



Department of Computer Science and Engineering

Diploma Computer Science and Engineering

Course Name	: Microprocessor and Programming	L	T	P	Credits
Course Code	: DTCS501	3	0	0	3
Semester	: V				
Pre-requisite	: Basic knowledge of digital electronics and computer organization.				

Course Learning Objectives:

- Understand the basic architecture and features of an 8085 microprocessor.
- Understand the basics of 8086 microprocessor and its organization.
- Understand the 8086-instruction set which will help students write programs for the microprocessor.
- Comprehend assembly programming and tools related to assembly programming.
- Design assembly programs for the microprocessor and its interfacing with other devices.

Course Outcomes:

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

Course Outcome	Statement	Bloom's Level	Skill
CO1	Explain 8085 architecture, register organization, and limitations.	L2 – Understand	Understanding, Conceptual Knowledge
CO2	Describe 8086 architecture, register organization, and memory segmentation.	L2 – Understand	Understanding, Analytical Thinking
CO3	Apply the 8086-instruction set and addressing modes for programming.	L3 – Apply	Programming, Problem Solving
CO4	Develop assembly language programs using programming tools.	L3 – Apply	Programming, Tool Usage
CO5	Design programs using procedures, macros, and interfacing techniques.	L4 – Analyse	Design, Implementation, Interfacing Skills

Details of the Course:

Unit 1: Basics of Microprocessor

Contact Hours/Teaching Hours: 6

Evolution of Microprocessor and types, Salient features of 8085 Microprocessor, architecture of 8085 (Block diagram), register organization, limitations of 8-bit Microprocessor.

Self-Learning Hours = 4

Students shall study the evolution of microprocessors across generations and prepare a comparative note on 8-bit microprocessor limitations.



Department of Computer Science and Engineering

Diploma Computer Science and Engineering

Team Activity Hours = 2

Group discussion on evolution of microprocessor generations and their impact on computing capability.

Unit 2: 16-bit Microprocessor 8086

Contact Hours/Teaching Hours: 08

Salient features of 8086 Microprocessor, architecture of 8086 (Block diagram, signal description), register organization, concepts of pipelining, memory segmentation and memory address generation. Minimum and Maximum Mode operation and diagram.

Self-Learning Hours = 5

Students shall practice memory address generation examples and study minimum/maximum mode configurations.

Team Activity Hours = 3

Group activity comparing 8085 vs 8086 architecture and pipelining benefits.

Unit 3: 8086 Instruction Set

Contact Hours/Teaching Hours: 9

Machine Language Instruction format, addressing modes, Instruction set (Arithmetic, logical, data transfer, bit manipulation, string, program control transfer, process control).

Self-Learning Hours = 6

Students shall practice writing instructions using different addressing modes for arithmetic and logical operations.

Team Activity Hours = 3

Group exercise on classifying instructions by category and identifying appropriate addressing modes for sample problems.

Unit 4: Assembly Programming

Contact Hours/Teaching Hours: 9

The art of assembly Language Programming, Program development steps – defining problem, algorithms, flowchart, initialization checklist, choosing instructions, converting algorithms to assembly language programs. Assembly Language Programming Tools – Editors, Assembler, Linker, Debugger. Assembler directives, model of 8086 assembly language programming, programming using assembler.

Self-Learning Hours = 6

Students shall write flowcharts and convert simple algorithms into assembly programs using an assembler.

Team Activity Hours = 3

Group lab activity assembling, linking, and debugging sample assembly programs.

Unit 5: Procedure and Macro / System Interfacing

Contact Hours/Teaching Hours: 10

Defining Procedure (Directives used, FAR and NEAR, CALL and RET instructions), Defining Macros. Assembly Language Programs using Procedure and Macros. System Interfacing: Interfacing Techniques



Department of Computer Science and Engineering

Diploma Computer Science and Engineering

(I/O mapped I/O, Memory mapped I/O, memory and I/O addressing, 8086 addressing, address decoding, memory interfacing as Even and Odd bank).

