| **Course Code:3IT200PC** | **Course Title: Discrete Structure & Graph Theory** | **L-3 T-0 P-0 C-3** |
|---|---|---|
| Course Prerequisite: | Applied Mathematics –I & II | |
| Course Objectives: | **1.** Increase Critical thinking and analytical problem-solving skills and awareness of computer related ethics to discrete Mathematical Logic.<br>**2.** Apply appropriate discrete mathematical concepts and operations to interpret data and to solve problems.<br>**3.** Identify a problem and analyze it in terms of its significant parts and the information needed to solve problems based on sets, relation, function and recursion.<br>**4.** Formulate and evaluate possible solutions to problems and select the chosen solution based on Boolean algebra.<br>**5.** Construct graphs, interpret them, and draw appropriate conclusions.<br>**6.** Construct trees, interpret them, and draw appropriate conclusions. | |
| Course Outcomes (Expected Outcome): | 1. **Describe** basic terminology of Mathematical Logic, Theory of inference & Predicate calculus.<br>2. **Solve** engineering problems on the basis of set theory.<br>3. **Examine** Algebraic Structures and grammar<br>4. **Investigate** the concept of Lattices & Boolean Algebra to **solve** engineering problems.<br>5. **Inspect** data using graphs and related algorithms.<br>6. **Design** data using trees and related algorithms. | |
| **Unit I:** | **Mathematical Logic** | **Hours:7** |
| Statements &Notation,Connectives, Normal forms, The Theory of Inference for the Statement Calculus, Predicate Calculus, The Inference Theory of the Predicate Calculus. | | |
| **Unit II:** | **Set Theory** | **Hours:7** |
| Basic concepts of Set Theory, Representation of Discrete Structure, Relation and ordering, Functions, Recursion. | | |
| **Unit III:** | **Algebraic Structures** | **Hours:7** |
| Algebraic Systems, Semi groups and Monoids, Grammars and Languages, Polish expression & their compilation, Groups, Semi groups, Application of Residue Arithmetic to Computers. | | |
| **Unit IV:** | **Lattice & Boolean Algebra** | **Hours:7** |
| Lattices as Partially Ordered Sets, Boolean Algebra, Boolean Functions, Representation of Boolean Functions, Minimization of Boolean Functions. | | |
| **Unit V:** | **Graph Theory** | **Hours:7** |
| Basic concepts of Graph Theory, Paths, Reachability & Connectedness, Matrix representation of graphs, Storage Representation and Manipulation of Graphs, Coloring Graphs. | | |
| **Unit VI:** | **Trees** | **Hours:7** |
| Trees, Tree Searching, Minimal spanning trees, Simple Precedence Grammars, rooted tree, expression tree, B tree, Distance between spanning trees of a graph. | | |
| **Textbook:**<br>J.P. Trembley, R. Manohar: "Discrete Mathematical Structures with Application to Computer Science" 1988 (Tata McGraw Hill) | | |

**Reference Books:**

1.G Shankar Rao, "Discrete Mathematical Structures", New Age International, 2002 ISBN:81-224-1424-9.
2 Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, McGraw Hill Edition.
3. S.K. Chakraborty &B.K.Sarkar ;"Discrete Mathematics" OXFORD.
4. Bernard Kolman,RobertC.Busby, Sharon Ross: "Discrete Mathematical Structures" Third Edition PHI.

