| Semester II | | |
|---|---|---|
| **Course code** | **Subjects** | **Credits** |
| ENG 112 | Business Communication | 3 |
| MTH 114 | Mathematics II | 3 |
| CMP 174 | Digital Systems | 3 |
| CMP 175 | Object-Oriented Language (Java) | 3 |
| CMP 176 | Data Structure and Algorithm | 3 |
| PRJ 181 | Project I | 2 |
| **Total Credits** | | **17** |

**Pokhara University**
**Faculty of Management Studies**

Course Code: CMP 174 | Credits: 3[Hrs]
Course Title: Digital Systems | Total Lectures: 48 hours
Nature of the Course: Theory & Practical | Program: BCSIT
Level: Bachelor | Year: I Semester: II

## 1. Course Description

This course offers a comprehensive introduction to digital systems and logic design, covering key topics such as number systems, Boolean algebra, logic gates, and the simplification of Boolean functions. It includes practical design and implementation of both combinational and sequential circuits, focusing on essential components like adders, subtractors, decoders, encoders, multiplexers, demultiplexers, and code converters. Students gain in-depth knowledge of flip-flops, shift registers, and counters, crucial for sequential logic. The course culminates in the design of core digital components, including the Arithmetic Logic Unit (ALU), accumulator, status register, and processor unit. This course provides a balanced mix of theoretical knowledge and hands-on experience, equipping students with the skills necessary to understand, design, and analyze complex digital systems.

## 2. General Objectives

The general objectives of this course are:

- To equip the students with the fundamental concept of logic system.
- To provide students with basic tools for the design of digital circuits.
- To provide students a strong grasp of computer hardware basics and software for problem-solving, utilize accessible learning, hands-on activities, and examples.

## 3. Specific Objectives and Contents

| Specific Objectives | Contents |
|---|---|
| • Define of number systems<br>• Conversion between decimal, binary, octal, and hexadecimal systems for both integer and floating-point values.<br>• Determine of 1's and 2's complements of binary numbers.<br>• Execute the arithmetic operations on binary numbers | **Unit I: Binary Foundation and Digital Representation (8 hrs)**<br>1.1 Introduction to Digital System<br>1.2 Binary Number System Hexadecimal and Octal Number Systems<br>1.3 Number system conversion<br>1.4 Binary Codes: weighted and non-weighted codes<br>1.5 Alphanumeric codes (ASCII, EBCDIC)<br>1.6 Representation of Negative Numbers<br>1.7 Subtraction using complements |
| • Recognize the laws and theorems of Boolean algebra<br>• Comprehension of logic gates, truth tables. and their practical implementation<br>• Proficiency in implementing universal gates in digital circuitry | **Unit II: Boolean Building Blocks (6 hrs)**<br>2.1Basic Laws of Boolean Algebra<br>2.2De Morgan's Theorems<br>2.3Logic Gates and Their Symbols<br>2.4Logic Gate Truth Tables<br>2.5Universal Gates |

| | |
|---|---|
| • Understand the concepts of the minterms and maxterms in Boolean algebra.<br>• Develop the proficiency in simplifying Boolean functions using sum of products and product of sums methods.<br>• Gain proficiency in determining the dual form and complement of Boolean functions.<br>• Improve the proficiency in employing Karnaugh maps and handling don't-care conditions to streamline Boolean function simplification. | **Unit III: Simplification of Boolean Functions (6 hrs.)**<br>3.1 Minterms and Maxterms<br>3.2 Sum of products and Product of sums<br>3.3 Dual and complement of Boolean function<br>3.4 K-map & don't care conditions<br>3.5 Two-Level and Multilevel gate Implementations |
| • Develop design methodologies for combinational logic circuits<br>• Become skilled in creating adders and subtractors<br>• Master in decoder and encoder circuits, along with their practical uses<br>• Become Capable in designing and employing multiplexers and demultiplexers<br>• Become Proficiennt in various code conversion methods like 8421, BCD, Gray, Excess-3, and 2421<br>• Learn the principles and applications of Programmable Logic Devices | **Unit IV: Combinational Logic (9 hrs.)**<br>4.1 Introduction to combinational Logic circuit<br>4.2 Adders and Subtractors<br>4.3 Decoder and Encoder<br>4.4 Multiplexer and Demultiplexer<br>4.5 Code Conversion (8421, BCD, Gray, Excess-3,2421)<br>4.6 Programmable Logic Device (PROM) |
| • Understand the functionalities and uses of diverse types of sequential logic circuits<br>• Master the activation processes of flip-flops<br>• Learn to handling different flip-flop variants like RS, JK, T, D, and master-slave.<br>• Develop in creating state diagrams and tables to represent sequential logic systems. | **Unit V: Sequential Logic (6 hrs.)**<br>5.1 Types of sequential logic circuit<br>5.2 Triggering of flip flops<br>5.3 Flip-flops (RS, JK, T, D, master-slave)<br>5.4 State Diagrams and State Tables |
| • Learn how shift registers work and their different modes (SISO, SIPO, PISO, PISO) | **Unit VI: Registers and Counters (6 hrs)**<br>6.1 Shift Register<br>6.2 Modes of shift register (SISO, SIPO, PISO, |

| | |
|---|---|
| • Develop proficiency in designing and implementing asynchronous counters such as Binary ripple and BCD counters<br>• Improve the skill in designing and operating synchronous counters, capable of both up and down counting | PISO)<br>6.3 Asynchronous counter (Binary ripple, CD counter)<br>6.4 Synchronous Counter (up/down counter) |
| • Become Proficient in designing a 4-bit Arithmetic Logic Unit (ALU)<br>• Improve the skill of accumulator design and operation.<br>• Understand the functionality of status registers and flags<br>• Escalate the competence in designing a processor unit for digital systems. | **Unit VII: Digital Systems Design (7 hrs.)**<br>7.1 Arithmetic Logic Unit (Design of 4-bit ALU)<br>7.2 Accumulator<br>7.3 Status register and flags<br>7.4 Processor Unit |

*Note:* The figures in the parentheses indicate the approximate periods for the respective units.

## 4. Laboratory Works

1. Implement AND, OR, and NOT gates using basic electronic components.
2. Verify truth tables for each gate through practical experimentation.
3. Implement the simplified Boolean expressions using logic gates.
4. Verify De-Morgan's theorem
5. Design of half adder & full adder
6. Encoder and decoder
7. Multiplexer and Demultiplexer
8. Design of flip flops
9. Design of shift register and counters

*Experiential activities can be showcased through hands-on implementation on a digital logic trainer kit or simulated using dedicated software.*

## 5. Methods of Instruction

- Lecture
- Group discussion
- Question-answers
- Demonstration and discussion
- Presentations
- Guest lectures
- Group work/project work
- Problem solving
- Simulation
- Tutorials

## 6. Evaluation system and Students' Responsibilities

### Evaluation System

In addition to the formal exam(s), the internal evaluation of a student may consist of quizzes, assignments, lab reports, projects, class participation, etc. The tabular presentation of the internal evaluation is as follows.

| Internal Evaluation | Weight | Marks | External Evaluation | Marks |
|---|---|---|---|---|
| **Theory** | | 30 | Semester-End examination | 50 |
| Attendance & Class Participation | 10% | | | |
| Assignments | 20% | | | |
| Presentations/Quizzes | 10% | | | |
| Internal Assessment | 60% | | | |
| **Practical** | | 20 | | |
| Attendance & Class Participation | 10% | | | |
| Lab Report/Project Report | 20% | | | |
| Practical Exam/Project Work | 40% | | | |
| Viva | 30% | | | |
| Total Internal | | 50 | | |
| Full Marks: 50 + 50 = 100 | | | | |

### Student's Responsibilities

Each student must secure at least 45% marks separately in internal assessment and practical evaluation with 80% attendance in the class in order to appear in the Semester End Examination. Failing to get such score will be given NOT QUALIFIED (NQ) to appear the Semester-End Examinations. Students are advised to attend all the classes, formal exam, test, etc. and complete all the assignments within the specified time period. Students are required to complete all the requirements defined for the completion of the course.

