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**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI**

1. **WORK-INTEGRATED LEARNING PROGRAMMES DIVISION**
2. **B Tech(Information Systems) in collaboration with WIPRO**
3. **Second Semester 2022-2023(July 2023)**

**Handout**

**COURSE HANDOUT**

**Part A: Content Design**

|  |  |
| --- | --- |
| **Course Title** | Computer Programming |
| **Course No(s)** | SEWI ZC163 |
| **Credit Units** |  |
| **Course Author** |  |
| **Version No** | 1.0 |
| **Date** |  |

**Course Objectives**

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| **No** | **Course Objective** |
| **CO1** | Serves as an introductory course in computer programming. To learn basic principles of Problem solving. |
| **CO2** | To understand techniques for specifying data and operations on data using a programming language |
| **CO3** | To understand and explore systematic techniques and approaches for constructing programs. |

**Text Book(s)**

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| T1 | J.R. Hanly and E.B. Koffman, Problem Solving and Program Design in C. 5th Edition. Pearson Education 2007 |

**Reference Book(s) & other resources**

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| --- | --- |
| R1 | J. B. Dixit, Programming in C, Third Edition, Firewall Media © 2010  [Available on 24x7 Ebooks] |
| R2 | Brian W. Kernighan, Dennis Ritchie, The C Programming Language. Prentice Hall. 2nd Edition. |
| R3 | E Balaguruswamy, Programming in ANSI C, 4th Edition, Tata McGraw-Hill Education, 2008. |
| R4 | Byron, S. Gottfreid, "Programming with C", Tata McGraw Hill, 2nd edition 1998. |
| R5 | Behrouz A. Forouzan, Richard F. Gilberg: Computer Science - A Structured Approach Using C, 3 rd Edition, Cengage Learning, 2007. |

**Modular Content Structure**

1. **Introduction: Computers and Programming**
   1. Introduction
      1. Computers and Programming,
      2. Programming Languages Types,
      3. Problem solving
   2. Number systems and Representations,
      1. Decimal and Binary number representations,
      2. Unsigned Binary number representation and arithmetic
      3. Signed Binary representations (Signed Magnitude, 1’s Complement, 2’s Complement)
      4. Signed Binary Numbers: Arithmetic (Overflow, Sign Extension)
      5. Character representations
      6. Data types
2. **Elements of C Language**
   1. Getting started with C
      1. Structure of a C program,
      2. Program compilation and execution in gcc
      3. Data types in C
      4. Operators & Expressions
      5. Expression Evaluation
      6. Operator Precedence & Associativity
      7. Operator Typecasting
3. **Top Down Design using Functions**
   1. Basic Concepts
   2. Library Functions
   3. Top-Down Design and Structure Charts
   4. Functions without Arguments
   5. Functions with Input Arguments
   6. Storage classes
   7. Introduction to pointers
      1. Formal Output Parameters as Actual Arguments
4. **Conditional Constructs**
   1. Sequential and Conditional Execution
   2. The if Statement
   3. if Statements with Compound Statements(if else)
   4. **if—else –if statement**
   5. switch—case statement
5. **Iterative Constructs**
   1. Introduction to Iterative constructs and Flow charting
   2. Iterative statements in C Language: **for**
   3. Iterative statements in C Language: **while**
   4. Iterative statements in C Language: **do-while**
   5. Introduction to Recursion
   6. Recursion vs. Iteration
6. **Random Access Lists: Arrays**
   1. Integer Arrays: Indexing, Iterating
   2. Character Arrays
   3. Strings and operations
   4. Searching in the list: Linear search & Binary search
   5. Ordering the list: Bubble sort, Selection sort ,Insertion Sort
   6. Two Dimensional List representations and Operations
7. **Abstract Data Types: Structure & Union**
   1. User defined Data types : Structure Data type
   2. User defined Data types :Union
   3. Problem Solving with Structure Types
8. **Pointers and Linked Lists**
   1. Introduction to Pointers
   2. Pointer Arithmetic
   3. Pointers to Structures
   4. Arrays and Pointers
   5. Dynamic Memory Allocation
   6. Pass by Reference
   7. Linked List: Implementation of Linked List,
   8. Operations on Linked List: Search, Delete, Insert Swap-Space Management
9. **File Handling**
   1. Introduction to File I/O,
   2. Basic File operations
   3. Command line arguments
   4. Text File Processing