Self-Learning Hours = 6

Students shall implement programs using procedures and macros, and study I/O vs memory-mapped interfacing differences.

Team Activity Hours = 3

Group project on designing a small interfacing scheme using even/odd bank memory organization.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO01	3	1	-	-	-	-	1	3	-	-
CO02	3	1	-	-	-	-	1	3	-	-
CO03	3	2	1	1	-	-	1	2	1	1
CO04	2	2	2	2	-	-	1	2	2	1
CO05	2	2	3	2	1	-	1	3	2	1
Avg.	3	2	1	1	-	-	1	3	1	1

Text Books:

1. Douglas V. Hall, Microprocessor & Interfacing (Programming & Hardware), Tata McGraw Hill.
2. James L. Antonakos, An Introduction to the Intel Family of Microprocessors, Pearson Education Asia.

Reference Books:

1. John Uffenbeck, The 8086/88 Family: Design, Programming & Interfacing, PHI.

Online Resources:

1. NPTEL – Microprocessors and Microcontrollers
<https://nptel.ac.in/>
2. GeeksforGeeks – Microprocessor
<https://www.geeksforgeeks.org/microprocessor/>



Department of Computer Science and Engineering

Diploma Computer Science and Engineering

Course Name : Web Technology

Course Code : DTCS503

Semester : V

Pre-requisite : Computer Networks (DTCS-403) , Programming Fundamentals.

L	T	P	Credits
3	0	0	3

Course Learning Objectives:

1. **Understand** the fundamentals of the Internet, World Wide Web, client-server architecture, and commonly used Internet protocols involved in web communication.
2. **Learn** the structure and syntax of HTML5 to create well-organized static web pages using text formatting, hyperlinks, images, tables, forms, and other essential HTML elements.
3. **Apply** Cascading Style Sheets (CSS3) to improve the presentation, layout, and responsiveness of web pages using modern styling techniques such as Flexbox and Grid.
4. **Develop** interactive web pages using JavaScript by implementing programming constructs, functions, arrays, events, and Document Object Model (DOM) manipulation.
5. **Build** responsive and user-friendly websites by integrating HTML, CSS, JavaScript, form validation, media queries, and Bootstrap components following modern web development practices.

Course Outcomes:

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

Course Outcome (CO)	Statement	Bloom's Level	Skill
CO1	Explain the fundamentals of the Internet, World Wide Web, client-server architecture, web pages, and commonly used Internet protocols in web communication.	Understand (L2)	Conceptual Understanding
CO2	Design and develop static web pages using HTML5 elements, hyperlinks, tables, forms, images, and basic page layouts.	Apply (L3)	Web Page Design
CO3	Apply CSS3 to enhance the appearance and layout of web pages using selectors, the box	Apply (L3)	Web Page Styling



Department of Computer Science and Engineering

Diploma Computer Science and Engineering

Course Outcome (CO)	Statement	Bloom's Level	Skill
	model, Flexbox, Grid, and responsive styling techniques.		
CO4	Develop interactive web pages using JavaScript by implementing variables, control structures, functions, arrays, and basic programming constructs.	Apply (L3)	Client-Side Programming
CO5	Build responsive and interactive websites by integrating JavaScript DOM manipulation, event handling, form validation, media queries, and Bootstrap components.	Create (L6)	Responsive Web Development

Details of the Course:

Unit 1: Basics of Internet and Web

Contact Hours/Teaching Hours: 7

The basics of Internet, World Wide Web, Web page, Home page, Web site, Static, Dynamic and Active web page, Overview of Protocols – SMTP, Telnet, TFTP, SNMP, HTTP (including HTTP request methods – GET and POST), Client server computing concepts.

Self-Learning Hours = 5

Students shall study and compare different Internet protocols and their roles in client-server computing, with focus on how HTTP GET/POST requests carry data between client and server.

Team Activity Hours = 2

Group discussion on evolution of the web (static to dynamic to active pages) with real-world examples.