## 7. Prescribed Books and References

### Text Books


1. Morris Mano (2017). Digital logic and computer design. Pearson India


### References


1.Fletcher, J. R. (2017). Digital Logic and Computer Design. Wiley

2.Mano, M. M., & Ciletti, M. D. (2021). Digital Design: With an Introduction to the Verilog HDL. Pearson

**3.**Malvino, A. P., & Leach, D. P. (2010). Digital Principles and Applications. McGraw-Hill Education

**Pokhara University**
**Faculty of Management Studies**

Course Code: CMP 175 Credits:3[Hrs]
Course Title: Object Oriented Programming (Java) Total Lectures: 48 hours
Nature of the Course: Theory & Practical Program: BCSIT
Level: Bachelor Year: I Semester: II

**1. Course Description:**

This course offers a comprehensive introduction to Java programming, starting with an overview of object-oriented programming (OOP) concepts and the transition from procedure-oriented programming. Students learn the fundamentals of Java, including variables, data types, operators, control statements, and arrays. Moving on to OOP principles, the course covers classes, objects, encapsulation, constructors, static members, and inheritance. It also explores polymorphism, abstract classes, packages, and interfaces. Exception handling and stream manipulation are addressed, along with graphical user interface (GUI) programming using Swing components. Additionally, students delve into the benefits and implementation of generics for enhanced code reusability and type safety. Through hands-on exercises and projects, students develop practical Java programming skills essential for software development.

**2. General Objectives:**

- To understanding of fundamental programming concepts such as variables, data types, and control statements in Java.
- Develop proficiency in object-oriented programming principles including classes, objects, inheritance, and polymorphism.
- Learn to effectively handle exceptions and manipulate files in Java programs.
- Acquire practical skills in GUI programming using Swing components and understand the benefits of using generics for code reusability and type safety.

**3. Specific Objectives and Contents**

| Specific Objective | Contents |
|---|---|
| • Recognize limitations of procedure-oriented programming versus object-oriented programming.<br>• Highlight advantages and disadvantages of object-oriented programming, focusing on its key features. | **Unit I: Introduction to Object-Oriented Programming (3 hrs.)**<br>1.1 Problems in Procedure-Oriented Programming<br>1.2 Introduction to Object Oriented Programming, advantages and disadvantages<br>1.3 Features and concepts of Object-Oriented Programming<br>1.4 Basic Concept of OOP |
| • Understand Java's features like platform independence and robustness.<br>• Explain JVM components and Java program structure with naming | **Unit II: Basic Java [9 hrs.]**<br>2.1. Introduction to Java: Features of Java,<br>2.2 The Java Virtual Machine (JVM), Parts of Java program, Naming Conventions in |

| | |
|---|---|
| conventions.<br>• Apply Java fundamentals like variables, data types, operators, arrays, and I/O operations in programming. | Java<br>2.3 Variables and constants<br>2.4 Data Types in Java<br>2.5 Operators in Java,<br>2.6 Reading and Displaying Output<br>2.7 Command Line Arguments.<br>2.8 Control Statements in Java<br>2.9 Array |
| • Create classes and objects in Java with proper instance variable initialization.<br>• Understand and apply access specifiers and encapsulation to control class member access.<br>• Implement constructors and grasp garbage collection concepts, including "this" pointer and static members in Java classes. | **Unit III: Object-Oriented Programming (6 hrs.)**<br>3.1 Classes and Objects: Object Creation, Initializing the Instance Variables<br>3.2 Access Specifiers and Encapsulation<br>3.3 Constructors and Garbage collection<br>3.4 "this" pointer<br>3.5 static members |
| • Explain inheritance and its role in code reuse, covering inheritance types and implementation in Java.<br>• Understand polymorphism principles, including method overriding, overloading, dynamic method invocation, and runtime polymorphism.<br>• Describe abstract classes, methods, packages, interfaces, and lambda functions, demonstrating their usage in Java programming. | **Unit IV: Inheritance and Polymorphism (6 hrs.)**<br>4.1 Inheritance and Reuse<br>4.2 Types of Inheritance and its Implementation<br>4.3 Polymorphism: Method Overriding, Method overloading, Dynamic method invocation and Run-time polymorphism<br>4.4 Abstract Classes: Abstract Method and Abstract Class<br>4.5 Packages and Interfaces<br>4.6 Lambda function |
| • Understand Java exceptions, including types and significance, and proficiently implement exception handling mechanisms for both built-in and user-defined exceptions in Java programs | **Unit V: Exception Handling (6 hrs.)**<br>5.1 Introduction to Exception<br>5.2 Errors in Java Program<br>5.2 Types of Exceptions<br>5.3 Exception handling mechanism<br>5.4 Built-in Exceptions in Java<br>5.5 User defined exception in JAVA |
| • Understand Java streams, differentiating between byte and character streams.<br>• Learn file management using I/O classes like File Input Stream, File Output Stream, Data Input Stream, Data Output Stream, Object Input Stream, and Object Output Stream. | **Unit VI: Stream in JAVA (6 hrs.)**<br>6.1 Introduction to stream, byte stream and character stream<br>6.2 I/O class hierarchy<br>6.3 Manipulating file:<br>▪ File Input Stream,<br>▪ File Output Stream,<br>▪ Data Input Stream,<br>▪ Data Output Stream, |

| | |
|---|---|
| | ▪ Object Input Stream,<br>▪ Object Output Stream |
| • Design GUI creation with Swing components, including buttons, labels, text fields, and text areas, and gain expertise in event-driven programming for mouse and key events | **Unit VII: GUI Programming with Swing [8 hrs.]**<br>7.1 Introduction to graphical user interface (GUI) programming in java<br>7.2 Using Swing components (buttons, labels, text fields, text area, etc.)<br>7.3 Event-driven programming and event handling: Mouse event and key event<br>7.4 Building Simple Interactive Applications |
| • Develop the skill of using generics in Java and demonstrate proficiency in implementing generic classes, methods, and constructors<br>• Apply polymorphism concepts within generic classes and methods | **Unit VIII: Generics (4 hrs.)**<br>8.1 Advantages of using Generics<br>8.2 Generic classes<br>8.3 Generic methods<br>8.4 Generic constructors<br>8.5 Polymorphism in generic |