| **Course Code: 3IT201PC** | **Course Title: Object Oriented Programming** | **LTPC: L-3 T-0 P-0 C-3** |
|---|---|---|
| Course Prerequisite: | Basic knowledge of programming concepts and familiarity with fundamental computer science principles. | |
| Course Objectives: | 1. To explore the principles of Object-Oriented Programming (OOP) such as data abstraction, encapsulation, inheritance and polymorphism.<br>2. To use the object-oriented paradigm in program design.<br>3. To provide programming insight using OOP constructs.<br>4. To lay a foundation for advanced programming | |
| Course Outcomes (Expected Outcome): | On completion of the course, the students will be able to<br>1. Describe Object Oriented approach to design software.<br>2. Illustrate programs using classes and objects.<br>3. Examine the forms of inheritance and use them in programs.<br>4. Analyze polymorphic behavior of objects.<br>5. Design and develop GUI programs.<br>6. Construct Applets for web applications | |
| **Unit I: Introduction to Object Oriented Programming** | | **Hours: 7** |
| Overview of OOP and its Importance, Encapsulation, Abstraction, Inheritance, and Polymorphism, OOP Vs Procedural Programming: Key Differences, Applications and Advantages of OOP. Introduction to Java and its Features, Java Virtual Machine (JVM): Role and Functionality. Java Programming Constructs: Variables and Data Types: Primitive Data Types, Identifiers, and Literals. | | |
| **Unit II: Java Fundamentals** | | **Hours: 7** |
| Operators, Control Structures, Classes and objects Operators and Expressions: Types of Operators, Precedence and Associativity Rules. Type Conversion and Casting<br>Decision-Making Structures: if-else, switch, Loops: for, while, do-while. Introduction to Classes and Objects, Creating Objects and Using Methods. Constructors: Purpose and Basics, Cleaning Up Unused Objects (Garbage Collection). Class Variables and Methods, The "this" Keyword: Usage and Importance. Arrays in Java and Basics of Command-Line Arguments | | |
| **Unit III: Inheritance, Interfaces and Packages** | | **Hours: 7** |
| Inheritance: Inheritance, Aggregation, Method Overriding, super keyword, final keyword, Abstract class. Interfaces: Defining interfaces, implementing interfaces, accessing interface variables, Extending interfaces. Packages: Packages, java.lang package, Enum type. | | |
| **Unit IV: Exception handling and Input /Output** | | **Hours: 7** |
| Exception: Introduction, Exception handling Techniques, User-defined exception, Exception Encapsulation and Enrichment. Input/Output: The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package. | | |
| **Unit V: Applets** | | **Hours: 7** |
| Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag. | | |
| **Unit VI: Event Handling and AWT** | | **Hours: 7** |
| Introduction to Event Handling, Event Delegation Model: Concept and Benefits. Types of Events and Event Sources, Event Listeners: Definition and Types, Adapter and Inner Classes for Event Handling. Introduction to AWT and its Role in GUI Development, Basic AWT Components: Button, Label, Checkbox, Radio Buttons, | | |
| **Textbook:**<br>1. Sachin Malhotra and Saurabh Choudhary: Programming in Java, Oxford University Press 2010. | | |

**Reference Books:**

1. H.M.Dietel and P.J.Dietel, "Java How to Program" Pearson Education/PHI, Sixth Edition.
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Dr. R. NageswaraRao: Core Java an Integrated Approach (Dreamtech)
4. Khalid Mughal: A Programmer's Guide to Java Certification, 3rdEdition (Pearson)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners, (SPD), 2010.
6. Herbert Schildt: Java Complete References (McGraw Hill)

| **Course Code: 3IT202PC** | **Course Title: Analog and Digital Electronics** | **LTPC: L-3, T-0, P-0, C-3** |
|---|---|---|
| Course Prerequisite: | Fundamentals of Applied Physics and Electrical Engineering | |
| Course Objectives: | 1. To understand the basic operation and applications of analog devices such as BJT and JFET<br>2. To understand the working of analog ICs like Op-Amp and Timer<br>3. To study the working and operation of waveform generators<br>4. To study and develop skills to design basic combinational and Sequential logic circuits<br>5. To explore the applications of various logic circuits<br>6. To lay foundation for understanding computer architecture and organization | |
| Course Outcomes (Expected Outcome): | After completion of this course students will be able to-<br>1. Describe the basic operation and applications of BJT.<br>2. Explain analog ICs like Op-Amp IC-741 and Timer IC- 555<br>3. Classify the working of sinusoidal and non-sinusoidal Waveform generators.<br>4. Apply the concept of K-map to simplify logic expressions.<br>5. Design and implement Combinational circuits<br>6. Inspect the applications of Sequential circuits | |
| **Unit I:** | **Introduction to Analog Circuits** | **Hours:07** |
| Transistor as an amplifier. Need of biasing, Potential divider bias circuit, Transistor as an electronic switch, Construction and working of JFET, Construction and working of MOSFET. | | |
| **Unit II:** | **Operational Amplifier** | **Hours:07** |
| Block diagram of Op-Amp, ideal Op-Amp parameters. Virtual Short, Applications of op-amp: Inverting & Non-Inverting Amplifier, Voltage follower, Summing Amplifier, Subtractor. | | |
| **Unit III:** | **Wave Generators** | **Hours:07** |
| Transistorized Oscillators: R-C Phase Shift Oscillator, Transistor crystal oscillator, Timer IC 555: Block diagram, working, Applications of IC-555: Astable Multivibrator & Monostable Multivibrator. | | |
| **Unit IV:** | **Introduction to Digital Circuits** | **Hours:07** |
| Logic gates, Number systems & its conversion, Logic expression realization & minimization using K-map (up to 4 variables only). Half Adder, Full Adder, Half Subtractor, Full Subtractor. | | |
| **Unit V:** | **Logic Circuits** | **Hours:07** |
| Difference between Combinational and Sequential circuits, Code converters (BCD, Excess-3 and Gray), Multiplexers, De-multiplexers and Decoders. Flip Flops: SR flip-flop, JK flip-flop, D flip-flop and T flip-flop. | | |
| **Unit VI:** | **Sequential Circuits** | **Hours:07** |
| Difference between Asynchronous & Synchronous sequential circuits, Mod of counter, Up-Counter, Down-Counter. Ring Counter. (Only Asynchronous type of counters). Introduction to shift Registers, SISO, SIPO, PISO and PIPO. | | |
| **Text Book:**<br>1. V. K. Mehta, Rohit Mehta: Principles of Electronics (S. CHAND)<br>2. Gayakwad R.A.: Op-Amps & Linear Integrated circuits (PHI)<br>3. Jain R.P. Modern Digital Electronics (TMH) | | |