Unit 2: Introduction to HTML

Contact Hours/Teaching Hours: 10

Introduction to HTML and HTML5 Features, Essential Tags, Tags and Attributes, Text Styles and Arrangements, Text Effects, Various Tags, Color and Background, Lists and their



Graphic Era

HILL UNIVERSITY

Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Department of Computer Science and Engineering

Diploma Computer Science and Engineering

Types, Attributes of Image Tag, Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents, Sections of a Page and Graphics, Footnote and eMailing, Creating Table, Form and Style Sheet.

Self-Learning Hours = 7

Students shall design a multi-page static website using tables, frames, forms, and style sheets.

Team Activity Hours = 3

Group project building a sample static website demonstrating various HTML tags and layout elements.

Unit 3: Cascading Style Sheets (CSS3)

Contact Hours/Teaching Hours: 8

Introduction to CSS, Advantages of CSS, CSS Syntax, Types of CSS (Inline, Internal and External), CSS Selectors (Element, Class, ID, Universal and Group Selectors), CSS Properties (Color, Background, Font, Text, Border, Margin and Padding), CSS Box Model, Display Property, Position Property, Float and Clear, Overflow, Introduction to Flexbox, Basic CSS Grid Layout.

Self-Learning Hours = 5

Students shall explore modern CSS properties such as transitions, shadows, gradients, and simple animations to enhance the appearance of web pages.

Team Activity Hours = 3

Design a responsive web page for a college or business using CSS styling, Flexbox, and Grid Layout.

Unit 4: JavaScript Fundamentals

Contact Hours/Teaching Hours: 8

Introduction to JavaScript, Features of JavaScript, Embedding JavaScript in HTML, Variables and Constants, Data Types, Operators, Input and Output Functions, Decision Making Statements (if, if-else, switch), Looping Statements (for, while and do-while), Functions, Arrays, Basic String Operations.



Department of Computer Science and Engineering

Diploma Computer Science and Engineering

Self-Learning Hours = 5

Students shall explore built-in JavaScript functions and simple programs for arithmetic operations, pattern generation, and string manipulation.

Team Activity Hours = 3

Develop a JavaScript-based web page demonstrating user interaction through menus, loops, functions, and basic calculations.

Unit 5 JavaScript DOM and Responsive Web Design

Contact Hours/Teaching Hours: 8

JavaScript Objects, Events and Event Handling, Document Object Model (DOM), Accessing and Manipulating HTML Elements, Modifying CSS using JavaScript, Client-Side Form Validation, Introduction to Responsive Web Design, Viewport, Media Queries, Introduction to Bootstrap, Bootstrap Grid System, Containers, Navigation Bar, Buttons, Cards and Forms.

Self-Learning Hours = 5

Students shall explore additional Bootstrap components and develop responsive web pages for different screen sizes.

Team Activity Hours = 3

Develop a responsive website with multiple pages using HTML, CSS, JavaScript, DOM manipulation, form validation, and Bootstrap components.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1	-	-	1	-	1	1	2	-
CO2	2	2	3	1	1	-	1	-	3	1
CO3	2	2	2	1	-	-	1	-	3	1
CO4	2	1	-	-	-	-	1	-	2	1
CO5	2	2	3	2	1	1	1	-	3	2
Avg.	2	2	2	1	1	1	1	1	3	1



Graphic Era HILL UNIVERSITY

Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Department of Computer Science and Engineering

Diploma Computer Science and Engineering

Text Books

1. Chris Bates, *Web Programming: Building Internet Applications*, Wiley India, 3rd Edition, 2006.
2. Paul J. Deitel, Harvey M. Deitel, *Internet and World Wide Web: How to Program*, Pearson, 5th Edition, 2012.

Reference Books

1. Jon Duckett, *HTML and CSS: Design and Build Websites*, Wiley, 2011.
2. Jon Duckett, *JavaScript and JQuery: Interactive Front-End Web Development*, Wiley, 2014.