**4. List of practical**

1. Program to define the structure of a basic JAVA program
2. Program to define the data types, variables, operators, arrays, and control structures
3. Program to define class and constructors. Demonstrate constructors and garbage collection
4. Program to define class, methods, and objects. Demonstrate method overloading
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate I/O operations.
8. Program to demonstrate Exception Handling
9. Program to demonstrate Layout managers
10. Implementation of generic concepts

***Note: Creating a project based on Java using object-oriented concepts***

**5. Methods of Instruction**

- Lecture
- Group discussion
- Question-answers
- Demonstration and discussion
- Presentations
- Guest lectures
- Group work/project work
- Problem solving
- Simulation
- Tutorials

## 6. Evaluation System and Students' Responsibilities

### Evaluation System

The internal evaluation of a student may consist of assignments, attendance, term exams, lab reports and projects etc. The tabular presentation of the internal evaluation is as follows:

| **Internal Evaluation** | **Weight** | **Marks** | **External Evaluation** | **Marks** |
|---|---|---|---|---|
| **Theory** | | **30** | **Semester End** | **50** |
| Attendance & Class Participation | 10% | | | |
| Assignments | 20% | | | |
| Presentations/Quizzes | 10% | | | |
| Internal Assessment | 60% | | | |
| **Practical** | | **20** | | |
| Attendance & Class Participation | 10% | | | |
| Lab Report/Project Report | 20% | | | |
| Practical Exam/Project Work | 40% | | | |
| Viva | 30% | | | |
| **Total Internal** | | **50** | | |
| **Full Marks: 50 + 50 = 100** | | | | |

### Students' Responsibilities

Each student must secure at least 45% marks separately in internal assessment and practical evaluation with 80% attendance in the class to appear in the semester-end examination. Failing to get such a score will be given NOT QUALIFIED (NQ) to appear the Semester-End Examinations. Students are advised to attend all the classes, formal exam, test, etc. and complete all the assignments within the specified time period. Students are required to complete all the requirements defined for the completion of the course.

## 7. Prescribed Books and References

### Text Books


1. Schildt, H. (2006). The Complete Reference JAVA (7th ed.). Tata McGraw
2. Balaguruswamy, E. (2009). Programming with JAVA: A Primer (3rd ed.). TATA McGrawHill Company


### References


1.Liang, D. (2014). Introduction to Java Programming (Comprehensive Version) (7th ed.). Pearson

2.Malhotra, S., & Chaudhary, S. (2014). Programming in Java. Oxford University Press

3.Lowe, D., Murach, J., & Steelman, A. (2005). Murach's Beginning Java 2. SPD

**Pokhara University**
**Faculty of Management Studies**

Course Code: CMP 176 Credits:3[Hrs]
Course Title: Data Structure and Algorithm Total Lectures: 48 hours
Nature of the Course: Theory & Practical Program: BCSIT
Level: Bachelor Year: I Semester: II

## 1. Course Description

This course offers a thorough examination of the core principles of data structures and algorithms, crucial for computer science students. It starts with an introduction to data structures and advances through abstract data types, algorithm analysis, and design techniques. Topics covered include recursion, stacks, queues, linked lists, trees, sorting, searching, hashing, and graph algorithms, with in-depth explanations and practical examples. Through hands-on exercises, students gain proficiency in designing, implementing, and analyzing these structures and algorithms, with a focus on understanding their efficiency and real-world applications. Upon completion, students are equipped with the essential knowledge and skills to address intricate problems and develop efficient software solutions.

## 2. General Objectives

- Provide a comprehensive understanding of fundamental data structures and algorithms.
- Equip students with proficiency in designing, implementing, and analyzing data structures and algorithms.
- Foster a deep comprehension of the efficiency and practical implications of different algorithms.
- Prepare students to tackle complex problems and develop effective software solutions.

## 3. Specific Objectives and Contents

| Specific Objectives | Content |
|---|---|
| • Explain fundamental concepts and importance of data structures.<br>• Define and classify different types of data structures.<br>• Differentiate between data structures and abstract data types (ADTs).<br>• Analyze and evaluate algorithms in terms of time and space complexity. | **Unit I: Introduction to data Structure [3 Hrs.]**<br>**1.1 introduction**<br>**1.2** Definition,<br>**1.3** Classification of data structure<br>**1.4** Abstract Data Type<br>**1.5** Comparison between Data structure and ADT,<br>**1.6** Algorithm<br>**1.7** Analysis algorithm<br>**1.8** Design algorithm<br>▪ Incremental approach<br>▪ Divide and conquer |

| | |
|---|---|
| | **1.9** Performance analysis and measurement<br>▪ Space complexity<br>▪ Time complexity |
| • Discuss the principles and characteristics of recursion.<br>• Apply recursion to solve problems and implement algorithms efficiently. | **Unit II: Recursion [4 Hrs.]**<br>2.1 Introduction to Recursion<br>2.2 Principle of Recursion<br>2.3 Types of Recursions<br>▪ Direct,<br>▪ Indirect,<br>▪ Linear<br>▪ Tail recursion<br>2.4 Recursion Examples<br>▪ TOH,<br>▪ Fibonacci Series,<br>2.5 Application of Recursion |
| • Become proficient in using stacks and understanding their terms.<br>• Proficiency in implementing stack algorithms such as POP and PUSH.<br>• Application of stacks in solving problems like reverse string, postfix expression evaluation, and infix to postfix conversion. | **Unit III: Stacks [4 Hrs.]**<br>3.1 Introduction<br>3.2 Operation stack<br>3.3 Stack terminology<br>3.4 Algorithm for POP and PUSH<br>3.5 Stack Applications<br>▪ Stack frame<br>▪ Reverse string<br>▪ Calculation of postfix expression<br>▪ A notation conversion<br>3.6 Algorithm for converting infix expression to postfix from. |
| • Discuss of queue terminology and operations.<br>• Gain proficiency in implementing queue insertion and deletion algorithms.<br>• Recognize queue variations and their applications, such as circular queues and priority queues. | **Unit IV: Queue [4 Hrs.]**<br>4.1 Introduction<br>4.2 Queue terminology<br>4.3 Algorithm for insertion queue<br>4.4 Algorithm for deletions in queue<br>4.5 Limitation of simple queue<br>4.6 Variation in a queue<br>▪ A circular queue<br>▪ Priority of queue<br>4.7 Application of queue |
| • Comprehend the advantages and disadvantages of linked lists.<br>• Define key terms associated with linked lists, such as data field and linked field.<br>• Demonstrate the representation of a linear linked list.<br>• Execute operations on linked lists including | **Unit V: Linked List [5 Hrs.]**<br>5.1 Introduction<br>5.2 Linked List<br>▪ Advantage and disadvantage<br>5.3 Key term<br>▪ Data field<br>▪ Linked field |

