HIMACHAL PRADESH UNIVERSITY
SUMMER HILL, SHIMLA-171005

Syllabus of PGDCA (CBCS) Course (1 year)- two semesters and scheme of examination. (Effective from 2025 onwards)

1. **About the Course**

   The Post Graduate Diploma in Computer Applications (PGDCA) is a dynamic program designed to provide students with a comprehensive understanding of computer applications. This one-year course bridges the gap between theoretical knowledge and practical expertise, empowering graduates with the necessary skills to excel in the ever-evolving technology sector. From software development to database management, and web designing to programming languages, the PGDCA equips learners with a broad spectrum of competencies, opening doors to a plethora of career opportunities in the IT industry.

2. **Eligibility**

   Provided that the candidate is a Graduate with minimum 50% marks (45% in a case of SC./ST.) in aggregate in Bachelor's Degree or equivalent from a University established by law in India shall be eligible to apply for the admission.

   Or

   A Bachelor's Degree or equivalent with a minimum of 48 credits in Major subject, 48 credits in two minor subjects, 9 credits in compulsory, 1 credit in GI & hobby with aggregate of 106 credits for the award of pass degree.

   Age Limit: As per University Rules applicable to other professional PG Degree programme of the University.

3. **Basis of Admission**

   The admission to PGDCA course will be made on the basis of merit of the Qualifying Examination (Bachelor Degree).

4. **Scheme of Examination**

   English shall be the medium of instruction and examination. The pass marks in each course shall be 40% in each written paper and in the internal assessment separately, and 40% in viva-voce, project work and semester course and 50% in the aggregate subject to the conditions that aggregate shall be determined at the end of the examination. Other rules shall be as per the rules of the university

   a. **Theory Papers:**

      Each paper will be of 100 marks (75 marks for theory exam and 25 marks for internal assessment) and duration of each paper will be 3 hours. In respect of theory papers

25 marks in each paper shall be reserved for award of internal assessment based on such work as assignments/practical/periodical tests/quiz etc.

Note: In each theory paper, nine questions are to be set. Four questions are to be set from each Unit and candidate is required to attempt two questions from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

b. Practical Examination:

Each paper will be of 100 marks (75 marks for practical exam and 25 marks shall be reserved for internal assessment) and duration of each paper will be 3 hours.
Practical exam will be conducted by the external examiner from the panel submitted by Chairman, Department of Computer Science, and Himachal Pradesh University and duly approved by the university authority/evaluation branch, Himachal Pradesh University, Shimla.

5. Medium of Instruction

English will be the medium of instruction as well as examination.

6. Promotion Rule

As per the Himachal Pradesh University norms.

PROGRAMME OUTCOMES (POs)

PO1	**Foundational Knowledge in Computer Applications**: Graduates will have a strong foundational knowledge in various aspects of computer applications including software, hardware, and their maintenance.
PO2	**Programming Proficiency**: Students will gain proficiency in various programming languages and software development tools, enabling them to develop applications effectively.
PO3	**Database Management Skills**: Graduates will acquire skills in database management systems, enabling them to design, implement, and manage databases for various applications.
PO4	**Understanding of Operating Systems**: Students will understand the working of different operating systems and will be able to efficiently use and manage them.
PO5	**Network and Security Awareness**: Graduates will have a basic understanding of networking concepts, security issues, and the implementation of secure networks and systems.
PO6	**Web Development Skills**: Students will learn web technologies and acquire the skills needed to design and develop web applications.
PO7	**Problem-solving and Analytical Skills**: The program will enhance students' problem-solving abilities and analytical thinking, enabling them to apply these skills in computing and IT-related challenges.
PO8	**Preparedness for Industry or Further Studies**: Graduates will be well-prepared to enter the workforce in the IT and computing industry or to pursue further studies in related fields.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1	**Technical Proficiency**: Graduates will gain advanced knowledge and skills in programming, database management, software development, and web technologies, enabling them to design, develop, and implement complex computer applications efficiently.
PSO2	**Analytical and Problem-Solving Skills**: The course enhances analytical thinking and problem-solving capabilities, preparing students to tackle diverse challenges in computing and technology with innovative solutions.
PSO3	**Adaptability to Technological Changes**: The PGDCA course instills a foundation for lifelong learning, ensuring graduates are adaptable and can keep pace with the continuous advancements in computer science and technology.

