Delhi Skill and Entrepreneurship University

Diploma in Computer Engineering

Syllabus Document

Effective From Academic Year 2021-22

Program Information

Introduction

The computer business is one of India's fastest-expanding divisions and will remain so for a long time. A Diploma in Computer Engineering will help you build a solid foundation in hardware, software, operating systems, computer architecture, electrical engineering and a variety of sub-disciplines and understand its utilisation in different fields. A Diploma in Computer Engineering program covers basic topics like computer programming, operating system, networking, database, etc. After completing the program, you can work as a programmer, system analyst, or cloud architect and maintain computers for other organisations. You can even start your own IT company or work with other organisations.

Program Vision

The vision of a Diploma in Computer Engineering is to impart knowledge and practical expertise to empower students with new technologies in the field of Computer Engineering. This course has been designed to include specialized fields for the current and futuristic demands of the IT industry. Apart from IT skills, students will get multiple opportunities to enhance their personalities and focus to handle life challenges smoothly and practice good hobbies.

- **Technical Knowledge/Skills**: HTML, JavaScript, PHP, XML, Flutter, AJAX, Python.
- **Software Skill and Project Skills**: Programming skills & Software management Skills in PHP, Android, .NET, Cloud, Java, Advance Java Programming, and MySQL.
- **Personality Traits and Ethics**: Assertiveness, Good attitude, Compassionate, Patience, Punctuality, and Sincerity
- **Soft Skills**: Flexibility and adaptability, work ethics, Responsibility, Good Verbal, written and communication Skills, Interpersonal Skills.

Program Mission

- To produce Computer Engineers of high talent, technically skilled and ethical values to serve the society and nation.
- To make the department a centre of excellence in the field of Computer Engineering and related research.
- To provide a knowledge base and consultancy services to the community in all areas of Computer Engineering.
- To promote innovative and original thinking in the budding engineers to face the challenges of the future.
- To be equipped with unique industry-led education demands and practical training, the students are promoted to become an entrepreneur and capable of working on IT projects.

Program Outcome

1. To be able to apply an understanding of mathematics and Engineering sciences to the solution of Computer Engineering problems.
2. To be able to identify, formulate, and solve computer Engineering problems using multidisciplinary knowledge.
3. To be able to design IT solutions for Computer Engineering problems and system design to meet the needs of the public considering the health, safety, cultural, societal, and environmental factors.
4. To be able to apply study-based knowledge and research methods to complex problems including design, analysis, interpretation of data, and synthesis of the information to provide valid conclusions.
5. To be able to create, select, and apply suitable techniques, and simulation tools for the prediction and modelling of Engineering activities with their limitations.
6. To be able to assess societal, health, safety, legal and cultural issues relevant to the Computer Engineering profession.
7. To be able to provide computer Engineering solutions for sustainable development.
8. To be able to apply ethical principles and responsibilities for Computer Engineering practice.
9. To be able to function effectively as an individual member or leader in diverse teams, and multidisciplinary projects.
10. To be able to communicate effectively with the Engineering community and with society at large, such as, writing effective reports and design documentation, and making effective presentations.
11. To be able to apply Engineering and management principles to one’s work, or in a team, to manage projects in multidisciplinary environments.
12. To be able to recognize the need for lifelong learning for professional development and personnel growth.

Credit Scheme

Semester V							
S. No.	Course Code	Course Name	Hours/week				Total Credits
			L	T	O	P	
1	???	Face the World Skills V	1	0	0	0	1
2	???	English Communication V	1	0	0	0	1
3	CS-PC501	Python Programming	3	0	0	4	5
4	CS-PC502	Web Development	3	0	0	4	5
5	CS-PC503	Computer Hardware and Maintenance	3	0	0	4	5
6	CS-PE50X	Elective	3	0	0	2	4
7	CS-PR501	Minor Project	0	0	0	4	2
8	CS-SI501	Summer Training Evaluation	0	0	0	2	1
Total			14	0	0	18	23

Elective							
S. No.	Course Code	Course Name	Hours/week				Total Credits
			L	T	O	P	
1	CS-PE501	Cryptography and Network Security	3	0	0	2	4
2	CS-PE502	Data Mining and Data Warehousing	3	0	0	2	4
3	CS-PE503	E-Commerce and Digital Marketing	3	0	0	2	4
4	CS-PE504	Internet of Things	3	0	0	2	4

SEMESTER V

CS-PC501 | Python Programming

Teaching Scheme			
Lecture hours per week	Tutorial Hours per week	Practical hours per week	Credits
3	0	3	4.5

Prerequisites:

Basic programming concepts and operating system operations.