| | |
|---|---|
| creation, insertion, deletion, traversal, searching, concatenation, and display.<br>• Identify and differentiate between various types of linked lists, including single, double, circular, and circular double linked lists. | 5.4 Representation liner linked list<br>5.5 Operation of linked list<br>▪ Creation<br>▪ Insertion<br>▪ Deletion<br>▪ Traversing<br>▪ Searching<br>▪ Concatenation<br>▪ Display<br>5.6 Types of linked list<br>▪ Single linked list<br>▪ Double linked list<br>▪ Circular linked list<br>▪ Circular double linked list<br>5.7 Create single linked list<br>5.8 Insertion of single linked list at specific position<br>5.9 Deletion of single linked list at specific position<br>5.10 Application: addition of two polynomials |
| • Define tree terminology and apply it, including concepts like strictly binary trees and complete binary trees.<br>• Understand different representations of binary trees, like array and linked list representations.<br>• Create a binary tree and implement various traversal methods.<br>• Perform operations on binary search trees, including insertion, search, and deletion, and understand their properties.<br>• Learn about AVL balanced trees, their principles, properties, and how they ensure efficient data structure operations by maintaining balance and minimizing search times<br>. | **Unit VI: Trees [7 Hrs.]**<br>6.1 Introduction<br>6.2 Tree terminology<br>6.3 Binary tree<br>▪ Strictly binary tree<br>▪ Complete binary tree<br>▪ Extended binary tree<br>6.4 Binary tree representation<br>▪ Array representation of binary tree<br>▪ Linked list representation of binary tree<br>6.5 Create binary tree<br>6.6 A traversal of a binary tree<br>▪ Preorder traversal<br>▪ Inorder traversal<br>▪ Post order traversal<br>6.7 Binary search tree<br>▪ Insertion<br>▪ Search<br>▪ Deletion<br>6.8 Tree Height, Level and Depth,<br>6.9 Balanced Tree: AVL Balanced Trees<br>6.10The Huffman Algorithm |

| | |
|---|---|
| | 6.11 B-Tree |
| • Understand the distinction between internal and external sorting techniques.<br>• Learn various common sorting algorithms such as Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Shell Sort, and Binary Sort.<br>• Analyze the efficiency of sorting algorithms and their performance using Big O notation.<br>• Implement sorting algorithms and evaluate their effectiveness in sorting large datasets. | **Unit VII: Sorting[7 Hrs.]**<br>7.1 Introduction<br>7.2 Internal & External Sort,<br>7.3 Common sorting algorithm<br>▪ Bubble sort<br>▪ Insertion<br>▪ Selection Sort,<br>▪ Quick Sort,<br>▪ Merge Sort,<br>▪ Shell Sort,<br>▪ Binary Sort,<br>7.4 Efficiency of Sorting, Big 'O' Notation |
| • Various searching techniques including Sequential Search, Binary Search, and Tree Search.<br>• Learn about hashing techniques, including hash functions and hash tables, and their applications.<br>• Explore collision resolution techniques such as linear probing, quadratic probing, and double hashing.<br>• Compare the efficiency of different search techniques and hashing methods to determine their suitability for various applications. | **Unit VIII: Searching [5 Hrs.]**<br>8.1 Introduction<br>8.2 Searching Technique<br>▪ Sequential Search,<br>▪ Binary Search,<br>▪ Tree Search,<br>8.3 Hashing:<br>▪ Hash functions<br>o Character of a good hash functions<br>o Type of hash function<br>▪ Hash tables and application<br>8.4 Collision resolution techniques<br>8.5 Hashing with open addressing<br>▪ Linear probing<br>▪ Quadratic probing<br>▪ Double hashing<br>8.6 Hashing with chaining<br>8.7 Rehashing<br>8.8 Efficiency comparison of different search technique |
| • Understand the fundamental concepts and terminology related to graphs.<br>• Learn about different types of graphs, including undirected and directed graphs.<br>• Explore graph representation techniques and graph traversal algorithms such as Breadth-First Search (BFS) and Depth-First Search (DFS).<br>• Study spanning trees, minimum spanning trees, and algorithms such as Kruskal's algorithm and Prim's algorithm for their | **Unit 9: Graph [7 Hrs.]**<br>9.1 Introduction<br>9.2 Graph terminology<br>9.3 Types of Graphs<br>▪ Undirected graph<br>▪ Directed graph<br>9.4 Graph representation<br>9.5 Graph Traversal<br>▪ Breath first search<br>▪ Depth first search<br>9.6 Spanning tree and Minimum spanning |

| | |
|---|---|
| construction. | tree<br>▪ Kruskal's algorithm<br>▪ Prime algorithm<br>9.7 Shortest Path problem<br>▪ Dijkstrs's Algorithm<br>9.8 Application graph |
| • Learn the concept of asymptotic notations, including Big O, Omega, and Theta notation.<br>• Learn the limitations of Big O notation and its applicability in analyzing algorithmic complexity. | **Unit 10: Growth Functions [2 Hrs.]**<br>10.1. Introduction to Asymptotic Notations<br>10.2 Big Oh notation<br>10.3 Omega notation<br>10.4 Theata notation<br>10.5 Limatitation of big Oh notation |

**4. Laboratory Work**

It builds the foundation on how to write a program using any high-level language. Hence, this course requires a lot of programming practice so that students will be able to develop good logic building and program developing capability which is essential throughout the course.

Some important contents that should be included in lab exercises are as follows:

1. Implementations of different operations related to Stack.
2. Implementation of different operations related to linear and circular queue.
3. Solution of TOH and Fibonacci Series using Recursion.
4. Implementations of different operations related to singly linked list.
5. Implementation of Trees: AVL trees, Balancing AVL.
6. Implementation of merge sort.
7. Implementation of different searching technique: sequential, Tree and Binary.
8. Implementation of Graphs: Graph traversal
9. Implementation of Hashing

***Note: Each of the above lab session should cover more than 4 hours of practical work.***

**5. Methods of Instruction**

- Lecture
- Group discussion
- Question-answers
- Demonstration and discussion
- Presentations
- Guest lectures
- Group work/project work
- Problem solving
- Simulation
- Tutorials

**6. Evaluation system and Student's Responsibilities**

**Evaluation System**

In addition to the formal exam(s), the internal evaluation of a student may consist of quizzes, assignments, lab reports, projects, class participation, etc. The tabular presentation of the internal evaluation is as follows.

| External Evaluation | Marks | Internal Evaluation | Weight | Marks |
|---|---|---|---|---|
| Semester-End examination | 50 | **Theory** | | 30 |
| | | Attendance & Class Participation | 10% | |
| | | Assignments | 20% | |
| | | Presentations/Quizzes | 10% | |
| | | Internal Assessment | 60% | |
| | | **Practical** | | |
| | | Attendance & Class Participation | 10% | 20 |
| | | Lab Report/Project Report | 20% | |
| | | Practical Exam/Project Work | 40% | |
| | | Viva | 30% | |
| Total External | 50 | Total Internal | | 50 |
| Full Marks: 50 + 50 = 100 | | | | |

**Student's Requirements**

Each student must secure at least 45% marks separately in both internal assessment and practical evaluation with 80% attendance in the class in order to appear in the Semester End Examination. Failing to get such score will be given NOT QUALIFIED (NQ) to appear the Semester-End Examinations. Students are advised to attend all the classes, formal exam, test, etc. and complete all the assignments within the specified time period. ***Students are required to complete all the requirements defined for the completion of the courses.***

## *7*. Prescribed Books and References

**Text Books**

Langsam, Y., Augenstein, M. J., & Tanenbaum, A. M. (2019). Data Structures using C and C++. PHI