**Reference Books:**

1. N. N. Bhargava, D. C. Kulshreshtha, S. C. Gupta: Basic Electronics & Linear circuits, (TTTI)
2. S. Salivahanan: Electronics Devices & circuits, Third Edition
3. John P. Hayes: Introduction to Digital Logic Design (Pearson)
4. Anand Kumar: Fundamentals of Digital Circuits (PHI)

| Course Code: 3IT203PC | Course Title: Object Oriented Programming | L-0 T-0 P-2 C-1 |
|---|---|---|
| **Course Pre-requisite:** Basic Computer Programming | | |
| **Course Objectives:** | Design, implement, test, and debug simple programs in an object-oriented programming language.<br>1. To develop the knowledge of object-oriented paradigm in the Java programming language.<br>2. To evaluate classical problems using java programming.<br>3. To develop software development skills using java programming for real world applications. | |
| **Course Outcomes:** | On completion of the course, the students will be able to<br>Describe Object Oriented approach to design software.<br>1. Design and implement simple programs in an object-oriented programming language.<br>2. Analyze the basics of object-oriented design and the concepts of encapsulation, abstraction.<br>3. Assess the concept of inheritance, and polymorphism<br>4. Construct applications in Java by applying concepts like interfaces, packages and exception handling.<br>5. Apply Java concepts like API, Applets, for program design.<br>6. Design and develop programs on AWT and swings. | |

**List of Experiments:**

This is a sample list of Experiments; a minimum of 10 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to Object Oriented Programming and installation of JDK. Write a program to print a
message "Hello World..."
2. Develop a program to explain the use of Operators in java.
3. Develop a Program to study and implement Looping Statements belonging to Java. 4. Develop a Program to study and implement Selection Statements belonging to Java. 5. Develop a program to study and implement some Pyramid.
6. Develop a program to demonstrate the concept of Class, Method and Object.
7. Develop a program to study and implement the concept of Method Overloading.
8. Develop a program to study and implement the concept of Constructor in Java.
9. Develop a program to study and implement the concept of Constructor Overloading in Java.
10. Develop a program to study and implement the Array in Java.
11. Develop a Program on various ways to accept data through keyboard (Command Line Argument)
12. Develop a program to study and implement the concept of Inheritance.
13. Develop a program to study and implement the concept of Method Overriding.
14. Develop a program to study and implement the Abstract Class.
15. Develop a program to study and implement the concept of Interface in Java.
16. Develop a program to study and implement Exception Handling Mechanism in Java.
17. Develop a program to study and implement Java I/O.
18. Develop a program to study and implement simple Applet in java.
19. Develop a program on Applet to demonstrate Graphics, Font and Color class.
20. Develop a Program on passing parameters to applets
21. Develop a Program to create GUI application without event handling using AWT controls
22. Develop a Program to create GUI application with event handling using AWT controls
23. Develop a program on Multithreading
24. Develop a Program to create GUI application with event handling using Swing controls
25. Mini Project based on content of the syllabus. (Group of 2-3 students)

| **Course Code: 3IT204PC** | **Course Title: Analog and Digital Electronics** | **LTPC: L-0 T-0 P-2 C-1** |
|---|---|---|
| Course Prerequisite: Basic Electrical Engineering | | |
| Course Objectives: | 1. To understand the basic operation and applications of analog devices such as BJT.<br>2. To introduce popular analog ICs like IC 741 and IC 555 and their practical use.<br>3. To understand the basic building blocks of digital circuits and their applications.<br>4. To introduce various combinational and sequential circuits | |
| Course Outcomes (Expected Outcome): | On completion of the course, the students will be able to:<br>1. Develop the basic applications of BJT.<br>2. Examine analog ICs like Op-Amp IC-741 and Timer IC-555<br>3. Analyze truth table of various logic gates.<br>4. Determine the working of half adder and Full adder using logic gates<br>5. Inspect the Combinational circuits like Multiplexer and De-Multiplexer.<br>6. Synthesize the working of sequential circuits. | |

**List of Experiments:**

This is a sample list of Experiments.

**Minimum 10 experiments** are to be performed covering the entire syllabus. At least two experiments should be based on topic beyond syllabi.

