

**DIPLOMA CURRICULUM OF  
INFORMATION TECHNOLOGY  
ENGINEERING  
(THIRD YEAR)  
(5<sup>th</sup> Semester)**

**(To be implemented from 2026-27)**

***Prepared by;***



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| Teaching and Evaluation Scheme for Fifth Semester Information Technology |                    |             |                                                                                                                               |               |                |   |    |                   |                        |              |                        |             |         |
|--------------------------------------------------------------------------|--------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|---|----|-------------------|------------------------|--------------|------------------------|-------------|---------|
|                                                                          |                    |             |                                                                                                                               | Study Scheme  |                |   |    | Evaluation Scheme |                        |              |                        |             |         |
| Sl. No.                                                                  | Category of course | Course Code | Course Title                                                                                                                  | Pre-requisite | Periods / Week |   |    | Theory            |                        | Practical    |                        | Total Marks | Credits |
|                                                                          |                    |             |                                                                                                                               |               | L              | T | P  | End Sem Exam      | Progressive Assessment | End Sem Exam | Progressive Assignment |             |         |
| 1                                                                        | Programme Core     | ITPC301 TH1 | Internet of Things (IoT)                                                                                                      |               | 3              | 0 | 0  | 70                | 30                     | 0            | 0                      | 100         | 3       |
| 2                                                                        |                    | ITPC303 TH2 | Web Technologies                                                                                                              |               | 3              | 0 | 0  | 70                | 30                     | 0            | 0                      | 100         | 3       |
| 3                                                                        |                    | ITPC305 PR1 | Internet of Things (IoT) Lab                                                                                                  |               | 0              | 0 | 4  | 0                 | 0                      | 15           | 35                     | 50          | 2       |
| 4                                                                        |                    | ITPC307 PR2 | Web Technologies Lab                                                                                                          |               | 0              | 0 | 4  | 0                 | 0                      | 15           | 35                     | 50          | 2       |
| 5                                                                        | Programme Elective | ITPE301 TH3 | (A) Programming with Java<br>(B) Data Science: Data Warehousing and Data Mining<br>(C) Advanced Computer Networks             |               | 3              | 0 | 0  | 70                | 30                     | 0            | 0                      | 100         | 3       |
| 6                                                                        |                    | ITPE303 TH4 | (A) Mobile Computing<br>(B) Cyber Security<br>(C) Data Analytics                                                              |               | 3              | 0 | 0  | 70                | 30                     | 0            | 0                      | 100         | 3       |
| 7                                                                        |                    | ITPE305 PR3 | (A) Programming with Java Lab<br>(B) Data Science: Data Warehousing and Data Mining Lab<br>(C) Advanced Computer Networks Lab |               | 0              | 0 | 4  | 0                 | 0                      | 15           | 35                     | 50          | 2       |
| 8                                                                        | Open Elective      | OE301 TH5   | Open Elective - I<br>(A) Universal Human Values<br>(B) Leadership and Management Skills<br>(C) Professional Skills            |               | 3              | 0 | 0  | 70                | 30                     | 0            | 0                      | 100         | 3       |
| 9                                                                        | Summer Internship  | SI301       | Summer Internship - II<br>(4-6weeks) after IV SEM                                                                             |               | 0              | 0 | 0  | 0                 | 0                      | 15           | 35                     | 50          | 2       |
| 10                                                                       | Major Project      | PR301 PR4   | Major Project - I                                                                                                             |               | 0              | 0 | 4  | 0                 | 0                      | 15           | 35                     | 50          | 2       |
|                                                                          |                    |             |                                                                                                                               |               | 15             | 0 | 16 | 350               | 150                    | 75           | 175                    | 750         | 25      |

## **SEMESTER - V COURSES**

### TH1- INTERNET OF THINGS

| L                     | T | P | Total Marks = 100 | Course Code: ITPC301       |
|-----------------------|---|---|-------------------|----------------------------|
| 3                     | 0 | 0 |                   | Theory Assessment          |
| Total Contact Hrs: 45 |   |   |                   | End Term Exam: 70          |
| Theory:45             |   |   |                   | Progressive Assessment: 30 |
| Tutorial:0            |   |   |                   | Category of Course: PC     |
| Practical:0           |   |   |                   |                            |
| Pre-requisite: NIL    |   |   |                   |                            |
| Credit: 3             |   |   |                   |                            |

### RATIONALE:

The Internet of Things (IoT) is revolutionizing the way devices communicate, interact, and function, creating a connected world that bridges physical and digital spaces. With industries embracing smart solutions in areas like healthcare, agriculture, manufacturing, transportation, and home automation, there is a growing demand for skilled professionals who can design, implement, and manage IoT systems.

### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Explain Core IoT Concepts, including architecture, components, and communication models.
- Identify IoT Ecosystem Elements, such as sensors, actuators, microcontrollers, communication protocols, and cloud platforms.
- Integrate Hardware Components like Arduino, Raspberry Pi, sensors, and actuators for IoT projects.
- Analyze Sensor Data from IoT devices.
- Identify Common Security Threats in IoT ecosystems, including data breaches, device hijacking, and network vulnerabilities.

### DETAILED COURSE CONTENTS:

| <b>Unit No.</b> | <b>Topic/Sub-Topic</b>                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Allotted Time (Hours)</b> |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| I               | <b>Introduction to Internet of Things (IoT)</b> - Overview of IoT - Definition and significance of IoT, Historical evolution and future prospects, Applications across various industries, IoT Architecture and Components, Basic architecture - sensors, actuators, connectivity, and data processing, Hardware components: microcontrollers (e.g., Arduino, Raspberry Pi), Software components: operating systems and middleware. | 8                            |
| II              | <b>Sensors, Actuators, and Data Acquisition:</b> Sensors and Actuators, Types of sensors: temperature, humidity, motion, etc., Actuators: motors, relays, and control mechanisms, Interfacing sensors and actuators with                                                                                                                                                                                                            | 10                           |

|     |                                                                                                                                                                                                                                                                                                                                                                                            |    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|     | microcontrollers, Data Acquisition and Processing - Analog and digital data acquisition methods, Signal conditioning and filtering techniques, Introduction to data processing and storage.                                                                                                                                                                                                |    |
| III | <b>Communication Protocols and Networking</b> - IoT Communication Protocols, Overview of protocols: MQTT, CoAP, HTTP, etc., Wireless communication: Wi-Fi, Bluetooth, Zigbee, Lora WAN., Wired communication: Ethernet, Serial communication, Networking Fundamentals - IP addressing and subnetting, Network topologies and architectures, Introduction to IPv6 and its relevance to IoT. | 10 |
| IV  | <b>IoT Platforms and Cloud Integration</b> - IoT Platforms, Overview of popular IoT platforms (e.g., AWS IoT, Google Cloud IoT), Data analytics and visualization tools, Edge computing concepts, Cloud Computing for IoT, Introduction to cloud services: IaaS, PaaS, SaaS, Integration of IoT devices with cloud platforms, Data storage, processing, and management in cloud.           | 10 |
| V   | <b>IoT Security and Privacy</b> - Security Challenges in IoT, Common vulnerabilities and threats, Authentication and authorization mechanisms, Data encryption and secure communication, Privacy Considerations - Data privacy laws and regulations, User consent and data ownership, Best Practices for ensuring privacy in IoT applications.                                             | 7  |

## REFERENCES:

|    |                                                                                                                               |
|----|-------------------------------------------------------------------------------------------------------------------------------|
| 1. | Internet of Things by Jeeva Jose                                                                                              |
| 2. | Internet of Things by Raj Kamal                                                                                               |
| 3. | Internet of Things (IoT) by Dr. Kamlesh Lakhwani, Dr. Hemant Kumar Gainey, Joseph Kofi Wireko, and Kamal Kant Hiran           |
| 4. | Internet of Things: From research and innovation to market deployment by Dr. Ovidiu Vermesan and Dr. Peter Friess             |
| 5. | The Internet of Things in the Cloud: A Middleware Perspective by Honbo Zhou                                                   |
| 6. | Internet of Things: Architectures, Protocols and Standards by Simone Cirani, Gianluigi Ferrari, Marco Picone, and Luca Veltri |
| 7. | Internet of Things (IoT): Concepts and Applications edited by Dr. Jamil Y. Khan and Dr. Mehmet R. Yuce                        |

## TH2- WEB TECHNOLOGIES

|                              |          |          |                          |                               |
|------------------------------|----------|----------|--------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 100</b> | <b>Course Code: ITPC303</b>   |
| 3                            | 0        | 0        |                          | <b>Theory Assessment</b>      |
| <b>Total Contact Hrs: 45</b> |          |          |                          | End TermExam: 70              |
| Theory: 45                   |          |          |                          | Progressive Assessment: 30    |
| Tutorial: 0                  |          |          |                          | <b>Category of Course: PC</b> |
| Practical: 0                 |          |          |                          |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                          |                               |
| <b>Credit: 3</b>             |          |          |                          |                               |

### RATIONALE:

This course provides a comprehensive understanding of web technologies, covering both client- side and server-side development. Students will learn web architecture, scripting languages like JavaScript and PHP, and database integration to build dynamic and interactive web applications. By the end of the course, they will be equipped with the skills to develop secure, scalable, and efficient web-based systems.

### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Identify key web development protocols, technologies, and architectures.
- Explain the role of client-side and server-side scripting in dynamic web applications.
- Develop interactive web pages using HTML, CSS, JavaScript, and PHP.
- Compare different web application architectures and evaluate their scalability and security.
- Develop a functional, database-driven web application using modern web development tools.