**Reference Books**

1 Rowe, G. W. (1997). Introduction to Data Structures and Algorithms with C and C++. PHI
2 Lafore, R. (2002). Data Structures and Algorithms in Java. Sams Publishing
3 Baluja, G. S. (2016). Data Structures through C. Dhanpat Rai & Co

**Pokhara University**
**Faculty of Management Studies**

Course Code: MTHS213 174 Credits:3[Hrs]
Course Title: **Mathematics II** Total Lectures: 48 hours
Nature of the Course: Theory Program: BCSIT
Level: Bachelor Year: I Semester: II

**1. Course Description**

This course covers essential mathematical concepts starting with complex numbers, including their definition, algebra, properties, and graphical representation. It introduces De Moivre's theorem and applications. The course progresses to infinite sequences and series, focusing on convergence tests and specific tests like P-series and ratio tests. It explores antiderivatives, including definite and improper integrals, quadrature, rectification, and Beta and Gamma functions. Optimization for functions of several variables, partial differentiation, and finding maxima and minima are also covered. Students will study ordinary differential equations, including first-order solutions and second-order equations with constant coefficients, along with initial and boundary value problems. The course addresses number theory, including division, primes, GCD, LCM, and modular arithmetic, with applications in cryptology. Finally, it covers Fourier series and integrals, exploring even and odd functions, periodic functions, and Fourier coefficients, as well as sine and cosine integrals.

**2. General objective**

- Understand complex numbers, their properties, and algebraic operations.
- Proficiently analyze infinite sequences and series using convergence tests.
- Master antiderivatives, including definite and improper integrals, and apply Beta and Gamma functions in problem-solving.
- Solve ordinary differential equations and optimization problems using techniques like partial differentiation

**3. Specific Objectives and Contents**

| Specific Objectives | Content |
|---|---|
| • Understand and define complex numbers, including integral powers of *ii*.<br>• Execute addition, subtraction, multiplication, and division of complex numbers.<br>• Investigate properties of complex numbers, including conjugates and moduli.<br>• Represent complex numbers using Argand's diagram, express in polar form, and apply De Moivre's theorem | **Unit I: Complex Numbers [8 hrs.]**<br>1.1 efinition of a complex number, integral powers of i.<br>**1.2** lgebra of complex numbers (sum, difference, multiplication, division).<br>**1.3** roperties of complex numbers (without proof), conjugate of a complex number and its properties. |

| | |
|---|---|
| | **1.4** odulus of a complex number and its properties (without proof), representation of a complex number by a point in a plane (Argand's diagram).<br>**1.5** olar representation of a complex number.<br>**1.6** quare roots of a complex number (only Cartesian form)<br>**1.7** De Moivre's theorem (statement only) and its application. |
| • Learn the concept and conditions of convergence tests for infinite series.<br>• Use direct and limit comparison tests to determine series convergence or divergence.<br>• Apply P-series, De Alembert's ratio, and alternating series tests to analyze series convergence. | **Unit II: Infinite Sequence and Series [7 hrs.]**<br>2.1. Introduction<br>2.2. Convergence test of infinite series (statement only).<br>2.3. Direct comparison test, Limit comparison test (statement only).<br>2.4. P-series test, De Alembert's ratio test, and Alternating series test (statement only). |
| • Learn the concepts, properties, and applications of definite and improper integrals.<br>• Calculate areas (quadrature) and curve lengths (rectification) for functions $y=f(x)y=f(x)$ using antiderivative techniques<br>• Study and apply the properties of Beta and Gamma functions in different mathematical contexts. | **Unit III: Application of Antiderivative [7 Hrs.]**<br>1.1. Definite integral<br>1.2. Properties of the definite integral<br>1.3. Improper Integral<br>1.4. Quadrature $[y = f(x)]$<br>1.5. Rectification $[y = f(x)]$<br>1.6. Beta and Gamma function. |
| • Learn the concept and importance of partial derivatives<br>• Use rules of partial differentiation for accurate calculations<br>• Identify maxima and minima for functions of two variables | **Unit IV: Optimization: Functions of several variables [6 hrs]**<br>4.1. Introduction<br>4.2. Partial derivative<br>4.3. Rules of partial differentiation<br>4.4. Maxima and minima for the function of two variables. |
| • Understand the order and degree of differential equations | **Unit V: Ordinary Differential Equation [7 Hrs.]**<br>5.1. Introduction. |

| | |
|---|---|
| • Solve first-order and first-degree differential equations using various methods.<br>• Solve second-order linear differential equations with constant coefficients and address initial and boundary value<br>• problem. | 5.2. Order and degree of differential equation.<br>5.3. Solution of the first order and first-degree differential equation.<br>5.4. Variable separation, homogeneous, linear differential equation.<br>5.5. Second-order linear differential equation with constant coefficients.<br>5.6. Initial and boundary value problems. |
| • Identify prime numbers and apply them in problem-solving<br>• Master division algorithm, GCD, and LCM for integer problem-solving.<br>• Apply modular arithmetic in cryptography for secure message transmission | **Unit VI: Integers and Division [6 Hrs.]**<br><br>1.1. Introduction<br>1.2. Division, primes, the fundamental theorem of arithmetic (statement only)<br>1.3. The infinitude of primes<br>1.4. The division algorithm, GCD and LCM<br>1.5. Modular arithmetic<br>1.6. Application of congruence's Cryptology. |
| • Classify functions as even or odd and analyze their properties.<br>• Represent periodic functions using Fourier series and determine coefficients.<br>• Apply Fourier integrals to represent non-periodic functions | **Unit VII: Fourier Series and Integrals [7 Hrs.]**<br><br>1.1. Introduction<br>1.2. Even and odd function<br>1.3. Periodic function<br>1.4. Fourier series and Fourier coefficients (without proof)<br>1.5. Fourier sine and cosine series<br>1.6. Fourier integral<br>1.7. Fourier sine and cosine integral |

**4. Methods of Instruction**

- Lecture
- Group discussion
- Question-answers
- Demonstration and discussion
- Presentations
- Guest lectures

- Group work/project work
- Problem solving
- Simulation
- Tutorials

## 5. Evaluation System and Student's Responsibilities

### Evaluation System

In addition to the formal exam(s), the internal evaluation of a student may consist of quizzes, assignments, class participation, etc. The tabular presentation of the internal evaluation is as follows.

| External Evaluation | Marks | Internal Evaluation | Weight | Marks |
|---|---|---|---|---|
| Semester-End examination | 50 | **Theory** | | 50 |
| | | Attendance & Class Participation | 10% | |
| | | Assignments | 20% | |
| | | Presentations/Quizzes | 10% | |
| | | Internal Assessment | 60% | |
| Total External | 50 | Total Internal | | 50 |
| Full Marks: 50 + 50 = 100 | | | | |

### Student's Requirement

Each student must secure at least 45% marks separately in both internal assessment and practical evaluation with 80% attendance in the class to appear in the semester-end examination. Failing to get such a score will be given NOT QUALIFIED (NQ) to appear for the Semester-End Examinations. Students are advised to attend all the classes, formal exams, tests, etc., and complete all the assignments within the specified period. ***Students are required to complete all the requirements defined for the completion of the course.***

## 6. Prescribed Books and References

### Text Books


1. Kreyszig, E. (2020). *Advanced Engineering Mathematics*. New Delhi: John Wiley & Sons Inc.
2. Thomas, G. B. Jr., & Finney, R. L. (2003). *Calculus and Analytical Geometry*. New Delhi: Narosa Publishing House.
3. Rosen, K. H. (2003). *Discrete Mathematics and its Applications* (5th ed.). McGraw Hill Companies.