**Learning Outcomes:**

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| No | Learning Outcomes |
| LO1 | Students will be able to describe various parts of computer hardware and terminology used in computer programming. |
| LO2 | Students will be able to describe the number systems. |
| LO3 | Students will be able to write, compile and debug programs with different data types in C language. |
| LO4 | Students will be able to design simple programs involving decision structures, loops and functions. |
| L05 | Students will be able to apply the dynamic memory allocation using pointers. |
| LO6 | Students will be use different operations on files to store |

**Part B: Contact Session Plan**

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| **Academic Term** | II Semester 2022 – 23(July 2023) |
| **Course Title** | Computer Programming |
| **Course No** | SEWI ZC142 |
| **Lead Instructor** |  |

**Course Contents**

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| **Contact Hour** | **List of Topic Title**  **(from content structure in Part A)** | **Topic #**  **(from content structure in Part A)** | **Text/Ref Book/external resource** |
| 1 | * Introduction   + Computers and Programming,   + Programming Languages Types,   + Problem solving * Number systems and Representations,   + Decimal and Binary number representations,   + Unsigned Binary number representation and arithmetic   + Signed Binary representations (Signed Magnitude, 1’s Complement, 2’s Complement)   + Signed Binary Numbers: Arithmetic (Overflow, Sign Extension)   + Character representations   + Data types | 1.1 - 1.2 | T1: 1.2 – 1.5  R1: Chapter 1, |
|  |
| 2 | * Getting started with C   + Structure of a C program,   + Program compilation and execution in gcc   + Data types in C   + Operators & Expressions   + Expression Evaluation   + Tips and common programming errors   + Programming examples and   exercise | 2.1.1-2.1.5 | T1:2.1-2.8  R1:Ch 2 |
| 3 | * + Operator Precedence & Associativity   + Operator Typecasting   + Tips and common programming errors   + Programming examples and   exercise | 2.1.6-2.1.7 | R1:Ch 3 |
| 4 | * **Top Down Design using Functions** * Basic Concepts * Library Functions * Top-Down Design and Structure Charts * Storage Classes * Functions without Arguments * Functions with Input Arguments * Introduction to pointers * Formal Output Parameters as Actual Arguments * Tips and common programming errors * Programming examples and exercise | 3.1-3.7 | T1:Ch 3:3.2 - 3.5  T1:Ch 6:6.5  T1:Ch 13:13.4 |
| 5 | * **Conditional Constructs** * Sequential and Conditional Execution * The if Statement * if Statements with Compound Statements(if else) * if—else –if statement * switch—case statement * Tips and common programming errors * Programming examples and   Exercise | 4.1-4.5 | T1:Ch 4:4.1 - 4.9  R1:Ch 5 |
| 6 |
| 7 | * **Iterative Constructs** * Introduction to Iterative constructs and Flow charting * Iterative statements in C Language: **for** * Iterative statements in C Language: **while** * Iterative statements in C Language: **do-while** * Introduction to Recursion * Recursion vs. Iteration * Tips and common programming errors * Programming examples and   Exercises | 5.1-5.6 | T1:Ch 5:5.1 - 5.7  T1:10.1- 10.3, 10.6  R1:Ch 5  R1: Ch 6-Recursion |
| 8 |
| 9 | * **Random Access Lists: Arrays** * Integer Arrays: Indexing, Iterating * Character Arrays * Strings and operations * Searching in the list: Linear search & Binary search * Ordering the list: Bubble sort, Selection sort ,Insertion Sort * Two Dimensional List representations and Operations * Tips and common programming errors * Programming examples and   Exercises | 6.1-6.6 | T1:Ch8:8.1 – 8.6  T1:Ch9:9.1-9.6  R1:Ch 8 |
| 10 |
| 11 | * **Abstract Data Types: Structure & Union** * User defined Data types : Structure Data type * User defined Data types :Union * Problem Solving with Structure Types | 7.1-7.3 | T1:Ch11:11.1 - 11.4  R1:Ch 11 |
| 12 | * **Pointers and Linked Lists** * Introduction to Pointers * Pointer Arithmetic * Pointers to Structures * Tips and common programming errors * Programming examples and * Exercise | 8.1-8.3 | T1:Ch14:14.1 – 14.2  R1:Ch14 |
| 13 | * Arrays and Pointers * Dynamic Memory Allocation * Pass by Reference * Linked List: Implementation of Linked List, * Operations on Linked List: Search, Delete, Insert * Tips and common programming errors * Programming examples and   Exercises | 8.4-8.8 | T1:Ch14:14.3 – 14.4  R1:Ch14 |
| 14 |
| 15 | * Introduction to File I/O, * Basic File operations * Command line arguments * Text File Processing * Tips and common programming errors * Programming examples and   Exercise | 9.1-9.4 | T1:Ch12:12.1 - 12.3  R1:Ch 12 |
| 16 | * Programming examples and   Exercise  Review and revision of all topics |  |  |