### DETAILED COURSE CONTENTS:

| <b>Unit No.</b> | <b>Topic/Sub-Topic</b>                                                                                                                                                                                                                                                                         | <b>Allotted Time (Hours)</b> |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| I               | <b>Introduction to www:</b> Protocols and programs, secure connections, application and development tools, the web browser, what is server, setting up UNIX and LINUX web servers, Logging users, dynamic IP<br><b>Web Design:</b> Website design principles, planning the site and navigation | 8                            |
| II              | <b>Web Systems Architecture:</b> Architecture of Web based systems- client/server (2-tier) architecture, 3-Tier architecture, Building blocks of fast and scalable data access Concepts - Caches-Proxies- Indexes-Load Balancers- Queues, Web Application architecture (WAA)                   | 8                            |
| III             | <b>JavaScript:</b> Client-side scripting, what is JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition.                                                                                                                                                       | 8                            |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| IV | <b>Advance scripting:</b> JavaScript and objects, JavaScript own objects, DOM and web browser environments, forms and validations, DHTML: Combining HTML, CSS and JavaScript, events and buttons, controlling your browser, Ajax: Introduction advantages & disadvantages, Ajax based web application, alternatives of Ajax, XML, XSL and XSLT: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, XML with application, XSL and XSLT. Introduction to Web Services | 8 |
| V  | <b>PHP:</b> Server-side scripting, Arrays, function and forms, advance PHP Databases - Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting Database, deleting data and tables, PHP my admin and database bugs.                                                                                                                               | 8 |
| VI | <b>Introduction to Modern Frameworks:</b> React, Angular, Node JS, Bootstrap, Tailwind CSS.                                                                                                                                                                                                                                                                                                                                                                                                         | 5 |

## REFERENCES:

|    |                                                                                         |
|----|-----------------------------------------------------------------------------------------|
| 1. | “Web Technologies--A Computer Science Perspective”, Jeffrey C.Jackson                   |
| 2. | “Internet & World Wide Web How To Program”, Deitel, Deitel, Goldberg, Pearson Education |
| 3. | “Web programming- Building Internet Application”, Chris Bales                           |
| 4. | Web Applications: Concepts and Real World Design, Knuckles.                             |



## PR1- INTERNET OF THINGS LAB

|                              |          |          |                         |                               |
|------------------------------|----------|----------|-------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 50</b> | <b>Course Code: ITPC305</b>   |
| 0                            | 0        | 4        |                         | <b>Theory Assessment</b>      |
| <b>Total Contact Hrs: 60</b> |          |          |                         | End Term Exam: 15             |
| Theory:0                     |          |          |                         | Progressive Assessment: 35    |
| Tutorial:0                   |          |          |                         | <b>Category of Course: PC</b> |
| Practical:60                 |          |          |                         |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                         |                               |
| <b>Credit: 2</b>             |          |          |                         |                               |

### RATIONALE:

The Internet of Things (IoT) Lab course provides hands-on experience in designing and implementing IoT-based systems using microcontrollers, sensors, and communication protocols. Students will learn how to collect, process, and transmit data securely using industry- standard tools and cloud platforms. The course emphasizes practical applications of IoT, covering automation, real-time data processing, and secure data communication.

### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Identify various IoT components, including microcontrollers, sensors, and communication protocols.
- Explain the working principles of IoT devices and protocols like MQTT, HTTP, and Wi-Fi communication.
- Interface sensors and actuators with Arduino and Raspberry Pi for data collection and automation.
- Process real-time sensor data and visualize insights using Python and cloud-based platforms.
- Implement security mechanisms like data encryption to ensure secure IoT communication.
- Develop a functional IoT application, such as a smart home automation system, integrating multiple IoT technologies.

### DETAILED COURSE CONTENTS:

| <b>Unit No.</b> | <b>Topic/Sub-Topic</b>                                                                                             | <b>Allotted Time (Hours)</b> |
|-----------------|--------------------------------------------------------------------------------------------------------------------|------------------------------|
| I               | Setting up Arduino and Raspberry Pi boards. Running a basic LED blink program.                                     | 6                            |
| II              | Connecting a temperature and humidity sensor (DHT11) to Arduino. Displaying sensor readings on the Serial Monitor. | 6                            |
| III             | Connecting a PIR motion sensor and LDR (Light Dependent Resistor). Displaying motion and light intensity values.   | 6                            |

|      |                                                                                                        |   |
|------|--------------------------------------------------------------------------------------------------------|---|
| IV   | Interfacing a relay module with Arduino. Turning an LED or motor ON/OFF based on sensor input.         | 6 |
| V    | Installing an MQTT broker (e.g., Mosquitto). Sending and receiving messages using MQTT.                | 6 |
| VI   | Connecting an ESP8266 module to a Wi-Fi network. Sending sensor data to a cloud platform (ThingSpeak). | 6 |
| VII  | Collecting and processing real-time sensor data. Implementing basic edge computing using Python.       | 6 |
| VIII | Storing IoT sensor data in a CSV file. Visualizing the data using Matplotlib in Python.                | 6 |
| IX   | Encrypting sensor data before transmission. Implementing simple AES encryption using Python.           | 6 |
| X    | Controlling home appliances using a web interface. Turning devices ON/OFF using HTTP requests.         | 6 |

## REFERENCES:

|    |                                                                                                                                   |
|----|-----------------------------------------------------------------------------------------------------------------------------------|
| 1. | Pethuru R., Buyya R., Internet of Things: Principles and Paradigms, 1st Edition, Morgan Kaufmann, Cambridge, 2016.                |
| 2. | Madiseti V., Bahga A., Internet of Things: A Hands-on Approach, 1st Edition, VPT, Atlanta, 2014.                                  |
| 3. | Hersent O., Boswarthick D., Elloumi O., The Internet of Things: Key Applications and Protocols, 2nd Edition, Wiley, London, 2012. |
| 4. | Pujolle G., Security in IoT: Challenges and Solutions, 1st Edition, Springer, Cham, 2020.                                         |
| 5. | Dalmasso E., Programming the Internet of Things (IoT): Using JavaScript and Node.js, 1st Edition, Apress, New York, 2021.         |

## PR2- WEB TECHNOLOGIES LAB

|                              |          |          |                         |                               |
|------------------------------|----------|----------|-------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 50</b> | <b>Course Code: ITPC307</b>   |
| 0                            | 0        | 4        |                         | <b>Theory Assessment</b>      |
| <b>Total Contact Hrs: 60</b> |          |          |                         | End TermExam: 15              |
| Theory:0                     |          |          |                         | Progressive Assessment: 35    |
| Tutorial:0                   |          |          |                         | <b>Category of Course: PC</b> |
| Practical:60                 |          |          |                         |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                         |                               |
| <b>Credit: 2</b>             |          |          |                         |                               |

### RATIONALE:

This course provides hands-on experience in full-stack web development, covering both frontend and backend technologies. Students will build dynamic web applications using HTML, CSS, JavaScript, PHP, and MySQL while understanding client-server interactions. By the end of the course, they will be able to develop and deploy a fully functional web service application.

### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Use LAMP Stack (or XAMPP) for web applications.
- Write simple applications with Technologies like HTML, JavaScript, PHP, CSS.
- Connect to Database and get results.
- Develop a fully functional web service application.

### DETAILED COURSE CONTENTS:

| <b>Unit No.</b> | <b>Topic/Sub-Topic</b>                                                                                   | <b>Allotted Time (Hours)</b> |
|-----------------|----------------------------------------------------------------------------------------------------------|------------------------------|
| I               | Coding Server Client Programs                                                                            | 4                            |
| II              | Developing Web Application using HTML, JavaScript                                                        | 6                            |
| III             | Developing Advanced Web Application Programs using CSS                                                   | 10                           |
| IV              | Practicing PHP: Basics                                                                                   | 10                           |
| V               | Practicing PHP: Web Application Development                                                              | 10                           |
| VI              | Practicing PHP: MySQL - tiered Applications                                                              | 10                           |
| VII             | Developing a fully functional Web Service Application using all the Technologies learned in this course. | 10                           |

## REFERENCES:

|    |                                                                                         |
|----|-----------------------------------------------------------------------------------------|
| 1. | “Web Technologies--A Computer Science Perspective”, Jeffrey C.Jackson,                  |
| 2. | “Internet & World Wide Web How to Program”, Deitel, Deitel, Goldberg, Pearson Education |
| 3. | “Web programming- Building Internet Application”, Chris Bales                           |
| 4. | Web Applications: Concepts and Real-World Design, Knuckles                              |

## TH3A- PROGRAMMING WITH JAVA

|                              |          |          |                          |                               |
|------------------------------|----------|----------|--------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 100</b> | <b>Course Code: ITPE301A</b>  |
| 3                            | 0        | 0        |                          | <b>Theory Assessment</b>      |
| <b>Total Contact Hrs: 45</b> |          |          |                          | End Term Exam: 70             |
| Theory: 45                   |          |          |                          | Progressive Assessment: 30    |
| Tutorial: 0                  |          |          |                          |                               |
| Practical: 0                 |          |          |                          |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                          |                               |
| <b>Credit: 3</b>             |          |          |                          | <b>Category of Course: PE</b> |

### RATIONALE:

This course provides a comprehensive introduction to Java programming, covering its history, evolution, and core concepts. Students will learn object-oriented programming (OOP) principles, including classes, inheritance, and interfaces, along with essential topics like exception handling, multithreading, and collections framework.

### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Explain the history, evolution, and core concepts of Java.
- Use datatypes, variables, arrays, operators, and control statements effectively.
- Implement classes, methods, inheritance, packages, and interfaces.
- Implement exception handling to ensure robust and error-free programs.
- Create and manage multiple threads for concurrent programming

### DETAILED COURSE CONTENT:

| <b>UNIT NO.</b> | <b>TOPIC/SUB-TOPIC</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>ALLOTTED TIME (HRS.)</b> |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>I.</b>       | <b>Introduction to Java</b> <ul style="list-style-type: none"> <li>• History and features of Java</li> <li>• Setting up the Java Development Kit (JDK)</li> <li>• Understanding the Java Virtual Machine (JVM)</li> <li>• Basic Java syntax: data types, variables, operators, control flow statements (if-else, switch, loops)</li> <li>• Input/Output operations (using Scanner and System.out)</li> <li>• Writing a Simple Program</li> <li>• Compiling and executing</li> <li>• Create Packaged class</li> </ul> | <b>6</b>                    |

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>II.</b>  | <b>Introduction To Object Oriented Programming</b> <ul style="list-style-type: none"> <li>• Basic concepts of OOPs: objects, classes, data encapsulation, inheritance, Polymorphism etc.</li> <li>• Fundamentals of Class &amp; Object,</li> <li>• New Keyword, reference variable, Members methods of a class,</li> <li>• Access modifiers: public, private, protected, default.</li> <li>• Encapsulation: Hiding data through access modifiers.</li> <li>• Access Control</li> <li>• Static Methods, Static Variables, Static Block</li> <li>• Constructor, Overloading methods, Overloading constructors</li> <li>• Using of final keyword, Finalize method</li> </ul> | <b>9</b> |
| <b>III.</b> | <b>Inheritance</b> <ul style="list-style-type: none"> <li>• Basics of Inheritance, members accessibility in inheritance</li> <li>• Types of inheritance: Single, multilevel, hierarchical.</li> <li>• Super keyword.</li> <li>• Method overriding.</li> <li>• Final keyword (for classes, methods, and variables).</li> <li>• Dynamic Method Dispatch, Abstract class, Preventing Overriding, Preventing Inheritance</li> <li>• Interfaces: Defining and implementing interfaces.</li> </ul>                                                                                                                                                                              | <b>6</b> |
| <b>IV.</b>  | <b>Interfaces</b> <ul style="list-style-type: none"> <li>• Purpose of interface</li> <li>• Defining an interface</li> <li>• implementing interfaces</li> <li>• Interface reference variables</li> <li>• Interface with variables</li> <li>• Extending interfaces</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                               | <b>5</b> |
| <b>V.</b>   | <b>Arrays and Strings</b> <ul style="list-style-type: none"> <li>• Arrays: declaring and initializing arrays, accessing array elements</li> <li>• Multidimensional arrays</li> <li>• String manipulation: creating strings, string methods (length, concat, substring, etc.)</li> <li>• Wrapper classes: Integer, Float, Double, etc.</li> </ul>                                                                                                                                                                                                                                                                                                                          | <b>6</b> |
| <b>VI.</b>  | <b>Exception Handling and File Handling</b> <ul style="list-style-type: none"> <li>• Exceptions: types of exceptions, try-catch blocks, finally block</li> <li>• Throwing exceptions</li> <li>• Custom exceptions</li> <li>• File input/output: reading from and writing to files</li> <li>• Using File Input Stream, File Output Stream, Buffered Reader, Buffered Writer</li> </ul>                                                                                                                                                                                                                                                                                     | <b>7</b> |

|             |                                                                                                                                                                                                                                                                                                                                                                     |           |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>VII.</b> | <b>Multithreaded programming</b> <ul style="list-style-type: none"> <li>• Basics of threads,</li> <li>• Java threaded model,</li> <li>• defining threads using Runnable interface,</li> <li>• defining threads using Thread superclass,</li> <li>• Multiple threads, Thread Priority values,</li> <li>• Thread Synchronization Using synchronized blocks</li> </ul> | <b>6</b>  |
|             | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                        | <b>45</b> |

#### REFERENCES:

|    |                                                                                    |
|----|------------------------------------------------------------------------------------|
| 1. | Programming with Java–E. Balagurusamy, Mc Graw Hill Education, India,2021          |
| 2. | Core Java: An Integrated Approach–R. Nageswara Rao, Dream tech Press, India,2018   |
| 3. | Java Programming–Poornachandra Sarang, Mc Graw Hill Education, India,2019          |
| 4. | Object-Oriented Programming with Java–M.T. Savaliya, BPB Publications, India, 2020 |
| 5. | “Advanced Java Programming”–K. Somasundaram, McGraw Hill Education, India, 2017    |

## TH3B- DATA SCIENCE: DATA WAREHOUSING AND DATA MINING

|                              |          |          |                          |                               |
|------------------------------|----------|----------|--------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 100</b> | <b>Course Code: ITPE301B</b>  |
| 3                            | 0        | 0        |                          |                               |
| <b>Total Contact Hrs: 45</b> |          |          |                          | <b>Theory Assessment</b>      |
| Theory: 45                   |          |          |                          | End Term Exam: 70             |
| Tutorial: 0                  |          |          |                          | Progressive Assessment: 30    |
| Practical: 0                 |          |          |                          |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                          |                               |
| <b>Credit: 3</b>             |          |          |                          | <b>Category of Course: PE</b> |

### RATIONALE:

The Data Science: Data Warehousing and Data Mining course introduces students to fundamental concepts in data storage, retrieval, and knowledge discovery. It equips learners with skills to design data warehouses, apply data mining techniques, and extract meaningful insights for decision-making. Through hands-on practice, students will gain expertise in data preprocessing, pattern recognition, and predictive modeling.

### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Explain the principles of data warehousing and data mining techniques.
- Apply ETL (Extract, Transform, Load) processes to build and manage data warehouses.
- Analyze large datasets to identify patterns, trends, and correlations.
- Evaluate different data mining algorithms for classification, clustering, and association rule mining.
- Analyze real-world data science solutions using data mining tools and techniques.

### DETAILED COURSE CONTENTS:

| Unit No. | Topic/Sub-Topic                                                                                                                                                                                                                                                                                                                                                                                                       | Allotted Time (Hours) |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| I        | <b>Introduction to Data Science and Data Warehousing:</b> Introduction to Data Science, Importance of Data Warehousing and Data Mining in AI & ML, Overview of Data Warehousing Architecture, ETL Process: Extraction, Transformation, and Loading, Introduction to OLTP vs OLAP, Data Warehouse Schemas (Star Schema, Snowflake Schema), Data Marts and Data Lakes, Introduction to Data Integration & Data Cleaning | 9                     |
| II       | <b>Data Warehousing Techniques and Tools:</b> Dimensional Modeling Concepts, Fact and Dimension Tables, Introduction to Data Cube and Data Aggregation, Indexing and Query Optimization, Data Loading and Querying in a Warehouse                                                                                                                                                                                     | 9                     |



|     |                                                                                                                                                                                                                                                                                                          |   |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| III | <b>Introduction to Data Mining:</b> Basics of Data Mining, Data Preprocessing and Data Cleaning Techniques, Data Reduction and Feature Selection, Handling Noisy and Incomplete Data, Introduction to Classification and Clustering, Popular Data Mining Algorithms, Supervised vs Unsupervised Learning | 9 |
| IV  | <b>Data Mining Techniques and Applications:</b> Association Rule Mining (Apriori Algorithm), Decision Trees and Rule-Based Classification, K-Means Clustering & Hierarchical Clustering, Anomaly Detection and Outlier Analysis, Mining Text and Web Data                                                | 9 |
| V   | <b>Advanced Topics in Data Mining:</b> Introduction to Big Data Mining, Mining Streaming Data, introduction to Deep Learning for Data Mining, Ethical Considerations and Privacy in Data Mining                                                                                                          | 9 |

## REFERENCES:

|    |                                                                                                                                             |
|----|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, 4th Edition, Morgan Kaufmann Publishers, San Francisco, 2022. |
| 2. | Ralph Kimball, Margy Ross, The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling, 3rd Edition, Wiley, New Jersey, 2013.  |
| 3. | Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar, Introduction to Data Mining, 2nd Edition, Pearson, Boston, 2018.              |
| 4. | Paulraj Ponniah, Data Warehousing Fundamentals for IT Professionals, 2nd Edition, Wiley, New Jersey, 2010.                                  |
| 5. | Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Introducing Data Science, 1st Edition, Manning Publications, New York, 2016.                  |

## TH3C- ADVANCED COMPUTER NETWORKS

|                              |          |          |                          |                               |
|------------------------------|----------|----------|--------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 100</b> | <b>Course Code: ITPE301C</b>  |
| 3                            | 0        | 0        |                          |                               |
| <b>Total Contact Hrs: 45</b> |          |          |                          | <b>Theory Assessment</b>      |
| Theory: 45                   |          |          |                          | End Term Exam: 70             |
| Tutorial: 0                  |          |          |                          | Progressive Assessment: 30    |
| Practical: 0                 |          |          |                          |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                          |                               |
| <b>Credit: 3</b>             |          |          |                          | <b>Category of Course: PE</b> |

### RATIONALE:

Advanced Computer Networks provide in-depth knowledge of modern networking technologies, protocols, and security mechanisms essential for designing and managing efficient communication systems. This course covers topics like switching, routing, wireless networks, SDN, cloud networking, and security to equip students with practical skills. Understanding these concepts enables students to build scalable, secure, and high-performance networks for real-world applications.

### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Describe the fundamental concepts of advanced networking, including OSI and TCP/IP models, routing protocols, and security mechanisms.
- Explain the working of wireless networks, mobile communications, and software-defined networking (SDN).
- Implement network configurations, VLANs, and routing techniques using simulation tools and real-world scenarios.
- Evaluate different network protocols, security mechanisms, and cloud-based networking architectures.
- Assess network performance, troubleshoot issues, and propose solutions for optimizing network efficiency and security.
- Develop secure and scalable network architectures using modern networking concepts like IoT, SDN, and 5G.