### Reference


1. Shrestha, K. K., &Thagurathi, R. K. (Year of publication). *Applied Mathematics*. Kathmandu, Nepal: Buddha Publication

**Pokhara University**
**Faculty of Management Studies**

Course Code: ENG. 112 Credits:3[Hrs]
Course Title: Business Communication Total Lectures: 48 hours
Nature of the Course: Theory Program: BCSIT
Level: Bachelor Year: I Semester: II

## 1. Course Description

This course is designed to equip students with the practical concepts, knowledge and skills essential for an effective business communication. It covers the fundamental components of successful communication, including oral, written, non-verbal, visual, and intercultural aspects within the business environment. The course primarily focuses on developing core competencies for successful communication in modern business settings through task-based classroom activities. It complements the technical knowledge of business frameworks, highlighting the practical aspects of individual involvement as communicators in business. It underscores the practical role of individuals as communicators in business and enhances their ability to communicate effectively, thereby contributing to their employability and career progression.

## General Objectives

The general objectives of this course are as follows:

- To familiarize the students with fundamentals of business communication
- To enable students to communicate effectively in written and oral business context
- To enable students to produce business documents with appropriate organization and design
- To empower students with nonverbal and visual modes of business communication
- To empower students to develop intercultural communicative competence
- To enhance students' skills in using appropriate graphics and visuals in written documents and oral presentation

## 3. Specific Objectives and Content of the Course

| Learning Objectives | Contents |
|---|---|
| • Explain the meaning and definition of business communication.<br>• Describe the process of communication.<br>• Describe the principles of effective business communication.<br>• Explain the modes of business communication. | **Unit I: Foundation of Business Communication (8 hrs.)**<br>1.1 Meaning and definition of business communication<br>1.2 Process of communication<br>1.3 Principles of effective business communication (clarity, conciseness, completeness, correctness, concreteness, consideration and courtesy) |

| Learning Objectives | Contents |
|---|---|
| • Discuss the barriers to effective communication.<br>• Describe communication in an organizational structure.<br>• Acquaint students with business communication in the digital age.<br>• Follow the etiquettes of business communication. | 1.4 Modes of communication: intra-personal, inter-personal, visual or presentational mode, electronic or digital mode of communication<br>1.5 Barriers to effective communication (noise and distractions, filters, competing messages, channel breakdown)<br>1.6 Communication in an organizational structure (downward, upward, horizontal, diagonal)<br>1.7 Business communication in the digital age<br>1.8 Etiquettes of business communication |
| • Describe the process of business writing.<br>• Explain the qualities of business writing.<br>• Follow the basics of document design.<br>• Compose effective memos and emails.<br>• Prepare brief document messages.<br>• Prepare mid-length professional business proposals, reports and plans.<br>• Consider the ethical issues in business writing. | **Unit II: Written Business Communication** **(12 hrs.)**<br>2.1 Writing process: planning (Analyzing the situation, analyzing the audience, choosing the medium, organizing the information) writing (Being sensitive to the audience and composing the message) and completing (revising, producing, proofreading, distributing).<br>2.2 Qualities of business writing<br>2.3 Preparing business documents: basics of document design (organization, order, access, variety)<br>2.4 Writing brief messages: memos, letters, emails, blogs, notices, press release<br>2.5 Writing business proposals, reports, plans: informal reports, proposals and plans, and formal components of advanced business documents<br>2.6 Ethical considerations in business writing: plagiarism, crediting and referencing the sources |

| Learning Objectives | Contents |
|---|---|
| • Explain the basics of oral business communication process.<br>• Distinguish between oral and written business communication.<br>• Deliver effective oral presentation and public speech.<br>• Perform effective job interview.<br>• Conduct effective in-person and virtual business meetings and participate in it actively. | **Unit III: Oral Business Communication (6 hrs.)**<br>3.1 Basics of oral business communication process: qualities of oral communication and distinction between oral and written<br>3.2 Major oral communication situations<br>3.2.1 Mastering oral presentation and public speech<br>3.2.2 Effective job interview process<br>3.2.3 Effective business meetings: in-person and digital mode |
| • Define the concept of non-verbal communication.<br>• Explain the characteristics of non-verbal communication.<br>• Communicate with appropriate physical appearance, tone of voice, facial expression, use of space, touch, and time in communication.<br>• Acquaint with the key considerations in effective business communication.<br>• Explain the meaning of intercultural business communication.<br>• Discuss the barriers to effective intercultural business communication.<br>• Overcome the barriers to effective intercultural communication | **Unit IV: Non-verbal and Intercultural Business Communication (6 hrs.)**<br>4.1 Meaning of non-verbal communication<br>4.2 Characteristics of non-verbal communication<br>4.3 Types of non-verbal communication<br>4.3.1 Physical appearance<br>4.3.2 Vocal characteristics<br>4.3.3 Gesture and posture<br>4.3.4 Facial expression<br>4.3.5 Use of space<br>4.3.6 Touch<br>4.3.7 Use of time<br>4.4 Key considerations in non-verbal communication<br>4.5 Intercultural communication and diversity sensitivity in business communication<br>4.5.1 Meaning of intercultural communication<br>4.5.2 Barriers to effective intercultural communication<br>4.5.3 Overcoming the barriers to intercultural communication |

| Learning Objectives | Contents |
|---|---|
| • Acquaint students with the concept of visual communication and its use.<br>• Use and describe visual messages used in business communication appropriately. | **Unit V: Visual Communication (5 hrs.)**<br>5.1 Uses of visual aids in business communication<br>5.2 Types of visual aids:<br>5.2.1 Signs, symbols, signals<br>5.2.2 Tables<br>5.2.3 Figures<br>5.2.4 Bar graphs<br>5.2.5 Gantt chart<br>5.2.6 Infographics<br>5.2.7 Pie chart<br>5.2.8 Organizational chart<br>5.2.9 Flowchart<br>5.2.10 Diagrams<br>5.2.11 Map<br>5.2.12 Photograph<br>5.3 Ethical consideration in using visual aids |
| • Enable students to produce professional email and resume.<br>• Enable students to draft effective business proposals and reports.<br>• Enable students to excel in job interview and business meetings. | **VI: Employment Communication and Presentation (Practicum) 10 hrs.**<br>6.1 Cover letter and resume writing workshop- 2 hrs.<br>6.2 Mock job interview and business meetings- 3 hrs.<br>6.3 Creating LinkedIn profile 2 hr.<br>6.4 Oral presentation practicum 3 hrs. |

***Note:*** *The figures in the parenthesis indicate the approximate teaching hours for respective units*

4.**Methods of Instruction**

- Lecture
- Group discussion
- Question-answers
- Demonstration and discussion
- Presentations
- Guest lecture
- Group work/project work
- Problem solving
- Simulation
- Tutorial

.