Rationale:

Python has emerged as one of the scientific and analytical languages that has been well accepted by a large number of users from different domains. It offers an enormous number of libraries that offer various means for data handling, data analysis, and data visualisation. An exposure of Python language will help students in understanding its potential and applications in solving real-world problems from the domain of data mining, scientific programming, machine learning and many more.

Objectives:

The objective of this course is to make students familiar with the process of coding by giving them comprehensive details on how to handle data in different formats viz. numbers, strings, lists, dictionaries, sets, tuples etc. Students will be able to design the codes using simple conditional and iterative loops. Students will also understand modularization of code using inbuilt functions as well as user defined functions.

Learning Outcomes:

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

- Understand open-source software, Python installation and configuration.
- Understand simple scripting using Python.
- Understand different data types and arithmetical, logical and relational expressions in python.
- Understand controls and iterative structures by writing codes for some real-world problems.
- Modularize the code using inbuilt functions and user defined functions.
- Handle simple data structures, lists, Dictionaries, Sets and tuples.

Syllabus:

Unit	Title	Hours

UNIT 1	**Basic Introduction** Origin, Need of Python Programming, Features, program structure, identifiers, reserved words, IDLE-Python Interpreter	**4**
UNIT 2	**Python Programming Introduction** Variables and assignment statements, data types, input and print functions, String formatting	**4**
UNIT 3	**Operators and Expressions** Arithmetic, Logical, Relational Expressions, Operator Precedence and Associativity, Comment Statements, different kinds of error (Syntax, Runtime Exceptions, Logic Errors)	**5**
UNIT 4	**Conditional Statements** Conditional Programming like Boolean Processing, if/else statement, Compound if/else statement, nested conditions, Multi Way Decision Statement, Errors in conditional Statements.	**5**
UNIT 5	**Iterative Programming** While, for, definite and indefinite loops, nested loops, abnormal termination of loops using Break Continue statement, while/else and for/else.	
UNIT 6	**Functions** Standard Mathematical, time, random number, system specific functions, user defined functions, parameter passing, global variables, Default parameters, recursion, and functions as data.	**5**
UNIT 7	**Lists, Tuples, Sets, and Dictionary** List Traversal, Creating Lists, checking membership of a list, slicing common list functions. Tuples, sets and Dictionaries - Counting and grouping with dictionaries, sets qualification with all and any.	**5**
UNIT 8	**NumPy, Matplotlib, and Pandas Library** Introduction to NumPy, Creation of One-Dimensional Arrays, Re-shaping of an Array, Element-wise Operations, Aggregate Operations, Array indexing, Array Slicing, insert Row/Columns, Append Row/Columns, Array Manipulation Operations. Introduction to matplotlib: Bar Graphs, pie charts Pandas: Using series and Dataframes, Deleting and merging items, Displaying dataframes.	**6**

List of Practicals/Experiments:

The required list of experiments is provided as under. The examples cited here are purely indicative and not exhaustive. Attempts shall be made to perform all experiments.

1. Installation of Python and Environment Settings
2. Terminal Commands and Python Script Writing
3. Write Python programs using various data types and expressions of python through simple coding exercises

4. Solving mathematical statistical formulas using python arithmetic, logical and relational expressions.
5. Writing small codes of real-life situations to demonstrate conditional setups, if/else, nested if/else.
6. Demonstration of iterative programming using while, for loops.
7. Exploring simple data inbuilt data structures, lists, dictionary, sets and tuples
8. Writing user defined functions and using inbuilt functions related to mathematics, time, random numbers.
9. Perform various operations like Search the maximum and minimum element, sort, reverse etc. on Arrays using NumPy
10. Using Matplotlib draw line, bar, and pie chart using sample data.
11. Create, update and display dataframe using Pandas library.