### DETAILED COURSE CONTENTS:

| <b>Unit No.</b> | <b>Topic/Sub-Topic</b>                                                                                                                                                                                                                                        | <b>Allotted Time (Hours)</b> |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| I               | <b>Introduction to Advanced Computer Networks:</b> Overview of Computer Networks and Evolution, Network Architectures: Client Server vs. Peer-to-Peer, OSI and TCP/IP Models: Detailed Study, Addressing Mechanisms: IPv4, IPv6, Subnetting and Super netting | 9                            |
| II              | <b>Switching and Routing Concepts:</b> Switching Techniques, Circuit, Packet, and Virtual Circuit Switching, Network Routing Algorithms:                                                                                                                      | 9                            |

|     |                                                                                                                                                                                                                                                 |   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|     | Distance Vector, Link State, Static vs. Dynamic Routing, Routing Protocols: RIP, OSPF                                                                                                                                                           |   |
| III | <b>Wireless and Mobile Networks:</b> Basics of Wireless Communication, Wi-Fi, Bluetooth, and Cellular Networks (2G, 3G, 4G, 5G), Wireless LANs: IEEE 802.11 Standards, Mobile IP and Handoff Mechanisms                                         | 9 |
| IV  | <b>Network Security and Cryptography:</b> Security Challenges in Modern Networks, Symmetric and Asymmetric Cryptography, Network Authentication Mechanisms, Firewalls, VPNs, and IDS/IPS                                                        | 9 |
| V   | <b>Software-Defined Networking (SDN) and Cloud Networking:</b> Introduction to SDN: Concepts and Benefits, OpenFlow and SDN Controllers, Virtualization in Networking (NFV), Cloud Computing and Network Virtualization, Edge and Fog Computing | 9 |

## REFERENCES:

|    |                                                                                                    |
|----|----------------------------------------------------------------------------------------------------|
| 1. | Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearson, New Delhi, 2019.                     |
| 2. | William Stallings, Data and Computer Communications, 10th Edition, Pearson, New Delhi, 2017.       |
| 3. | Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw-Hill, New York, 2013. |
| 4. | Douglas E. Comer, Internetworking with TCP/IP, 6th Edition, Pearson, Boston, 2014.                 |

## TH4A- MOBILE COMPUTING

|                              |          |          |                          |                               |
|------------------------------|----------|----------|--------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 100</b> | <b>Course Code: ITPE303A</b>  |
| 3                            | 0        | 0        |                          | <b>Theory Assessment</b>      |
| <b>Total Contact Hrs: 45</b> |          |          |                          | End Term Exam: 70             |
| Theory: 45                   |          |          |                          | Progressive Assessment: 30    |
| Tutorial: 0                  |          |          |                          | <b>Category of Course: PE</b> |
| Practical: 0                 |          |          |                          |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                          |                               |
| <b>Credit: 3</b>             |          |          |                          |                               |

### RATIONALE:

In the present scenario, many applications have already migrated from the desktop / laptop to mobile and hand-held devices. In the endeavor to remain connected anytime and anywhere with ubiquitous computing environment, mobile device and handheld gadgets plays a vital role. At the same time these devices work in the wireless environment, their security is a major challenge. This course enlightens students in the understanding of mobile computing.

**LEARNING OUTCOMES:** After completing this course, student will be able to:

- Explain mobile and wireless network,
- Demonstrate the working principles of infrared, cellular and wireless networks,
- Explain various type of multiplexing schemes,
- Explain voice and data compression,
- Explain Global System for Mobile architecture,
- Explain connectivity technologies like Bluetooth, Wi-Fi.

### DETAILED COURSE CONTENT:

| UNIT NO. | TOPIC / SUB-TOPIC                                                                                                                                                                                                                                   | ALLOTTED TIME (HRS.) |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b> | <b>Introduction to Wireless and Mobile Network:</b> Historic background, Cellular Industry, advantages & disadvantages of Mobile systems, Cell concepts, Wireless Network                                                                           | <b>5</b>             |
| <b>2</b> | <b>Basics of Wireless &amp; Mobile System:</b> Wire based and wireless systems, Infrared systems, cellular radio, Concepts of wireless LANS, voice signals-its characteristics, Frequency spectrum, digital signal, Broadband and base band signals | <b>7</b>             |

|               |                                                                                                                                                                                                                                                                                        |           |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>3</b>      | <b>Cellular Systems:</b> Cell layout, path-loss, propagation delay, fading, size and shape of cell, Concepts of frequency reuse, spectrum efficiency, Cell capacity to handle calls, Call demand in a cell, channel requirement, cell splitting, cell sectoring concept                | <b>6</b>  |
| <b>4</b>      | <b>Channel Utilization Schemes:</b> Concepts of Multiplexing: FDM, FDMA, TDD, TDM, TDMA, CDMA, Concepts of spread spectrum and frequency hopping. Introductory idea on AMPS; Compression operations - voice compression and data compression, V.42, fax compression-introductory idea. | <b>10</b> |
| <b>5</b>      | <b>Global System for Mobile Communication (GSM):</b> Historical background, SIM and GSM, Overview of GSM operations-Registration, Call Establishment, Roaming, GSM channel and operations                                                                                              | <b>8</b>  |
| <b>6</b>      | <b>Blue tooth and Wireless LANS:</b> Need of compatibility, Bluetooth concepts, Comparison with IR system, Architecture, potential applications, IEEE802.11x Wireless LAN standard-basic configuration and architecture, concepts of wireless home networking                          | <b>5</b>  |
| <b>7</b>      | <b>Security and Privacy:</b> Introduction, frequency hopping spread spectrum, Encryption concepts, Public Key Encryption, Authentication Model, Smart Card, Biometric Authentication                                                                                                   | <b>4</b>  |
| <b>Total:</b> |                                                                                                                                                                                                                                                                                        | <b>45</b> |

#### REFERENCE BOOKS:

1. Mobile Communications by Jochen H Schiller, Pearson Education
2. Mobile and Wireless Networks by Uyles D Black, Prentice Hall
3. Data over Wireless Networks- Blue tooth, WAP & Wireless by Gil Held, TMH
4. The TCP/IP Guide: A Comprehensive, Illustrated Internet Protocols Reference by Charles M. Kozierok, No Strach Press

## TH4B- CYBER SECURITY

|                       |   |   |                   |                            |
|-----------------------|---|---|-------------------|----------------------------|
| L                     | T | P | Total Marks = 100 | Course Code: ITPE303B      |
| 3                     | 0 | 0 |                   | Theory Assessment          |
| Total Contact Hrs: 45 |   |   |                   | End Term Exam: 70          |
| Theory: 45            |   |   |                   | Progressive Assessment: 30 |
| Tutorial: 0           |   |   |                   | Category of Course: PE     |
| Practical: 0          |   |   |                   |                            |
| Pre-requisite: NIL    |   |   |                   |                            |
| Credit: 3             |   |   |                   |                            |

### RATIONALE:

Cyber security course has been designed and developed to provide knowledge and skills related to the various aspects of the cyber world. This includes topics related to computer systems, mobile systems, Network Infrastructure, and various applications related to cyber world. Moreover, this course elaborates on the security protocols and standard that are required for cyber world.

### LEARNING OUTCOMES:

After completing this course, student will be able to:

- Explain the basic concepts related to cyber security,
- Explain network infrastructure and its security,
- Explain Assets, Vulnerability and Threats in the cyber world,
- Exhibit Information Security Standards (ISO27001), Protocols and Regulatory Framework
- Exhibit mobile and cloud security.

### DETAILED COURSE CONTENT:

| UNIT NO. | TOPIC / SUB-TOPIC                                                                                                                                                                                                                                                                                         | ALLOTTED TIME (HRS.) |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b> | <b>Introduction to Cyber Security:</b> Introduction to Cyber world, Basics of Information Security, Cryptography and cryptographic algorithm, Symmetric Key Cryptography, Asymmetric Key Cryptography, Steganography.                                                                                     | <b>10</b>            |
| <b>2</b> | <b>Network Security:</b> Principles of Security, Network Security Model, Security of Network Infrastructure, Network zones and zone management, Firewalls and UTM, Intrusion Detection System (IDS), Intrusion Prevention System (IPS), Security measures in Data Centres, Identity and Access Management | <b>10</b>            |

|              |                                                                                                                                                                                                             |           |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>3</b>     | <b>Cyber Security Standards:</b> CIA Triad of Information Security, Assets, Vulnerabilities and Threats Risk Identification, Risk Assessment and Risk Mitigation, ISO 27001:2013                            | <b>8</b>  |
| <b>4</b>     | <b>Cyber Security Policy:</b> Perimeter and Internal Security, Cyber Security Policy Development, Introduction to Regulatory Policy Framework for Cyber Security, Introduction to ITACT 2000 and ITACT 2008 | <b>7</b>  |
| <b>5</b>     | <b>Mobile and Mobile Security:</b> Basics of Mobile Device – SOC, SIM and SIM security, Android and IOS Operating System SIM Fraud – SIM swap, OTP fraud, Security of Mobile Applications                   | <b>7</b>  |
| <b>6</b>     | <b>Cloud and Cloud Security:</b> Basics of Cloud Computing Environment, Cloud security                                                                                                                      | <b>3</b>  |
| <b>Total</b> |                                                                                                                                                                                                             | <b>45</b> |

#### REFERENCE BOOKS:

1. Cyber Security by Nina Godbole and Sunit Belapur, Wiley India Pvt Ltd.
2. Mobile Communications by Jochen H Schiller, Pearson Education.
3. Introduction to Cyber Security -Guide to the World of Cyber Security by Anand Shinde, Notion Press.
4. ISO 27001:2013 Handbook
5. TCP/IP Guide: A Comprehensive illustrated Internet Protocol Reference by Charles M. Kozierok, No Starch Press.