1. To study and plot the characteristics of NPN Transistor in CE configuration.
2. To study transistor as an electronic switch.
3. To study and plot the characteristics of JFET.
4. To study the working of Op Amp IC741 as an Inverting Amplifier.
5. To study the working of Op Amp IC741 as an Non-Inverting Amplifier.
6. To design and study a Square Wave Generator using Timer IC 555.
7. To design and study a Monostable Multivibrator using Timer IC 555.
8. To study and verify the truth table of different logic gates using TTL ICs (7404,7408,7432,7486 etc)
9. To study and verify the operation of Half Adder and Half Subtractor using logic gates.
10. To study and verify the operation of Full Adder using logic gates.
11. To study and verify the operation of Full Subtractor using logic gates.
12. To study and verify the truth table of SR Flip Flop using NAND gates.
13. To study and verify the truth table of JK Flip Flop using NAND gates.
14. Implement and study 8:1 Multiplexer using IC 74151.
15. Study of IC 74154 Decoder/ De Multiplexer
16. To study the working of 3-bit asynchronous up counter using JK Flip Flops
17. To study the working of 3-bit asynchronous down counter using JK Flip Flops.
18. To study the working of Ring Counter using JK Flip Flops.
19. To study 3-bit right shift register using suitable Flip Flops.

| **Course Code: 3IT205MD** | **Course Title: Introduction to Data Structures** | **LTPC: L-2 T-0 P-0 C-2** |
|---|---|---|
| Course Prerequisite: Fundamentals of programming Language & Logic Building Skills | | |
| Course Objectives: | 1. To understand the linear and nonlinear data Structures and its memory representations.<br>2. To understand various data searching and sorting methods with its complexity.<br>3. To introduce various techniques for representation of the data in the real world. | |
| Course Outcomes (Expected Outcome): | On completion of the course, the students will be able to:<br>1. Describe the basic concepts of data structures and linear arrays.<br>2. Examine operations like insertion, deletion, searching and traversing on various data structures<br>3. Illustrate the usage of various data structures in approaching problem solution. | |
| **Unit I:** | **Introduction to Data Structures and Linear Arrays** | **Hours: 9** |
| Introduction to Data structures, Data Structure Operations, Algorithmic Notation, Complexity of algorithms. Linear arrays: Memory Representation of arrays, traversing linear arrays, insertion and deletion operations, Bubble sort, insertion sort, selection sort, merge sort, radix sort, Linear search and Binary search. | | |
| **Unit II:** | **Linked Lists, Stacks and Queues** | **Hours: 9** |
| Linked lists: Memory Representation of Linked List, traversing a linked list, searching a linked list. Insertion & deletion operations on linked lists. Stacks: Sequential Memory Representation of Stacks,Arithmetic expressions: Polish notation, Queues: Sequential Memory Representation of Queue, Dequeue, Priority queues | | |
| **Unit III:** | **Trees and Graphs** | **Hours: 9** |
| Introduction to Trees, Binary trees, Memory Representation of Binary Tree, Traversing binary trees, Binary Search Tree, Searching, Inserting and deleting in BST. Introduction to Graphs, Memory representation of graphs, Warshalls' algorithm, Breadth First Search, Depth First Search. | | |
| Textbooks:<br>1. Seymour Lipschutz: Data Structures, Schaum's Outline Series, McGraw-Hill, International Editions.<br>2. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill. | | |
| Reference Books:<br>1. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.<br>2. Data Structure Using C, Balagurusamy<br>3. Standish: Data Structures in Java, Pearson Education. | | |

| Course Code: 3IT206OE1 | Course Title: OE-1 Cyber Law | LTPC: L-3, T-0, P-0, C-3 |
|---|---|---|
| **Course Prerequisite:** | Basic understanding of computer systems, internet concepts, and an awareness of legal and ethical issues in technology. | |
| **Course Objectives:** | 1. Introduction to basics of Computer, Internet and Cyber Law.<br>2. Demonstrate the concepts of e-Commerce.<br>3. Describe Cyber Crimes.<br>4. Enlist and predict the types of Cyber Crimes.<br>5. Inspect the principles of the Information Technology Act, 2000.<br>6. Examine the Internet Security issues. | |
| **Course Outcomes (Expected Outcome):** | After successfully completing the course, students will be able to-<br>1. Describe the fundamentals of computer, internet and cyber law.<br>2. Outline the fundamentals of E-Commerce.<br>3. Illustrate the knowledge of cybercrimes.<br>4. Classify cybercrimes.<br>5. Explain the principles of the Information Technology Act.<br>6. Inspect the Internet security issues. | |
| **Unit I:** | **Fundamentals of Computer, Internet and Cyber Law** | **Hours: 07** |
| Functional Components of Computer, applications of computers, Internet architecture, world wide web, internet server and types, Need for Cyber Law, difference between Cyber Crimes and Conventional Crimes. | | |
| **Unit II:** | **Introduction to E-Commerce** | **Hours: 07** |
| Electronic data interchange and legal issues, e-commerce models, e-banking, credit card, e-mail, e-governance and objective, models and types. | | |
| **Unit III:** | **Concepts of Cyber Crime** | **Hours: 07** |
| Characteristics of Cyber Crime, Causes and Measures to combat Cyber Crimes, Cyber Crimes against Individuals, Institution and State. | | |
| **Unit IV:** | **Categories of Cyber Crimes** | **Hours: 07** |
| Classification of Cyber Crimes, Hacking, Cracking, Digital Forgery, Cyber Stalking/ Harassment, cyber terrorism, Cyber Pornography and Obscenity, Identity Theft, Cyber Defamation, Virus attacks, Computer Fraud, Social Networking Crimes. | | |
| **Unit V:** | **Information Technology Act, 2000** | **Hours: 07** |
| Silent features of Information Technology Act, 2000, Definitions, Digital, Signatures and Certificates, Security Procedures, Electronic Contracts, Penalties and Adjudication, Liabilities of Service Providers. | | |
| **Unit VI:** | **Internet Security** | **Hours: 07** |
| Internet Security, ethical issues of Information Technology- software piracy, firewall and types of firewalls, biometrics and internet security products software. | | |