| Unit | Activity and Instructional Techniques |
|---|---|
| I | Lecture, group discussion, individual presentations |
| II | Demonstration, classroom practice, group work, individual tasks, project work |
| III | Demonstration, presentation, mock-meetings, mock, interview, pair work and group work |
| IV | Demonstration, presentation, pair work and group work |
| V | Demonstration, presentation, pair work and group work |
| VI | Demonstration, pair work and group work, presentation |
| VII | Workshop (individual work, group work, presentation) |

**5. Evaluation System and Students' Responsibilities**

**Evaluation System**

The internal evaluation of a student may consist of assignments, attendance, term-exams, lab reports and projects etc. The tabular presentation of the internal evaluation is as follows:

| Internal Evaluation | Weight | Marks | External Evaluation | Marks |
|---|---|---|---|---|
| **Theory** | | **30** | **Semester End** | **50** |
| Attendance and classroom participation | 5 | | | |
| Assignments | 10 | | | |
| Presentations | 5 | | | |
| Internal assessment | 10 | | | |
| **Employment Communication and Presentation Practicum** | | **20** | | |
| Qualities of cover letter and resume | 5 | | | |
| Mock- meeting/ interview | 5 | | | |
| LinkedIn profile creation | 5 | | | |
| Presentation | 5 | | | |
| **Total Internal** | | **50** | | |
| **Full Marks: 50 + 50 = 100** | | | | |

**Students' Responsibilities**

Each student must secure at least 45% marks separately in internal assessment and practical evaluation with 80% attendance in the class to appear in the Semester End Examination.

Failing to get such score will be given NOT QUALIFIED (NQ) to appear the Semester-End Examinations. Students are advised to attend all the classes, formal exam, test, etc. and complete all the assignments within the specified time. Students are required to complete all the requirements defined for the completion of the course.

**External Evaluation (Final Examination) 50%**

The Office of the Controller of Examination University will be conducted external examination at the end of the semester.

| SN | Question Types | Points |
|---|---|---|
| 1 | Case analysis | 15 |
| 2 | Analytical Questions: 15x1 | 15 |
| 3 | Short questions: 10x5 marks | 50 |
| | Very short answer questions: 10x2 marks | 20 |
| | **Total** | **100** |

## 6. Prescribed Books and References

***Text Books***


1. Adhikari, Dharma and Upadhyaya, Phandindra (2014). *Technical Communication: Concept and Process*. Kathmandu: Buddha Publication (for Unit 1: page no. 2-11, for Unit II: 144-152; for Unit V: page no. 154-168
2. Courtland L. Bovee and John V. Thill, Business (2021) *Communication Today: Occasional Handouts.* Pearson: London (for Unit 1: page no. 48- 52; 64-67; 100-104, for Unit II: page no.140-141, for Unit IV: page no.98-100; 114-132, for Unit VI: page no. 463-475, 503, 521, 557-621)
3. GC, Saroj (2021). *Business Communication: Theory and Applications.* Kathmandu: Advance Sarswati Publication (for Unit II: page no. 14-32; 141-190; 191-246), for Unit III: page no. 247-295
4. Guffey, M. E., & Loewy, D. (2019). *Essentials of business communication*. Boston: Cengage Learning. (for Unit 1: page 1-7)


**Reference Books**


1. Bruckmann, C. G., & Hartley, P. (2007). *Business communication*. Routledge.
2. Hartley P. & Chatterton, P. (2015). *Business Communication: Rethinking your professional practice for the post-digital age.* London. Routledge
3. Floyd, K. & Peter W. (2020). *Business and Professional Communication: Putting People First*. New York. Mc Grow Hill Education
4. Guffey, Mary E. & Carolyn M. S. (2011). *Business English*. Ohio: Cengage Learning. Oxford Business English Dictionary for Learners of English. Oxford: OUP.
5. Guffey, M. E., & Loewy, D. (2011). *Business Communication: Process and Product.* (7th ed.). Mason, Ohio: South-Western.
6. Rentz, K., Flatley, M. E., & Lentz, P. (2011).*Business Communication: Connecting in a Digital World.* (12th ed.). New York: Mc-Graw Hill. (for Unit I: page no. 1-7)
7. Hartley, P. (2002). *Business Communication. London:* Routledge

**Pokhara University**
**Faculty of Management Studies**

| | |
|---|---|
| Course Code: PRJ 181 | Credits:2[Hrs] |
| Course Title: Project I | Total Lectures: 32 hours |
| Nature of the Course: Theory | Program: BCSIT |
| Level: Bachelor | Year: I Semester: II |

## 1. Course Description

This course equips students with essential web development skills using HTML, CSS, and JavaScript. Students begin by learning to structure web pages with HTML, followed by enhancing them with CSS for styling and layout control to create visually appealing and responsive designs. JavaScript is introduced to add interactivity and dynamic functionality, enabling the creation of engaging user experiences. Advanced topics such as form validation, DOM manipulation, and AJAX requests are also covered, providing the tools needed for real-world web development challenges. By the end of the course, students will have a solid understanding of web development principles and practical experience in creating interactive, responsive websites, preparing them for more complex projects in future semesters.

## 2. General Objectives

- Understand the fundamental concepts and structures of HTML, CSS, and JavaScript for web development.
- Develop skills in creating visually appealing and responsive web designs using CSS.
- Gain proficiency in using JavaScript to add interactivity and dynamic functionality to web pages.

## 3. Laboratory Work

It builds the foundation for how to create simple static web pages. Hence, this course requires a lot of programming practice so that students will be able to develop good logic-building and program-developing capabilities which is essential throughout the course.

**Some important contents that should be included in project work are:**

1. Creating a simple static website with 4 pages, using HTML5 (include all tags included in HTML and HTML5
2. Create a simple image gallery using CSS
3. Create a responsive web page using the box model
4. Create a form with all the elements and validate it using client-side scripting
5. Create a user registration form using HTML 5 and validate it using JavaScript
6. Creating jQuery Slider and Image Gallery
7. Use jQuery date picker and sort
8. Work with JSON data and make AJAX requests using fetch API or XMLHttpRequest
9. The general concept of React, Angular, or Vue.js for building web application

**4. Methods of Instruction**

- Case discussion
- Group discussion
- Practical works,
- Demonstration and discussion
- Project-based Learning
- Self-Directed learning
- industry insights and case study
- Case readings, Case question and answer
- Simulation
- Tutorial

**5. Evaluation system, Project timeline and Student's Responsibility**

| SN | Evaluation Details | Day for Evaluation (48 hrs.) | Marks |
|---|---|---|---|
| 1. | Introduction to Project I | Project Seminar (Introduction) | 5 marks for attendance and submission of topic on time |
| 2. | Topic finalization | Day 2-4 (Discussion on project topic, Research) | |
| 3. | Proposal Defense | Day 6-10 (Preparation for proposal defense) | 5 |
| 4. | Mid- Term Defense | Day 11 (Presentation, printed copy of project proposal- 2 pcs, Demo) | 15 |
| 5. | End- Term Defense | Day 24 (Presentation, Demo 60% of the work is to be completed) | 25 |
| 6. | Final Defense | Day 48 (Final Project presentation, Demo and Q&A) | 50 |
| **Total** | | | 100 |