## TH4C- DATA ANALYTICS

|                              |          |          |                          |                               |
|------------------------------|----------|----------|--------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 100</b> | <b>Course Code: ITPE303C</b>  |
| 3                            | 0        | 0        |                          | <b>Theory Assessment</b>      |
| <b>Total Contact Hrs: 45</b> |          |          |                          | End Term Exam: 70             |
| Theory: 45                   |          |          |                          | Progressive Assessment: 30    |
| Tutorial: 0                  |          |          |                          | <b>Category of Course: PE</b> |
| Practical: 0                 |          |          |                          |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                          |                               |
| <b>Credit: 3</b>             |          |          |                          |                               |

### RATIONALE:

This course is designed to introduce under graduate students to the fundamental concepts and techniques in Data Analytics. Through this course, students will gain a comprehensive understanding of the complete analytics workflow, from data collection and cleaning to advanced statistical analysis, machine learning models, and visualization. Real-world applications and case studies will be emphasized throughout.

### LEARNING OUTCOMES:

After completing this course, student will be able to:

- Demonstrate proficiency in data analytics tools and techniques.
- Explain preprocess and clean data.
- Exhibit and apply statistical and machine learning models.
- Utilize visualization tools to communicate data insights.
- Demonstrate ethical issues related to data analytics.

### DETAILED COURSE CONTENT:

| UNIT NO. | TOPIC / SUB-TOPIC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ALLOTTED TIME (HRS.) |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>1</b> | <p><b>Introduction to Data Analytics</b> – What is Data Analytics, Types of Data Analytics (Descriptive, Predictive, Prescriptive), Data Analytics Lifecycle (Data Collection, Cleaning, Analysis, Reporting), Applications across Industries (Healthcare, Business, Engineering, etc.).</p> <p>Tools and Technologies for Data Analytics – Overview of tools (Python, R, SQL), Introduction to data analysis libraries in Python (Pandas, NumPy, Matplotlib, Seaborn, Scikit-learn), Jupyter Notebooks for data science and reporting. Data Collection Methods – Data sources (Structured vs. Unstructured), Data collection techniques (APIs, Web Scraping, Databases, Surveys, Public Datasets), Ethical considerations in data collection.</p> <p>Introduction to Data Cleaning – Importance of data quality, Handling missing data, duplicates, outliers, and errors.</p> | <b>7</b>             |



|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2 | <p><b>Introduction to Exploratory Data Analysis (EDA)</b> – Definition and purpose of EDA in data science, Techniques for summarizing data (Central Tendency: Mean, Median, Mode; Variability: Variance, Standard Deviation; Skewness). Statistical Visualization Techniques – Histograms, Boxplots, Bar Charts, Heatmaps, Scatterplots, Pairplots, and Correlation Matrices. Data Transformation for Visualization – Normalization and Standardization techniques, Encoding categorical data (One-Hot Encoding, Label Encoding).</p> <p>Advanced Visualization Tools – Creating complex visualizations using Matplotlib, Seaborn, and Plotly, Introduction to interactive dashboards using Tableau or Dash.</p>                                                                                                                                                                                                              | 10 |
| 3 | <p><b>Descriptive Statistics</b> – Measures of Central Tendency (Mean, Median, Mode), Measures of Dispersion (Variance, Standard Deviation, Interquartile Range). Probability and Distributions – Introduction to Probability Distributions (Normal, Poisson, Binomial), Central Limit Theorem, Z-scores and their relevance in analytics. Inferential Statistics – Sampling methods and distributions, Estimation techniques, Understanding and constructing Confidence Intervals. Hypothesis Testing – Concepts of Null and Alternative Hypotheses, P-values, Statistical Tests (T- Test, Chi-Square Test, ANOVA), Understanding Type I and Type II Errors. Statistical Power Analysis – Introduction to Effect Size, Sample Size Calculation, and Statistical Power in hypothesis testing.</p>                                                                                                                             | 10 |
| 4 | <p><b>Introduction to Machine Learning</b> – Difference between Supervised and Unsupervised Learning, Overview of key algorithms (Linear Regression, Decision Trees, Random Forest, KNN).</p> <p>Supervised Learning Algorithms – Understanding Linear Regression and Logistic Regression, Evaluation metrics (Accuracy, Precision, Recall, F1-score), Addressing overfitting and underfitting, Cross- validation techniques for model evaluation. Unsupervised Learning Algorithms – Overview of Clustering techniques (K-Means, Hierarchical Clustering, DBSCAN), Dimensionality Reduction techniques (PCA, t-SNE). Model Tuning and Hyperparameter Optimization – Techniques like Grid Search and Random Search for optimizing models, Model evaluation using Cross-Validation and Train-Test Split strategies. Introduction to Deep Learning (Optional/Advanced) – Basic concepts of Neural Networks, Backpropagation</p> | 9  |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 5 | <p><b>Big Data Fundamentals</b> – Introduction to Big Data, Key characteristics (Volume, Velocity, Variety), Overview of Big Data technologies (Hadoop, Spark, NoSQL), Understanding Distributed Computing (MapReduce, HDFS). Big Data Analytics with Apache Spark – Introduction to PySpark for big data analysis, Working with Distributed DataFrames, Using MLlib for scalable machine learning. Natural Language Processing (NLP) – Key text processing techniques (Tokenization, Stopword Removal, Lemmatization), Text Classification, Sentiment Analysis, Named Entity Recognition (NER). Time Series Analysis – Time Series Forecasting methods (ARIMA, Exponential Smoothing), Handling seasonal and trend components for accurate forecasting. Ethical Issues in Data Analytics – Data privacy, consent, and anonymization in analytics, addressing bias in data and algorithms, Ensuring transparency and accountability in data analytics.</p> | 9 |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|

## REFERENCE BOOKS:

1. Data Science for Business by Foster Provost and Tom Fawcett, O'Reilly Media.
2. Python for Data Analysis by Wes McKinney, O'Reilly Media,
3. Storytelling with Data by Cole Nussbaumer Knafllic, John Wiley C Sons Inc.
4. Python Data Science Handbook by Jake VanderPlas, O'Reilly Media.
5. The Art of Data Science by Roger D. Peng and Elizabeth Matsui, Lulu.com
6. Statistics for Business and Economics by Paul Newbold, William C. Carlson and Betty Thorne, Pearson Education
7. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron, O'Reilly Media.
8. Pattern Recognition and Machine Learning” by Christopher M. Bishop, Springer NP Exclusive (CBS)
9. Learning Spark by Holden Karau, Andy Konwinski, Patrick Wendell, Matia Zaharia O'Reilly Media.
10. Natural Language Processing with Python by Steven Bird, Ewan Klein and Edward Loper, O'Reilly Media.

## PR3A- PROGRAMMING WITH JAVA LAB

|                     |   |   |                 |                             |
|---------------------|---|---|-----------------|-----------------------------|
| L                   | T | P | Total Marks: 50 | Course Code: ITPE 305A      |
| 0                   | 0 | 4 |                 |                             |
| Total Contact Hours |   |   |                 | Practical Assessment        |
| Practical : 60 Hrs  |   |   |                 | End Term Exam : 15          |
|                     |   |   |                 | Progressive Assessment : 35 |
|                     |   |   |                 |                             |
| Pre-Requisite : Nil |   |   |                 |                             |
| Credit : 2          |   |   |                 | Category of Course : PE     |

### RATIONALE:

This lab series is designed to provide hands-on experience aligned with core Java programming concepts. Each exercise reinforces theoretical understanding through practical implementation. The structured progression ensures learners build a strong foundation from basics to advanced topics like file input output and frameworks.

### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Explain the core concepts and syntax of Java programming, including data types, control structures, and operators.
- Apply object-oriented programming principles such as encapsulation, inheritance to create java applications.
- Apply object-oriented programming principles like polymorphism, and abstraction to build modular and reusable code.
- Implement exception handling and multithreading techniques to create robust and concurrent Java applications.
- Implement/utilize Java's standard libraries and frameworks for effective input/output operations, data manipulation, and utility functions.

### DETAILED COURSE CONTENTS:

| Unit No. | Topic/Sub-Topic                                                                                                                                                                                                                    | Allotted Time (Hours) |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| I        | <b>Setting Up Java and Writing First Program:</b> Install Java JDK and configure environment variables. Write, compile, and run a basic "Hello World" program. Demonstrate the use of variables, arrays, and different data types. | 6                     |
| II       | <b>Expressions and Operators:</b> Create a program using arithmetic, relational, and logical operators. Practice operator precedence and mixed-type expressions.                                                                   | 6                     |
| III      | <b>Control Flow &amp; Looping:</b> Write programs using if-else, switch, while, do-while, and for loops. Implement examples with break, continue, and nested loops.                                                                | 6                     |

|      |                                                                                                                                                                                                                             |   |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| IV   | <b>Classes, Objects &amp; Constructors:</b> Define a class with fields and methods. Use constructors (default, parameterized) and method overloading. Demonstrate the use of this and new keyword.                          | 6 |
| V    | <b>Static, Final and Access Control:</b> Implement static variables, static methods, and static blocks. Use access modifiers (public, private, Protected) and final keyword.                                                | 6 |
| VI   | <b>Inheritance and Method Overriding:</b> Create a class hierarchy demonstrating multilevel inheritance. Use super keyword and show constructor execution sequence. Override methods and implement dynamic method dispatch. | 6 |
| VII  | <b>Abstract Classes and Preventing Overriding:</b> Create an abstract class and implement its abstract methods in a subclass. Use final to prevent Method overriding or class inheritance. Create a packaged class.         | 6 |
| VIII | <b>Handling Exceptions:</b> Write programs using try-catch-finally blocks. Create user-defined exceptions. Demonstrate throw, throws, and nested exception handling.                                                        | 6 |
| IX   | <b>Working with Interfaces:</b> Define and implement interfaces. Use interface reference variables and interface inheritance.                                                                                               | 6 |
| X    | <b>Using Java Standard Libraries:</b> Use String, StringBuilder, Math, and Date classes. Practice with Java Collections (Array List, HashMap, etc.). Perform file input/output operations.                                  | 6 |