**Recommended Books:**


1. Pavan Duggal, "Cyber Law", ISBN: INK8196241070, Edition: 3rd, Volumes: 1, LexisNexis Publication, 2023.
2. Nilakshi Jain and Ramesh Menon, "Cyber Security and Cyber Laws", Wiley Publication.
3. Vakul Sharma and Seema Sharma, "Information Technology Law and Practice" , ISBN : 9789395116336, Edition 8th, Volume 01, LexisNexis Publication , 2023.
4. Craig B, “Cyber Law: The Law of the Internet and Information Technology”, Pearson Education.
5. K. Kumar, “Cyber Laws: Intellectual property & E Commerce, Security”, First Edition, Dominant Publisher, 2011.
6. Nandan Kamath, "Law Relating to Computer, Internet and E-commerce", Edition 5th, Universal Law Publishing, 2016.
7. Dr. Pramod Kr. Singh, “Laws on Cyber Crimes [Along with IT Act and Relevant Rules]” Book Enclave Jaipur India.

| Course Code: 3IT206OE2 | Course Title: OE-1 Web Technology | LTPC: L-3 T-0 P-0 C-3 |
|---|---|---|
| **Course Prerequisite:** | **Computer Fundamentals** | |
| **Course Objectives:** | **1.** Describe different Concept of Web.<br>**2.** Describe the importance of CSS.<br>**3.** Prepare concept of Client-side Programming.<br>**4.** Examine the server-side programming.<br>**5.** Explain Representation of Web Data XML Documents and Vocabularies<br>**6.** Describe Web Service Concepts | |
| **Course Outcomes:** | 1. Define Web technologies and Apply the Style sheet and HTML documents<br>2. Practice the client-side programming, Java Script and define Document object Model.<br>3. Analyze and practice Server-Side Programming and discuss concept of Java Servlets.<br>4. Construct java beans as well as develop Java Server pages<br>5. Categorize Web Services: WSDL and Analyze Object Data: SOAP<br>6. Develop web pages using Servlets, JSP, Markup languages and CSS. | |
| **Unit I:** | **Web Essentials** | **Hours: 07** |
| The internet, Basic Internet Protocols, The World Wide Web, HTTP Request Message, HTTP Response Message, Web Clients, Web Servers, Markup Languages: XHTML 1.0, Basics of XHTML, Fundamentals HTML Elements, Relative URLs, Lists, Tables, Frames, Forms, Defining XHTML's abstract syntax: XML, Creating HTML Documents | | |
| **Unit II:** | **Style Sheets** | **Hours: 07** |
| Introduction to Cascading Style Sheets, CSS Features, CSS Core Syntax, Style Sheets and HTML, Style Rule Cascading and Inheritance, Text Properties, CSS Box Model, Normal Flow Box Layout, Beyond the Normal Flow | | |
| **Unit III:** | **Client-Side Programming:** | **Hours: 07** |
| Introduction to Java Script ™ Language, JavaScript in Perspective, Basic Syntax, Variables and Data types, Statements, Operators, Literals, Functions, Objects, Arrays, Built-in Objects, JavaScript Debuggers, Host Objects: Introduction to the Document object Model, Intrinsic Event Handling, Modifying Element Style, The Document Tree, DOM Event Handling, Accommodation Noncompliant Browsers, Additional Properties of Window | | |
| **Unit IV:** | **Server-Side Programming** | **Hours: 07** |
| Java Servlets Servlet Architecture Overview, Servlet Generating Dynamic Content, Servlet Life Cycle, Parameter Data, Sessions, Cookies, URl Rewriting, Other Servlet Capabilities, Data Storage, Servlet and Concurrency. | | |
| **Unit V:** | **Representing Web Data** | **Hours: 07** |
| XML Documents and Vocabularies, XML versions and XML Declaration, XML Namespaces, JavaScript And XML: Ajax, Dom-Based XML Processing, Event-Oriented parsing: SAX, Transforming XML Documents, Selecting XML Data: XPath, Template-Based Transformation: XSLT, Displaying XML Documents in Browsers, Introduction to Java Server Pages, JSP and Servlets, Running JSP Applications, | | |

