TRIBHUVAN UNIVERSITY

INSTITUTE OF SCIENCE AND TECHNOLOGY

# SCHOOL OF MATHEMATICAL SCIENCES

# Bachelor in Mathematical Sciences (B.Math.Sc.)

## Course of Study

*Code No.*: MSCS 201 *Full Mark*: 75

*Paper*: **Introduction to Programming II** *Pass Mark*: 30

*Nature*: Theory + Lab *Credit*: 3

***Course Description:***

The aim of this course is to develop the object oriented programming skills using C++ programming language. The course helps the students to discover the basic concepts of object-oriented programming concept such as object, class, inheritance, polymorphism, abstraction and encapsulation

***Course Objectives:***

The main objective of this course is to provide students knowledge of different concepts C++ programming so that they will be able to develop small to medium size computer programs using object-oriented concepts of C++.

***Mode of Delivery*:**

The course will be taught by lecture (48 hrs), and lab work (24 hrs). The students are encouraged to develop computer programs related to the concepts of the C language after completion of each chapter.

***Course Content*:**

**Unit 1 Introduction** **2 hrs**

Object-Oriented Programming Paradigm; Basic Concepts of Object-Oriented Programming; Benefits of OOP; Object-Oriented Languages; Applications of OOP; What is C++?; A Simple C++ Program

**Unit 2 Tokens, Expressions and Control Structures** **6 hrs**

Tokens; Keywords; Identifiers and Constants; Basic Data Types; User-Defined Data Types; Storage Classes; Derived Data Types; Symbolic Constants; Type Compatibility; Variable Declaration; Dynamic Initialization of Variables; Reference Variables; Operators; Scope Resolution Operator; Member Dereferencing Operators; Memory Management Operators; Manipulators; Type Cast Operator; Expressions; Operator Overloading; Control Structures

**Unit 3 Functions** **4 hrs**

Introduction; The Main Function; Function Prototype; Call by Reference; Return by Reference; Inline Function; Function Arguments; Function Overloading; Friend and Virtual Functions; Library Function

**Unit 4 Classes and Objects** **10 hrs**

Specifying a Class; Defining Member Functions; A C++ Program with Class; Making an Outside Function Inline; Nesting of Member Functions; Private Member Functions; Arrays within a Class; Memory Allocation for Objects; Static Data Members; Static Member Functions; Arrays of Objects; Objects as Function Arguments; Friendly Functions; Returning Objects; const Member Functions

**Unit 5 Constructors and Destructors** **4 hrs**

Constructors; Parameterized Constructors; Multiple Constructors; Default Constructors; Dynamic Initialization of Objects; Copy Constructor; Dynamic Constructors; Destructors

**Unit 6 Operator Overloading and Type Conversions** **4 hrs**

Overloading Unary Operators; Overloading Binary Operators; Overloading Binary Operators Using Friend Functions; Type Conversions

**Unit 7 Inheritance: Extending Classes** **6 hrs**

Defining Derived Classes; Single Inheritance; Multilevel, Multiple Inheritance and Hierarchical Inheritance; Hybrid Inheritance; Virtual Base Classes; Abstract Classes; Constructors in Derived Classes; Member Classes

**Unit 8 Pointers, Virtual Functions and Polymorphism** **4 hrs**

Pointers; Pointers to Objects; this Pointer; Pointers to Derived Classes; Virtual Functions; Pure Virtual Functions; Virtual Constructors and Destructors

**Unit 9 Templates and Exception Handling** **8 hrs**

Concept of Template; Function overloading and problems; Function Template; Overloading function template; Class Template; Derived class template; Concept of error handling; Basic of exception handling Exception handling mechanism: throw, catch and try

**Laboratory Work:**

After completing this course, students should have practical knowledge on different conceprs of C++ programming so that they will be able to develop a small mini project on their interested field.

**Recommended Books:**


1. Object oriented programming with C++; E Balagurusamy; 6e
2. Object-Oriented Programming in C++; Fourth Edition; Robert Lafore
3. C++ Primer; Fifth Edition; Stanley B. Lippman, Josee Lajoie, Barbara Moo


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