SEMESTER –I

Course Code	Paper	Credits	Univ. Exam Marks	Internal Assessment	Total Marks
DCS-101	Fundamentals of Programming Using C	4	75	25	100
DCS-102	Office Automation Tools	4	75	25	100
DCS-103	Computer Organization	4	75	25	100
DCS-104	Elective - 1	4	75	25	100
DCS-105	Practical-I (C Language)	3	75	25	100
DCS-106	Practical-II (Office Automation Tools)	3	75	25	100
Total		**22**			**600**

Elective-1	
Course Code	**Paper**
DCS-104 (i)	Operating System
DCS-104 (ii)	Software Engineering
DCS-104 (iii)	Multimedia Technology

SEMESTER –II

Course Code	Paper	Credits	Univ. Exam Marks	Internal Assessment	Total Marks
DCS-201	Data and File Structure	4	75	25	100
DCS-202	Web Technology and Designing	4	75	25	100
DCS-203	Database Management system	4	75	25	100
DCS-204	Elective - 2	4	75	25	100
DCS-205	Practical-III (Web Technology and Designing)	3	75	25	100
DCS-206	Practical-IV (DBMS)	3	75	25	100
Total		**22**			**600**

Elective-2	
Course Code	**Paper**
DCS-204 (i)	Data Communication and Networks
DCS-204 (ii)	Object oriented programming using JAVA
DCS-204 (iii)	Artificial Intelligence

Total Credits: 22 + 22 = 44

DCS – 101 FUNDAMENTALS OF PROGRAMMING USING C L T
3 1

Course Objective: This is an introductory course and covers the key features of the C language and its usage. The first unit help in thoroughly understanding the C syntax and basic programming paradigms. The other unit focuses on more complex concepts of the C language.

UNIT - I

Programming Tools: Problem analysis, Program constructs (sequential, decision, loops), Algorithm, Flowchart, Pseudo code, Decision table, Modular programming, Top Down and Bottom-up approaches, Concept of High-Level Languages, Low Level Languages, Assembly Languages, Compiler, Interpreter, Type of errors.

Overview of C: General structure of C Program, Documentation Section.

Operators and expressions: Constants and Variables, Declaring Variables, Data types, enumerated data type, Type casting, Operators and types.

Control Statements: Decision making using *if, if-else, elseif* and *switch* statements, Looping using *for*, *while* and *do-while* statements, *break* and *continue* statements.

Functions: Unformatted and formatted I/O Functions, Library functions, user-defined function and categories.

UNIT - II

Array: Introduction to arrays, Declaring arrays, Initializing arrays, Processing arrays.

Functions: Defining a function, return statement, invoking a Function, specifying and passing arguments to a function,

Pointers: Definition, Need of Pointers, declaring Pointers, Accessing Values via Pointers, Pointer arithmetic, Pointer to Array, Pointer to function.

Structures: Declaring a structure, Initializing Structures, Accessing Elements of structures, Arrays of structures, Nested structures, Pointers to structures.

Union: Defining a Union, Syntax of the Union, Creating Union Variables, Accessing Union Members.

Text Books:

1. Mullis Cooper: Spirit of C: Jacob Publications
2. Yashwant Kanetkar: Let us C: BPB
3. Dr. R. Rambabu, Rohit Kumar Verma: Programming in C for absolute beginner's: NTL Publication

Reference Books:

1. Kerninghan B.W. & Ritchie D. M.: The C Programming Language: PHI
2. Yashwant Kanetkar: Pointers in C: BPB
3. Gotterfied B.: Programming in C: Tata McGraw Hill

Course Outcomes:
CO1: Student should be able to understand the logic building used in Programming.
CO2: Students should be able to write algorithms for solving various real-life problems.
CO3: To convert algorithms into programs using C.

DCS – 102 OFFICE AUTOMATION TOOLS

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3	1

Course Objective: This is an introductory course and covers the key features related to hardware and software components of computer system. Students learn how to use MS Office applications for work such as creating professional quality documents, store, organize and analyse the information and create dynamic slide presentations with animation, images, videos etc. effectively.