Online Resources:

W3Schools – HTML, JavaScript

<https://www.w3schools.com/>

MDN Web Docs – JavaScript

<https://developer.mozilla.org/>

Free code camp - Project

<https://www.freecodecamp.org/news/how-to-make-a-landing-page-with-html-css-and-javascript/>



Department of Computer Science and Engineering

Diploma Computer Science and Engineering

Course Name	: Operating System
Course Code	: DTCS 504
Semester	: V
Pre-requisite	: Basic knowledge of computer organization and C programming/data structures.

L	T	P	Credits
3	0	0	3

Course Learning Objectives:

- Understand the evolution, generations, and types of operating systems.
- Understand operating system structures, services, and system calls.
- Understand process concepts, scheduling, and inter-process communication.
- Apply CPU scheduling algorithms and understand deadlock handling techniques.
- Understand file systems and memory management techniques including virtual memory.

Course Outcomes:

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

Course Outcome	Statement	Bloom's Level	Skill
CO1	Explain the evolution, generations, and structures of operating systems, including system calls.	L2 – Understand	Discipline Knowledge
CO2	Apply process management concepts and CPU scheduling algorithms to solve process-scheduling problems.	L3 – Apply	Problem Analysis, Design
CO3	Analyse deadlock situations and apply methods for deadlock prevention, avoidance, detection, and recovery.	L4 – Analyse	Problem Analysis, Design
CO4	Apply file allocation methods and directory structures to design effective file systems.	L3 – Apply	Design, Life-long Learning
CO5	Apply memory management and virtual memory techniques, including page replacement algorithms, to optimize system performance.	L3 – Apply	Design, Life-long Learning

Details of the Course:

Unit 1: Introduction

Contact Hours/Teaching Hours: 7

Operating system, Evolution, Generations – 1st, 2nd, 3rd, 4th. Mainframe Systems – Batch, Multi programmed, Multitasking, Time sharing, Multiprocessor Systems, Distributed Systems, Real Time Systems. Operating system structure – Simple structure, layered, monolithic, microkernel. System calls – Uses, process control, file management, Device management, Information maintenance, communication.



Department of Computer Science and Engineering

Diploma Computer Science and Engineering

Self-Learning Hours = 5

Students shall prepare a comparative note on different OS generations and system types (batch vs time-sharing vs real-time).

Team Activity Hours = 2

Group discussion on real-world examples of distributed and clustered systems used in industry.

Unit 2: Process Management

Contact Hours/Teaching Hours: 07

Processes – Concept, process states, process control block. Process scheduling – Scheduling queues, scheduler, context switch. Operations on processes – creation, termination. Inter process communication. Scheduling – Objectives, concept, criteria, CPU and I/O burst cycle. Types of Scheduling: Pre-emptive, Non-pre-emptive. Scheduling Algorithms: FCFS, SJF, Round Robin, Priority.

Self-Learning Hours = 5

Students shall solve numerical problems on CPU scheduling algorithms (FCFS, SJF, Round Robin, Priority) using Gantt charts and calculate average waiting/turnaround time.

Team Activity Hours = 2

Group activity comparing scheduling algorithm performance on sample process sets.

Unit 3: Deadlocks

Contact Hours/Teaching Hours: 08

Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

Self-Learning Hours = 5

Students shall solve deadlock avoidance problems using Banker's Algorithm and study methods for deadlock detection and recovery.

Team Activity Hours = 3

Group exercise simulating deadlock prevention and avoidance scenarios using pseudocode.

Unit 4: File System

Contact Hours/Teaching Hours: 10

File – Concept, Attributes, Operations, Types, Structure. Access Methods – Sequential, Direct. Swapping. Allocation Methods – Contiguous, Linked, Indexed. Directory Structure – Single level, Two level, Tree Structure. Protection – Types of accesses, Access control.

Self-Learning Hours = 7

Students shall study file allocation methods (contiguous, linked, indexed) and compare directory structures (single-level, two-level, tree).

Team Activity Hours = 3

Group activity comparing file allocation methods and access techniques on sample file systems.



