# GUJARAT TECHNOLOGICAL UNIVERSITY

**Program Name: Diploma in Engineering**

**Level: Diploma**

**Branch: Automation and Robotics**

**Course / Subject Code : DI01C41021(Only for C to D Students)**

**Course / Subject Name : Object Oriented Programming with C++**

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| w. e. f. Academic Year: | 2024-25 |
| Semester: | 1st |
| Category of the Course: | ESC 02 |

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|---|---|
| **Prerequisite:** | Basic Programming knowledge |
| **Rationale:** | This course intends to teach the students about basic concepts of 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 sincerely the students will be able to develop programs in 'C++' using Object Oriented Programming Concepts. |

**Course Outcome:**

After Completion of the Course, Student will able to:

| No | Course Outcomes | RBT Level |
|---|---|---|
| 01 | Apply object-oriented approach to solve given problem | A |
| 02 | Implement object-oriented program using constructor and destructor. | A |
| 03 | Implement Inheritance for code reuse in c++ program. | A |
| 04 | Develop program using runtime polymorphism | A |

**Revised Bloom's Taxonomy (RBT)*

**Teaching and Examination Scheme:**

| Teaching Scheme (in Hours) | | | Total Credits L+T+ (PR/2) | Assessment Pattern and Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory | | Tutorial / Practical | | |
| L | T | PR | C | ESE (E) | PA / CA (M) | PA/CA (I) | ESE (V) | |
| 0 | 1 | 4 | 3 | 0 | 0 | 20 | 30 | 50 |

## 1. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) that are the sub-components of the COs. *Some of the **PrOs** marked **'*'** are compulsory, as they are crucial for that particular CO. These PrOs need to be attained at least at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'.*

| S.No. | Practical Outcomes (PrOs) | Approx. Hrs. required |
|---|---|---|
| 1 | Develop flowchart for basic programs like sum, subtract, multiply and divide using decision making. | 2 |
| 2 | Develop flowchart for Fibonacci Series. | 4 |
| 3 | Develop algorithm for LCM and HCF using Pseudo Code | 2 |
| 4 | Develop minimum 5 programs using cin and cout. | 2 |
| 5 | Develop simple C++ programs for sum, subtract, multiply and divide. | 2 |
| 6 | Develop programs on string operations. | 4 |
| 7 | Develop programs using one dimensional and two-dimensional arrays. | 2 |
| 8 | Develop programs using if-else, nested if-else and if-else-if ladder statements. | 4 |
| 9 | Develop programs using for, nested for, while and do-while loops. | 4 |
| 10 | Develop programs using switch and goto statements. | 4 |
| 11 | Develop programs using functions. | 4 |
| 12 | Develop at least 2 programs using file operations. | 2 |
| 13 | Define minimum 5 different classes such as student, distance, shape, employee, account, inventory, vector, movie-ticket booking, time, | 6 |
| 14 | Develop programs display use of inheritance. | 4 |

| | | |
|---|---|---|
| 15 | Develop programs using Constructors and destructor in base and derive classes. | 4 |
| 16 | Develop a program to show use of this pointer. | 4 |
| 17 | Develop a program using runtime polymorphism. | 4 |
| | Total | 60 |

***Note***

i. *More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*

ii. *The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency..*

| S.No. | Sample Performance Indicators for the PrOs | Weightage in % |
|---|---|---|
| 1 | Correctness of program | 30 |
| 2 | Readability and documentation of the program/Quality of input and output displayed | 10 |
| 3 | Code efficiency | 20 |
| 4 | Debugging ability | 20 |
| 5 | Program execution/answer to sample questions | 20 |
| | **Total** | **100** |

## 2. MAJOR EQUIPMENT/ INSTRUMENTS AND SOFTWARE REQUIRED

These major equipment/instruments and Software required to develop PrOs are given below with broad specifications to facilitate procurement of them by the administrators/management of the institutes. This will ensure conduction of practical in all institutions across the state in proper way so that the desired skills are developed in students.

| S.No. | Equipment Name with Broad Specifications | PrO. No. |
|---|---|---|
| 1 | Computer with latest configuration with windows or unix os | All |

| | | |
|---|---|---|
| 2 | C++ Compiler | All |

## 3. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs and PrOs. More could be added to fulfil the development of this competency.

a) Follow safety practices.
b) Practice good housekeeping.
c) Demonstrate working as a leader/a team member.
d) Maintain tools and equipment
e) Follow ethical practices.

