**III Semester**

| TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES | | | |
|---|---|---|---|
| Course Code: | **21MAT31** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 03 | Exam Hours | 03 |

**Course Objectives:**

CLO 1. To have an insight into solving ordinary differential equations by using Laplace transform techniques
CLO 2. Learn to use the Fourier series to represent periodical physical phenomena in engineering analysis.
CLO 3. To enable the students to study Fourier Transforms and concepts of infinite Fourier Sine and Cosine transforms and to learn the method of solving difference equations by the z-transform method.
CLO 4. To develop the proficiency in solving ordinary and partial differential equations arising in engineering applications, using numerical methods

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

**Module-1**

Definition and Laplace transforms of elementary functions (statements only). Problems on Laplace transform of $e^{at}f(t)$, $t^n f(t)$, $\frac{f(t)}{t}$. Laplace transforms of Periodic functions (statement only) and unit-step function – problems.

Inverse Laplace transforms definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) and problems. Laplace transforms of derivatives, solution of differential equations.

**Self-study:** Solution of simultaneous first-order differential equations.

| **Teaching-Learning Process** | Chalk and talk method / |
|---|---|

**Module-2**

Introduction to infinite series, convergence and divergence. Periodic functions, Dirichlet's condition. Fourier series of periodic functions with period $2\pi$ and arbitrary period. Half range Fourier series. Practical harmonic analysis.

**Self-study:** Convergence of series by D'Alembert's Ratio test and, Cauchy's root test

| **Teaching-Learning Process** | Chalk and talk method / Powerpoint Presentation |
|---|---|

| Module-3 | |
|---|---|
| Infinite Fourier transforms definition, Fourier sine and cosine transforms. Inverse Fourier transforms, Inverse Fourier cosine and sine transforms. Problems.<br><br>Difference equations, z-transform-definition, Standard z-transforms, Damping and shifting rules, Problems. Inverse z-transform and applications to solve difference equations.<br><br>**Self-Study:** Initial value and final value theorems, problems. | |
| **Teaching-Learning Process** | Chalk and talk method / Powerpoint Presentation |
| **Module-4** | |
| Classifications of second-order partial differential equations, finite difference approximations to derivatives, Solution of Laplace's equation using standard five-point formula. Solution of heat equation by Schmidt explicit formula and Crank- Nicholson method, Solution of the Wave equation. Problems.<br><br>**Self-Study:** Solution of Poisson equations using standard five-point formula. | |
| **Teaching-Learning Process** | Chalk and talk method / Powerpoint Presentation |
| **Module-5** | |
| Second-order differential equations - Runge-Kutta method and Milne's predictor and corrector method. (No derivations of formulae).<br><br>Calculus of Variations: Functionals, Euler's equation, Problems on extremals of functional. Geodesics on a plane, Variational problems.<br><br>**Self- Study:** Hanging chain problem | |
| **Teaching-Learning Process** | Chalk and talk method / PowerPoint Presentation |

**Course Outcomes (Course Skill Set)**

At the end of the course the student will be able to:

CO 1. To solve ordinary differential equations using Laplace transform.
CO 2. Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
CO 3. To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations
CO 4. To solve mathematical models represented by initial or boundary value problems involving partial differential equations
CO 5. Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

**Continuous Internal Evaluation:**

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5$^{th}$ week of the semester
2. Second test at the end of the 10$^{th}$ week of the semester
3. Third test at the end of the 15$^{th}$ week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4$^{th}$ week of the semester
5. Second assignment at the end of 9$^{th}$ week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

**CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module

**Suggested Learning Resources:**

**Textbooks**


1. B. S. Grewal: "Higher Engineering Mathematics", Khanna publishers, 44th Ed.2018
2. E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed. (Reprint), 2016.


**Reference Books:**


1. V. Ramana: "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed.
2. Srimanta Pal & Subodh C. Bhunia: "Engineering Mathematics" Oxford University Press, 3rd Reprint, 2016.
3. N.P Bali and Manish Goyal: "A textbook of Engineering Mathematics" Laxmi Publications, Latest edition.
4. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co.Newyork, Latest ed.
5. Gupta C.B, Sing S.R and Mukesh Kumar: "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015.
6. H.K.Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S.Chand Publication (2014).
7. James Stewart: "Calculus" Cengage publications, 7th edition, 4th Reprint 2019


**Weblinks and Video Lectures (e-Resources):**

1. http://www.class-central.com/subject/math(MOOCs)
2. http://academicearth.org/
3. http://www.bookstreet.in.
4. VTU e-Shikshana Program
5. VTU EDUSAT Program

