III Semester

TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES			
Course Code:	**21CB31**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning Objectives:

CLO 1. To have an insight on 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 teacher 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 analyse 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 / PowerPoint Presentation

Module-2

Introduction to infinite series, convergence and divergence. Periodic functions, Dirichlet's condition. Fourier series of periodic functions with period 2π 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-	Chalk and talk method / PowerPoint Presentation

Learning Process	

Module-3

Infinite Fourier transforms definition, Fourier sine and cosine transforms. Inverse Fourier transforms, Inverse Fourier cosine and sine transforms. Problems.

Difference equations, z-transform-definition, Standard z-transforms, Damping and shifting rules, Problems. Inverse z-transform and applications to solve difference equations.

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.

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).

Calculus of Variations: Functionals, Euler's equation, Problems on extremals of functional. Geodesics on a plane, Variational problems.

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 analyse 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 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 is 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.
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. Marks scored out of 100 shall be proportionally reduced to 50 marks

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

Web links 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

15.09.2022

III Semester

DATA STRUCTURES AND APPLICATIONS			
Course Code:	**21CB32**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 Theory + 10 Labs	Total Marks	100
Credits	04	Exam Hours	03

Course Learning Objectives:

CLO 1. Explain 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, Trees and Graphs.
CLO 4. Find suitable data structure for application development.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher 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 analyse 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, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, Dynamically allocated arrays.
Array Operations: Traversing, inserting, deleting, searching, and sorting. Multidimensional Arrays, Polynomials and Sparse Matrices.
Strings: Basic Terminology, Storing, Operations and Pattern Matching algorithms, Programming Examples.

Teaching-Learning	Problem based learning (Implementation of different programs to illustrate application of arrays and structures.

Process	https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html 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, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. Recursion - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function. Queues: Definition, Array Representation, Queue Operations, Circular Queues, Circular, queues using Dynamic arrays, Dequeues, Priority Queues, A Mazing Problem. Multiple Stacks and Queues. Programming Examples.G	
Teaching-Learning Process	Active Learning, Problem based learning https://nptel.ac.in/courses/106/102/106102064/ 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.	
Teaching-Learning Process	MOOC, Active Learning, Problem solving based on linked lists. https://nptel.ac.in/courses/106/102/106102064/ https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html

Module-4	
Trees: 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.	
Teaching-Learning Process	Problem based learning http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first-traversal/dft-practice.html
Module-5	
Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search. Sorting and Searching: Insertion Sort, Radix sort, Address Calculation Sort. Hashing: Hash Table organizations, Hashing Functions, Static and Dynamic Hashing. Files and Their Organization: Data Hierarchy, File Attributes, Text Files and Binary Files, Basic File Operations, File Organizations and Indexing	
Teaching-Learning Process	NPTL, MOOC etc. courses on trees and graphs. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
PRACTICAL COMPONENT OF IPCC	
Sl. NO	**Experiments**
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. Inserting an Element (ELEM) at a given valid Position (POS) d. Deleting an Element at a given valid Position (POS) e. Exit. Support the program with functions for each of the above operations.
2.	Design, Develop and Implement a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.
3.	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 how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations.
4.	Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.
5.	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

6.	Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations.
7.	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Programme, Sem,PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) e. Exit
8.	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation,Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit
9.	Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes a. Represent and Evaluate a Polynomial $P(x,y,z) = 6x^2y^2z - 4yz^5+3x^3yz+2xy^5z-2xyz^3$ b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations
10.	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: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exit

Course Outcomes (Course Skill Set)

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

CO 1. Use different types of data structures, operations and algorithms.

CO 2. Apply searching and sorting operations on files.

CO 3. Use stack, Queue, Lists, Trees and Graphs in problem solving.

CO 4. Implement all data structures in a high-level language for problem solving.G

Assessment Details (both CIE and SEE)(IPCC)

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

CIE for the theory component of IPCC

Two Tests each of **20 Marks (duration 01 hour**)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester

Two assignments each of **10 Marks**

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

Scaled-down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test **(duration 02/03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks**.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

SEE for IPCC

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

1. The question paper will have ten questions. Each question is set for 20 marks. Marks scorded shall be proportionally scaled down 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.
3. The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be proportionally reduced to 50 marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.

SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in the SEE. Marks scored out of 100 shall be proportionally reduced to 50 marks

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.

Reference Books:

1. Gilberg and Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
2. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
3. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications,2nd Ed, McGraw Hill, 2013
4. A M Tenenbaum, Data Structures using C, PHI, 1989
5. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

Web links 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

COMPUTER ORGANIZATION			
Course Code	**21CB33**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 Theory + 10 Labs	Total Marks	100
Credits	04	Exam Hours	03

Course Learning Objectives

CLO 1. Explain the basic sub systems of a computer, their organization, structure and operation.
CLO 2. Illustrate the concept of machine instructions and programs
CLO 3. Demonstrate different ways of communicating with I/O devices and standard I/O interfaces.
CLO 4. Describe memory hierarchy and concept of virtual memory.
CLO 5. Describe arithmetic and logical operations with integer and floating-point operands.
CLO 6. Illustrate organization of a simple processor, pipelined processor and other computing systems.
CLO 7. Demonstrate the use of flipflops and apply for registers
CLO 8. Understanding the behavior of Logic Gates, Adders, Decoders, Multiplexers and Flip-Flops

Teaching-Learning Process (General Instructions)

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

1. Lecturer method (L) needs 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 analyse 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, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions

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, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB.

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, Replacement Algorithms, Performance Considerations.

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, Signed Operand Multiplication, Fast Multiplication, Integer Division.

Teaching-Learning Process	Chalk& board, Problem based learning

Module-5

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 Edge-Triggered D Flip Flop 3,SR Flip Flop, J K Flip Flop, T Flip Flop, Flip Flop with additional inputs, AsynchronousSequential Circuits

Teaching-Learning Process	Chalk and board, MOOC

PRACTICAL COMPONENT OF IPCC

Sl. No	Experiments
1	Introduction to Verilog HDL/VHDL
2	Verify the behavior of logic gates using truth tables (AND, OR, NOT, XOR, NAND, NOR)
3	Implementing HALF ADDER, FULL ADDER using basic logic gates
4	Implementing Binary -to -Gray, Gray -to -Binary code conversions
5	Implementing 3-8 line DECODER.
6	Implementing 4x1 and 8x1 MULTIPLEXERS
7	Verify the excitation tables of various FLIP-FLOPS
8	Design of an 8-bit Input/ Output system with four 8-bit Internal Registers
9	Design of an 8-bit ARITHMETIC LOGIC UNIT

Course Outcomes

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

CO 1. Explain the basic organization of a computer system.

CO 2. Demonstrate functioning of different sub systems, such as processor, Input/output,and memory.

CO 3. Illustrate hardwired control and micro programmed control, pipelining, embedded and othercomputing systems.

CO 4. Design and analyse simple arithmetic and logical units.

CO 5. Simplify digital circuits using Karnaugh Map and explain flip flops and make us in designing different data processing circuits.

CO 6. Analyze the behaviour of logic gates

CO 7. Analyze the operational behaviour and applications of various flip-flop

Assessment Details (both CIE and SEE)(IPCC)

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CIE for the theory component of IPCC

Two Tests each of **20 Marks (duration 01 hour**)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester

Two assignments each of **10 Marks**

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

Scaled-down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test **(duration 02/03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks**.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

SEE for IPCC

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

4. The question paper will have ten questions. Each question is set for 20 marks. Marks scorded shall be proportionally scaled down to 50 Marks
5. 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.
6. The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be proportionally reduced to 50 marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.

SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in

the SEE. Marks scored out of 100 shall be proportionally reduced to 50 marks

Text Books

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, Tata McGraw Hill
2. Charles H Roth and Larry L Kinney, Analog and Digital Electronics, Cengage Learning, 2019

Reference:

1. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015
2. A Verilog HDL Primer by J. Bhasker Bk&Hardcover; Published by Star Galaxy Press. ISBN: 0-9656277-4-8
3. Verilog HDL : A Guide to Digital Design and Synthesis by Samir Palnitkar Published by Prentice Hall Publication date: March 1996

Web links 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

15.09.2022

III Semester

BUSINESS COMMUNICATION AND VALUE SCIENCE – I			
Course Code	**21CB34**	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 what life skills are and their importance in leading a happy and well-adjusted life.
CLO 2. Motivate students to look within and create a better version of self.