## REFERENCES:

|    |                                                                                     |
|----|-------------------------------------------------------------------------------------|
| 1. | Programming with Java – E. Balagurusamy, McGraw Hill Education, India, 2021         |
| 2. | Core Java: An Integrated Approach – R. Nageswara Rao, Dream tech Press, India, 2018 |
| 3. | Java Programming– Poornachandra Sarang, McGraw Hill Education, India, 2019          |
| 4. | Object-Oriented Programming with Java– M.T. Savaliya, BPB Publications, India, 2020 |
| 5. | “Advanced Java Programming” – K. Somasundaram, McGraw Hill Education, India, 2017   |

## PR3B- DATA SCIENCE: DATA WAREHOUSING AND DATA MINING LAB

|                     |   |   |                 |                             |
|---------------------|---|---|-----------------|-----------------------------|
| L                   | T | P | Total Marks: 50 | Course Code: ITPE 305B      |
| 0                   | 0 | 4 |                 |                             |
| Total Contact Hours |   |   |                 | Practical Assessment        |
| Practical : 60 Hrs  |   |   |                 | End Term Exam : 15          |
|                     |   |   |                 | Progressive Assessment : 35 |
|                     |   |   |                 |                             |
| Pre-Requisite : Nil |   |   |                 |                             |
| Credit : 2          |   |   |                 | Category of Course : PE     |

### RATIONALE:

This lab course provides hands-on experience in core concepts of Data Warehousing and Data Mining, essential for modern data-driven applications. Students will explore data preprocessing, schema design, ETL processes, and mining algorithms using real-world datasets and tools. The practical exposure aims to build foundational skills for AI, ML, and data analytics roles.

### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Demonstrate the ability to design and simulate a basic data warehouse architecture, including components such as ETL processes, OLTP and OLAP systems using open- source tools.
- Apply data extraction, transformation, and loading (ETL) techniques to integrate.
- Execute analytical queries using SQL, indexing, and query planning strategies to improve data retrieval performance.
- Perform data preprocessing and cleaning using Python libraries to handle missing values, normalize data.
- Implement basic machine learning models for classification and clustering.

### DETAILED COURSE CONTENTS:

| Unit No. | Topic/Sub-Topic                                                                                                                                                                                                    | Allotted Time (Hours) |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| I        | <b>Exploring Data Warehousing Architecture:</b> Simulate a basic data warehouse architecture using open-source tools like Talend or Apache Nifi. Identify components of ETL, OLTP vs OLAP with practical examples. | 4                     |
| II       | <b>Data Extraction and Transformation:</b> Perform data extraction from CSV/SQL sources. Apply transformation operations like filtering, aggregation, and normalization.                                           | 6                     |
| III      | <b>Data Loading and Querying:</b> Load data into warehouse tables using SQL scripts. Run OLAP-style queries for slicing, dicing, roll-up, and drill-                                                               | 10                    |

|     |                                                                                                                                                                                                  |    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|     | down.                                                                                                                                                                                            |    |
| IV  | <b>Query Optimization:</b> Analyze query performance using indexing. Use EXPLAIN plans to identify bottlenecks and improve query execution.                                                      | 10 |
| V   | <b>Data Preprocessing and Cleaning:</b> Perform handling of missing values, normalization, encoding, and outlier detection using Python.                                                         | 10 |
| VI  | <b>Feature Selection and Dimensionality Reduction:</b> Apply PCA and correlation-based feature selection on a sample dataset. Evaluate feature importance using Random Forest or Decision Trees. | 10 |
| VII | <b>Classification and Clustering:</b> Build and evaluate a Decision Tree classifier. Apply K-Means and Hierarchical Clustering on a sample dataset using Scikit-learn.                           | 10 |

## REFERENCES:

|    |                                                                                                                                             |
|----|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, 4th Edition, Morgan Kaufmann Publishers, San Francisco, 2022. |
| 2. | Ralph Kimball, Margy Ross, The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling, 3rd Edition, Wiley, New Jersey, 2013.  |
| 3. | Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar, Introduction to Data Mining, 2nd Edition, Pearson, Boston, 2018.              |
| 4. | Paulraj Ponniah, Data Warehousing Fundamentals for IT Professionals, 2nd Edition, Wiley, New Jersey, 2010.                                  |
| 5. | Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Introducing Data Science, 1st Edition, Manning Publications, New York, 2016.                  |

## PR3C- ADVANCED COMPUTER NETWORKS LAB

|                     |   |   |                 |                             |
|---------------------|---|---|-----------------|-----------------------------|
| L                   | T | P | Total Marks: 50 | Course Code: ITPE305C       |
| 0                   | 0 | 4 |                 |                             |
| Total Contact Hours |   |   |                 | Practical Assessment        |
| Practical : 60 Hrs  |   |   |                 | End Term Exam : 15          |
|                     |   |   |                 | Progressive Assessment : 35 |
|                     |   |   |                 |                             |
| Pre-Requisite : Nil |   |   |                 |                             |
| Credit : 2          |   |   |                 | Category of Course : PE     |

### RATIONALE:

This lab series equips students with practical skills in advanced computer networking concepts, bridging foundational theory with real-world applications. It covers key areas like routing, switching, wireless communication, network security, and emerging technologies such as SDN and cloud networking. These labs are designed to prepare students for industry demands and advanced research in the field of networking.

### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Demonstrate a clear understanding of network architectures and communication models by simulating data flow through OSI and TCP/IP layers using real-time tools.
- Apply IP addressing techniques including subnetting and supernetting to design efficient network topologies and validate them using simulation tools.
- Evaluate different switching techniques such as circuit, packet, and virtual circuit switching through hands-on simulations.
- Analyze static and dynamic routing protocols to understand packet forwarding, route propagation, and routing table updates.
- Design secure wireless networks by implementing encryption standards and monitoring traffic using packet analysis tools.

### DETAILED COURSE CONTENTS:

| Unit No. | Topic/Sub-Topic                                                                                                                                                                                         | Allotted Time (Hours) |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| I        | <b>Exploring OSI and TCP/IP Models:</b> Simulate and analyze data flow across OSI layers using packet analyzer tools. Map real-time traffic to the OSI/TCP-IP layers.                                   | 10                    |
| II       | <b>IP Addressing, Subnetting &amp; Supernetting:</b> Design subnets and calculate subnet masks using CIDR notation. Use a subnet calculator tool and validate configurations using a network simulator. | 10                    |
| III      | <b>Switching Techniques Simulation:</b> Simulate circuit switching, packet                                                                                                                              | 10                    |



|    |                                                                                                                                                                                            |    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|    | switching, and virtual circuit switching.                                                                                                                                                  |    |
| IV | <b>Static and Dynamic Routing Configuration:</b> Configure static and dynamic routes using Cisco Packet Tracer. Observe route propagation and packet delivery.                             | 10 |
| V  | <b>Implementing Routing Algorithms:</b> Simulate Distance Vector (RIP) and Link State (OSPF) routing protocols using Cisco Packet Tracer. Analyze route convergence and hop count changes. | 10 |
| VI | <b>Wireless Network Setup and Security:</b> Set up a wireless LAN using routers and simulate connection from clients. Enable WPA2/WPA3 security and analyze traffic using Wireshark.       | 10 |

## REFERENCES:

|    |                                                                                                    |
|----|----------------------------------------------------------------------------------------------------|
| 1. | Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearson, New Delhi, 2019.                     |
| 2. | William Stallings, Data and Computer Communications, 10th Edition, Pearson, New Delhi, 2017.       |
| 3. | Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw-Hill, New York, 2013. |
| 4. | Douglas E. Comer, Internetworking with TCP/IP, 6th Edition, Pearson, Boston, 2014.                 |

### TH:5(a)- UNIVERSAL HUMAN VALUES

|                              |          |          |                          |                               |
|------------------------------|----------|----------|--------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 100</b> | <b>Course Code: OE301A</b>    |
| 3                            | 0        | 0        |                          | <b>Theory Assessment</b>      |
| <b>Total Contact Hrs: 45</b> |          |          |                          | End Term Exam: 70             |
| Theory: 45                   |          |          |                          | Progressive Assessment: 30    |
| Tutorial: 0                  |          |          |                          | <b>Category of Course: OE</b> |
| Practical: 0                 |          |          |                          |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                          |                               |
| <b>Credit: 3</b>             |          |          |                          |                               |

#### RATIONALE:

The Universal Human Values (UHV) course aims to help diploma students develop a strong ethical foundation, nurturing responsible individuals who contribute positively to society. In an era driven by rapid technological advancements, it is crucial for students not only to gain technical expertise but also to cultivate values that promote harmony, respect, and sustainability.

#### LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Identify fundamental human aspirations such as happiness and prosperity.
- Differentiate between the self and the body and understand their respective needs.
- Practice self-reflection to improve decision-making, emotional balance, and personal growth.
- Develop respectful and trustworthy relationships within family, friends, and society.
- Explain the role of values like trust, respect, and love in building strong social bonds.
- Promote cooperation and harmony within communities through ethical practices.

