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services: An Architects Guide”, Prentice Hall, Nov 2003.                                                                                                                                               |                            |                 |
| 2                                                                                                                                                                                                             | Keith Ballinger, “NET Web services: Architecture and Implementation with .Net”, Pearson Education, First Education Feb 2003.                                                                                                                                        |                            |                 |
| <b>Reference Books</b>                                                                                                                                                                                        |                                                                                                                                                                                                                                                                     |                            |                 |
| 1                                                                                                                                                                                                             | Ramesh Nagappan, Developing Java Web Services: Architecting and developing secure Web Services Using Java”, John Wiley and Sons, first Edition Feb 2003.                                                                                                            |                            |                 |
| 2                                                                                                                                                                                                             | Eric A Marks and Mark J Werrell, “Executive Guide to Web services”, John Wiley and sons, March 2003.                                                                                                                                                                |                            |                 |
| 3                                                                                                                                                                                                             | Anne Thomas Manes, “Web Services: A managers Guide” Addison Wesley, June 2003.                                                                                                                                                                                      |                            |                 |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                                                                                                                           |                                                                                                                                                                                                                                                                     |                            |                 |
| 1                                                                                                                                                                                                             | <a href="https://www.tutorialspoint.com/webservices/index.htm">https://www.tutorialspoint.com/webservices/index.htm</a>                                                                                                                                             |                            |                 |
| 2                                                                                                                                                                                                             | <a href="https://www.javatpoint.com/web-services-tutorial">https://www.javatpoint.com/web-services-tutorial</a>                                                                                                                                                     |                            |                 |
| 3                                                                                                                                                                                                             | <a href="https://www.btechguru.com/training--programming--xml--web-services--web-services-part-1-video-lecture--11801--24--147.html">https://www.btechguru.com/training--programming--xml--web-services--web-services-part-1-video-lecture--11801--24--147.html</a> |                            |                 |
| Course Designed By:                                                                                                                                                                                           |                                                                                                                                                                                                                                                                     |                            |                 |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | S          | S          | S          | M          | M          | S          | M          | M          | M          | S           |
| <b>C02</b>                               | S          | S          | S          | M          | M          | S          | M          | S          | M          | S           |
| <b>C03</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |

\*S-Strong; M-Medium; L-Low

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|                                                                     |                                                                                                                     |                            |                 |
|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------|
| <b>Unit:6</b>                                                       |                                                                                                                     | <b>CONTEMPORARY ISSUES</b> | <b>2 hours</b>  |
| Expert lectures, online seminars – webinars                         |                                                                                                                     |                            |                 |
|                                                                     |                                                                                                                     |                            |                 |
|                                                                     |                                                                                                                     | <b>Total Lecture hours</b> | <b>60 hours</b> |
|                                                                     |                                                                                                                     |                            |                 |
| <b>Text Books</b>                                                   |                                                                                                                     |                            |                 |
| 1                                                                   | P.D.Wasserman, "Neural computing and practice", Van Nostran Reinhold, New York, 1991.                               |                            |                 |
| 2                                                                   | LiminFu,"NeuralNetworkinComputerIntelligence",McGrawHill, International editions, 1994.                             |                            |                 |
| <b>Reference Books</b>                                              |                                                                                                                     |                            |                 |
| 1                                                                   | B Kosko, "Neural Network and Fuzzy systems", Prentice Hall,1996.                                                    |                            |                 |
| 2                                                                   | Klir& Yuan, "Fuzzy sets and Fuzzy logic", Theory and Applications, Prentice Hall of India, 1996.                    |                            |                 |
|                                                                     |                                                                                                                     |                            |                 |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b> |                                                                                                                     |                            |                 |
| 1                                                                   | <a href="http://www.myreaders.info/html/soft_computing.html">http://www.myreaders.info/html/soft_computing.html</a> |                            |                 |
| 2                                                                   | <a href="https://www.youtube.com/watch?v=mlfM4SGOAg0">https://www.youtube.com/watch?v=mlfM4SGOAg0</a>               |                            |                 |
| 3                                                                   | <a href="https://nptel.ac.in/courses/106/105/106105173/">https://nptel.ac.in/courses/106/105/106105173/</a>         |                            |                 |
|                                                                     |                                                                                                                     |                            |                 |
| Course Designed By:                                                 |                                                                                                                     |                            |                 |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | M          | S          | S          | S          | M          | S          | M          | M          | M          | S           |
| <b>C02</b>                               | M          | S          | S          | S          | M          | S          | M          | S          | S          | S           |
| <b>C03</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |

\*S-Strong; M-Medium; L-Low



|                                                                                                                                                                                                                                                                                                                           |                                                                                                                |                  |                  |   |         |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|------------------|------------------|---|---------|---|
| Course code                                                                                                                                                                                                                                                                                                               | 3EB                                                                                                            | EMBEDDED SYSTEMS | L                | T | P       | C |
| Core/Elective/Supportive                                                                                                                                                                                                                                                                                                  | Elective-II                                                                                                    |                  | 4                | 4 |         | 4 |
| Pre-requisite                                                                                                                                                                                                                                                                                                             | Able to know the basics of Hardware systems with understand the concept of basic processor like 8085, 8085 etc |                  | Syllabus Version |   | 2021-22 |   |
| Course Objectives:                                                                                                                                                                                                                                                                                                        |                                                                                                                |                  |                  |   |         |   |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                |                                                                                                                |                  |                  |   |         |   |
| 1. Present the introduction to 8051 Microcontroller Instruction Set, concepts on RTOS & Software tools.                                                                                                                                                                                                                   |                                                                                                                |                  |                  |   |         |   |
| 2. Gain the knowledge about the embedded software development.                                                                                                                                                                                                                                                            |                                                                                                                |                  |                  |   |         |   |
| 3. Learn about Microcontroller and software tools in the embedded systems.                                                                                                                                                                                                                                                |                                                                                                                |                  |                  |   |         |   |
| Expected Course Outcomes:                                                                                                                                                                                                                                                                                                 |                                                                                                                |                  |                  |   |         |   |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                      |                                                                                                                |                  |                  |   |         |   |
| 1                                                                                                                                                                                                                                                                                                                         | Understand the concept of 8051 microcontroller                                                                 |                  |                  |   | K1,K2   |   |
| 2                                                                                                                                                                                                                                                                                                                         | Understand the Instruction Set and Programming                                                                 |                  |                  |   | K2,K3   |   |
| 3                                                                                                                                                                                                                                                                                                                         | Analyze the concepts of RTOS                                                                                   |                  |                  |   | K4,K5   |   |
| 4                                                                                                                                                                                                                                                                                                                         | Analyze and design various real time embedded systems using RTOS                                               |                  |                  |   | K5,K6   |   |
| 5                                                                                                                                                                                                                                                                                                                         | Debug the malfunctioning system using various debugging techniques                                             |                  |                  |   | K6      |   |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6- Create                                                                                                                                                                                                                                       |                                                                                                                |                  |                  |   |         |   |
| Unit:1                                                                                                                                                                                                                                                                                                                    |                                                                                                                |                  |                  |   |         |   |
| 8051 MICROCONTROLLER                                                                                                                                                                                                                                                                                                      |                                                                                                                | 12 hours         |                  |   |         |   |
| 8051 Microcontroller: Introduction - 8051 Architecture-Input/Output Pins, Ports and Circuits - External Memory - Counters / Timers - Serial Data Input / Output -Interrupts                                                                                                                                               |                                                                                                                |                  |                  |   |         |   |
| Unit:2                                                                                                                                                                                                                                                                                                                    |                                                                                                                |                  |                  |   |         |   |
| BASICS OF PROGRAMMING                                                                                                                                                                                                                                                                                                     |                                                                                                                | 12 hours         |                  |   |         |   |
| Instruction Set and Programming Moving Data-Addressing Modes-Logical operations- Arithmetic Operation-Jump and Call Instructions-Simple Program. Applications: Keyboard Interface- Display Interface-Pulse Measurements-DIA and AID Conversions-Multiple Interrupts.                                                      |                                                                                                                |                  |                  |   |         |   |
| Unit:3                                                                                                                                                                                                                                                                                                                    |                                                                                                                |                  |                  |   |         |   |
| RTOS CONCEPTS                                                                                                                                                                                                                                                                                                             |                                                                                                                | 12 hours         |                  |   |         |   |
| CONCEPTS ON RTOS: Introduction to RTOS-Selecting an RTOS-Task and Task states - Tasks and data- Semaphores and shared data. MORE operating systems services: Interrupt Process communication - Message Queues, Mailboxes and pipes- Timer Functions-Events - Memory Management-Interrupt Routines in an RTOS Environment. |                                                                                                                |                  |                  |   |         |   |
| Unit:4                                                                                                                                                                                                                                                                                                                    |                                                                                                                |                  |                  |   |         |   |
| DESIGN USING RTOS                                                                                                                                                                                                                                                                                                         |                                                                                                                | 10 hours         |                  |   |         |   |
| Basic Design using a RTOS: Principles - Encapsulating semaphores and Queues-Hard real time scheduling considerations-Saving memory space and power- introductions to RTL &QNX.                                                                                                                                            |                                                                                                                |                  |                  |   |         |   |
| Page 58 of 63                                                                                                                                                                                                                                                                                                             |                                                                                                                |                  |                  |   |         |   |