| Basic JSP, JavaBeans Classes and JSP, Tag Libraries and Files. | | |
|---|---|---|
| **Unit VI:** | **Web Services:** | **Hours: 07** |
| Web Service Concepts, writing a Java Web Service, writing a Java Web Service Client, Describing Web Services: WSDL, Representing Data Types: XML Schema, Communicating Object Data: SOAP. | | |

**Text Book:**

1. Web Technologies by Jeffrey C. Jackson (Pearson)

**Reference Books:**

1. The Web Warrior guide to Web Programming by Xue Bai, Micheal Ekedahl, Don Gosselin (CENGAGE Learning)
2. Internet Protocols by Subrata Goswami (Springer India)

| Course Code:3IT206OE3 | Course Title: OE-1 Internet of Things | LTPC: L-3 T-0 P-0 C-3 |
|---|---|---|
| **Course Prerequisite:** | Computer Fundamentals | |
| **Course Objectives:** | 1. Understand the fundamentals and applications of the Internet of Things.<br>2. Learn about IoT architectures, protocols, and enabling technologies.<br>3. Explore various sensors, actuators, and microcontrollers used in IoT.<br>4. Design basic IoT systems and understand communication models.<br>5. Apply knowledge of data acquisition, processing, and communication.<br>6. Gain hands-on experience with simple IoT projects using development boards.. | |
| **Course Outcomes (Expected Outcome):** | 1. Explain the basic concepts and evolution of IoT.<br>2. Describe IoT architecture, devices, and communication protocols.<br>3. Identify and integrate sensors and actuators for various applications.<br>4. Develop basic IoT applications using microcontrollers like Arduino or NodeMCU.<br>5. Analyze and implement IoT communication technologies (e.g., Wi-Fi, Bluetooth, MQTT).<br>6. Design a simple IoT-based solution for real-world problems. | |
| **Unit I** | **Introduction to IoT** | **Hours:07** |
| Definition, Characteristics, and Benefits, Evolution of IoT: M2M to IoT, IoT Ecosystem: Hardware, Software, and Applications, Applications of IoT in various domains (Home, Health, Industry, Agriculture) | | |
| **Unit II** | **IoT Architecture and Protocols** | **Hours:07** |
| IoT Reference Architecture (Three and Five Layer), Communication Models: Request-Response, Publish-Subscribe, IoT Protocols: HTTP, CoAP, MQTT, AMQP, Networking technologies: IPv4/IPv6, TCP/UDP | | |
| **Unit III** | **Sensors, Actuators, and Embedded Systems:** | **Hours:07** |
| Introduction to sensors and actuators, Types of sensors: Temperature, Humidity, Motion, Light, etc., Overview of embedded systems and microcontrollers, Introduction to Arduino and Raspberry Pi | | |
| **Unit IV** | **Communication and Networking Technologies** | **Hours:07** |

| | | |
|---|---|---|
| Wireless Technologies: Wi-Fi, Bluetooth, Zigbee, LoRa, RFID, NFC, Internet Protocols for IoT, Cloud and Edge Computing in IoT, Data transmission and security basics | | |
| **Unit V** | **IoT Platforms and Data Management** | **Hours:07** |
| IoT Platforms: ThingSpeak, Blynk, Google Firebase, IBM Watson IoT, Cloud Storage and Analytics, Data Collection, Processing and Visualization, Introduction to Big Data in IoT | | |
| **Unit VI** | **IoT Applications and Project Development** | **Hours:07** |
| Smart Home, Smart City, Smart Agriculture, Smart Healthcare, Mini-project: Building a simple IoT solution using Arduino/NodeMCU, Case studies of real-life IoT implementations, Challenges and future directions in IoT | | |

**Text Books:**

1. "Internet of Things – A Hands-on Approach", Arshdeep Bahga and Vijay Madisetti Universities Press
2. "Internet of Things", Raj Kamal, McGraw Hill Education