References/ Suggested Readings:

(a) Books

1. Introduction to Python Programming, Gowrishankar S. and Veena A., CRC Press, 2019.

2. Python Programming for Data Analysis, Jose Unpingco, Springer Nature, 2021.

(b) Open source software and website address:

1. Python: An Introduction to Programming, James R. Parker, 2nd Ed., Mercury Learning And Information, 2021.

2. Introduction to Computation and Programming Using Python, John V. Guttag, The MIT Press, 2021.

3. Python Programming: A Practical Approach, Vijay Kumar Sharma, Vimal Kumar, Swati Pathak, and Shashwat Pathak, CRC Press, 2021.

CS-PC502 | Web Development

Teaching Scheme			
Lecture hours per week	Tutorial Hours per week	Practical hours per week	Credits
3	0	3	4.5

Prerequisites:

Basic programming concepts.

Rationale:

In today's digital era, the requirement of having online platforms, through the means of websites and mobile applications, for business enterprises is undeniable. Such platforms offer a wide range of opportunities and/or services to entities involved. Hence, the study of web development practices may enable students to come up with practical, innovative, and affordable ways to build recognition for businesses.

Objectives:

- To know the principles of web design
- To understand designing of the web sites
- To impart knowledge of building dynamic web pages and develop interactive web applications

Learning Outcomes:

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

- Understand the fundamentals of the Internet and Principles of web design
- Realize the potential of designing websites
- Design dynamic web pages with different technologies
- Familiarize with modern interactive web applications

Syllabus:

Unit	Title	Hours
UNIT 1	**World Wide Web** Introduction, Web page, Home page, Web site, Static and Dynamic website, Client-Server Computing concepts, Web Client and Web Server, Web Browser, Client-side and Server-side Scripting Languages	5
UNIT 2	**HTML** Basics of HTML, HTML comments, formatting and fonts, colour, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character	7

entities, frames and frame sets, Overview and features of the latest version of HTML

UNIT 3	**Cascading Style Sheets** Introduction to CSS, Basic syntax and structure, Use of CSS in setting background images, colours and properties, manipulating texts, fonts, borders and boxes, margins, padding lists, and positioning tables, images, text etc.	**5**
UNIT 4	**Java Script** Introduction to JavaScript, Basic Syntax and Structure, Data types, Control statements, Operators, Dialog boxes, Built-in and user defined functions, Objects in JavaScript, Handling Events, Basic validations, Document Object Model, Browser Object Model	**8**
UNIT 5	**XML** Introduction, Features, Naming rules, uses of XML, Building block of XML Document, Difference between HTML and XML, XML Parser, DTD using XML with HTML and CSS	**6**
UNIT 6	**PHP and MySQL** Introduction and basic syntax of PHP, Decision and Looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Form Data Handling with PHP, Database connectivity and handling using PHP-MySQL	**8**

List of Practicals/Experiments:

The required list of experiments is provided as under. The examples cited here are purely indicative and not exhaustive. Attempts shall be made to perform all experiments.

1. Create a static web page which defines all text formatting tags of HTML in tabular format.
2. Create a static webpage using table tags, list tags, images in HTML.
3. Create a webpage using HTML form objects.
4. Create a webpage using HTML frames.
5. To Display list of items in different styles.
6. Create your own style sheets and use them in your web page.
7. Create a web page using XML.
8. Create JavaScript for conditional statements and loops.
9. Create JavaScript for arrays.
10. Create JavaScript for strings.
11. Create a PHP program for arrays.
12. Create a PHP program for loops.
13. Create a PHP program using a recursive function.
14. Create a PHP program for strings.
15. Create a PHP program to get data from XML file in PHP.
16. Create a PHP program to send HTML form data to email.
17. Create a PHP program to store the username in a cookie and check whether the user has successfully logged in or not.
18. Create a PHP program to set sessions on successful login.

References/ Suggested Readings:

(a) Books

1. Bayross, I. (2013). Web enabled commercial application development using HTML, JavaScript, DHTML and PHP. 4th edition. BPB Publication.

(b) Open source software and website address:

1. Thomas A. Powell, HTML & CSS: The Complete Reference, 5th edition, McGraw Hill
2. Ralph Moseley and M. T. Savaliya, Developing Web Applications, Wiley-India Private Limited, 2011.
3. Robert W.Sebesta, Programming the World Wide Web, 7th edition, Pearson Education, 2013.