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Quizzes
- Assignments
- Seminars

**III Semester**

| DATA STRUCTURES AND APPLICATIONS | | | |
|---|---|---|---|
| Course Code: | **21CS32** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 3:0:2:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 T + 20 P | Total Marks | 100 |
| Credits | 04 | Exam Hours | 03 |

**Course Objectives:**

CLO 1. Explain the fundamentals of data structures and their applications essential for implementing solutions to problems.
CLO 2. Illustrate representation of data structures: Stack, Queues, Linked Lists, Trees and Graphs.
CLO 3. Design and Develop Solutions to problems using Arrays, Structures, Stack, Queues, Linked Lists.
CLO 4. Explore usage of Trees and Graph for application development.
CLO 5. Apply the Hashing techniques in mapping key value pairs.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

**Module-1**

**Introduction:** Data Structures, Classifications (Primitive & Non-Primitive), Data structure operations (Traversing, inserting, deleting, searching, and sorting). Review of Arrays. Structures: Array of structures Self-Referential Structures.
Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, dynamically allocated arrays and Multidimensional Arrays.
Demonstration of representation of Polynomials and Sparse Matrices with arrays.

**Textbook 1: Chapter 1: 1.2, Chapter 2: 2.2 - 2.7, Text Textbook 2: Chapter 1: 1.1 - 1.4, Chapter 3: 3.1 - 3.3, 3.5, 3.7, Chapter 4: 4.1 - 4.9, 4.14 Textbook 3: Chapter 1: 1.3**

**Laboratory Component:**

1. Design, Develop and Implement a menu driven Program in C for the following Array Operations
   a. Creating an Array of N Integer Elements
   b. Display of Array Elements with Suitable Headings
   c. Exit.
   Support the program with functions for each of the above operations.

2. Design, Develop and Implement a menu driven Program in C for the following Array operations
   a. Inserting an Element (ELEM) at a given valid Position (POS)
   b. Deleting an Element at a given valid Position POS)

c. Display of Array Elements
d. Exit.

Support the program with functions for each of the above operations.

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| **Teaching-Learning Process** | Problem based learning (Implementation of different programs to illustrate application of arrays and structures.<br>https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s<br><br>https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html<br>https://ds1-iiith.vlabs.ac.in/data-structures-1/List%20of%20experiments.html |

**Module-2**

**Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays. Different representation of expression. Stack Applications: Infix to postfix conversion, Infix to prefix conversion, evaluation of postfix expression, recursion.

**Queues:** Definition, Array Representation of Queues, Queue Operations, Circular Queues, Queues and Circular queues using Dynamic arrays, Dequeues, Priority Queues.

**Textbook 1: Chapter 3: 3.1 -3.4, 3.6 Textbook 2: Chapter 6: 6.1 -6.4, 6.5, 6.7-6.13**

**Laboratory Component:**

1. Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX)
   a. *Push* an Element on to Stack
   b. *Pop* an Element from Stack
   c. Demonstrate *Overflow* and *Underflow* situations on Stack
   d. Display the status of Stack
   e. Exit

   Support the program with appropriate functions for each of the above operations
2. Design, Develop and Implement a Program in C for the following Stack Applications
   a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^
   b. Solving Tower of Hanoi problem with n disks

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| **Teaching-Learning Process** | Active Learning, Problem based learning<br>https://nptel.ac.in/courses/106/102/106102064/<br>https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html |

**Module-3**

**Linked Lists:** Definition, classification of linked lists. Representation of different types of linked lists in Memory, Traversing, Insertion, Deletion, Searching, Sorting, and Concatenation Operations on Singly linked list, Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples.

**Textbook 1: Chapter 4: 4.1 – 4.4, 4.5.2, 4.7, 4.8, Textbook 2: Chapter 5: 5.1 – 5.9**

**Laboratory Component:**

1. Singly Linked List (SLL) of Integer Data
   a. Create a SLL stack of N integer.
   b. Display of SLL
   c. Linear search. Create a SLL queue of N Students Data Concatenation of two SLL of integers.
2. Design, Develop and Implement a menu driven Program in C for the following operationson Doubly Linked List (DLL) of Professor Data with the fields: ID, Name, Branch, Area of specialization

a. Create a DLL stack of N Professor's Data.
b. Create a DLL queue of N Professor's Data

Display the status of DLL and count the number of nodes in it.