|                                                                                                                                                                                                                                                                                                  |                                                                                                                                   |                            |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------|
| <b>Unit:5</b>                                                                                                                                                                                                                                                                                    |                                                                                                                                   | <b>SOFTWARE TOOLS</b>      | <b>12 hours</b> |
| SOFTWARE TOOLS: Embedded software Development Tools:Hosts and Target Machines-Linker/Locators for Embedded software-getting Embedded software into the Target systems. Debugging Techniques: Testing on your Host machine -Instruction set simulators- The assert macro- using laboratory tools. |                                                                                                                                   |                            |                 |
| <b>Unit:6</b>                                                                                                                                                                                                                                                                                    |                                                                                                                                   | <b>CONTEMPORARY ISSUES</b> | <b>2 hours</b>  |
| Expert lectures, online seminars – webinars                                                                                                                                                                                                                                                      |                                                                                                                                   |                            |                 |
|                                                                                                                                                                                                                                                                                                  |                                                                                                                                   | <b>Total Lecture hours</b> | <b>60 hours</b> |
|                                                                                                                                                                                                                                                                                                  |                                                                                                                                   |                            |                 |
| <b>Text Books</b>                                                                                                                                                                                                                                                                                |                                                                                                                                   |                            |                 |
| 1                                                                                                                                                                                                                                                                                                | David E. Simon, “An Embedded Software primer” Pearson Education Asia, 2003.                                                       |                            |                 |
| 2                                                                                                                                                                                                                                                                                                | Kenneth J Ayala, “The 8051 Microcontroller and Architecture programming and application”, Second Edition, Penram International.   |                            |                 |
| <b>Reference Books</b>                                                                                                                                                                                                                                                                           |                                                                                                                                   |                            |                 |
| 1                                                                                                                                                                                                                                                                                                | Raj Kamal, “Embedded Systems – Architecture, programming and design”, Tata McGraw – Hill, 2003.                                   |                            |                 |
|                                                                                                                                                                                                                                                                                                  |                                                                                                                                   |                            |                 |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                                                                                                                                                                                                              |                                                                                                                                   |                            |                 |
| 1                                                                                                                                                                                                                                                                                                | <a href="https://onlinecourses.nptel.ac.in/noc20_cs14/preview">https://onlinecourses.nptel.ac.in/noc20_cs14/preview</a>           |                            |                 |
| 2                                                                                                                                                                                                                                                                                                | <a href="https://www.javatpoint.com/embedded-system-tutorial">https://www.javatpoint.com/embedded-system-tutorial</a>             |                            |                 |
| 3                                                                                                                                                                                                                                                                                                | <a href="https://www.tutorialspoint.com/embedded_systems/index.htm">https://www.tutorialspoint.com/embedded_systems/index.htm</a> |                            |                 |
|                                                                                                                                                                                                                                                                                                  |                                                                                                                                   |                            |                 |
| Course Designed By:                                                                                                                                                                                                                                                                              |                                                                                                                                   |                            |                 |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | L          | L          | L          | S          | M          | S          | S          | M          | M          | S           |
| <b>C02</b>                               | M          | M          | S          | S          | M          | S          | M          | S          | S          | S           |
| <b>C03</b>                               | M          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |

\*S-Strong; M-Medium; L-Low

|                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                           |                                         |          |   |         |       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|----------|---|---------|-------|
| Course code                                                                                                                                                                                                                                                                                                                                       | 3EC                                                                                                                       | BLOCK CHAIN TECHNOLOGY                  | L        | T | P       | C     |
| Core/Elective/Supportive                                                                                                                                                                                                                                                                                                                          |                                                                                                                           | Elective II                             | 4        | 4 |         | 4     |
| Pre-requisite                                                                                                                                                                                                                                                                                                                                     |                                                                                                                           | Basics of Block Chain & Crypto Currency | Syllabus |   | 2025-26 |       |
| Course Objectives:                                                                                                                                                                                                                                                                                                                                |                                                                                                                           |                                         |          |   |         |       |
| The main objectives of this course are to:                                                                                                                                                                                                                                                                                                        |                                                                                                                           |                                         |          |   |         |       |
| 1. Understand the fundamentals of block chain and cryptocurrency.                                                                                                                                                                                                                                                                                 |                                                                                                                           |                                         |          |   |         |       |
| 2. Understand the influence and role of block chain in various other fields.                                                                                                                                                                                                                                                                      |                                                                                                                           |                                         |          |   |         |       |
| 3. Learn security features and its significance.                                                                                                                                                                                                                                                                                                  |                                                                                                                           |                                         |          |   |         |       |
| 4. Identify problems & challenges posed by Block Chain.                                                                                                                                                                                                                                                                                           |                                                                                                                           |                                         |          |   |         |       |
| Expected Course Outcomes:                                                                                                                                                                                                                                                                                                                         |                                                                                                                           |                                         |          |   |         |       |
| On the successful completion of the course, student will be able to:                                                                                                                                                                                                                                                                              |                                                                                                                           |                                         |          |   |         |       |
| 1                                                                                                                                                                                                                                                                                                                                                 | Demonstrate blockchain technology and crypto currency                                                                     |                                         |          |   |         | K1,K2 |
| 2                                                                                                                                                                                                                                                                                                                                                 | Understand the mining mechanism in blockchain                                                                             |                                         |          |   |         | K2    |
| 3                                                                                                                                                                                                                                                                                                                                                 | Apply and identify security measures, and various types of services that allow people to trade and transact with bitcoins |                                         |          |   |         | K3,K4 |
| 4                                                                                                                                                                                                                                                                                                                                                 | Apply and analyze Blockchain in health care industry                                                                      |                                         |          |   |         | K4,K5 |
| 5                                                                                                                                                                                                                                                                                                                                                 | Analyze security, privacy, and efficiency of a given Blockchain system                                                    |                                         |          |   |         | K5,K6 |
| K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create                                                                                                                                                                                                                                                              |                                                                                                                           |                                         |          |   |         |       |
| Unit:1                                                                                                                                                                                                                                                                                                                                            |                                                                                                                           |                                         |          |   |         |       |
| INTRODUCTION                                                                                                                                                                                                                                                                                                                                      |                                                                                                                           |                                         | 12 hours |   |         |       |
| Introduction to Blockchain - The big picture of the industry – size, growth, structure, players. Bitcoin versus Cryptocurrencies versus Blockchain - Distributed Ledger Technology (DLT). Strategic analysis of the space – Blockchain platforms, regulators, application providers. The major application: currency, identity, chain of custody. |                                                                                                                           |                                         |          |   |         |       |
| Unit:2                                                                                                                                                                                                                                                                                                                                            |                                                                                                                           |                                         |          |   |         |       |
| NETWORK AND SECURITY                                                                                                                                                                                                                                                                                                                              |                                                                                                                           |                                         | 12 hours |   |         |       |
| Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Blockchain 1.0, 2.0 and 3.0 – transition, advancements and features. Privacy, Security issues in Blockchain.                                                                                                                       |                                                                                                                           |                                         |          |   |         |       |
| Unit:3                                                                                                                                                                                                                                                                                                                                            |                                                                                                                           |                                         |          |   |         |       |
| CRYPTOCURRENCY                                                                                                                                                                                                                                                                                                                                    |                                                                                                                           |                                         | 12 hours |   |         |       |
| Cryptocurrency - History, Distributed Ledger, Bitcoin protocols -Symmetric-key cryptography - Public-key cryptography - Digital Signatures -High and Low trust societies - Types of Trust model: Peer-to-Peer, Leviathan, and Intermediary. Application of Cryptography to Blockchain                                                             |                                                                                                                           |                                         |          |   |         |       |
| Unit:4                                                                                                                                                                                                                                                                                                                                            |                                                                                                                           |                                         |          |   |         |       |
| CRYPTOCURRENCY REGULATION                                                                                                                                                                                                                                                                                                                         |                                                                                                                           |                                         | 11 hours |   |         |       |
| Cryptocurrency Regulation - Stakeholders, Roots of Bit coin, Legal views - exchange of cryptocurrency - Black Market - Global Economy. Cyrptoeconomics – assets, supply and                                                                                                                                                                       |                                                                                                                           |                                         |          |   |         |       |

