



COURSE PLAN

| | | | | |
|---------------------------|---------------------------------------|-----|---|----------|
| Department : | Instrumentation & Control Engineering | | | |
| Course Name & code : | Data Structures using C++ | | | ICE 4065 |
| Semester & branch : | 7 th Sem | E&I | | |
| Name of the faculty : | Ms. Preeti Mohanty | | | |
| No of contact hours/week: | L | T | P | C |
| | 3 | 0 | 0 | 3 |

COURSE OUTCOMES (COS)

| At the end of this course, the student should be able to: | | No. of Contact Hours | Marks | Program Outcomes (POs) | PSO | BL (Recommended) |
|---|---|----------------------|-------|------------------------|------|---------------------|
| CO1 | Demonstrate the use of classes using basic C++ program. | 5 | 13 | PO1, PO2, PO5 | PSO2 | 3, 4 |
| CO2 | Develop C++ programs using inheritance. | 7 | 20 | PO1, PO5 | PSO2 | 3, 4 |
| CO3 | Apply the concepts of linked lists and recursion. | 10 | 27 | PO1, PO2, | PSO2 | 3, 4 |
| CO4 | Apply the concepts of trees and queues. | 9 | 26 | PO1, PO2, | PSO2 | 3, 4 |
| CO5 | Demonstrate the sorting and searching algorithms. | 5 | 14 | PO1, PO2, | PSO2 | 3, 4 |
| Total | | 36 | 100 | | | |

Assessment Plan

| S. No. | Assessment Mode | Assessment Method | Time Duration | Marks | Weightage | Typology of Questions (Recommended) | Schedule | **Topics Covered |
|---|----------------------|------------------------|---------------|-------|--|---|---|--|
| 1 | MISAC | 1 Surprise Assignment | 15 Mins | 5 | 1 Question \times 5M = 5 marks (Minimum 5 questions to be given) | Bloom's taxonomy (BT) level of the question should be L3 and above. | August 28, 2023 – September 02, 2023 | Structure for C++ program, operators, classes, operator overloading. (L1 – L8) |
| | | 2 Mid-term Examination | 120 Mins | 30 | Objective: 5M 10 MCQs \times $\frac{1}{2}$ = 5 marks Descriptive: 25M (3 Questions of each of 2 marks and 3 marks and 2 Questions of 5 marks) | Bloom's taxonomy (B) level of the question should be L3 and above. | September 25, 2023 – September 30, 2023 | |
| | | 3 Quiz | 15 Mins | 5 | 10 MCQs \times $\frac{1}{2}$ = 5 | Bloom's taxonomy (BT) level of the question should be L3 and above. | October 09, 2023 – October 14, 2023 | |
| 2 | FISAC | 1 *** | *** | 10 | *** | Bloom's taxonomy (BT) level of the question should be L3 and above. | October 30, 2023 – November 06, 2023 | Linked list and recursion (L13-L22) |
| <u>END – SEMESTER ASSESSMENT</u> | | | | | | | | |
| 1 | Regular/Make-Up Exam | | 180 Mins | 50 | Answer all 5 full questions of 10 marks each. Each question can have 3 parts of 2/3/4/5/6 marks. | Bloom's taxonomy (BT) level of the question should be L3 and above. | 17 th week of the semester | Comprehensive examination covering full syllabus. |

**** Individual faculty will be entering the topics**

***** Individual faculty must identify the assessment method from table 3 and fill in the details.**

NOTE: Information provided in the table is as per the In-semester assessment plan and schedule of V and VII semester B. Tech provided from Academic Section.

Flexible In-semester Assessment Component (FISAC):

- i) ONE of the components mentioned in Table 3 is to be selected by the faculty.
- ii) The type of assessment should be informed to the students well in advance.
- iii) Syllabus for the last component of In-semester Assessment (ISAC) i.e. FISAC should cover the topics mentioned for self-study if any / topics which are not covered till MISAC 3: Quiz.

Table 3: Flexible In-semester Assessment Component (FISAC)

| No | Type | Description |
|----|--|---|
| A. | Quiz/MCQs | <ul style="list-style-type: none">➤ Similar to MISAC 3: Quiz/MCQs➤ Number of Questions:20➤ Time duration:30 minutes |
| B. | Surprise Assignment | <ul style="list-style-type: none">➤ Similar to MISAC 1: Surprise assignment➤ Bloom's taxonomy (BT) level of the question should be L3➤ Faculty have to set FIVE sets of Questions with each set having a minimum of TWO questions➤ Each student will write the answers for ONE set of questions having a minimum of TWO questions.➤ Question sets have to be distributed in such way that no two adjacent students would get the same set of questions.➤ Time Duration: 30 minutes |
| C. | Take Home Assignment | <ul style="list-style-type: none">➤ TEN questions will be given to each student.➤ Questions must be at Blooms Taxonomy Level 3 or 4➤ Questions will be given to the students at least A MONTH in advance.➤ Students have to write the answers to all the questions.➤ Critical evaluation is to be done to differentiate. |
| D. | Group Assignment | <ul style="list-style-type: none">➤ The students have to be grouped in such a way that there are 3 to 4 students in each group.➤ Each group is to be given one question.➤ The questions should be at Blooms Taxonomy Level 4 or 5➤ Questions are to be given well in advance (at least A MONTH before)➤ The questions may be in the form of case studies, design, report writing, writing reflection article of their understanding on a journal paper given by the faculty to each group etc. |
| E. | Seminar | <ul style="list-style-type: none">➤ Students are to be given the topics for seminar relevant to the course of study.➤ Topics are to be given A MONTH in advance.➤ Should be at Blooms Taxonomy Level 4 or 5➤ Topics should be related to the courses of study.➤ Topics should be in the field of recent developments in the courses of study.➤ Students have to collect the data regarding the seminar topic and submit a report.➤ Students should make a presentation for about TEN minutes using Power Point. |
| F. | Quiz / Assignment based on invited talks | <ul style="list-style-type: none">➤ Faculty have to arrange for the invited talk in the emerging areas in the courses of study.➤ Quiz / Assignment is to be conducted on the topic of the invited talk.➤ Questions should be at Blooms Taxonomy Level 4 or 5 |

