GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

PROGRAMMING IN C++
(Code:3330702)

Diploma Programme in which this course is offered	Semester in which offered
Computer Engineering	3rd Semester

1. RATIONALE

This course intends to teach the students about basic concepts of Object-Oriented Programming (OOP) and C++. Large programs are probably the most complicated entities ever created by humans. Because of this complexity, programs are prone to error and software errors can be expensive and even life-threatening. Object-oriented programming offers a new and powerful way to cope with this complexity and act as the backbone to all other courses that are based on Object Oriented concept. Therefore by learning this course senicierly the students will be able to develop programs in 'C++' using Object Oriented Programming Concepts.

2. COMPETENCY (Programme Outcome (POs) according to NBA Terminology):

The course content should be taught and implemented with the aim to develop various types of related skills leading to the achievement of the following competency

- **Develop programs in 'C++' using Object Oriented Programming Concepts.**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	
3	2	2	7	70	30	20	30	150

Legends: L -Lecture; **T -**Tutorial/Teacher Guided Student Activity; **P -**Practical; **C -**Credit;**ESE**-End Semester Examination; **PA** -Progressive Assessment

4. COURSE DETAILS

Unit	MajorLearning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Principles of Object Oriented Programming	1a. Differentiate procedure and object oriented languages	1.1 Procedure oriented Programming 1.2 Object oriented programming paradigm 1.3 Basic concepts of Object Oriented Programming 1.4 Advantages of Object Oriented Programming 1.5 Object Oriented Languages 1.6 Applications of Object Oriented Programming
	1b. Explain the general structure of C++ Language	1.7 C++ Concepts 1.8 Structure of C++ program 1.9 Applications of C++
	1c. List different data types available in C++	1.10 Basic Data types in C++ 1.11 User defined Data types 1.12 Derived Data types
	1d. Inititalize Data using variables and develop simple C++ programs	1.13 Defining Constants 1.14 Declaration of variables and Dynamic initialization of variables 1.15 Reference variables
	1e. Differentiate various operators	1.16 Operators in C++ 1.17 Scope Resolution Operators 1.18 Member dereferencing Operators 1.19 Memory Management Operators and Manipulators 1.20 Type cast Operator
Unit– II Functions in C++ and Working with objects	2a. Develop programs using functions	2.1 The Main Function 2.2 Function prototyping 2.3 Call by Reference and Return by Reference
	2b. Develop programs using inline functions	2.4 Inline functions
	2c. Define functions using default, constant, arguments, function overloading	2.5 Default Arguments 2.6 Constant Arguments 2.7 Function Overloading
	2d. Develop Simple Programs using class and objects, array of objects, friend functions, passing and returning objects	2.8 Classes and Objects : 2.9 Overview of C structure 2.10 Defining Class and Creating Objects 2.11 Memory Allocation for Objects 2.12 Defining Member function 2.13 Making an outside function Inline 2.14 Nesting of Member functions 2.15 Private Member functions 2.16 Arrays within a Class

Unit	MajorLearning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
	2e. Differentiate static members and normal members	2.17 Static Data member and Static Member functions, 2.18 Array of Objects, 2.19 Passing Objects as an Argument, Returning Object, 2.20 Friend function, Pointer to members
Unit– III Constructor and Destructor	3a. Define constructor & destructor	3.1 Constructor Concepts 3.2 Destructor
	3b. Develop program using constructor and destructor	3.3 Parameterized Constructor, 3.4 Multiple Constructors in a Class, 3.5 Constructor with Default Arguments, 3.6 Copy Constructor, 3.7 Dynamic Constructor
Unit– IV Inheritance	4a. Define Inheritance	4.1 Concepts of Inheritance
	4b. List the applications of inheritance, types of inheritance and develop programs using single, multilevel and multiple inheritance	4.2 Defining Derived Classes 4.3 Single Inheritance 4.4 Making a Private Member Inherited 4.5 Multiple Inheritance 4.6 Multilevel Inheritance 4.7 Hybrid Inheritance 4.8 Virtual Base Class 4.9 Abstract Classes
	4c. Apply the concept of constructor in derived classes	4.10 Constructor in Derived Classes
Unit– V Pointers, Virtual functions and polymorphism	5a. Apply Pointer to objects	5.1 Pointers to objects, 5.2 Develop programs using pointers to objects
	5b. List applications of 'this' pointer	5.3 'this' Pointer
	5c. Define derived classes and virtual functions	5.4 Pointer to Derived Classes 5.5 Virtual Functions 5.6 Pointer to virtual Functions
Unit– VI Managing Console I/O Operations	6a. Apply various input and output formats on single set of data	6.1 Input and Output Streams 6.2 C++ Stream Classes 6.3 Unformatted and formatted I/O Operations
	6b. Develop programs using manipulators	6.4 Formatting with Manipulators