**Detailed Plan for Lab work/Design work**

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| **Lab No** | **Lab Objective** | **Lab Sheet Access URL** | **Content Reference** |
| 1 | Executing basic Unix/Linux commands |  |  |
| 2 | Executing programs demonstrating decision control, looping constructs, arrays, recursion, structures etc |  |  |
| 3 | Executing Sorting, Searching algorithms |  |  |

**Evaluation Scheme**

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| **Evaluation Component** | **Name**  (Quiz, Lab, Project, Mid term exam, End semester exam, etc) | **Type**  (Open book, Closed book, Online, etc.) | **Weight** | **Duration** | **Day, Date, Session, Time** |
| **EC – 1** | Quizzes / Assignments |  | 20% |  | To be announced |
| **EC – 2** | Mid Term exam | Closed book | 30% | 90m | To be announced |
| **EC – 3** | End Semester exam | Open book | 50% | 150m | To be announced |

***Note*** *- Evaluation components can be tailored depending on the proposed model.*

**Important Information**

Syllabus for Mid-Semester Test (Closed Book): Topics in Weeks 1-7

Syllabus for Comprehensive Exam (Open Book): All topics given in plan of study

Evaluation Guidelines:

1. EC-1 consists of either two Assignments or three Quizzes. Announcements regarding the same will be made in a timely manner.
2. For Closed Book tests: No books or reference material of any kind will be permitted. Laptops/Mobiles of any kind are not allowed. Exchange of any material is not allowed.
3. For Open Book exams: Use of prescribed and reference text books, in original (not photocopies) is permitted. Class notes/slides as reference material in filed or bound form is permitted. However, loose sheets of paper will not be allowed. Use of calculators is permitted in all exams. Laptops/Mobiles of any kind are not allowed. Exchange of any material is not allowed.
4. If a student is unable to appear for the Regular Test/Exam due to genuine exigencies, the student should follow the procedure to apply for the Make-Up Test/Exam. The genuineness of the reason for absence in the Regular Exam shall be assessed prior to giving permission to appear for the Make-up Exam. Make-Up Test/Exam will be conducted only at selected exam centres on the dates to be announced later.

It shall be the responsibility of the individual student to be regular in maintaining the self-study schedule as given in the course handout, attend the lectures, and take all the prescribed evaluation components such as Assignment/Quiz, Mid-Semester Test and Comprehensive Exam according to the evaluation scheme provided in the handout.