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| **Teaching-Learning Process** | MOOC, Active Learning, Problem solving based on linked lists.<br>https://nptel.ac.in/courses/106/102/106102064/<br>https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html<br>https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html<br>https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html<br>https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html |

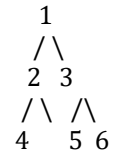
**Module-4**

**Trees 1:** Terminologies, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, and Searching operation on Binary search tree. Application of Trees-Evaluation of Expression.

**Textbook 1: Chapter 5: 5.1 –5.5, 5.7; Textbook 2: Chapter 7: 7.1 – 7.9**

**Laboratory Component:**

1. Given an array of elements, construct a complete binary tree from this array in level order fashion. That is, elements from left in the array will be filled in the tree level wise starting from level 0. Ex: Input :
   arr[] = {1, 2, 3, 4, 5, 6}
   Output : Root of the following tree




2. Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers
   a. Create a BST of N Integers
   b. Traverse the BST in Inorder, Preorder and Post Order

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| **Teaching-Learning Process** | Problem based learning<br>http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html<br>https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html<br>https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first-traversal/dft-practice.html |

**Module-5**

**Trees 2:** AVL tree, Red-black tree, Splay tree, B-tree.

**Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Traversal methods: Breadth First Search and Depth FirstSearch.

**Hashing:** Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.

**Textbook 1: Chapter 10:10.2, 10.3, 10.4, Textbook 2:7.10 – 7.12, 7.15 Chapter 11: 11.2, Textbook 1: Chapter 6 : 6.1–6.2, Chapter 8 : 8.1-8.3, Textbook 2: 8.1 – 8.3, 8.5, 8.7**

**Textbook 3: Chapter 15:15.1, 15.2,15.3, 15.4,15.5 and 15.7**

**Laboratory Component:**

1. Design, Develop and implement a program in C for the following operations on Graph (G) of cities
    a. Create a Graph of N cities using Adjacency Matrix.
    b. Print all the nodes reachable from a given starting node in a diagraph using DFS/BFS method.

2. Design and develop a program in C that uses Hash Function H:K->L as H(K)=K mod m(reminder method) and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.

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| **Teaching-Learning Process** | NPTL, MOOC etc. courses on trees and graphs.<br>http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html |

**Course Outcomes (Course Skill Set)**

At the end of the course the student will be able to:

CO 1. Identify different data structures and their applications.
CO 2. Apply stack and queues in solving problems.
CO 3. Demonstrate applications of linked list.
CO 4. Explore the applications of trees and graphs to model and solve the real-world problem.
CO 5. Make use of Hashing techniques and resolve collisions during mapping of key value pairs

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

**Continuous Internal Evaluation:**

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5$^{th}$ week of the semester
2. Second test at the end of the 10$^{th}$ week of the semester
3. Third test at the end of the 15$^{th}$ week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4$^{th}$ week of the semester
5. Second assignment at the end of 9$^{th}$ week of the semester

Practical Sessions need to be assessed by appropriate rubrics and viva-voce method. This will contribute to **20 marks**.

- Rubrics for each Experiment taken average for all Lab components – 15 Marks.
- Viva-Voce– 5 Marks (more emphasized on demonstration topics)

The sum of three tests, two assignments, and practical sessions will be out of 100 marks and will be **scaled down to 50 marks**

(to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

**CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 Marks
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module

**Suggested Learning Resources:**

**Textbooks:**

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.
3. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.

**Reference Books:**

1. Gilberg and Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
2. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications,2nd Ed, McGraw Hill, 2013
3. A M Tenenbaum, Data Structures using C, PHI, 1989
4. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

**Weblinks and Video Lectures (e-Resources):**

1. http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html
2. https://nptel.ac.in/courses/106/105/106105171/
3. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Real world problem solving using group discussion.
- Back/Forward stacks on browsers.
- Undo/Redo stacks in Excel or Word.
- Linked list representation of real-world queues -Music player, image viewer

**III Semester**

| ANALOG AND DIGITAL ELECTRONICS | | | |
|---|---|---|---|
| Course Code | **21CS33** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 3:0:2:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 T + 20 P | Total Marks | 100 |
| Credits | 04 | Exam Hours | 03 |

**Course Learning Objectives:**

CLO 1. Explain the use of photo electronics devices, 555 timer IC, Regulator ICs and uA741
CLO 2. Make use of simplifying techniques in the design of combinational circuits.
CLO 3. Illustrate combinational and sequential digital circuits
CLO 4. Demonstrate the use of flipflops and apply for registers
CLO 5. Design and test counters, Analog-to-Digital and Digital-to-Analog conversion techniques.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in a multiple representation.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

**Module-1**

BJT Biasing: Fixed bias, Collector to base Bias, voltage divider bias

Operational Amplifier Application Circuits: Peak Detector, Schmitt trigger, Active Filters, Non-Linear Amplifier, Relaxation Oscillator, Current-to-Voltage and Voltage-to-Current Converter, Regulated Power Supply Parameters, adjustable voltage regulator, D to A and A to D converter.