UNIT - I

Basics of Computers: Characteristics of computer, History of computers, Applications of computers; Hardware, Software, and Firmware. Types of software; Input and Output devices, Block diagram of a computer

Disk Operating System: Booting sequence, Warm and Cold Booting; Concept of File and directory,

DOS commands: Internal Commands: DIR, MD, CD, CLS, COPY, DATE, DEL, PATH, PROMPT, REN, RD, TIME, TYPE, VER, VOL; External Commands: XCOPY, ATTRIB, BACKUP, RESTORE, FORMAT, DISKCOPY, Introduction to CONFIG.SYS and AUTOEXEC.BAT files.

Windows: GUI, Icons, Toolbar, Control panel, Files and folder management under windows, Accessories, Web browsers, System Tools, Recycle Bin

Computer Virus: Types, Prevention, Detection, Cure.

UNIT – II

Word Processing Software: Basics of Word Processing: creating, opening, saving, and printing document, Menu Toolbars, Editing Text: Copy, Paste, Delete, move etc., Finding and Replacing Text, Spell Check, Autocorrect feature, language setting and thesaurus

Formatting: Character, Paragraph and Page formatting, working with indents, Bulleted and numbered lists, adding Headers and Footers.

Tables: Inserting/creating table using toolbar and drawing, formatting table, adding/deleting rows/columns, applying borders to tables, Mail merge: Creating merged envelops, creating merged mailing labels

Spreadsheet Software: Worksheet overview: Row, Column, Cells, Menus, creating, opening, saving, and printing worksheet; working with Range, editing information: Entering text, numbers and formulae, AutoSum, AutoFill, spell checking, Functions: Statistical, Mathematical and String functions, date and Time functions, Charts: Line graphs, Pie charts, Bar graphs, adding Titles, Legends etc. to charts, Printing Charts

Presentation Software: Basic features, selecting design templates, creating, saving and printing a simple presentation, various views, Adding pictures, shapes, clipart, audio and movie.

Text Books:

1. Basandra, S.K: Computers Todays by Galgotia Publications, New Delhi.
2. Rajaraman, V.: Fundamentals of Computers, PHI, New Delhi
3. Sinha, P.K,: Computer Fundamentals by. BPB Pubs, New

Reference Books:

1. Jennifer Ackerman Kettell, Guy Hart0Davis, Curt Simmons, "Microsoft Office 2003: The Complete Reference", Tata McGraw Hill.
2. Biswaroop Roy Choudhary, "Computer course", Fusion Books.

Course Outcomes:
CO1: Able to understand the concept of input and output devices of Computers
CO2: Learn the functional units and classify types of computers, how they process information
CO3: Able to perform basic word processing, Spreadsheet and Presentation Graphics Software skills.
CO4: Able to use the Internet safely, legally, and responsibly.

DCS – 103 COMPUTER ORGANISATION

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3 1

Course Objectives: To introduce the fundamental concepts of digital computer organization. To develop a basic understanding of the building blocks of a digital computer system. To enable understanding of how these building blocks are organized together to architect a digital computer system. To enable understanding of how various functional units of a digital computer system interacts to meet the processing requirements of the user.

UNIT - I

Data representation: Number systems, decimal to binary, octal and hexadecimal conversion and vice versa, binary coded decimal numbers, Hamming code for error detection, Alphanumeric codes, Arithmetic operations, Binary addition and subtraction, addition/ subtraction of numbers in 1's and 2's complement notation for binary numbers, BCD arithmetic operation

Digital Logic: Boolean algebra, Logic Gates, Combinational Circuits, Canonical forms, Minterm, Maxterm, Combinational Circuits simplification using K-map, Design of circuits using NAND, NOR, AND, OR, NOT gates

Basics of Organization & Architecture: Structure & Function, A brief history, First, Second, Third & later generations, Von Neumann Machine, Block diagrams of computer system.

Register Transfer Language: Register transfer, Bus and Memory transfer (three-stage bus buffers, memory transfer), arithmetic microoperations, Logic micro-operation, shift micro-operations, arithmetic logic shift unit.

UNIT- II

Instruction Codes: stored program organization, indirect address, computer registers (common bus register), Computer instructions (instruction set completeness), timing and control, instruction cycle (fetch and decode, types of instruction, register-reference instructions).

Micro Programmed Control: Control memory, addressing sequencing (conditional branching, mapping of instructions, subroutine)

Central Processing Unit: Introduction, general register organization, stack organization (register stack, memory stack, reverse polish notation, evaluation of arithmetic expressions), instruction formats (three address instructions, two address instructions, one address instructions), addressing modes, data transfer and manipulation, Program control (status bit conditions, conditional branch instructions, program interrupt, types of interrupts).