#### DETAILED COURSE CONTENT:

| <b>Unit No.</b> | <b>Topic/Sub-Topic</b>                                                                                                                                                                                                                                                                                                                                                                                             | <b>Allotted Time (Hours)</b> |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>1</b>        | <b>Introduction to Value Education and Human Values</b> - Concept and Need for Value Education - Understanding the importance of value education in personal and professional life, Differentiating between values and skills.<br>Basic Human Aspirations - Exploring fundamental human aspirations: happiness and prosperity, Methods to achieve these aspirations through right understanding and relationships. | <b>8</b>                     |
| <b>2</b>        | <b>Harmony in the Human Being</b> - Understanding the Self - Differentiating between the 'Self' (I) and the Body, Understanding the needs of the Self and the Body, Harmony of the Self with the Body - Ensuring the harmony of 'T' with the Body, Practices for mental and physical well-being.                                                                                                                   | <b>8</b>                     |
| <b>3</b>        | <b>Harmony in the Family and Society</b> - Family as the Basic Unit of Society - Understanding values in human relationships, Trust and respect as the foundational values in relationships, Harmony in Society - The concept of an undivided society, Universal human order and world family.                                                                                                                     | <b>8</b>                     |

|          |                                                                                                                                                                                                                                                                                                                                  |           |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>4</b> | <b>Harmony in Nature and Existence</b> - Interconnectedness in Nature -Understanding the four orders of nature: material, plant, animal, and human, Mutual fulfillment among these orders, Co-existence in Existence - Holistic perception of harmony in existence, Role of human beings in maintaining environmental balance.   | <b>8</b>  |
| <b>5</b> | <b>Professional Ethics</b> - Ethical Human Conduct - Integrating values into professional life, Concept of professional ethics and accountability, Case Studies in Professional Ethics - Analyzing real-life scenarios to understand ethical dilemmas, Developing solutions based on universal human values.                     | <b>8</b>  |
| <b>6</b> | <b>Personal Development and Social Responsibility</b> - Self-Reflection and Self-Exploration - Techniques for self-assessment and personal growth, Setting personal goals aligned with universal values, Social Responsibility - Understanding one's role in society, Participating in community service and social initiatives. | <b>5</b>  |
|          | <b>TOTAL</b>                                                                                                                                                                                                                                                                                                                     | <b>45</b> |

#### REFERENCES:

|    |                                                                                                                                                                                                        |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | R. R. Gaur, R. Asthana, G. P. Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019.                                                 |
| 2. | R. R. Gaur, R. Asthana, G. P. Bagaria, Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019.                            |
| 3. | A. Nagraj, JeevanVidya: EkParichaya, Amarkantak, 1999.                                                                                                                                                 |
| 4. | A. N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.                                                                                                                               |
| 5. | Moral Thinking: An Introduction To Values And Ethics, Vineet Sahu, IIT Kanpur: <a href="https://onlinecourses.nptel.ac.in/noc23_hs89/preview">https://onlinecourses.nptel.ac.in/noc23_hs89/preview</a> |

**TH:5(b)- LEADERSHIP AND MANAGEMENT SKILLS**

|                              |          |          |                          |                               |
|------------------------------|----------|----------|--------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 100</b> | <b>Course Code: OE301B</b>    |
| 3                            | 0        | 0        |                          | <b>Theory Assessment</b>      |
| <b>Total Contact Hrs: 45</b> |          |          |                          | EndTermExam: 70               |
| Theory: 45                   |          |          |                          | Progressive Assessment: 30    |
| Tutorial: 0                  |          |          |                          | <b>Category of Course: OE</b> |
| Practical: 0                 |          |          |                          |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                          |                               |
| <b>Credit: 3</b>             |          |          |                          |                               |

**RATIONALE:**

This course/subject on Leadership and Management Skills for students undergoing Diploma programmes is an exploration in leading and managing people, majorly in education based on sound and acceptable principles and theories for effective leadership. The leadership skills will enable them to take initiative, guide team efforts, motivate peers, and ensure effective collaboration. They'll learn how to delegate tasks, resolve conflicts, and foster a positive team environment. The management skills will help them in organizing tasks, setting timelines, and ensuring efficient workflow within a team.

It is expected that the students will be able to handle projects with better project outcomes and earn a more productive learning experience. This will benefit their academic journey, future careers, and overall professional development:

**LEARNING OUTCOMES:**

After completion of the course, the students will be able to

- Explain the principles of management
- Collaborate across cultures for effective team work
- Communicate with people for a positive work culture
- Demonstrate personal dispositions, skills & abilities of a leader
- Undertake the process of change management
- Design training for staff development
- Adapt suitable leadership style for improved work efficiency.

**DETAILED COURSE CONTENT:**

| <b>Unit No.</b> | <b>Topic/Sub-Topic</b>                                                                                                                                                                                                                                                                                             | <b>Allotted Time (Hours)</b> |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>1</b>        | <b>Leadership &amp; Management, concept, principles:</b> Definition of leadership, management, Leadership theories, Leadership characteristics Principles of management, Managerial functions, Leader v/s Manager, Leader/Manager traits and character, Leadership Styles                                          | <b>10</b>                    |
| <b>2</b>        | <b>Human Resource Management in Organizations:</b> Human Resource Management: Meaning, Nature, Objectives, Scope, Job & Job analysis. Staff Development: Need and Objectives of Staff Development, Approaches, Training & development, Organizational Development: Components of OD process. Learning organization | <b>10</b>                    |

|              |                                                                                                                                                                                                                                                                                                                                                                                              |           |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>3</b>     | <b>Personal disposition, skills &amp; abilities of leaders:</b> Self-awareness<br>Leadership characteristics, traits Leadership skills & abilities Emotional intelligence & its components, importance in leadership Communication skills for effective leadership, barriers to effective communication, Active Listening, Mindful listening, Leading & Mentorship – Influencing & mentoring | <b>09</b> |
| <b>4</b>     | <b>Leader’s role in Motivating, Inspiring and Transformative leadership, nurturing team-work:</b> Goal setting & leadership, Transformative Leadership, vision & envisioning, Motivational role of leader in people management, Group & team, Team dynamics, Conflict management, strategies in managing conflicts                                                                           | <b>08</b> |
| <b>5</b>     | <b>Change Management &amp; Leadership:</b> Models of change Forces driving change Change Management – process, goal, importance, The process of change happening in an organization, Key aspects of leadership in change management – responsibilities of a change leader.                                                                                                                   | <b>08</b> |
| <b>TOTAL</b> |                                                                                                                                                                                                                                                                                                                                                                                              | <b>45</b> |

#### SUGGESTED ACTIVITIES:

1. Group/individual presentation on the basic principles of leadership and management, Discussion on readings - Individual or group presentation of assigned topics in class on leadership and management principles and theories.
2. Activities on Envisioning, Goal setting
3. ACTION PLAN to be prepared

#### REFERENCES:

|    |                                                                                                                                                                            |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Theories of Educational Leadership and Management (3rd ed.), by Bush, Tony (2003). SAGE Publications, Ltd.                                                                 |
| 2. | The inspiring leader: unlocking the secrets of how extraordinary leaders motivate. By Zenger, John, Joseph Folkman, and Scott Edinger (2009). New York: McGraw Hill Press. |
| 3. | Knowing yourself. On becoming a leader: the leadership classic. By Bennis, Warren (2009). New York: Basic Books.                                                           |
| 4. | Leading Change. By P. Kotter, Harvard Business, 2012.                                                                                                                      |
| 5. | The Fifth Discipline. By Peter M. Senge, Crwon Currency, 2006.                                                                                                             |
| 6. | The Leadership Sutra: An Indian Approach to Power. By Devdutt Pattanaik, – Penguin Random House, 2017.                                                                     |
| 7. | Leadership and Management. By Dr. A. Chandra Mohan. Himalaya Publishing House, 2010.                                                                                       |

**TH:5(c)- PROFESSIONAL SKILLS**

|                       |   |   |                   |                            |
|-----------------------|---|---|-------------------|----------------------------|
| L                     | T | P | Total Marks = 100 | Course Code: OE301C        |
| 3                     | 0 | 0 |                   |                            |
| Total Contact Hrs: 45 |   |   |                   | Theory Assessment          |
| Theory: 45            |   |   |                   | EndTermExam: 70            |
| Tutorial: 0           |   |   |                   | Progressive Assessment: 30 |
| Practical: 0          |   |   |                   |                            |
| Pre-requisite: NIL    |   |   |                   |                            |
| Credit: 3             |   |   |                   | Category of Course: OE     |

**RATIONALE:**

The term, “Professional skills” carries significant weight in the job market and career development. This open elective course explores various types of professional skills, their significance, and how they can be cultivated and harnessed for career progression. By understanding the landscape of professional skills, student can better position himself or herself for success in the competitive job market. It is crucial to continuously update and adapt the professional skills to stay ahead in a rapidly changing work environment. By investing in professional development, one can enhance employability and open doors to new opportunities.

**LEARNING OUTCOMES:**

After completion of the course, the students will be able to

- Demonstrate Self-competency and Confidence
- Practice Emotional Competency
- Work in a team work or in collaboration
- Demonstrate problem solving and decision making skills
- Apply time management strategies and techniques effectively
- Apply professional ethics and integrity in professional and personal life

| <b>UNIT NO.</b>                  | <b>CONTENT</b>                                                                                                                                                                                                                                                 | <b>ALLOTTED TIME (HOURS)</b> |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| 1<br>Communication Skills:       | <ul style="list-style-type: none"> <li>• Active listening</li> <li>• Verbal and non-verbal communication</li> <li>• Written communication</li> <li>• Presentation skills</li> <li>• Conflict resolution</li> </ul>                                             | <b>08</b>                    |
| 2<br>Teamwork and Collaboration: | <ul style="list-style-type: none"> <li>• Building trust within a team</li> <li>• Effective collaboration strategies</li> <li>• Role delegation and responsibility sharing</li> <li>• Conflict resolution within a team</li> </ul>                              | <b>08</b>                    |
| 3<br>Problem-Solving:            | <ul style="list-style-type: none"> <li>• Identifying root causes of issues</li> <li>• Generating solutions and evaluating options</li> <li>• Decision-making under pressure</li> <li>• Critical thinking skills</li> <li>• Triple constraint issues</li> </ul> | <b>08</b>                    |

|                                                   |                                                                                                                                                                                                                                                                                                                      |           |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>4</b><br>Time<br>Management:                   | <ul style="list-style-type: none"> <li>• Prioritization and task management</li> <li>• Setting realistic deadlines</li> <li>• Effective time planning and organization</li> </ul>                                                                                                                                    | <b>07</b> |
| <b>5</b><br>Emotional<br>Intelligence:            | <ul style="list-style-type: none"> <li>• Self-awareness and emotional regulation</li> <li>• Empathy and understanding others' emotions</li> <li>• Managing interpersonal relationships</li> <li>• Motivation</li> <li>• Social skills</li> <li>• Emotional Intelligence (EQ)</li> <li>• Stress management</li> </ul> | <b>08</b> |
| <b>6</b><br>Professional<br>Ethics and Integrity: | <ul style="list-style-type: none"> <li>• Workplace ethics and code of conduct</li> <li>• Confidentiality and data privacy</li> <li>• Professional accountability-</li> <li>• Important Considerations:</li> </ul>                                                                                                    | <b>06</b> |
| <b>TOTAL</b>                                      |                                                                                                                                                                                                                                                                                                                      | <b>45</b> |