| | | |
|----|--------------------------------|--|
| G. | Development of Software / Apps | <ul style="list-style-type: none"> ➤ Faculty has to define the problem statement. ➤ Problem Statements are to be given well in advance (at least A MONTH before the scheduled date of submission) ➤ Should be at Blooms Taxonomy Level 4 or 5. ➤ Students have to develop the software / mobile apps using the appropriate software language / platform and submit a report on the same. ➤ If it is a group activity, contribution of each individual student has to be assessed and evaluated. |
| H. | Mini Project | <ul style="list-style-type: none"> ➤ Faculty has to define the problem statement. ➤ Problem Statements are to be given well in advance in advance (at least A MONTH before the due date for submission) ➤ Should be at Blooms Taxonomy Level 4 or 5 ➤ Students have to develop prototypes/models (physical/software based) ➤ A report covering all important aspects of the project has to be submitted by the students ➤ If it is a group activity, the contribution of each individual student has to be assessed and evaluated. |

LESSON PLAN

| L No | TOPICS | Course Outcome Addressed |
|------|---|--------------------------|
| 1 | Structure of C++ Program: Data Types. Basic, user-defined and derived | CO1 |
| 2 | Operators: assignment, arithmetic, relational, logical, increment/decrement, conditional, precedence of operators, manipulators, decision statements, programming control statements, Functions | CO1 |
| 3 | Main Function, Function Prototyping | CO1 |
| 4 | Call and return by reference, Inline functions | CO1 |
| 5 | Default and constant arguments, Pointers | CO1 |
| 6 | Classes: Public and private members, encapsulation, implementation of a class, syntax for accessing class members | CO2 |
| 7 | Constructors and destructors, Operator overloading for classes | CO2 |
| 8 | Friend classes and functions | CO2 |
| 9 | Inheritance: Classification, derived class constructors | CO2 |
| 10 | Overriding member functions, private and public inheritance | CO2 |
| 11 | Abstract base class | CO2 |
| 12 | Templates: Class templates and function templates | CO2 |
| 13 | Linked List: Data structure | CO3 |
| 14 | Linked list traversal | CO3 |
| 15 | Insert function | CO3 |
| 16 | Remove function | CO3 |
| 17 | Linked list with tail and doubly linked lists | CO3 |
| 18 | Recursion: Examples of recursive functions | CO3 |
| 19 | Examples of recursive functions | CO3 |
| 20 | Understanding of recursive functions | CO3 |
| 21 | Debugging of recursive functions | CO3 |
| 22 | Debugging of recursive functions | CO3 |
| 23 | Trees: Binary search tree, Functions for binary trees | CO4 |
| 24 | Binary trees traversal | CO4 |
| 25 | Implementation of tree as a class | CO4 |
| 26 | Expression tree | CO4 |
| 27 | Kernel Density tree | CO4 |
| 28 | Queues: Ring buffer and linked list queue implementation | CO4 |
| 29 | Applications | CO4 |
| 30 | Heaps | CO4 |
| 31 | Graphs, Sets | CO4 |
| 32 | Sorting and searching algorithms: Sorting | CO5 |
| 33 | Sorting, Searching | CO5 |
| 34 | Searching | CO5 |
| 35 | Hashing | CO5 |
| 36 | Radix sort | CO5 |

Course Articulation Matrix

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | 3 | 2 | - | - | 2 | - | - | - | - | - | - | - | - | 2 | - |
| CO2 | 3 | - | - | - | 2 | - | - | - | - | - | - | - | - | 2 | - |
| CO3 | 3 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | - | 2 | - |
| CO4 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | - |
| CO5 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | - |
| Articulation Level | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | - |

FACULTY MEMBERS TEACHING THE COURSE (IF MULTIPLE SECTIONS EXIST):

| FACULTY | SECTION | FACULTY | SECTION |
|---------|---------|---------|---------|
| N.A. | | | |
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References:

- 1) Nell Dale, "C++ Plus Data Structures", Jones and Bartlett Publishers, (4e), 2010.
- 2) Maria Litvin, Gary Litvin, "Programming with C++ and Data Structures", Vikas Publishing House Pvt. Ltd., 2001.
- 3) E Balagurusamy, "Object-oriented Programming with C++", TMH, (2e), 2001.
- 4) Yashavant P Kanetkar, "Let us C++", BPB Publications, 2003.

Submitted by: Preeti Mohanty

(Signature of the faculty)

Date: 31st July, 2023

Approved by: Dr. Shreesha C

(Signature of HOD)