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| demand, inflation and deflation – Regulation.                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                           |          |
|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                           |          |
| Unit:5                                                                                                                                                                                                                                                                                                                                             | CHALLENGES IN BLOCK CHAIN                                                                                                                                                                                 | 11 hours |
| Opportunities and challenges in Block Chain – Application of block chain: Industry 4.0 – machine to machine communication – Data management in industry 4.0 – future prospects. Block chain in Health 4.0 - Blockchain properties - Healthcare Costs - Healthcare Quality - Healthcare Value - Challenges for using blockchain for healthcare data |                                                                                                                                                                                                           |          |
|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                           |          |
| Unit:6                                                                                                                                                                                                                                                                                                                                             | CONTEMPORARY ISSUES                                                                                                                                                                                       | 2 hours  |
| Expert lectures, online seminars – webinars                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                           |          |
|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                           |          |
|                                                                                                                                                                                                                                                                                                                                                    | Total Lecture hours                                                                                                                                                                                       | 60 hours |
|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                           |          |
| Text Books                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                           |          |
| 1                                                                                                                                                                                                                                                                                                                                                  | Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press (July 19, 2016). |          |
| 2                                                                                                                                                                                                                                                                                                                                                  | Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”                                                                                                                                     |          |
| Reference Books                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                           |          |
| 1                                                                                                                                                                                                                                                                                                                                                  | Satoshi Nakamoto, “Bitcoin: A Peer-to-Peer Electronic Cash System”                                                                                                                                        |          |
| 2                                                                                                                                                                                                                                                                                                                                                  | Rodrigo da Rosa Righi, Antonio Marcos Alberti, Madhusudan Singh, “Blockchain Technology for Industry 4.0” Springer 2020.                                                                                  |          |
|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                           |          |
| Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                           |          |
| 1                                                                                                                                                                                                                                                                                                                                                  | <a href="https://www.javatpoint.com/blockchain-tutorial">https://www.javatpoint.com/blockchain-tutorial</a>                                                                                               |          |
| 2                                                                                                                                                                                                                                                                                                                                                  | <a href="https://www.tutorialspoint.com/blockchain/index.htm">https://www.tutorialspoint.com/blockchain/index.htm</a>                                                                                     |          |
| 3                                                                                                                                                                                                                                                                                                                                                  | <a href="https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/">https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/</a>                                                                               |          |
|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                           |          |
| Course Designed By:                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                           |          |

| Mapping with Programming Outcomes |     |     |     |     |     |     |     |     |     |      |
|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Cos                               | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1                               | S   | S   | S   | S   | S   | S   | S   | M   | S   | M    |
| CO2                               | S   | S   | S   | S   | S   | S   | S   | S   | S   | S    |
| CO3                               | S   | S   | S   | S   | S   | S   | S   | S   | S   | S    |
| CO4                               | S   | S   | S   | S   | S   | S   | S   | S   | S   | S    |
| CO5                               | S   | S   | S   | S   | S   | S   | S   | S   | S   | S    |