**Textbook 1: Part A: Chapter 4 (Sections 4.2, 4.3, 4.4), Chapter 7 (Sections 7.4, 7.6 to 7.11), Chapter 8 (Sections 8.1 and 8.5), Chapter 9.**

***Laboratory Component:***

1. Simulate BJT CE voltage divider biased voltage amplifier using any suitable circuit simulator.
2. Using ua 741 Opamp, design a 1 kHz Relaxation Oscillator with 50% duty cycle
3. Design an astable multivibrator circuit for three cases of duty cycle (50%, <50% and >50%) using NE 555 timer IC.
4. Using ua 741 opamap, design a window comparator for any given UTP and LTP.

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| **Teaching-Learning Process** | 1. Demonstration of circuits using simulation.<br>2. Project work: Design a integrated power supply and function generator operating at audio frequency. Sine, square and triangular functions are to be generated.<br>3. Chalk and Board for numerical |

**Module-2**

Karnaugh maps: minimum forms of switching functions, two and three variable Karnaugh maps, four variable Karnaugh maps, determination of minimum expressions using essential prime implicants, Quine-McClusky Method: determination of prime implicants, the prime implicant chart, Petricks method, simplification of incompletely specified functions, simplification using map-entered variables

**Textbook 1: Part B: Chapter 5 (Sections 5.1 to 5.4) Chapter 6 (Sections 6.1 to 6.5)**

***Laboratory Component:***

1. Given a 4-variable logic expression, simplify it using appropriate technique and inplement the same using basic gates.

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| **Teaching-Learning Process** | 1. Chalk and Board for numerical<br>2. Laboratory Demonstration |

**Module-3**

Combinational circuit design and simulation using gates: Review of Combinational circuit design, design of circuits with limited Gate Fan-in, Gate delays and Timing diagrams, Hazards in combinational Logic, simulation and testing of logic circuits

Multiplexers, Decoders and Programmable Logic Devices: Multiplexers, three state buffers, decoders and encoders, Programmable Logic devices.

**Textbook 1: Part B: Chapter 8, Chapter 9 (Sections 9.1 to 9.6)**

***Laboratory Component:***

1. Given a 4-variable logic expression, simplify it using appropriate technique and realize the simplified logic expression using 8:1 multiplexer IC.
2. Design and implement code converter I) Binary to Gray (II) Gray to Binary Code

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| **Teaching-Learning Process** | 1. Demonstration using simulator<br>2. Case study: Applications of Programmable Logic device<br>3. Chalk and Board for numerical |

**Module-4**

Introduction to VHDL: VHDL description of combinational circuits, VHDL Models for multiplexers, VHDL Modules.

Latches and Flip-Flops: Set Reset Latch, Gated Latches, Edge-Triggered D Flip Flop 3,SR Flip Flop, J K Flip Flop, T Flip Flop.

**Textbook 1: Part B: Chapter 10(Sections 10.1 to 10.3), Chapter 11 (Sections 11.1 to 11.7)**

***Laboratory Component:***

1. Given a 4-variable logic expression, simplify it using appropriate technique and simulate the same in HDL simulator
2. Realize a J-K Master / Slave Flip-Flop using NAND gates and verify its truth table. And implement the same in HDL.

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| **Teaching-Learning Process** | 1. Demonstration using simulator<br>2. Case study: Arithmetic and Logic unit in VHDL<br>3. Chalk and Board for numerical |

**Module-5**

Registers and Counters: Registers and Register Transfers, Parallel Adder with accumulator, shift registers, design of Binary counters, counters for other sequences, counter design using SR and J K Flip Flops.

**Textbook 1: Part B: Chapter 12 (Sections 12.1 to 12.5)**

***Laboratory Component:***

1. Design and implement a mod-n (n<8) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working.
2. Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate on 7-segment display (using IC-7447)

| **Teaching-Learning Process** | 1. Demonstration using simulator<br>2. Project Work: Designing any counter, use LED / Seven-segment display to display the output<br>3. Chalk and Board for numerical |
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**Course outcome (Course Skill Set)**

At the end of the course the student will be able to:

CO 1. Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.
CO 2. Explain the basic principles of A/D and D/A conversion circuits and develop the same.
CO 3. Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods
CO 4. Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types.
CO 5. Develop simple HDL programs

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

**Continuous Internal Evaluation:**

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Practical Sessions need to be assessed by appropriate rubrics and viva-voce method. This will contribute to **20 marks**.