The ADOs are best developed through the laboratory/field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

## 4. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare small reports (of 1 to 5 pages for each activity). For micro project report should be as per suggested format, for other activities students and teachers together can decide the format of the report. Students should also collect/record physical evidences such as photographs/videos of the activities for their (student's) portfolio which will be useful for their placement interviews:

- Students are encouraged to learn Visual Language programming like scratch, snap etc.
- Undertake micro-projects in teams.
- Prepare charts to explain use/process of the identified topic.
- https://www.codechef.com/ , in this website very elementary programs are available, students are expected to solve those programs
- https://code.org/, an hour of code may be organized and students are encouraged to participate
- Students are encouraged to register themselves in various MOOCs such as: Swayam, edx, Coursera, Udemy etc to further enhance their learning.
- List the applications which are developed using C

- Encourage students to participate in different coding competitions like hackathon, online competitions on codechef etc.
- Encourage students to form a coding club at institute level and can help the slow learners

## 5. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
- Guide student(s) in undertaking micro-projects.

c) Managing Learning Environment
d) Diagnosing Essential Missed Learning concepts that will help for students.
e) Guide Students to do Personalized learning so that students can understand the course material at his or her pace.
f) Encourage students to do Group learning by sharing so that teaching can easily be enhanced.
g) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the students for ***self-learning***, but to be assessed using different assessment methods.
h) Guide students on how to address issues on environment and sustainability using the knowledge of this course

## 6. SUGGESTED MICRO-PROJECTS

***Only one micro-project*** is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop- based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total work load on each student due to the micro-project should be about ***16 (sixteen) student engagement hours*** (i.e., about one hour per week) during the course. The students ought to submit micro-project by the end of the semester (so that they develop the industry-oriented COs).

A suggestive list of micro-projects is given here. This should relate highly with competency of the course and the COs. Similar micro-projects could be added by the concerned course teacher:

- Develop C++ program for Library Management System. In this user can enter the record of new books and retrieve the details of books available in the library. User can issue the books to the students and maintain their records. Late fine is charged for students who return the issued books after the due date. Only one book is issued to students. New book is not issued to students those not returned the last
- Develop C++ Program for Banking Record system. In this user can add, edit, search, delete or adjust records in files of Bank.
- Develop C++ Program for Bus Reservation system. In this user can add bus information, reserve bus seat, display reservation information, and receive information about buses that are available.
- Develop C++ Program for Phone Book Management system. In this user can adding, searching, modifying, listing, and deleting records through the use of file.
- Develop C++ Program for Student Database Management system. In this user can adding, searching, modifying, listing, and deleting records through the use of file.
- Develop C++ Program for Telephone Directory system. In this user can adding, searching, modifying, listing, and deleting records through the use of file.

## 7. SUGGESTED LEARNING RESOURCES

| S.No. | Title of Book | Author | Publication with place, year and ISBN |
|---|---|---|---|
| 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 |
| 6 | C++ An Introduction to Programming | Jesse Liberty, Jim Keogh | Prentice-Hall, India |

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|---|---|---|---|
| 7 | The Complete Reference C++ | Herbert Schildt | Tata McGraw-Hill |

## 8. SUGGESTED LEARNING WEBSITES

- https://snap.berkeley.edu/snap/snap.html
- https://scratch.mit.edu/download/scratch2

c) https://nptel.ac.in/courses/106/105/106105151/
d) https://www.programiz.com/cpp-programming
e) https://www.codecademy.com/learn/learn-c-plus-plus
f) https://www.tutorialspoint.com
g) www.w3schools com
h) https://www.udemy.com/topic/c-plus-plus/
i) https://www.udacity.com/course/c-for-programmers--ud210

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