\*S-Strong; M-Medium; L-Low

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|                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                             |                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Unit:4</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>SOLVE PROBLEMS</b>                                                                                                                                                       | <b>12 hours</b> |
| Problem solving: problem definition, problem solving methods, selecting and using information,data processing, solution methods, solving problems by searching, recognizing patterns, spatial reasoning, necessity and sufficiency, choosing and using models, making choices and decisions.                                                                                                 |                                                                                                                                                                             |                 |
| <b>Unit:5</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>REASONING</b>                                                                                                                                                            | <b>10 hours</b> |
| Reasoning: Deductive and hypothetical reasoning, computational problem solving; generating, implementing, and evaluating solutions, interpersonal problem solving. Advanced problem solving: Combining skills – using imagination, developing models, Carrying out investigations, Data analysis and inference. Graphical methods of solution, Probability, tree diagrams and decision trees |                                                                                                                                                                             |                 |
| <b>Unit:6</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>CONTEMPORARY ISSUES</b>                                                                                                                                                  | <b>2 hours</b>  |
| Expert lectures, online seminars – webinars                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                             |                 |
|                                                                                                                                                                                                                                                                                                                                                                                              | <b>Total Lecture hours</b>                                                                                                                                                  | <b>60 hours</b> |
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                             |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                            | John Butterworth and Geoff Thwaites, Thinking skills: Critical Thinking and Problem Solving, Cambridge University Press, 2013.                                              |                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                            | H. S. Fogler and S. E. LeBlanc, Strategies for Creative Problem Solving, 2nd edition, Pearson, Upper Saddle River, NJ, 2008.                                                |                 |
| 3                                                                                                                                                                                                                                                                                                                                                                                            | A. Whimbey and J. Lochhead, Problem Solving & Comprehension, 6th edition, Lawrence Erlbaum, Mahwah, NJ, 1999.                                                               |                 |
| <b>Reference Books</b>                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                             |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                            | M. Levine, Effective Problem Solving, 2nd edition, Prentice Hall, Upper Saddle River, NJ, 1994.                                                                             |                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                            | Michael Baker, The Basic of Critical Thinking, The Critical Thinking Co press, 2015.                                                                                        |                 |
| 3                                                                                                                                                                                                                                                                                                                                                                                            | David Kelley and Tom Kelley, Creative Confidence, 2013.                                                                                                                     |                 |
| <b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                             |                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                            | <a href="https://www.tutorialspoint.com/critical_thinking/index.htm">https://www.tutorialspoint.com/critical_thinking/index.htm</a>                                         |                 |
| 2                                                                                                                                                                                                                                                                                                                                                                                            | <a href="https://www.tutorialspoint.com/design_thinking/design_thinking_quick_guide.htm">https://www.tutorialspoint.com/design_thinking/design_thinking_quick_guide.htm</a> |                 |
| 3                                                                                                                                                                                                                                                                                                                                                                                            | <a href="https://nptel.ac.in/courses/109/104/109104109/">https://nptel.ac.in/courses/109/104/109104109/</a>                                                                 |                 |
| Course Designed By:                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                             |                 |

| <b>Mapping with Programming Outcomes</b> |            |            |            |            |            |            |            |            |            |             |
|------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| <b>Cos</b>                               | <b>P01</b> | <b>P02</b> | <b>P03</b> | <b>P04</b> | <b>P05</b> | <b>P06</b> | <b>P07</b> | <b>P08</b> | <b>P09</b> | <b>P010</b> |
| <b>C01</b>                               | S          | S          | M          | S          | S          | S          | M          | S          | S          | S           |
| <b>C02</b>                               | S          | S          | M          | S          | S          | S          | M          | S          | S          | S           |
| <b>C03</b>                               | S          | S          | M          | S          | S          | S          | S          | S          | S          | S           |
| <b>C04</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |
| <b>C05</b>                               | S          | S          | S          | S          | S          | S          | S          | S          | S          | S           |

\*S-Strong; M-Medium; L-Low