- Rubrics for each Experiment taken average for all Lab components – 15 Marks.
- Viva-Voce– 5 Marks (more emphasized on demonstration topics)

The sum of three tests, two assignments, and practical sessions will be out of 100 marks and will be **scaled down to 50 marks**

(to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

**CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module

**Suggested Learning Resources:**

**Textbooks**

1. Charles H Roth and Larry L Kinney and Raghunandan G H Analog and Digital Electronics, Cengage Learning,2019

**Reference Books**

1. Anil K Maini, Varsha Agarwal, Electronic Devices and Circuits, Wiley, 2012.
2. Donald P Leach, Albert Paul Malvino & Goutam Saha, Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015.
3. M. Morris Mani, Digital Design, 4th Edition, Pearson Prentice Hall, 2008.
4. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008

**Weblinks and Video Lectures (e-Resources):**

1. Analog Electronic Circuits: https://nptel.ac.in/courses/108/102/108102112/
2. Digital Electronic Circuits: https://nptel.ac.in/courses/108/105/108105132/
3. Analog Electronics Lab: http://vlabs.iitkgp.ac.in/be/
4. Digital Electronics Lab: http://vlabs.iitkgp.ac.in/dec

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

1. Real world problem solving - applying the design concepts of oscillator, amplifier, switch, Digital circuits using Opamps, 555 timer, transistor, Digital ICs and design a application like tone generator, temperature sensor, digital clock, dancing lights etc.

**III Semester**

| COMPUTER ORGANIZATION AND ARCHITECTURE | | | |
|---|---|---|---|
| Course Code | **21CS34** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 03 | Exam Hours | 03 |

**Course Learning Objectives**

CLO 1. Understand the organization and architecture of computer systems, their structure and operation
CLO 2. Illustrate the concept of machine instructions and programs
CLO 3. Demonstrate different ways of communicating with I/O devices
CLO 4. Describe different types memory devices and their functions
CLO 5. Explain arithmetic and logical operations with different data types
CLO 6. Demonstrate processing unit with parallel processing and pipeline architecture

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

**Module-1**

**Basic Structure of Computers:** Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement.

**Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes

**Textbook 1: Chapter1 – 1.3, 1.4, 1.6 (1.6.1-1.6.4, 1.6.7), Chapter2 – 2.2 to 2.5**

| **Teaching-Learning Process** | Chalk and board, Active Learning, Problem based learning |
|---|---|

**Module-2**

**Input/Output Organization:** Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits

**Textbook 1: Chapter4 – 4.1, 4.2, 4.4, 4.5, 4.6**

| **Teaching-Learning Process** | Chalk and board, Active Learning, Demonstration |
|---|---|

**Module-3**

**Memory System:** Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Virtual memories

**Textbook 1: Chapter 5 – 5.1 to 5.4, 5.5 (5.5.1, 5.5.2)**

| **Teaching-Learning Process** | Chalk and board, Problem based learning, Demonstration |
|---|---|

| Module-4 | |
|---|---|
| **Arithmetic:** Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers<br><br>**Basic Processing Unit:** Fundamental Concepts, Execution of a Complete Instruction, Hardwired control, Microprogrammed control<br><br>**Textbook 1: Chapter2-2.1, Chapter6 – 6.1 to 6.3**<br>**Textbook 1: Chapter7 – 7.1, 7.2,7.4, 7.5** | |
| **Teaching-Learning Process** | Chalk& board, Problem based learning |
| **Module-5** | |
| **Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing, Array Processors<br><br>**Textbook 2: Chapter 9 – 9.1, 9.2, 9.3, 9.4, 9.6, 9.7** | |
| **Teaching-Learning Process** | Chalk and board, MOOC |

**Course Outcomes**

At the end of the course the student will be able to:

- CO 1. Explain the organization and architecture of computer systems with machine instructions and programs
- CO 2. Analyze the input/output devices communicating with computer system
- CO 3. Demonstrate the functions of different types of memory devices
- CO 4. Apply different data types on simple arithmetic and logical unit
- CO 5. Analyze the functions of basic processing unit, Parallel processing and pipelining

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

**Continuous Internal Evaluation:**

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5$^{th}$ week of the semester
2. Second test at the end of the 10$^{th}$ week of the semester
3. Third test at the end of the 15$^{th}$ week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4$^{th}$ week of the semester
5. Second assignment at the end of 9$^{th}$ week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13$^{th}$ week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

**CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scored shall be proportionally reduced to 50 marks
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module

**Textbooks**

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill
2. M. Morris Mano, Computer System Architecture, PHI, 3rd Edition

**Reference:**

1. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson

**Weblinks and Video Lectures (e-Resources):**

1. https://nptel.ac.in/courses/106/103/106103068/
2. https://nptel.ac.in/content/storage2/courses/106103068/pdf/coa.pdf
3. https://nptel.ac.in/courses/106/105/106105163/
4. https://nptel.ac.in/courses/106/106/106106092/
5. https://nptel.ac.in/courses/106/106/106106166/
6. http://www.nptelvideos.in/2012/11/computer-organization.html

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Discussion and literature survey on real world use cases
- Quizzes

**III Semester**

| OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY | | | |
|---|---|---|---|
| Course Code | **21CSL35** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 0:0:2:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 24 | Total Marks | 100 |
| Credits | 1 | Exam Hours | 03 |

**Course Objectives:**

CLO 1. Demonstrate the use of Eclipse/Netbeans IDE to create Java Applications.
CLO 2. Using java programming to develop programs for solving real-world problems.
CLO 3. Reinforce the understanding of basic object-oriented programming concepts.

| | |
|---|---|
| | **Note: two hours tutorial is suggested for each laboratory sessions.** |
| | **Prerequisite** |
| | • Students should be familiarized about java installation and setting the java environment.<br>• Usage of IDEs like Eclipse/Netbeans should be introduced. |
| **Sl. No.** | ***PART A – List of problems for which student should develop program and execute in the Laboratory*** |
| 1 | Aim: Introduce the java fundamentals, data types, operators in java<br><br>Program: Write a java program that prints all real solutions to the quadratic equation ax2+bx+c=0. Read in a, b, c and use the quadratic formula. |
| 2 | Aim: Demonstrating creation of java classes, objects, constructors, declaration and initialization of variables.<br><br>Program: Create a Java class called **Student** with the following details as variables within it.<br>USN<br>Name<br>Branch<br>Phone<br>Write a Java program to create n Student objects and print the USN, Name, Branch, and Phone of these objects with suitable headings. |
| 3 | Aim: Discuss the various Decision-making statements, loop constructs in java<br><br>Program:<br>A. Write a program to check prime number<br>B.Write a program for Arithmetic calculator using switch case menu |
| 4 | Aim: Demonstrate the core object-oriented concept of Inheritance, polymorphism<br><br>Design a super class called **Staff** with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a Java program to read and display at least 3 staff objects of all three categories. |
| 5 | Aim: Introduce concepts of method overloading, constructor overloading, overriding.<br><br>Program: Write a java program demonstrating Method overloading and Constructor overloading. |
| 6 | Aim: Introduce the concept of Abstraction, packages.<br><br>Program: Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages. |
| 7 | Aim: Introduction to abstract classes, abstract methods, and Interface in java |

| | |
|---|---|
| | Program: Write a program to generate the resume. Create 2 Java classes Teacher (data: personal information, qualification, experience, achievements) and Student (data: personal information, result, discipline) which implements the java interface Resume with the method biodata(). |
| 8 | Aim: Demonstrate creation of threads using Thread class and Runnable interface, multi-threaded programming.<br><br>Program: Write a Java program that implements a **multi-thread** application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number. |
| 9 | Aim: Introduce java Collections.<br><br>Program: Write a program to perform string operations using ArrayList. Write functions for the following a. Append - add at end b. Insert – add at particular index c. Search d. List all string starts with given letter. |
| 10 | Aim: Exception handling in java, introduction to throwable class, throw, throws, finally.<br><br>Program: Write a Java program to read two integers a and b. **Compute** a/b and print, when b is not zero. Raise an exception when b is equal to zero. |
| 11 | Aim: Introduce File operations in java.<br><br>Program:<br>Write a java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes |
| 12 | Aim: Introduce java Applet, awt, swings.<br><br>Programs:<br>Develop an applet that displays a simple message in center of the screen.<br>Develop a simple calculator using Swings. |
| | **PART B – Practical Based Learning** |
| 01 | A problem statement for each batch is to be generated in consultation with the co-examiner and student should develop an algorithm, program and execute the program for the given problem with appropriate outputs. |

**Course Outcome (Course Skill Set)**

At the end of the course the student will be able to:

CO 1. Use Eclipse/NetBeans IDE to design, develop, debug Java Projects.
CO 2. Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP.
CO 3. Demonstrate the ability to design and develop java programs, analyze, and interpret object-oriented data and document results.
CO 4. Apply the concepts of multiprogramming, exception/event handling, abstraction to develop robust programs.
CO 5. Develop user friendly applications using File I/O and GUI concepts.