IO Organization: Peripheral devices, I/O interfaces, asynchronous data transfer, Modes of Data transfer, Priority Interrupts, DMA, I-O processors, Serial Communication.

Text Books:

1. Morris M. Mano: Computer System & Architecture: PHI.
2. Stallings & Williams: Computer Organization & Architecture: Maxwell Macmillan.

Reference Books:

1. V.Rajaraman & Radhakrishnan: Introduction to Digital Computer Design: PHI
2. P.Pal Chowdhary: Computer Organization & Design: PHI

Course Outcomes:
CO1: Able to conceptualize the basics of organizational and architectural issues of a digital computer.
CO2: Able to analyse performance issues in processor and memory design of a digital computer.
CO3: Able to understand the architecture of modern computer, and also understand how the computer performs arithmetic operations on positive and negative numbers.

ELECTIVES

DCS – 104(i) OPERATING SYSTEM

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3	1

Course Objective: The objective of this course is to provide the basic knowledge of operating system. The entire course is divided into two parts; first unit covers the various basic functions of operating system, process management where student can get the knowledge of basic to advance level of the process management. The second unit will clear the functional concept of memory management and file structure of the operating system.

UNIT - I

Introduction: Definition of the Operating System, Functions and Different Types of Operating System

Process Management: Process Concept, Process Scheduling, Operation on Processes, Threads, Inter-Process Communication, CPU Scheduling–scheduling criteria, scheduling algorithms – FCFS, SJF, Priority scheduling, Round-Robin scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling.

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

UNIT - II

Memory Management: Logical & physical address space, Swapping, Continuous Allocation (single partition, multiple partition), Internal and External fragmentation, Paging, Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demand Paging, Page Replacement, Page Replacement Algorithms– FIFO, optimal, LRU, LRU approximation algorithms, counting algorithms Thrashing, Demand Segmentation.

File System Interface: File Concept, Access Methods–sequential, Direct, Index, Directory Structure–single-level, Two–level, Tree-structured, Acyclic-graph, General graph.

File System Implementation: File System Structure, Allocation Methods: Contiguous allocation, Linked allocation, Indexed allocation, Secondary Storage Structure: Disk Structure, Disk Scheduling, FCFS, SSTF, SCAN, C-SCAN, Look Scheduling.

Text Books:

1. Silberschatz, Galvin "Operating System Concepts", Addison Wesley Publishing Company, 1989.

Reference Books:

1.William Stallings, "Operating Systems", Macmillan Publishing Company.
2.Deitel H.M., "An Introduction To Operating System", Addison Wesley Publishing Company, 1984.
3.Tanenbaum, A.S., "Modern Operating System", Prentice Hall of India Pvt. Ltd. 1995.

Course Outcomes:
CO1: Able to Illustrate different conditions for deadlock and their possible solutions.
CO2: Able to describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.
CO3: Able to analyse the memory management and its allocation policies.

DCS-104 (ii) SOFTWARE ENGINEERING

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3	1

Course Objectives: The primary objective is to equip students with the fundamental principles and practices of software development, enabling them to design and implement complex software systems efficiently and effectively. This course emphasizes critical aspects such as requirements analysis, system design, coding practices, testing strategies, and project management, all within a collaborative and iterative development framework.

UNIT- I

Software engineering: Evolving Role of Software, Software Engineering, Changing nature of Software, Software Myths, Terminologies, Role of management in software development Software Process and desired Characteristics.

Software Life Cycle Models: Build & Fix Model, Water Fall Model, Incremental Process Model, Evolutionary Process Models, Unified Process, Comparison of Models, Other Software Processes, Selection of a Model.

Software Requirements Analysis & Specifications: Requirements Engineering, Types of Requirements, Feasibility Studies, Requirements Elicitation, Requirements Analysis Documentation, Validation and Management.

UNIT- II

Design Engineering: Design process and design quality, design concepts, the design model.

Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

Software Testing: Verification and Validation; Error, Fault, Bug and Failure; Unit and Integration Testing; White-box and Black-box Testing; Basis Path Testing, Control Structure Testing, Deriving Test Cases, Alpha and Beta Testing; Regression Testing.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

Reference Books:

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education

Course Outcomes
CO1: Able to describe the software development life cycle as well as describing the various software development model.
CO2: Able to illustrate the software requirement specification, and system design.
CO3: Able to understand the advantages and disadvantages of each model
CO4: Able to understand type of testing and enhance skills in the field of software testing.
CO5: Learn skill of software requirement specification and software quality assurance techniques.