Department of Computer Science and Engineering

Diploma Computer Science and Engineering

Unit 5: Memory Management

Contact Hours/Teaching Hours: 10

Basic Memory Management – Partitioning, Fixed & Variable. Virtual Memory – Concept, Paging, Page fault, Page Table. Page Replacement algorithms – FIFO, Optimal, LRU, NRU.

Self-Learning Hours = 7

Students shall solve page replacement algorithm numericals (FIFO, Optimal, LRU) and compare fixed vs variable partitioning schemes.

Team Activity Hours = 3

Group case study on memory partitioning strategies and virtual memory implementation used in modern OS.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO01	3	1	-	-	-	-	1	2	1	-
CO02	3	1	-	-	-	-	1	2	2	-
CO03	2	2	1	1	-	-	1	2	2	1
CO04	2	3	2	1	-	1	1	2	1	2
CO05	2	3	2	1	-	-	1	3	1	2
Avg.	2	2	1	1	0	0	1	2	1	1

Text Books:

1. Silberschatz, Galvin, Gagne, Operating System Concepts, John Wiley & Sons (Asia) Pte Ltd.
2. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall of India.

Reference Books:

1. Sumitabha Das, Unix Concepts and Applications, Tata McGraw-Hill.

Online Resources:

1. NPTEL – Operating Systems (IIT/IISc, SWAYAM certified course)
https://onlinecourses.nptel.ac.in/noc21_cs88/preview
2. GeeksforGeeks – Operating Systems
<https://www.geeksforgeeks.org/operating-systems/>
3. Javatpoint – Operating System Tutorial
<https://www.javatpoint.com/operating-system>



Department of Computer Science and Engineering

B.Tech. Computer Science and Engineering

Course Name : Java Programming

Course Code : DTCS 505

Semester : V

Pre-requisite : Basic knowledge of Object-Oriented Programming concepts and C/C++ programming.

L	T	P	Credits
3	0	0	3

Course Learning Objectives:

- To introduce students to the fundamentals of object-oriented programming and Java language features.
- To develop the ability to apply classes, objects, methods, inheritance, and visibility control in Java programming.
- To enable students to design modular Java programs using interfaces and packages.
- To build competence in applying multithreading and exception handling concepts in Java programs.
- To develop the ability to design GUI applications using Swing components and event handling, and perform file input/output operations.

Course Outcomes:

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

Course Outcome	Statement	Bloom's Level	Skill
CO1	Explain the fundamentals of object-oriented programming and Java control structures.	L2 – Understand	Understanding, Programming Fundamentals
CO2	Apply classes, inheritance, and arrays to develop Java programs.	L3 – Apply	Programming, Design
CO3	Apply interfaces and packages for modular programming.	L3 – Apply	Programming, Modular Design
CO4	Develop multithreaded programs with exception handling.	L4 – Analyse	Programming, Debugging, Critical Thinking
CO5	Design GUI applications using Swing with file I/O, incorporating event handling and layout management.	L4 – Analyse	Design, GUI Programming, File Handling

Details of the Course:

Unit 1: Introduction to Java

Contact Hours/Teaching Hours: 7



Department of Computer Science and Engineering

B.Tech. Computer Science and Engineering

Fundamentals of Object Oriented Programming, Object and Classes, Features of Java. Constants, Variables and Data Types, Scope of variable, Symbolic Constant, Type casting, Standard default values. Operators: Arithmetic, Relational, Logical, Assignment, Increment/Decrement, Conditional, Bit-wise, Special Operator. Decision making and Branching: if, if-else, else-if ladder, switch, ?: operator. Decision making and Looping: while, do-while, for, jumps in loops, labeled loops.

Self-Learning Hours = 5

Students shall practice writing simple Java programs using operators, decision-making, and looping constructs.

Team Activity Hours = 2

Group activity comparing Java operators and control structures with C/C++ equivalents.

Unit 2: Classes, Objects and Methods

Contact Hours/Teaching Hours: 10

Classes and Objects: Defining a class, Creating object, Accessing class members, Constructor, Method Overloading, Static Member.