5. SUGGESTED SPECIFICATIONTABLE WITH HOURS & MARKS(THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Principle of Object Oriented Programming	04	03	02	02	07
II	Functions in C++ and Working with objects	14	06	08	10	24
III	Constructor and Destructor	08	02	06	04	12
IV	Inheritance	08	04	05	05	14
V	Pointers, Virtual functions and polymorphism	02	02	02	02	06
VI	Managing Console I/O Operations	06	02	02	03	07
Total		42	19	25	26	70

Legends:R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may slightly vary from above table.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills **(Course Outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	UnitNo.	Exercises (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs. Required
1	I	Develop minimum 5 programs using control structures	2
2	I	Develop minimum 2 programs using arrays	2
3	I	Develop programs using reference variable, scope resolution operator, simple manipulators, and number data type.	4
4	II	Develop programs using call by reference and return by reference, default arguments, constant arguments, and	4

S. No.	UnitNo.	Exercises (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs. Required
		function overloading	
5	II	Define minimum 5 different classes such as student, distance, shape, employee, feet, time, data etc. with data member & member functions. Also Develop programs to test those classes functionality.	4
6	II	Develop Programs using array of objects and static member functions.	4
7	II	Develop programs to pass object as an argument and returning object.	4
8	III	Develop programs using various types of constructors and destructor.	4
9	III	Apply the concepts of constructors and destructors in the programs developed in unit-2 and test those programs.	4
10	IV	Develop programs using single, multilevel, multiple inheritance	6
11	IV	Develop programs using inheritance and constructors	4
12	V	Develop programs using pointer to derived classes	5
13	VI	Develop programs using unformatted i/o functions	5
14	VI	Develop programs using formatted i/o functions	4
		Total	**56**

Note:
- Develop i.e. write, debug, execute and test the program
- In tutorials - Students will write programs and in practical session -execute program

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:
Present seminar, develop mini projects, panel discussion, and develop a program with real life application examples on a particular topic.

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

The course activities include Lectures, Supervised Tutorials and Practical Exercises as per teaching scheme. The programmes in C++ would be prepared during tutorials and would be executed during practicals sessions. Following needs attention:

   i.   Concepts may be introduced in lectures using charts/ppt.

   ii.   Quiz on various topics like class, polymorphism, inheritance etc.

   iii.   Role play by studnets for understanding concept of inheritance

   iv.   Problem solving will be done through tutorials.

9. SUGGESTED LEARNING RESOURCES

(A) List of Books

Sr. No.	Title of Books	Author	Publication
1	Object Oriented Programming in C++	Lafore, Robert	SAMS, 2012
2	Object Oriented Programming with C++	Balagurusamy, E.	McGrawHill, Delhi, 2012
3	Object Oriented Programming with C++ - second edition	Sahay, Sourav	Oxford, Delhi 2012
4	Mastering C++	Venugopal	Tata McGrawHill, Delhi, 2011
5	Programming in c++	Kamthane, Ashok	Pearson, New Delhi, 2012

(B) List of Major Equipment/Materials

i. Hardware: Computer System with minimum PIV processor (or equivalent) and 1 GB RAM.
ii. Software: Turbo C++/ Borland C++/ any other higher software

(C) List of Software/Learning Websites

i. C++ Fundamentals:http://www.oupinheonline.com
ii. C++ Tutorials: http://www.tutorialspoint.com/cplusplus/cpp_overview.htm
iii. Video tutorials of C++:
http://nptel.iitm.ac.in/syllabus/syllabus.php?subjectId=106101006
iv. Learn C++ Programming: http://www.learncpp.com
v. Complete C++: http://www.cplusplus.com

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. R. M Shaikh**, Head Deapartment of Computer Engineering, KD Polytechnic,Patan.
- **Prof. K. N. Raval,** Head Deapartment of Computer Engineering, R C Technical Institute, Ahmedabad
- **Prof. (Ms.) M. P. Mehta** Sr. Lecturer Deapartment of Computer Engineering, K.D.Polytechnic, Patan

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Shailendra Singh,** Professor & Head Department of Computer Engineering and Applications
- **Dr. K. J. Mathai,** Associate Professor Department of Computer Engineering and Applications