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| **Course Title** | **Programming Fundamentals** | | |
| **Course Code** | **CC-112** | | |
| **Credit Hours** | 3 (3,0) | | |
| **Category** | Computer Science Core | | |
| **Prerequisite** | None | | |
| **Co-Requisite** | None | | |
| **Follow Up** | CSC-111 Object Oriented Programming | | |
| **Course Introduction** | This course provides fundamental concepts of programming to freshmen. The course is a prerequisite to many other courses; therefore, students are strongly advised to cover all the content and try to achieve CLOs to the maximum possible level. | | |
| **Course Learning Outcomes (CLOs)** | At the end of the course, the students will be able to: | **BT** | **PLO** |
| | CLO1: Demonstrate proficiency in writing, debugging, and executing basic programs using programming languages such as C++ or Python. | C3 (Apply) | 1,2,4,5 |
| | CLO2: Explain core programming concepts including variables, control structures, functions, and data types. | C2 (Understand) | 1,2 |
| | CLO3: Develop simple algorithms to solve computational problems. | C6 (Create) | 1,2,3,4 |
| | CLO4: Apply best practices in coding to produce efficient and readable programs. | C3 (Apply) | 1,2,4,5,8,9 |
| | CLO5: Analyze program outputs and troubleshoot common errors effectively. | C4 (Analyze) | 1,2,3,5,10 |
| **Text Book(s)** | 1. Tony Gaddis, Starting out with C++, 10th Edition, Pearson, 2024. | | |
| **Reference Material** | 1. Object Oriented Programming in C++ by Robert Lafore<br>2. Problem Solving and Program Design in C++, 7th Edition by Jeri R. Hanly & Elliot B. Koffman | | |

**Weekly Lesson Plan**

| Week No. | Course Content | Assignments/Readings |
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| **Week 1** | Introduction to Problem Solving: Problem solving steps, algorithms, pseudo-code, flowcharts, overview of Von-Neumann Architecture | Gaddis: Chapter 1<br>Handouts |
| **Week 2** | Overview of the structured program theorem (sequence, selection and iteration) | Gaddis: Chapter 1<br>Handouts<br>Quiz 1 |
| **Week 3** | Introduction to C++: Structure of a C++ program, compilation process (compiler & linker), development environment, simple program (printing text), Variables and Data Types: Concept of variables, data types (int, float, char, bool) | Gaddis: Chapter 2<br>Assignment 1 |
| **Week 4** | Input/output using cin/cout, arithmetic expressions, assignment statements, Operators and Expressions: Arithmetic operators, operator precedence, integer division, type casting, introduction to memory concepts | Gaddis: Chapter 3<br>Quiz 2 |
| **Week 5** | Decision Making I: Relational and equality operators, if and if-else statements, nested if | Gaddis: Chapter 4 |
| **Week 6** | Decision Making II & Loops: Logical operators, while loop, structured program development | Gaddis: Chapter 4-5<br>Quiz 3 |
| **Week 7** | Iteration Control: for, do-while loops, break and continue, introduction to switch statement | Gaddis: Chapter 5<br>Assignment 2 |
| **Week 8** | Functions I: Modular programming, function definition and prototypes, passing arguments by value | Gaddis: Chapter 6<br>Quiz 4 |

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| **Week 9** | Functions II: Passing by reference, scope rules, recursion, recursion vs iteration, random number generation | Gaddis: Chapter 6 |
| **Week 10** | Arrays I: One-dimensional arrays, initialization, processing arrays, passing arrays to functions | Gaddis: Chapter 7<br>Quiz 5 |
| **Week 11** | Arrays II: Searching and sorting arrays, multidimensional arrays, character arrays (strings basics) | Gaddis: Chapter 8<br>Assignment 3 |
| **Week 12** | Strings and Structures: C++ strings, string handling functions, structures, accessing members, typedef, unions | Gaddis: Chapter 9-10<br>Quiz 6 |
| **Week 13** | Pointers I: Pointer concepts, declaration and initialization, pointer operators, pointers and arrays | Gaddis: Chapter 9-10 |
| **Week 14** | Pointers II & Dynamic Memory: Pointer arithmetic, array of pointers, function pointers (intro), dynamic memory allocation (new/delete) | Gaddis: Chapter 9-10<br>Quiz 7 |
| **Week 15** | File Handling & Preprocessor: File streams (read/write), sequential files, basics of random access, preprocessor directives (#include, #define, macros, assertions) | Gaddis: Chapter 12<br>Assignment 4 |
| **Week 16** | Advanced Topics & Review: Bitwise operators, enumerations, command-line/variable arguments, program termination (exit),<br>course review | Gaddis: Chapter 11 |