**Project Work Phase:**

The entire project work shall be divided into three phases and evaluation shall be done accordingly.

| Phase | Description |
|---|---|
| **Phase 1: Conceptual Framework and Proposal** | **Team formation:** Students form teams of 2-4 members based on their interests, skills, and the nature of the project.<br>**Conceptual Framework:** Teams develop a conceptual framework for their project. This should include:<br>• **Problem statement:** Clearly define the problem the project aims to address.<br>• **Objectives:** Outline the goals and expected outcomes.<br>• **Scope:** Define the boundaries and limitations of the project.<br>• **Significance:** Explain the relevance and importance of the project.<br>• **Methodology:** Briefly describe the approach and methods to be used. |

| | |
|---|---|
| | **Documentation**<br>Teams document the conceptual framework in the format provided by the department for project proposals.<br>**Presentations**<br>Teams present their proposal in front of the examiner, providing a clear overview of their project |
| **Phase 2: Progress Report** | **1. Progress Report**<br>Teams demonstrate the progress made in the design phase, including.<br>• **Overall system design:** Present the architecture of the system<br>• **Architectural design:** Detail the structure and components of the system<br>• **Validation scheme:** Explain how the system's functionality will be validated<br>**2. Documentation of Progress:**<br>Teams document the progress made, highlighting key design decisions and any challenges encountered.<br>**3. Presentation to Internal Evaluator Committee:**<br>Teams present their progress report to the internal evaluator committee for feedback and assessment. |
| **Phase 3: Final Presentation and Defense** | 1. **Completion of all Phase:** Ensure that all phases of the project, including design, development, and testing, are completed.<br>2. **Product Output: Teams** develop the final output of their product using web technology. This could be a web application, platform, or any relevant web-based solution.<br>3. **Oral Defense:**<br>• Teams present the final product and its features to the external examiner.<br>• Conduct an oral defence, addressing questions from the examiner regarding design choices, implementation, and overall project execution<br>4. **Use web Technology**: Emphasize the incorporation of web technology in the project. This could include technologies like HTML, CSS, JavaScript, and relevant frameworks for web development<br>5. **Submission of Final Documentation:** Provide comprehensive documentation covering all aspects of the project, from the initial proposal to the final product. |

By following these three phases, students can systematically plan, execute, and present their project work, with a focus on utilizing web technology for effective solutions

**Project Evaluation Criteria**

**The marks of Mid-term, End- term and Final Defense are distributed as:**

1. Report 10 %
2. Presentation 5%
3. Demonstration 15%
4. Q&A 15%
5. Teamwork 5%

**Note:** There can be three members in the final defense and the marks are adjusted on an average basis: (Project supervisor, Program Coordinator and External)

**The project document shall include the following items:**

- Project Team members (At least 2 and a maximum of 3)
- Project supervisor(s)
- Technical description of the project.
- Project Analysis, Design, Coding, Testing and Implementation details.

**Student's Requirements**

Each student must secure at least 45% marks separately in both internal assessment and practical evaluation with 80% attendance in the class in order to appear in the Semester End Examination. Failing to get such a score will be given NOT QUALIFIED (NQ) to appear in the Semester-End Examinations. Students are advised to attend all the evaluation criteria and complete all the assignments within the specified period. ***Students are required to complete all the requirements defined for the completion of the course.***

## 6. Prescribed Books and References

**Text Books:**

Niederst Robbins, J. (2018). *A beginner's guide to HTML, CSS, JavaScript, and web graphics* (5th ed.). O'Reilly Media.

**Reference Books:**

1. Holzner, S. (2001). *HTML black book*. Dreamtech Press
2. Dreamtech Press. (2009). *Web technologies black book*
3. Knuckles, R. (2011). *Web applications: Concepts and real world design*. Wiley-India.
4. Deitel, P. J., & Deitel, H. M. (2012). *Internet and world wide web how to program* (5th ed.). Pearson

**Report Contents:**

**1. Prescribed content flow for the project proposal**

1. Introduction
2. Problem Statement
3. Objectives of Study
4. Methodology
   a. Requirement Identification
   - Study of existing system
   - Requirement Collection

   b. Feasibility Study
   - Technical

- Operational
- Economic

c. High Level Design of System (system flow chart/ methodology of the proposed system/ working mechanism of proposed system)

5. Gantt Chart (showing the project timeline)
6. Expected Outcome
7. References

**2. Prescribed content flow for the project report**

1. Cover & Title Page
2. Certificate Page
   - Supervisor Recommendation
   - Internal and External Examiners' Approval Letter
3. Abstract Page
4. Acknowledgements
5. Table of Contents
6. Abbreviations
7. List of Figures
8. List of Tables
7. Main Report
8. Appendices (Screen Shots/ Source Codes/ Supervisor Visit Log Sheets)
9. References

**3. Prescribed Chapters in Main Report**

**Chapter 1: Introduction**

1.1. Background of the Study
1.2. Statement of the Problem
1.3. Objectives of the Study
1.4. Scope of the Study
1.5. Limitations of the Study

**Chapter 2: Review of Literature**

2.1. Description of fundamental theories, general concepts and terminologies related to the project
2.2. Review of the similar Projects and Theories

**Chapter 3: System Analysis and Design**

3.1. System Analysis
3.1.1. Requirement Analysis
   - Functional Requirements
   - Non Functional Requirements

3.1.2. Feasibility Analysis
   - Technical
   - Operational
   - Financial
   - Schedule

3.1.3. Data Modeling
3.1.4. Process Modeling

3.2. System Design

3.2.1. Interface Design (UI Interface / Interface Structure Diagrams)

**Chapter 4: Implementation and Testing**

4.1. Implementation

4.1.1. Tools Used (Tools, Programming languages, Database platforms)

4.1.2. Implementation Details of Modules (Description of procedures/functions)

4.2. Testing

4.2.1. Test Cases for Unit Testing

4.2.2. Test Cases for System Testing

**Chapter 5: Conclusion and Future Recommendations**

5.1. Lesson Learnt

5.2. Conclusion

5.3. Recommendations

**Appendices (Screen Shots/ Source Codes/ Supervisor Visit Log Sheets)**

**Citation and Referencing**

The listing of references should be listed in the references section. The references contain the list of articles, books, that are cited in the document. The books, articles, and others that are studied during the study but are not cited in the document can be listed in the bibliography section.

**Report Format Standards**

**1.Page Number**

The pages from certificate page to the list of tables/figures should be numbered in roman starting from i. The pages from chapter 1 onwards should be numbered in numeric starting from 1. The page number should be inserted at bottom, aligned center.

**2. Page Size and Margin**

The paper size must be a page size corresponding to A4. The margins must be set as 6 Top = 1; Bottom = 1; Right = 1; Left 1.5

**3. Paragraph Style**

All paragraphs must be justified and have spacing of 1.5.

**4. Text Font of Document**

- The contents in the document should be in Times New Roman font
- The font size in the paragraphs of document should be 12 E. Section Headings
- Font size for the headings should be 16 for chapter title, 14 for section headings, 12 for the sub-section headings. All the headings should be bold faced.

**5. Figures and Tables**

Position of figures and tables should be aligned center. The figure caption should be centered below the figure and table captions should be centered above the table. All the captions should be of bold face with 12 font size.