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

**Continuous Internal Evaluation (CIE):**

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

**Semester End Evaluation (SEE):**

- SEE marks for the practical course is 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- *Students can pick one experiment from the questions lot of* $PART\ A$ *with equal choice to all the students in a batch. For* $PART\ B$ *examiners should frame a question for each batch, student should develop an algorithm, program, execute and demonstrate the results with appropriate output for the given problem.*
- *Weightage of marks for PART A is 80% and for PART B is 20%. General rubrics suggested to be followed for part A and part B.*
- Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero (Not allowed for Part B).
- The duration of SEE is 03 hours
- Rubrics suggested in Annexure-II of Regulation book

**Suggested Learning Resources:**


1. E Balagurusamy, Programming with Java, Graw Hill, 6th Edition, 2019.
2. Herbert Schildt, C: Java the Complete Reference, McGraw Hill, 11th Edition, 2020

**III Semester**

| MASTERING OFFICE (Practical based) | | | |
|---|---|---|---|
| Course Code | **21CSL381** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 1:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 12T + 12P | Total Marks | 100 |
| Credits | 01 | Exam Hours | 02 |

**Course Objectives:**

CLO 1. Understand the basics of computers and prepare documents and small presentations.
CLO 2. Attain the knowledge about spreadsheet/worksheet with various options.
CLO 3. Create simple presentations using templates various options available.
CLO 4. Demonstrate the ability to apply application software in an office environment.
CLO 5. Use MS Office to create projects, applications.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

**Module-1**

**MS-Word** -Working with Files, Text – Formatting, Moving, copying and pasting text, Styles – Lists – Bulleted and numbered lists, Nested lists, Formatting lists. Table Manipulations. Graphics – Adding clip Art, add an image from a file, editing graphics, Page formatting - Header and footers, page numbers, Protect the Document, Mail Merge, Macros – Creating & Saving web pages, Hyperlinks.

**Textbook 1: Chapter 2**

| **Teaching-Learning Process** | Chalk and board, Active Learning, practical based learning |
|---|---|

**Module-2**

**MS-Excel-** Modifying a Worksheet – Moving through cells, adding worksheets, rows and columns, Resizing rows and columns, selecting cells, Moving and copying cells, freezing panes - Macros – recording and running. Linking worksheets - Sorting and Filling, Alternating text and numbers with Auto fill, Auto filling functions. Graphics – Adding clip art, add an image from a file, Charts – Using chart Wizard, Copy a chart to Microsoft Word.

**Textbook 1: Chapter 3**

| **Teaching-Learning Process** | Active Learning, Demonstration, presentation, |
|---|---|

**Module-3**

**MS-Power Point -**Create a Presentation from a template- Working with Slides – Insert a new slide, applying a design template, changing slide layouts – Resizing a text box, Text box properties, delete a text box - Video and Audio effects, Color Schemes & Backgrounds Adding clip art, adding an image from a file, Save as a web page.

**Textbook 1: Chapter 5**

| **Teaching-Learning Process** | Demonstration, presentation preparation for case studies |
|---|---|

**Module-4**

**MS-Access -** Using Access database wizard, pages and projects. Creating Tables – Create a Table in design view. Datasheet Records – Adding, Editing, deleting records, Adding and deleting columns Resizing rows and columns, finding data in a table & replacing, Print a datasheet. Queries - MS-Access.

**Textbook 1: Chapter 4**

| **Teaching-Learning Process** | Chalk& board, Practical based learning. |
|---|---|

**Module-5**

**Microsoft Outlook-** Introduction, Starting Microsoft Outlook, Outlook Today, Different Views In Outlook, Outlook Data Files

**Textbook 1: Chapter 7**

| **Teaching-Learning Process** | Chalk and board, MOOC |
|---|---|

**Course Outcomes (Course Skill Set):**

At the end of the course the student will be able to:

CO 1. Know the basics of computers and prepare documents, spreadsheets, make small presentations with audio, video and graphs and would be acquainted with internet.
CO 2. Create, edit, save and print documents with list tables, header, footer, graphic, spellchecker, mail merge and grammar checker
CO 3. Attain the knowledge about spreadsheet with formula, macros spell checker etc.
CO 4. Demonstrate the ability to apply application software in an office environment.
CO 5. Use Google Suite for office data management tasks