CS-PC503 | Computer Hardware and Maintenance

Teaching Scheme			
Lecture hours per week	Tutorial Hours per week	Practical hours per week	Credits
3	0	3	4.5

Prerequisites:

Basic knowledge of computer systems.

Rationale:

The course provides the students with an understanding of Computer hardware, Fault diagnostics in computers peripherals and Networking.

Objectives:

- To understand the Computer Hardware, Computer Peripherals, basics of Computer Networking Installation, fault diagnosis and their maintenance.

Learning Outcomes:

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

- Configure a new Computer System and other peripheral devices
- Diagnose and rectify the faults in the Computer Systems, peripheral or network system
- Upgrade and maintain computer systems, peripherals and network systems

Syllabus:

Unit	Title	Hours
UNIT 1	**Fundamental of Computer Hardware Basics** Introduction to Computer Hardware, BIOS & Flash BIOS, Motherboard of PC and supporting cards, Motherboard types, Different types of BUS architecture in a PC, SMPS and other types of power supplies, Grounding or Earthing in input (AC) power supply and its significance	7
UNIT 2	**Motherboard and Supporting Cards** Different types of Motherboards in desktops, laptops and servers, Identification of motherboards. Interface slots, ports connections, Installation of supporting cards, Introduction to device drivers, Installing and uninstalling of device drivers in windows, mac, Linux and Unix environment. Faults, diagnosis and correction motherboard of desktop/laptop	7

UNIT 3 **Storage Unit** **9**

Different types of memories in a Computer System, ROM, RAM and its types, Memory module, Cache memory, Construction of HDD, Hard disk management such as partitioning, naming, making hard disk bootable. data transfer rate, storing methods in different storage devices, Optical memory CD/DVD, tape drives, Network attached storage (NAS) and cloud storage, Addition and up- gradation of memories in different types of systems.

Faults, diagnosis and correction of all devices mentioned above

UNIT 4 **Printers, Display Units and Peripherals** **9**

Types of Printers (Impact and Non-Impact), Block diagram and working mechanism of DMP, Laser, Inkjet and thermal printers, Multifunction printers

Identifications, diagnosis and correcting common faults in DMP, Laser and Inkjet printers and Multifunction Printers

Fundamentals of display devices, Different types of Monitors, types of display adapter cards, Keyboards and its types, Mouse and its types, Keyboard and mouse interface, Scanners and its types

Common faults, diagnosis methods and corrective measures of all the above mentioned peripherals.

UNIT 5 **Troubleshooting and Maintenance** **7**

Fundamentals of Troubleshooting, Troubleshooting Methods and tools, Diagnostic software, Fault diagnosis by visual Inspection,

Fault, failure, MTTR, MTBF, reliability, availability, bathtub curve

Type of maintenance, Preventive maintenance, Predictive maintenance, Break down or corrective maintenance etc.

Role of Maintenance team, allocation of jobs to maintenance engineer, Preparation of job card

Fault diagnostic Software utilities, Performance issues due to Environmental factors.

List of Practicals/Experiments:

1. Study of Layout plan of motherboard. Identification of different types of motherboards and different components of a motherboard
2. Identification of Ports on a PC motherboard and their applications.
3. Identification and study of different types Interfaces, Interface Cards such as SATA, IDE, SCSI, Network Interface Card, Display Card, Sound Card, Video Card, Ethernet Card, Accelerator Cards (Graphics Accelerator Card, Server Accelerator Card and IO Accelerator card etc.
4. To configure BIOS setup program and troubleshoot the typical problems using BIOS utility
5. Identification and study of different types of Memories such as RAM DDRs, ROM, HDD,SSD (PCIe-Peripheral Component Interconnect Express, NVMe - Non-Volatile Memory Express, SATA SSD).
6. Study of computer peripherals such as CD-ROMs, Scanner, Printers, Impact and Non Impact Printers, DMP, Inkjet, Laser Printer, key board, mouse
7. Identification of Faults in a Computer System, Nature of Faults (Solid and Intermittent), Types of Faults (Software and Hardware), Diagnostic Programs and Tools, Systematic Troubleshooting. Causes of common faults in a computer system.