DCS-104 (iii) MULTIMEDIA TECHNOLOGY

L	T
3	1

Course Objectives: It aims to equip students with the foundational skills and knowledge about the various forms of digital media, including images, videos, and audio. Students will explore key concepts in design, editing, and production, preparing them for careers in diverse multimedia industries. The course emphasizes both creative expression and technical proficiency, ensuring students are well-versed in the latest multimedia software and tools.

UNIT- I

Introduction to Multimedia: Needs and areas of use, Development platforms for multimedia, Identifying Multimedia elements: Text, Images, Sound, Animation and Video, Making simple Multimedia with PowerPoint. Concepts of plain & formatted text, RTF & HTML texts, Object Linking and Embedding concept.

Sound: Sound and it Attributes, Mono V/S Stereo Sound, Sound Channels, Sound and Its Effect in Multimedia, Analog V/S Digital Sound, Overview of Various Sound File Formats WAV, MP3.

UNIT- II

Graphics: Importance of Graphics in Multimedia, Vector and Raster Graphics

Image Capturing Methods: Scanner, Digital Camera Etc. Various Attributes of Images Size, Color, Depth, Resolution etc, Various Image File Format and their Features, Basics of animation, Software Tools for animation.

Video: Basics of Video Analog and Digital Video, use of video on PC. Introduction to graphics accelerator cards, Brief note on various video standards NTSC, HDTV, Introduction to video capturing Media & instrument Videodisk.

Virtual Reality Terminology: Head Mounts Display (HMD), Boom, Cave, Input Devices and Sensual Technology.

Text Books:

1. Multimedia: Making it Work (4th edition), Tay Vaughan, Tata McGraw Hills.
2. Multimedia basics volume/technology, Andreas hoi zinger, firewall media (Laxmi Publications Pvt. Ltd) New Delhi.
3. Fundamentals of Multimedia, by Ze-Nian Li & Mark S. Drew. Prentice Hall; 2nd edition (2014).

Reference Books:

1. Multimedia: Making It Work, by Tay Vaughan. McGraw-Hill Education; 9th edition (2014).
2. Digital Multimedia, by Nigel Chapman & Jenny Chapman. Wiley; 3rd edition (2009).

Course Outcomes
CO1: will have foundational skills and knowledge about the various forms of digital media, including images, videos, and audio
CO2: will gain hands-on experience with industry-standard multimedia software and tools, enabling them to create, edit, and manipulate images, videos, and audio effectively.
CO3: able to conceptualize and execute multimedia projects that effectively communicate ideas and stories through various digital media forms.
CO4: will learn to work effectively in teams, simulating real-world multimedia production environments

DCS – 201 DATA AND FILE STRUCTURE

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3	1

Course Objectives: The objective of this course is to provide basic to advance level of knowledge to students regarding various types of data structures and to provide knowledge regarding various problem-solving techniques.

UNIT - I

Preliminaries: Concept, Common operation on data structures, algorithm complexity, time-space trade-off between algorithm, physical & logical representation of different data structures.

Arrays: Arrays defined, representing arrays in memory, Various operation (traversal, insertion, deletion), Multidimensional arrays, Sequential allocation, Address calculation, Sparse arrays.

Linked List: Definition, type (linear, circular, doubly linked, inverted), representing linked lists in memory, advantages of using linked list over arrays, various operations on Linked list (traversal, insertion, deletion).

Stacks: Definition & concepts of stack structure, Implementation of stacks, Operation on stacks (push & pop), Application of stacks (converting arithmetic expression from infix notation to polish and their subsequent evaluation), quick sort technique to sort an array, recursion).

UNIT - II

Queue: Definition & concept of queues, implementation of queue, operation on queues (insert & delete), Type of queues (circular queue, priority queue).

Trees Structures: Tree, Binary Trees, Tree Traversal Algorithms (Pre-Order, In-Order, Post-Order), Trees in various Sorting & Searching Algorithms & their Complexity (Heap Sort, Binary Search Trees).

Sorting & Searching: Selection sort, Bubble sort, Merge sort, Radix sort, Quick sort, Linear search and Binary Search.