**Reference Books:**

1. "Architecting the Internet of Things", Dieter Uckelmann, Mark Harrison, Florian Michahelles, Springer
2. "Getting Started with the Internet of Things", Cuno Pfister, O'Reilly Media
3. "Designing the Internet of Things", Adrian McEwen and Hakim Cassimally, Wiley
4. "Building Internet of Things with the Arduino", Charalampos Doukas, CreateSpace Independent Publishin

| Course Code: 3IT207EM | Course Title: Entrepreneurship Development | LTPC: L-2, T-0, P-0, C-2 |
|---|---|---|
| **Course Prerequisite:** | Basic knowledge of business and introductory knowledge of financial literacy | |
| **Course Objectives:** | 1. Developing entrepreneurial spirit, motivation, and competencies for starting and managing ventures.<br>2. Understanding the role of entrepreneurship in personal growth, national development, and creating dignified livelihoods.<br>3. Gaining knowledge of human resource utilization, the entrepreneurial process, and skills for creating and managing entrepreneurial ventures. | |
| **Course Outcomes (Expected Outcome):** | After successfully completing the course, students will be able to-<br>1. Describe the dynamic role of entrepreneurship and small businesses.<br>2. Create Idea to Startup and Ownership for Small Business.<br>3. Inspect Financial Planning and Control. | |
| **Unit I:** | **Introduction to Entrepreneurship and Start-up** | **Hours: 09** |
| Introduction to Entrepreneurship and Start – Ups: Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation Types of Business Structures, Similarities/differences between entrepreneurs and managers. | | |
| **Unit II:** | **Business Ideas and Idea to Start-up** | **Hours: 09** |
| Business Ideas and their implementation: Discovering ideas and visualizing the business Activity map Business Plan. Idea to Start-up: Market Analysis – Identifying the target market, Competition evaluation and Strategy Development, Marketing and accounting, Risk analysis | | |
| **Unit III:** | **Management and Financing and Protection of Ideas** | **Hours: 09** |
| Management: Company's Organization Structure, Recruitment and management of talent. Financial organization and management. Financing and Protection of Ideas: Financing methods available for start-ups in India Communication of Ideas to potential investors – Investor Pitch Patenting and Licenses | | |

**Recommended Books:**


1. Steve Blank and Bob Dorf, "The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company", K & S Ranch, ISBN – 978-0984999392.
2. Eric Ries, "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses", Penguin UK, ISBN – 978-0670921607.
3. Adrian J. Slywotzky with Karl Weber, "Demand: Creating What People Love Before They Know They Want It", Headline Book Publishing, ISBN – 978-0755388974.
4. Clayton M. Christensen, "The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business", Harvard business ISBN: 978-142219602.

**Note:** The syllabi provided for each subject are indicative and intended solely for reference. As the courses are to be offered through online platforms such as MOOC, NPTEL, or other duly approved content providers, complete alignment of course content with the prescribed syllabus may not always be feasible. Accordingly, the syllabi are to be regarded as a notional framework.

The Head of the Department, in consultation with the duly constituted committee, shall exercise due diligence in the evaluation and approval of online courses opted by students, ensuring that the intended learning outcomes are in reasonable conformity with the reference syllabus.

## Information Technology

Track: Advanced Databases (Honours / Double Minor)

| | | | | |
|---|---|---|---|---|
| SEM III | 3IT245DH1 | Introduction to Databases | 4 | Theory |
| SEM IV | 4IT246DH1 | SQL and NoSQL Databases | 4 | Theory |

Syllabus

**Subject Code : 3IT245DH1**

**Subject Title: Introduction to Databases**

Course Pre-requisites : **Programming, Computer Fundamentals and Mathematical Thinking**

Course Objectives : The course aims to:

1. **Introduce the fundamentals of databases and relational data management.**
2. **Familiarize students with SQL syntax for data definition, manipulation, and retrieval.**
3. **Develop problem-solving skills through hands-on query writing and database design.**
4. **Provide an understanding of joins, relationships, normalization, and transactions for data consistency.**
5. **Enable students to design, implement, and manage end-to-end database systems with real-world mini projects.**

Course Outcomes (COs)

At the end of this course, students will be able to:

**CO1**: **Set up** a database environment and **create** tables with appropriate data types and constraints.

**CO2**: **Perform** data manipulation operations (INSERT, UPDATE, DELETE) and **retrieve** data using SELECT with filters and sorting.

**CO3**: **Apply** aggregate functions, grouping, and built-in functions to generate summaries and reports.

**CO4**: **Demonstrate** the use of different joins and **analyze** relationships (one-to-one, one-to-many, many-to-many) in relational databases.

**CO5**: **Construct** advanced SQL queries using subqueries, views, indexes, and **implement** transactions with COMMIT/ROLLBACK.

**CO6**: **Design** and **implement** normalized database schemas, perform backup/restore operations, and **develop** a mini-project for a real-world application.

**Course Syllabus:**

**Unit I**: **Getting Started with Databases** - Installing and setting up a database (MySQL/PostgreSQL/SQLite), Creating databases and tables, Data types and constraints (PRIMARY KEY, FOREIGN KEY, NOT NULL, UNIQUE, DEFAULT, CHECK), Hands-on: Create a sample student management database.