8. Different Types of Power Supplies, SMPS, Connection of Power Supplies, Block Diagram of SMPS.
9. Complete Assembly of a computer system from scratch.
10. Methods of preparing a raw computer system into a working machine by installing OS (Windows and Linux), device drivers, application software, connecting and installing peripherals, Partitioning and formatting of HDD/SDD.

References/ Suggested Readings:

(a) Books

1. IBM PC & Clones: Hardware Troubleshooting and Maintenance by B. Govindarajalu, Tata McGraw Hill

(b) Open source software and website address:

1. PC Upgrade & Repair Bible, Wiley India.
2. PC Systems, Installation and Maintenance, Second Edition by R. P. Beale

CS-PE501 | Cryptography and Network Security

Teaching Scheme			
Lecture hours per week	Tutorial Hours per week	Practical hours per week	Credits
3	0	3	4.5

Prerequisites:

Mathematical foundation and knowledge of computer networks.

Rationale:

The advancement in computing technology has led to a sharp increase in the rate at which information is being shared among different entities. To ensure the integrity of the data, confidentiality of the information, and reliability of the network through which data is being transmitted, the study of underlying concepts, principles, and mechanisms for providing security to the data and networks is of paramount importance.

Objectives:

- To provide in-depth knowledge of cryptography and network security
- To provide understanding of different cryptographic protocols and techniques
- To provide understanding of necessary approaches and techniques to build protection mechanisms in order to secure computer networks
- To identify and mitigate software security vulnerabilities in existing systems

Learning Outcomes:

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

- Develop concept of Security needed in communication of data through Computers and Networks
- Understand cryptographic mechanisms for secure transmission of data
- Demonstrate the generation of keys and execution of symmetric and public key algorithms from given data
- Implement cryptography solution for given security problem by identifying strength and weaknesses of algorithms based on cryptanalytic and brute force attack
- Understand Network Security concepts, Vulnerabilities, threats, Security practices and System security standards
- Analyze and design Network security protocols

Syllabus:

Unit Title **Hours**

UNIT 1	**Security Concept and Basics of Cryptography** Security Concept: Introduction, Need for security, Security approaches, Types of Security attacks, Security Services, Security Mechanisms, A model for Network Security Cryptography: Introduction, Plain text and Cipher text, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Cryptanalysis, Brute force attack.	**4**
UNIT 2	**Classical Symmetric Cipher Techniques** Symmetric Cipher Model, Substitution Techniques - Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad, Transposition Techniques - Rail Fence Cipher, Columnar Transposition Technique, Running Key Cipher	**4**
UNIT 3	**Data Encryption Standard** Concept of Stream, Block, and Feistel Ciphers, Feistel Cipher Structure, Data Encryption Standard (DES) Algorithm, DES encryption, DES decryption, Strength of DES, Avalanche Effect	**6**
UNIT 4	**Asymmetric Cipher Techniques** Public-Key Cryptosystems, Applications and requirements for Public-Key Cryptosystems, RSA algorithm, Security of RSA, Diffie-Hellman Key Exchange, Elgamal Cryptographic systems	**4**
UNIT 5	**Hash Functions and Message Authentication Code** Cryptographic Hash Functions: Message Authentication, MD5, Secure Hash Algorithm (SHA), SHA-128, SHA-256, and SHA-512 Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures	**4**
UNIT 6	**Network Security** Network Security Controls - Architecture, Encryption, Content Integrity, Access Control, Firewalls - Design and Types, Intrusion Detection System	**6**
UNIT 7	**Transport Level and Wireless Network Security** Transport-level Security: Web security Threats and approaches, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH) Wireless Network Security: Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security	**6**
UNIT 8	**Email Security, IP Security and System Security** Electronic Mail security: PGP, S/MIME IP Security: IP Security Overview, IP Security Policy System Security: Intruders, Malicious software and its types	**5**

List of Practicals/Experiments:

The required list of experiments is provided as under. The examples cited here are purely indicative and not exhaustive. Attempts shall be made to perform all experiments.

1. Program to implement Ceaser Cipher
2. Program to implement Playfair Cipher
3. Program to implement Mono-alphabetic Cipher
4. Program to implement Polyalphabetic Cipher
5. Program to implement Hill Cipher.