Text Books:

1. Jean Paul Tremblay & Paul G. Sorenson: An Introduction to Data Structures with Applications: Tata McGraw Hill.
2. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein: Data Structures using C: PHI

Reference Books:

1. Robert L. Kruse: Data Structures & Program Design: PHI
2. Aho, Hopcroft & Ullman: Data Structures and Algorithms: Addison Wesley.
3. T.A. Standish: Introduction to Data Structures.
4. Nell Dale & Susan C. Lilly: Pascal Plus Data Structures, Algorithms and Advanced Programming: Galgotia.

Course Outcomes:
CO1: Able to design or select an appropriate algorithm for a particular problem.
CO2: Able to design or select an appropriate data structure for a particular problem.
CO3: Able to determine representations for abstract entities and to implement the operations on these concrete representations.

DCS - 202 WEB TECHNOLOGY AND DESIGNING

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3	1

Course Objectives: The course is designed to provide the basic understanding of Web Technologies. This Course enables the student to create both Static and Dynamic Web Pages using HTML5, CSS, JAVASCRIPT and PHP.

UNIT-I

Web Terminologies: Internet, WWW, Web Browser, understanding how Web Browser Communicate with Web Server, Web Server, Uniform Resource Locator (URL), Hyper Text Transfer Protocol Secure (HTTPS).

HTML Introduction: Structure of HTML Program, Heading Styles, Text Styles, Other Text Effects; List: Definition, Creating Ordered and Unordered Lists, Adding Images, Creating Tables, Multimedia, Graphics; Form: Tags, Elements, Input Types, Text Area, Checkboxes, Submit Button, Frames, Audio Tag, Video Tag, iframe, Form Validation, Designing Static Web Pages with HTML.

CSS: Concepts and its Properties i.e. Border, Backgrounds, Fonts, Text Effects, Buffering, Web Log, Web Cache Positioning, CSS Selectors, CSS List, CSS Tables, CSS Menu Design Using BOOTSTRAP to build mobile responsive website.

UNIT-II

JavaScript: Introduction, Variables, Obtaining User Input, Operators, Control Structure, Looping Constructs, Break and Continue Statements, User Defined Functions, Recursion and Iterations, Array Declaration and Memory Allocation, Basic Form Validation in JavaScript; JavaScript Objects: Date, String, Boolean, Window, Document, Cookies, Document Object Model (DOM), Event Handling using JavaScript.

Introduction to PHP: Declaring variables, data types, arrays, strings, operations, expressions, control structures, functions, reading data from web form controls like Text Boxes, radio buttons, lists etc. Performing Basic Database operations (Insert, Update, Delete, select etc.), Setting Query parameter, Executing Query Join (Self Join, Inner Join, Outer Join, Cross Join), Cookies, Create Session, Accessing Data from Database into HTML page.

Text Book:

1. Web Technologies, Uttam K Roy, Oxford University Press.
2. Beginning Web Programming-Jon Duckett WROX

Reference Book:

1. Bonk, Curtis J. *The world is open: How web technology is revolutionizing education*. Association for the Advancement of Computing in Education (AACE), 2009.
2. Jackson, Jeffrey C. *Web Technologies*. Pearson India, 2006.

Course Outcomes:
CO1: Able to Design and develop web applications.
CO2: Able to explain client and server-side scripting and their applicability.
CO3: Able to Create scripts using JavaScript in a web page.

DCS – 203 DATABASE MANAGEMENT SYSTEMS

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3	1

Course objectives: The goal of this course is to teach the fundamentals of the database systems. The course aims to impart knowledge of the concepts related to database and operations on databases. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of databases.

UNIT-I

Basic Concepts: Data Modeling for a Database, Records and Files, Abstraction and Data Integration, Three-tier Architecture of DBMS, Components of a DBMS, Advantages and Disadvantages of a DBMS, Data Associations.
Data Models: Data Models Classification, Entity Relationship Model, Relational Data Model, Network Data Model and Hierarchical Model.
The Relational Model: Relational Database, Relational Algebra, Relational Calculus.
Relational Database Manipulation: SQL, Data Manipulation, Basic Data Retrieval, Condition Specification, Arithmetic and Aggregate Operators, SQL Join: Multiple Tables Queries, Set Manipulation, Categorization, Updates, Views, Integrity Constraints

UNIT-II

Relational Database Design: Relational Scheme and Relational Design, Anomalies in a Database, Universal Relation, Functional Dependencies, Decomposition, Normal forms based on primary keys (1 NF, 2 NF, 3 NF, & BCNF), Multi-valued Dependencies, 4 NF, Join dependencies, 5 NF
Database Security: Security and Integrity, Threats, Defence Mechanisms.
Transaction Processing Concepts: Introduction to Transaction Processing, Transaction & System Concepts, Properties of Transaction, Schedules and Recoverability, Serializability of Schedules.
Concurrency Control Techniques: Locking Techniques, Time stamp ordering, Multi-version Techniques, Optimistic Techniques, Granularity of Data items.