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

**Continuous Internal Evaluation (CIE):**

***NOTE: List of experiments to be prepared by the faculty based on the syllabus mentioned above***

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8$^{th}$ week of the semester and the second test shall be conducted after the 14$^{th}$ week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

**Semester End Evaluation (SEE):**

- SEE marks for the practical course is 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- The duration of SEE is 02 hours

Rubrics suggested in Annexure-II of Regulation book

**Weblinks and Video Lectures (e-Resources):**

1. https://youtu.be/9VRmgC2GRFE
2. https://youtu.be/rJPWi5x0g3I
3. https://youtu.be/tcj2BhhCMN4
4. https://youtu.be/ubmwp8kbfPc
5. https://youtu.be/i6eNvfQ8fTw
6. http://office.microsoft.com/en-us/training/CR010047968.aspx
7. https://gsuite.google.com/leaming-center
8. http://spoken-tutorial.org

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Real world problem solving using group discussion.
- Real world examples of Windows Framework.

**III Semester**

| PROGRAMMING IN C++ | | | |
|---|---|---|---|
| Course Code | **21CS382** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 1:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 12 | Total Marks | 100 |
| Credits | 01 | Exam Hours | 01 |

**Course Objectives:**

CLO 1. Understanding about object oriented programming and Gain knowledge about the capability to store information together in an object.
CLO 2. Understand the capability of a class to rely upon another class and functions.
CLO 3. Understand about constructors which are special type of functions.
CLO 4. Create and process data in files using file I/O functions
CLO 5. Use the generic programming features of C++ including Exception handling.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

**Module-1**

**Introduction to Object Oriented Programming:** Computer programming background- C++ overview- First C++ Program -Basic C++ syntax, Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism.

**Textbook 1: Chapter 1(1.1 to 1.8)**

| **Teaching-Learning Process** | Chalk and board, Active Learning, practical based learning |
|---|---|

**Module-2**

**Functions in C++:** Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Function overloading.

**Textbook 2: Chapter 3(3.2,3.3,3.4,3.13,3.14,3.19, 3.20) , chapter 4(4.3,4.4,4.5,4.6,4.7,4.9)** .

| **Teaching-Learning Process** | Chalk and board, Active Learning, Demonstration, presentation, problem solving |
|---|---|

**Module-3**

**Inheritance & Polymorphism:** Derived class Constructors, destructors-Types of Inheritance- Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance.

**Textbook 2: Chapter 6 (6.2,6.11) chapter 8 (8.1 to,8.8)**

| | |
|---|---|
| **Teaching-Learning Process** | Chalk and board, Demonstration, problem solving |

**Module-4**

**I/O Streams:** C++ Class Hierarchy- File Stream-Text File Handling- Binary File Handling during file operations.

**Textbook 1: Chapter 12(12.5) , Chapter 13 (13.6,13.7)**

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| **Teaching-Learning Process** | Chalk and board, Practical based learning, practical's |

**Module-5**

**Exception Handling:** Introduction to Exception - Benefits of Exception handling- Try and catch block- Throw statement- Pre-defined exceptions in C++ .

**Textbook 2: Chapter 13 (13.2 to13.6)**

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| **Teaching-Learning Process** | Chalk and board, MOOC |

**Course Outcomes (Course Skill Set):**

At the end of the course the student will be able to:

- CO 1. Able to understand and design the solution to a problem using object-oriented programming concepts.
- CO 2. Able to reuse the code with extensible Class types, User-defined operators and function Overloading.
- CO 3. Achieve code reusability and extensibility by means of Inheritance and Polymorphism
- CO 4. Identify and explore the Performance analysis of I/O Streams.
- CO 5. Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

**Continuous Internal Evaluation:**

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

**CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 01 hours)**

SEE paper will be set for 50 questions of each of 01 marks. The pattern of the question paper is MCQ. The time allotted for SEE is 01 hours

**Textbooks**

1. Bhushan Trivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.
2. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010.

**Reference Books**

1. Bhave , " Object Oriented Programming With C++", Pearson Education , 2004.
2. Ray Lischner, "Exploring C++ : The programmer's introduction to C++" , apress, 2010
3. Bhave , " Object Oriented Programming With C++", Pearson Education , 2004

**Weblinks and Video Lectures (e-Resources):**

1. Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA
2. Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw

**Tutorial Link:**

1. https://www.w3schools.com/cpp/cpp_intro.asp
2. https://www.edx.org/course/introduction-to-c-3

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- **Demonstration of simple projects**