6. Program to implement Rail fence technique
7. Program to implement Simple Columnar Transposition technique
8. Program to implement Advanced Columnar Transposition technique
9. Program to implement RSA Algorithm
10. Program to Implement the Diffie-Hellman Key Exchange algorithm for a given problem
11. Study of need, design and applications of collision resistant hash functions.
12. Study of working of Digital Signature Schemes.
13. Study of Firewall design principles and configuration of Firewall.

References/ Suggested Readings:

(a) Textbooks

1. William Stallings, “Cryptography and Network Security: Principles and Practice”, PHI.
2. Atul Kahate, “Cryptography and Network Security”, Tata McGraw Hill.

(b) Reference Books

1. C K Shyamala, N Harini and Dr. T R Padmanabhan, “Cryptography and Network Security”, Wiley India Pvt.Ltd
2. Behrouz A. Forouzan, “Cryptography and Network Security”, Tata McGraw Hill.
3. W. Mao, “Modern Cryptography – Theory and Practice”, Pearson Education.
4. Wade Trappe, Lawrence C Washington, “ Introduction to Cryptography with coding theory”, Pearson.

(c) Open source software and website address:

1. https://nptel.ac.in/courses/106105162
2. https://cse29-iiith.vlabs.ac.in/

CS-PE502 | Data Mining and Data Warehousing

Teaching Scheme			
Lecture hours per week	**Tutorial Hours per week**	**Practical hours per week**	**Credits**
3	**0**	**3**	**4.5**

Prerequisites:

Mathematical foundation and knowledge of computer database.

Rationale:

The course provides the students with an understanding of knowledge discovery from data (KDD) process, fundamental data mining & data warehousing concepts and techniques for discovering interesting patterns from data in various applications. The students will also get practical knowledge of data mining techniques using tools such as WEKA etc.

Objectives:

- To provide strong concepts and knowledge of KDD process, data mining, data warehouse, data mining methods and techniques such as association rules mining, data clustering and classification. To understand and use various classification, clustering methods on large data sets.

Learning Outcomes:

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

- Describe process of knowledge discovery from data
- Explain the concepts of Data Mining, kinds of data that can be mined
- Understand mining patterns, and target applications and explain major Issues in data mining
- Understanding data pre-processing, data Warehouse and OLAP technology
- Understanding mining frequent patterns and association, classification, clustering, and outlier detection
- Understand and apply machine learning/pattern recognition techniques, statistics, visualization, algorithm on data mining databases**.**

Syllabus:

Unit	Title	Hours
UNIT 1	**Introduction to Data Mining and Data Warehousing** Introduction, Motivation, Definition & Functionalities; knowledge discovery from data (KDD) process; data and attributes; types and	**7**

properties of attributes; types of datasets-record, graph and ordered; data visualization
Introduction to database and warehouse, components of data warehouse.

UNIT 2 **Data Warehouse and OLAP** **7**

Data Warehousing: Overview, Definition, difference between Data Warehouse and DBMS, Dimensional Design, Multidimensional data model, data cubes, Star, Snowflakes, Fact Constellations Schema.
OLAP: Introduction, operations, OLAP Cubes, MOLAP, ROLAP, HOLAP, RTOLAP

UNIT 3 **Data Pre-Processing** **7**

Concept of Noise, outliers, missing values, duplicate data; introduction to data pre-processing, aggregation, sampling, dimensionality reduction-PCA, feature subset selection.

UNIT 4 **Data Mining Algorithms: Association Rule Mining** **6**

Definition, Introduction, itemset, support count, support, frequent itemset, association rule, confidence, problem with association rule mining. Introduction to apriori mining.

UNIT 5 **Data Mining Algorithms: Classification** **6**

Introduction to classification, Decision tree classifier, Bayes classifier, k-Nearest Neighbours classifier, support vector classifier; Classifier evaluation methods- confusion metrics, accuracy, precision, recall, f-measure.

UNIT 6 **Data Mining Algorithms: Clustering** **6**

Introduction to clustering, types of clustering;
Partitioning method: k-means clustering
Hierarchical method: distance-based agglomerative clustering
Density based method: DBSCAN

List of Practicals/Experiments:

The required list of experiments is provided as under. The examples cited here are purely indicative and not exhaustive. Attempts shall be made to perform all experiments.