Text Books:

1. Desai, B., "An Introduction to Database Concepts." Galgotia Publications, New Delhi.

Reference Books:

1. Date C.J., "An Introduction to Database Systems", Narosa Publishing House, New Delhi.
2. Elimsari And Navathe, "Fundamentals of Database Systems", Addison Wesley, New York.

3. Ullman, J.D , “Principals Of Database Systems”, Galgotia Publications, New Delhi.

Course Outcomes:
CO1: Able to understand the basic concepts and the applications of database systems.
CO2: Able to Understand the relational database design principles.
CO3: Able to recognize the importance of database analysis and design in the implementation of any Database application.
CO4: Able to understand the process of drawing the ER-Diagrams.

ELECTIVES

DCS-204 (i) DATA COMMUNICATIONS AND NETWORKS L T
3 1

Course Objectives: The key objective is to acquire a foundational understanding of computer network and communication technologies. As part of this course, students will be introduced to network models and standards, network protocols and their use, wired and wireless technologies, network security and detailed description of all layers in ISO/OSI and TCP/IP.

UNIT- I

Introduction to Data Communication: Analog Signal, Digital Signal, Analog vs Digital Communication; Band Width Limitation, Data rate of a channel; Physical Layer: Transmission media: Guided (Twisted-pair, Coaxial and Optical fibre) and Unguided (Radio, Microwave and infrared), Switching: Circuit switching, Packet Switching, Message Switching, Telephone system, modems.

Computer Networks: Definition, Uses of Networks, Types of Networks, Classification of networks on the basis of Geographical Span (PAN, LAN, MAN and WAN), LAN topologies (Bus, Ring, Star, Mesh, Tree and Hybrid).

Network Connecting Devices: Repeaters, Hubs, Bridges, Routers, Gateways and Switches Reference Models

Transmission Modes: Simplex mode, Half-Duplex mode, Full-duplex mode

UNIT-II

Computer Network Models: Layered Architecture, OSI Model: Physical Layer, Data Link Layer: Design Issues, Error Detection and Correction: Nature of errors, Parity Check, CRC, Hamming Code, The Network Layer: Design Issues, Routing Algorithms (Shortest Path, Flooding, Flow Based, Distance Vector, Link State).

Transport Layer: Services provided by the Transport Layer, concept of Physical Addressing, and logical Addressing, Different Classes of IP addressing, Special IP Addressing, Classful Addressing, Classless addressing, Application Layer: Services of Application Layers TCP / IP model, Comparison between OSI and TCP/IP.

Application Protocols: DNS, FTP, Telnet, SMTP, SNMP, HTTP/HTTPS, POP.

Network Security: Privacy, Digital Signature, PGP, Cryptography and types.

Text Books:

1. Andrew S. Tahanbaum, Computer Network, PHI.
2. Behrouz A. Forouzan , Data Communication and Networking, Tata MacGraw Hill.
3. Dr M.L. Ravi Chandra, Dr N.L. Aravinda, Rohit Kumar Verma: Computer Networks a system top-down approach: PKS Publication

Reference Book:

1. Ata Elahi, Mehran Elahi, "Data, Network and Internal communication Technology", Cengage Learning India

Course Outcomes
CO1: Able to understand the underlying principles of computer networking.
CO2: Able to understand layered network architecture.
CO3: Able to identify network topologies and protocols.

DCS-204 (ii) OBJECT ORIENTED PROGRAMMING USING JAVA

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3	1

Course Objectives This course is designed to give you exposure to the concepts of object-oriented programming using java. It will help in learning to write programs in java using object-oriented concepts and features of java including exceptions handling and multithreading.