#### REFERENCES:

- Dr. Vitthal Gore: Professional Skills for 21st Century: A Key to Success: Blue Rose- ACADEMIC
- The ACE of Soft Skills: Attitude, Communication and Etiquette for Success: PEARSON
- The essence of Leadership: S. Manikutty: Bloomsbury

## SUMMER INTERNSHIP - II

|                             |          |          |                        |                               |
|-----------------------------|----------|----------|------------------------|-------------------------------|
| <b>L</b>                    | <b>T</b> | <b>P</b> | <b>Total Marks = 0</b> | <b>Course Code: SI-301</b>    |
| 0                           | 0        | 0        |                        |                               |
| <b>Total Contact Hrs: 0</b> |          |          |                        | <b>Theory Assessment</b>      |
| Theory: 0                   |          |          |                        | End Term Exam: 0              |
| Tutorial: 0                 |          |          |                        | Progressive Assessment: 0     |
| Practical: 0                |          |          |                        |                               |
| <b>Pre-requisite: NIL</b>   |          |          |                        | <b>Category of Course: SI</b> |
| <b>Credit: 2</b>            |          |          |                        |                               |

**RATIONALE:** The RATIONALE for a summer internship is to offer a structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them with the skills and knowledge necessary to succeed in their chosen field. This course provides opportunities to students for hand on industry experience.

**COURSE OUTCOME:** After completing this course, students will be able to:

- Apply theoretical knowledge gained in their academic coursework to real-world situations.
- Develop and refine specific skills relevant to the field.
- Gains hands-on experience in a professional network by interacting with mentors and industry professionals.
- Learn to manage their time effectively.
- Clarify career goals.

### DETAILED COURSE CONTENT:

|          |                                                                                                                                                                                                                                                                                                                                                                          |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> | <b>Orientation:</b> <ul style="list-style-type: none"> <li>• Introduction to the organization's mission, values, and culture.</li> <li>• Familiarization with workplace policies, procedures, and safety guidelines.</li> <li>• Orientation to the team and organizational structure.</li> </ul>                                                                         |
| <b>2</b> | <b>Project-Based Learning:</b> <ul style="list-style-type: none"> <li>• Description of the main project or tasks the intern will be working on during the internship.</li> <li>• Detailed project goals and objectives.</li> <li>• Training and guidance on project-specific tools, technologies, or methodologies.</li> </ul>                                           |
| <b>3</b> | <b>Technical and Skill Development:</b> <ul style="list-style-type: none"> <li>• Training sessions or workshops to enhance technical skills relevant to the internship role (e.g., programming languages, software tools, laboratory techniques).</li> <li>• Soft skills development, including communication, teamwork, problem-solving, and time management</li> </ul> |



|           |                                                                                                                                                                                                                                                                                   |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>4</b>  | <b>Mentorship and Supervision:</b> <ul style="list-style-type: none"> <li>• Regular meetings with a designated mentor or supervisor for guidance, feedback, and support.</li> <li>• Mentorship objectives and expectations.</li> </ul>                                            |
| <b>5</b>  | <b>Professional Development:</b> <ul style="list-style-type: none"> <li>• Sessions on professional etiquette, networking, and building a personal brand</li> <li>• Resume writing and interview preparation workshops.</li> </ul>                                                 |
| <b>6</b>  | <b>Industry and Field-Specific Knowledge:</b> <ul style="list-style-type: none"> <li>• Lectures, seminars, or presentations on industry trends, best practices, and emerging technologies.</li> <li>• Guest speakers from the field to share insights and experiences.</li> </ul> |
| <b>7</b>  | <b>Reporting and Documentation:</b> <ul style="list-style-type: none"> <li>• Training on how to document project progress, results, and findings.</li> <li>• Practice in creating reports, presentations, or other deliverables.</li> </ul>                                       |
| <b>8.</b> | <b>Ethics and Professionalism:</b> <ul style="list-style-type: none"> <li>• Discussions on ethical considerations within the field.</li> <li>• Scenarios and case studies related to ethical decision-making</li> </ul>                                                           |
| <b>9</b>  | <b>Feedback and Evaluation:</b> <ul style="list-style-type: none"> <li>• Regular performance evaluations and feedback sessions.</li> <li>• Self-assessment and goal-setting exercises.</li> </ul>                                                                                 |
| <b>10</b> | <b>Networking and Industry Exposure:</b> <ul style="list-style-type: none"> <li>• Opportunities to attend industry conferences, webinars, or networking events.</li> <li>• Encouragement to connect with professionals in the field.</li> </ul>                                   |

#### PR:4- MAJOR PROJECT I

|                              |          |          |                          |                               |
|------------------------------|----------|----------|--------------------------|-------------------------------|
| <b>L</b>                     | <b>T</b> | <b>P</b> | <b>Total Marks = 200</b> | <b>Course Code: PR302</b>     |
| 0                            | 0        | 4        |                          | <b>Theory Assessment</b>      |
| <b>Total Contact Hrs: 60</b> |          |          |                          | End Term Exam: 100            |
| Theory: 0                    |          |          |                          | Progressive Assessment: 100   |
| Tutorial: 0                  |          |          |                          | <b>Category of Course: PR</b> |
| Practical: 60                |          |          |                          |                               |
| <b>Pre-requisite: NIL</b>    |          |          |                          |                               |
| <b>Credit:2</b>              |          |          |                          |                               |

**RATIONALE:** A Major project generally requires, a larger amount of effort and more independent work than that involved in a normal assignment. It requires students to undertake their own fact-finding and analysis. The students will select the topic, perform and design work. Major project is as preparation for the students to take on more responsibilities and bigger project in the future. It is a learning experience, which aims to provide students with the opportunity to synthesize knowledge from different areas of learning, and critically and creatively apply it to real life situations. The leadership quality, co-ordination of job and maintaining good communal harmony is an important factor of this type of activity.

#### LEARNING OUTCOMES:

After the completion of this course, the students will be able to:

- Select suitable topic, problem and plan of action
- Apply theory and practices to investigate and solve industry / society related problems
- Maintain good relation among the peer groups
- Demonstrate leadership quality
- Estimate cost involvement
- Develop plan for effective utilization of time

#### GUIDELINES FOR MAJOR PROJECT

|                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• The project work may involve the designing a model or upgrading an existing system. The design is to be implemented into a working model.</li></ul>                                                                                                                        |
| <ul style="list-style-type: none"><li>• A project work may be carried out by a team of 3 to 5 students with a well-defined role of each student within the team. The group will select a project with approval of team of teachers &amp; the guide.</li></ul>                                                      |
| <ul style="list-style-type: none"><li>• Each group must prepare project proposal that includes project title, group members, sponsor details (if any), detailed problem definition, area, abstract, details of existing similar systems if any, scope of the project and software-hardware requirements.</li></ul> |
| <ul style="list-style-type: none"><li>• Major projects should be based on real/ live problems of the Industry/ Govt./ NGO/</li></ul>                                                                                                                                                                               |

MSME/Rural Sector or an innovative idea having the potential of a Start-up. Main objective of the major project is to provide the students with an opportunity to develop a complete project.

- For assessment, following components may be considered:
  - Synopsis and Project Title selection
  - Initiative in Performing Project tasks
  - Sense of responsibility and punctuality
  - Outcome of the completed stages of the Project
  - Communication and presentation skills
  - Interpersonal skills
  - Report writing skills
  - Viva voce

### **Organization of Project Report**

#### **1. Cover page:**

It should contain the following (in order)

- i. Title of the Project
- ii. Submitted in partial fulfilment of the requirements for the Diploma in <Branch Name>
- iii. By Name of the Student(s)
- iv. Logo of the Institution
- v. Branch Name/Depart Name and Institution Name with Address
- vi. Academic Year

#### **2. 1<sup>st</sup> Inner page**

Certificate:

It should contain the following

“ This is to certify that the work in this Project Report entitled <Project Title> by <Name of the Student (s)> has/have been carried out under my supervision in partial fulfillment of

the requirements for the Diploma in <Branch Name> during session <session> in <Branch/Department Name> of <Institute Name> and this work is the original work of the above student(s).”

Seal and signature of the Supervisor/Guide with date

3. 2<sup>nd</sup> Inner Page Declaration by the Student(s)

“I declare that this project entitled <Name of the Project> is my own work, except where indicated through the proper use of citations and references, and has not been submitted in any form for another degree or diploma at any other institute. Information derived from the published and unpublished work of others has been acknowledged in the text and a list of references is given.”

Signature of the Student with date

4. 3<sup>rd</sup> Inner Page Acknowledgement by the Student(s)

5. Contents.

6. Chapter wise arrangement of Reports

7. Last Chapter: Conclusion

It should contain

- i. Conclusion
- ii. Limitations
- iii. Scope for further Improvement

8. References