Inheritance and Visibility Control: Extending a Class, Multilevel and Hierarchical inheritance, Overriding Methods, Final variable/Methods/Classes, Abstract method and Classes. Visibility Control: Public, default, Private, Protected access. Arrays, Strings and Vectors: One/Two Dimensional arrays, Strings, Vectors, Wrapper Classes.

Self-Learning Hours = 7

Students shall implement class hierarchies using inheritance and practice array/string manipulation programs.

Team Activity Hours = 2

Group programming activity building a small class hierarchy demonstrating overriding and abstract classes.

Unit 3: Interfaces and Packages

Contact Hours/Teaching Hours: 7

Interfaces: Multiple Inheritance, Defining interfaces, Extending interfaces, Implementing interfaces, Accessing Interface variable. Packages: System Package, Using system Package, Naming Convention, Creating Package, Accessing a package, Using a package, adding a class to a package.

Self-Learning Hours = 5

Students shall create custom packages and implement interfaces to simulate multiple inheritance.

Team Activity Hours = 3

Group activity designing a modular application using user-defined packages and interfaces.

Unit 4: Multithreaded Programming and Exception Handling

Contact Hours/Teaching Hours: 8

Multi Threading: Creating Thread, Extending a thread class, Stopping and Blocking a thread, Life cycle of thread, Thread methods, Thread exceptions, Thread priority, Synchronization, Implementing Runnable Interface.



Department of Computer Science and Engineering

B.Tech. Computer Science and Engineering

Managing Errors and Exceptions: Types of errors, Exception, Multiple catch statement, finally statement, Using Exception for Debugging.

Self-Learning Hours = 5

Students shall implement multithreaded programs and practice exception handling with multiple catch blocks.

Team Activity Hours = 3

Group lab activity building a synchronized multithreaded producer-consumer style program.

Unit 5: GUI Programming with Swing and File I/O

Contact Hours/Teaching Hours: 10

Introduction to Swing: JFrame, JPanel, and Container concepts. Swing components (JButton, JLabel, JTextField, JCheckBox, JRadioButton, JComboBox, JOptionPane), anonymous classes and inner classes in Java. Events and event handlers (ActionListener, event handling model). Layout Managers (FlowLayout, BorderLayout, GridLayout). File I/O: Byte Streams and Character Streams, File class, FileReader and FileWriter, BufferedReader and BufferedWriter.

Self-Learning Hours = 7

Students shall build a simple GUI application using Swing components and event handling, and implement a program that reads/writes data to a file.

Team Activity Hours = 3

Group project developing a small GUI-based utility application (e.g., a note-saving tool or form) using Swing that persists data to a file using Java I/O streams.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO01	3	1	-	-	-	-	1	-	-	-	-	-	-	3	1
CO02	2	2	2	1	-	-	1	-	-	-	-	-	-	3	2
CO03	2	2	2	1	-	-	1	-	-	-	-	-	-	3	1
CO04	2	2	3	2	-	-	1	-	-	-	-	-	1	3	2
CO05	2	2	3	2	1	-	1	-	-	-	-	-	1	3	2
Avg.	2	2	2	1	1	1	1	-	-	-	-	-	1	3	2

Text Books:

1. Balgurusamy, E. *Programming with Java – A Primer*. Tata McGraw Hill.

Reference Books:

1. Herbert Schildt, *Java: The Complete Reference*, 9th Edition, Tata McGraw Hill.
 2. Cay S. Horstmann, *Core Java – Vol. I – Fundamentals*, Tenth Edition, Prentice Hall.
-



Graphic Era

HILL UNIVERSITY

Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Department of Computer Science and Engineering

B.Tech. Computer Science and Engineering

Online Resources:

1. **GeeksforGeeks – Java Swing**
<https://www.geeksforgeeks.org/java-swing/>
2. **NPTEL – Programming in Java**
<https://nptel.ac.in/>
3. **Oracle – The Java Tutorials**
<https://docs.oracle.com/javase/tutorial/>
4. **Baeldung – Java**
<https://www.baeldung.com/java-tutorial>