UNIT- I

Introduction to Java: Introduction to Object Oriented Programming, Features of Java (OOP, robustness, multithreading, networking, Interpreted and High Performance, Distributed, dynamic etc), JDK, JRE, JIT, JVM. Environment setup for java development (First java program)

Basics of Java: Data Type, Unicode, Variables, Operators, Statements/expression, Example Program with use of Scanner Class

Decisions and Loops: Array, Decision Constructs, Loop Constructs

Class and Objects: Class Fundamentals, Declaring Objects, Methods, Encapsulation, Access Modifier/Specifier, Constructors in Java

UNIT- II

Inheritance: Basics of Inheritance, Advantages of Inheritance, Member Access and Inheritance, Types of Inheritance, Use of Super Keyword, Use of Final Keyword

Polymorphism: Introduction to Polymorphism, Advantages of Polymorphism, Types of Polymorphism, Method Overloading, Method Overriding, Abstract Class, Application of Abstract Class

Exception Handling: Fundamentals of Exception Handling, Features of Exception, Types of Exception, Exceptions Handling in Java

Multithreading: Multithreading, Java thread Model, Creating Threads in Java, Thread Life Cycle, Creating Multiple Threads, Using isAlive( ) and join( ), Thread Priority, Synchronization, Interthread Communication

Text Books:

1. Java: The Complete Reference by Herbert Schildt. McGraw-Hill Education; 11th edition (2018).
2. Head First Java by Kathy Sierra and Bert Bates. O'Reilly Media; 2nd edition (2005).
3. Java: A Beginner's Guide by Herbert Schildt. McGraw-Hill Education; 9th edition (2014).

Reference Books:

1. Effective Java by Joshua Bloch. Addison-Wesley Professional; 3rd edition (2018).
2. Java Concurrency in Practice by Brian Goetz et al. Addison-Wesley Professional; 1st edition (2006).

Course Outcomes
CO1: will develop a foundational understanding of Java programming language syntax, semantics, and basic concepts
CO2: able to design, implement, test, and debug Java programs
CO3: will apply their Java programming skills to real-world scenarios, developing a portfolio of Java projects that showcase their abilities
CO4: will be prepared for entry-level positions in software development or related fields, equipped with the skills and knowledge necessary to pursue further education

DCS-204 (iii) ARTIFICIAL INTELLIGENCE

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Course Objectives: This course aims to introduce students to fundamental concepts and applications of artificial intelligence, providing hands-on experience with machine learning and neural networks. Students will also explore the ethical implications of AI technologies, preparing them to critically evaluate and responsibly implement AI solutions in various domains.

UNIT- I

Introduction: Definition of AI, Growth of AI, Application of AI, History of AI, Intelligent system. Heuristic Search Techniques: Search as a problem-solving technique, Blind search technique, Generate Test, Hill climbing, Best first search, Game playing, Minimax search, Alpha-Beta pruning.

Knowledge Representation: Definition and importance of knowledge, Propositional calculus, Predicate logic, well-formed formulas, quantifiers, Rule based system, Procedural vs Declarative Knowledge, Forward reasoning: Conflict resolution, backward reasoning, structured knowledge representation.

UNIT- II

Introduction to Neural Network: Hopfield network, single and multilayer networks

Introduction to Genetic algorithm: The Genetic algorithm, Genetic operators, working of Genetic algorithm, problem with Genetic algorithm.

Expert System: introduction, skill v/s knowledge, characteristics of expert system, knowledge engineering, inferencing, forward chaining and backward chaining expert system tools, Applications and future scope.

Natural language processing: Introduction, language parsing, Syntactic and semantic analysis, top down and bottom-up parsing

Text Books:

1. AI – E. Rich & K Knight Tata McGraw Hill (2nd edition).
2. Artificial intelligence and intelligent system by N.P.Padhy, Oxford publication

Reference Books:

1. Artificial Intelligence Application Programming By M. Tim Jones , Dreamtech publication.
2. Artificial intelligence by Rajendra Akerkar, PHI publication.
3. AI an engineering Approan –R.J Schalkoff, McGraw Hill international Edition.

Course Outcomes
CO1: understanding of the foundational concepts and principles of artificial intelligence, including machine learning, neural networks, natural language processing
CO2: able to critically evaluate the ethical and social implications of AI technologies, understanding issues related to bias, fairness, privacy, and accountability
CO3: will develop the skills necessary to communicate effectively about AI concepts and solutions, both orally and in writing