1. Downloading and installation of WEKA data mining toolkit.
2. Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.
3. Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel)
4. Study the arff file format.
5. Explore the available data sets in WEKA. Load a data set (ex. Weather dataset, Iris dataset, etc.)
6. Perform data preprocessing tasks and performing association rule mining on data sets.
7. Load dataset and observe the following:
    A. List the attribute names and their types
    B. Number of records in each dataset
    C. identify the class attribute (if any)
8. Understand and perform classification on data sets.

9. Understand and perform clustering on data sets.
10. Plot Histogram and Visualize the data in various dimensions.

References/ Suggested Readings:

(a) Textbooks

1. “Introduction to Data Mining”, by Pang-Ning Tan, Michael Steinbach & Vipin Kumar, Second Edition, Pearson.

2. “Data Mining” by Jiawei Han & Micheline Kamber, 3rd Edition, Morgan Kaufmann.

3. Data warehousing, Data mining, and OLAP by Alex Berson and Stephen J. Smith.

(b) Open source software and website address:

3. http://swayam.gov.in

4. https://www.cs.waikato.ac.nz/ml/weka

5. https://weka.wikispaces.com

CS-PE503 | e-Commerce and Digital Marketing

Teaching Scheme			
Lecture hours per week	Tutorial Hours per week	Practical hours per week	Credits
3	0	3	4.5

Prerequisites:

Basic knowledge of computer and social media.

Rationale:

The course provides the students with an understanding of the increasing significance of E-commerce and its application in business and its various sectors. It also provides insight into various digital marketing activities on various social media platforms.

Objectives:

- To understand the latest trends in E-commerce and digital marketing along with challenges and opportunities for an organization.

Learning Outcomes:

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

- Understand the features of e commerce technology and its business application.
- Understand electronic data exchange and its significance in e business.
- Explain Design, development and building of websites.
- Explain the emerging trends and tools in digital marketing.

Syllabus:

Unit	Title	Hours
UNIT 1	**Introduction** Meaning, Features of E-Commerce, Advantages and Limitations of E-Commerce, Categories of E-Commerce, latest trends in e-commerce in retail, banking, government. M-commerce: meaning and its applications	6
UNIT 2	**e-Business and Electronic Data Exchange** Different phases of launching E-business, customer relationship management, Application of E-business: E-Procurement, E-Communication, E-Delivery, E-Auction, E-Trading. Electronic Data Interchange (EDI) in E-Business: Meaning of EDI, Applications of EDI, Drawbacks of EDI	9
UNIT 3	**Website design and Development**	8

Design and Development of Website, Advantages of Website, Principles of Web Design, Life Cycle Approach for Building a Website, Different Ways of Building a website.

UNIT 4 **Introduction to Digital Marketing** **8**

Key Concepts of Digital Marketing, Traditional Marketing vs. Digital Marketing, The Opportunity of Digital Marketing, Characteristics of Digital Marketing, Implications of Digital Marketing, Strategies in Digital Marketing.

UNIT 5 **Activities of Digital Marketing** **8**

Search Engine Optimization, Email Marketing, Blog Marketing, Display Marketing

List of Practicals/Experiments:

The required list of experiments is provided as under. The examples cited here are purely indicative and not exhaustive. Attempts shall be made to perform all experiments.

1. Create graphics for social media platforms such as twitter, Facebook etc.
2. Design visually appealing infographics to present data, statistics, or information in a more engaging format.
3. Create charts, graphs, or diagrams to visually represent data.
4. Design professional-looking presentation slides for conferences, meetings, or webinars. We can use presentation templates and graphics to create visually impactful slides.
5. Design attractive covers for e-books, guides, or digital products.
6. Design graphics for Instagram Stories, Facebook Stories, or LinkedIn Stories
7. Customize templates or create your own visuals for story-based content.
8. Design a web page of your CV with headings as objective, educational qualification, achievements, strengths, hobbies, and personal details.
9. Conduct search engine optimization using wordpress.
10. Conduct comprehensive analysis of website's speed and performance using GTmetrix or similar tool.