**Unit II: Data Manipulation (DML Operations)** - Inserting, updating, and deleting records. SELECT queries with filtering (WHERE, LIKE, IN, BETWEEN). Sorting and limiting results (ORDER BY, LIMIT). Hands-on: Populate the database with sample data and perform CRUD operations.,

**Unit III: Querying and Functions** - Aggregate functions (COUNT, SUM, AVG, MAX, MIN). GROUP BY and HAVING clauses. Built-in functions: string, date, and numeric functions. Hands-on: Write queries for reporting and data summaries.

**Unit IV: Joins and Relationships** - INNER JOIN, LEFT JOIN, RIGHT JOIN, FULL JOIN. Self-joins and cross joins. Handling one-to-one, one-to-many, and many-to-many relationships. Hands-on: Design and query a database with relational tables (e.g., library or e-commerce system).

**Unit V: Advanced Querying and Transactions** - Subqueries and nested queries. Views and indexes. Transactions (COMMIT, ROLLBACK, SAVEPOINT). Hands-on: Build queries for real-world problem statements (inventory updates, order tracking).

**Unit VI: Practical Applications and Mini Project** - Designing a complete database schema (ER → Relational Mapping). Normalization (1NF, 2NF, 3NF) with practical examples. Backup and restore operations. Hands-on Mini Project: End-to-end database design and implementation (choose domain: student portal, hospital, online store, etc.).

**References:**


1. Learning MySQL and MariaDB: Heading in the Right Direction with MySQL and MariaDB, by Russell J. T. Dyer
2. Database System Concepts, By Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill Education

3. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw-Hill
4. SQL: The Complete Reference, James R. Groff, Paul N. Weinberg, Andy Oppel, McGraw-Hill

Track: Data Science and Analytics (Honours / Double Minor)

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|---|---|---|---|---|
| SEM III | 3IT245DH2 | Data Science | 4 | Theory |
| SEM IV | 4IT246DH2 | Natural Language Processing | 4 | Theory |

Syllabus

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**Honors Track : Data Science and Analytics**

**Subject Code :** 3IT245DH2

**Subject Title:** Data Science

Course Pre-requisites : **Programming concepts, Basic Mathematics**

Course Objectives : The course aims to:

1. Introduce Python programming environment using Anaconda, Jupyter Notebook, and essential libraries for data analysis.
2. Develop skills to work with NumPy, Python data structures, and implement statistical computations.
3. Familiarize students with fundamental statistical concepts, data distributions, and visualization techniques.
4. Enable learners to apply Python for real-world data analysis, including descriptive statistics, probability functions, and predictive modeling.
5. Provide practical exposure to machine learning basics and applications in sentiment analysis and real-world datasets (e.g., Kaggle, Facebook data).

Course Outcomes :

**CO1**: **Explain** the process of installing Anaconda, Python libraries, and using Jupyter Notebook for programming and data analysis.

**CO2**: **Apply** Python data structures, functions, and NumPy operations to perform basic statistical computations such as mean, median, and mode.

**CO3**: **Analyze** different types of data and **compute** descriptive statistical measures including variance and standard deviation.

**CO4**: **Interpret** data distributions, percentiles, and moments, and **visualize** them using plots and probability functions (PDF, PMF).

**CO5**: **Develop** data visualizations using Matplotlib and **evaluate** simple machine learning models using accuracy and performance metrics.

**CO6**: **Perform** real-world data analysis tasks such as Kaggle dataset exploration and **conduct** sentiment analysis using Python.

Course Syllabus

Unit I: Installing Anaconda with Python distribution, Installing Python libraries, Using iPython, Jupyter Notebook, Python and Anaconda

Unit II: NumPy Module, Data Structures in Python, Functions in Python For loop, If While Statements Types of Data, Computing Mean Median Mode

Unit III: Types of data you may encounter and how to treat them accordingly, Statistical concepts of mean, median, mode, standard deviation, and variance

Unit IV: Types of data distributions and how to plot them, Understanding percentiles and moments, Computing Mean, Median, Mode Data Visualization Computing Variance Standard Deviation, Computing PDF (Probability Density Function) and PMF (Probability Mass Function), Knowing Data Distribution, Identifying Percentile, Moments and Data Shape

Unit V: Exploring Matplotlib for Bar chart, Pie chart and Scatter plot, Machine learning, Training Data, Test Data, Prediction, Accuracy, Other evaluation measures

Unit VI: Facebook Data Analysis, Downloading data from Kaggle  Data and analyzing it with Python, Sentiment Analysis from Hotels Review Dataset

**References:**


1. Python for Data Analysis, Wes McKinney, O'Reilly Media
2. Data Science from Scratch: First Principles with Python, Joel Grus, O'Reilly Media
3. Data Science for Business, Foster Provost, Tom Fawcett, O'Reilly Media
4. Think Stats: Exploratory Data Analysis in Python, Allen B. Downey, O'Reilly Media
5. Data Science with Python, Amol PB, NotionPress


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