References/ Suggested Readings:

(a) Textbooks

1. E- Commerce and Digital marketing, published by Himalaya Publishing House
2. “E Business and E commerce Management “, by Dave chaffey

CS-PE504 | Internet of Things

Teaching Scheme			
Lecture hours per week	**Tutorial Hours per week**	**Practical hours per week**	**Credits**
3	**0**	**3**	**4.5**

Prerequisites:

Basic knowledge of microprocessors.

Rationale:

The course provides the students with understanding of Internet of Things (IoT) fundamentals and its implementation using Arduino & Raspberry Pi.

Objectives:

- To understand the IoT fundamentals, sensors, actuators, basics of IoT networking and communication protocols, wireless sensor networks, Arduino, Raspberry Pi, sensor integration & applications of IoT.

Learning Outcomes:

At the end of the course the students will be have:

- Basic IoT implementation skills using Raspberry Pi integrated with sensors.
- Basic IoT implementation skills using Arduino integrated with sensors.

Syllabus:

Unit	Title	Hours
UNIT 1	**Introduction to IoT** Introduction to IoT, Characteristics, IoT enablers, IoT components and implementation, IoT layered architecture, Challenges for IoT	**4**
UNIT 2	**Sensing & Actuation** Sensing: Introduction to Sensor, Characteristics & Sensor Types Actuators: Characteristics & Classification	**4**
UNIT 3	**Basics of IoT Networking, Communication Protocols** IoT Data Identification and Data Protocols: IPv4, IPv6, MQTT, CoAP, XMPP and AMQP Connectivity Technologies: IEEE802.15.4, 6LoWPAN, ZigBee, RFID, NFC, RFID, WiFi, Bluetooth, Wireless HART	**5**
UNIT 4	**Wireless Sensor Networks**	**6**

Wireless Sensor Networks: Sensor node, Wireless Sensor Network architecture: Layered and Clustered, Applications of Wireless Sensor Network in IoT

UNIT 5	**Introduction to Arduino and Raspberry Pi** Features of Arduino, Components of Arduino Board Arduino IDE: Features and working, Program Elements: Program Structure, Variables, Data Types, Operators, Decision Making, Loops, Functions, Input-Output Functions Raspberry Pi: Features, Architecture, Pin Configuration, Raspberry Pi Setup	**10**
UNIT 6	**Integration of Sensors and Communication Module with Arduino and Raspberry Pi** DHT Sensor, Light Sensor, PIR Sensor, Ultrasonic Sensor, Gas Sensor, Bluetooth, WiFi	**6**
UNIT 7	**Applications of IoT** Smart Home, Smart Cities, Smart Grids, Connected Vehicles, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, IoT in Environmental Protection	**4**

List of Practicals/Experiments:

1. To study Arduino Board and install Arduino IDE
2. Arduino program to blink LED
3. Interface DHT Sensor with Arduino IDE
4. Interface Light Sensor with Arduino IDE
5. Interface PIR Sensor with Arduino IDE
6. Interface Ultrasonic Sensor with Arduino IDE
7. Interface Gas Sensor with Arduino IDE
8. Interface Bluetooth & WiFi with Arduino IDE
9. Setup Raspberry Pi
10. Interface DHT Sensor with Raspberry Pi
11. Interface Light Sensor with Raspberry Pi
12. Interface PIR Sensor with Raspberry Pi
13. Interface Ultrasonic Sensor with Raspberry Pi
14. Interface Gas Sensor with Raspberry Pi
15. Interface Bluetooth & WiFi with Raspberry Pi

References/ Suggested Readings:

(a) Textbooks

1. Internet of Things by Dr. Jeeva Jose, Khanna Publishing House (Edition 2018)

2. “Internet of Things: A Hands-on Approach”, by Arsheep Bahga and Vijay Madisetti, Orient Blackswan Private Limited - New Delhi, First Edition

3. Internet of Things: Architecture and Design Principles, Raj Kamal, McGraw Hill, Second Edition

4. “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, by Pethuru Raj and Anupama C. Raman (CRC Press), First Edition

(b) Reference Books

1. Arduino Cookbook: Recipes to Begin, Expand, and Enhance Your Projects, Shroff/O'Reilly, Third Edition

2. Raspberry Pi Cookbook: Software and Hardware Problems and Solutions, Shroff/O'Reilly, Third edition