Teaching-Learning Process (General Instructions)

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

1. Lecturer method (L) needs 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 analyse 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

Overview of LOL (include activity on introducing self)
Class activity – presentation on favorite cricket captain in IPL and the skills and values they demonstrate
Self-work with immersion – interview a maid, watchman, sweeper, cab driver, beggar and narrate what you think are the values that drive them
Overview of business communication
Activity: Write a newspaper report on an IPL match

Teaching-Learning Process	Chalk and board

Module-2

Activity: Record a conversation between a celebrity and an interviewer
Quiz Time
Self-awareness – identity, body awareness, stress management
Essential Grammar – I: Refresher on Parts of Speech – Listen to an audio clip and note down the different parts of speech followed by discussion
Tenses: Applications of tenses in Functional Grammar – Take a quiz and then discuss
Sentence formation (general & Technical), Common errors, Voices. Show sequence from film where a character uses wrong sentence structure (e.g. Zindagi Na Milegi Dobara where the characters use 'the' before every word)

Teaching-Learning Process	Chalk and board

Module-3

Communication Skills: Overview of Communication Skills Barriers of communication, Effective communication **Types of communication**- verbal and non – verbal – Role-play based learning
Importance of Questioning Expressing self, connecting with emotions, visualizing and experiencing purpose **Activity:** Skit based on communication skills **Evaluation on Listening skills –** listen to recording and answer questions based on them **Email writing**: Formal and informal emails, activity

Teaching-Learning Process	Chalk and board

Module-4

Verbal communication: Pronunciation, clarity of speech
Vocabulary Enrichment: Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary – Read Economic Times, Reader's Digest, National Geographic and take part in a GD, using the words you learnt/liked from the articles.
Group discussion using words learnt
Practice: Toastmaster style Table Topics speech with evaluation
Written Communication: Summary writing, story writing
Build your CV – start writing your comprehensive CV including every achievement in your life, no format, no page limit
Project: Create a podcast on a topic that will interest college students
Life skill: Stress management, working with rhythm and balance, colours, and teamwork
Project: Create a musical using the learnings from unit

Teaching-Learning Process	Chalk& board

Module-5

Understanding Life Skills: Movie based learning – **Pursuit of Happiness.** What are the skills and values you can identify, what can you relate to?
Introduction to life skills What are the critical life skills
Multiple Intelligences
Embracing diversity – Activity on appreciation of diversity
Life skill: Community service – work with an NGO and make a presentation
Life skill: Join a trek – Values to be learned: Leadership, teamwork, dealing with ambiguity, managing stress, motivating people, creativity, result orientation

Teaching-Learning Process	Chalk and board

Course Outcomes

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

CO1. Recognize the need for life skills and values
CO 2. Recognize own strengths and opportunities
CO 3. Apply the life skills to different situations
CO 4. Understand the basic tenets of communication
CO 5. Apply the basic communication practices in different types of communication

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 is 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.
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 Marks scored out of 100 shall be proportionally reduced to 50 marks

Text Books

There are no prescribed texts for Semester 1 – there will be handouts and reference links shared.

Reference Books

1. Alan Mc'carthy and O'dell, English vocabulary in use.
2. APAART: Speak Well 1 (English language and communication)
3. APAART: Speak Well 2 (Soft Skills)
4. Dr. Saroj Hiremath, Business Communication

Web links and Video Lectures (e-Resources):

1. Train your mind to perform under pressure- Simon sinek https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under-pressure-capture-your-flag/
2. Brilliant way one CEO rallied his team in the middle of layoffs https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-before-numbers.html
3. Will Smith's Top Ten rules for success https://www.youtube.com/watch?v=bBsT9omTeh0
4. https://www.coursera.org/learn/learning-how-to-learn
5. https://www.coursera.org/specializations/effective-business-communication

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

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

III Semester

INTRODUCTION TO SCRIPTING LANGAUGES			
Course Code	**21CBL35**	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	01	Exam Hours	03

Course Learning objectives:

CLO 1.To Understand the concepts of scripting languages for developing web-based projects

CLO 2. To understand the applications the of Ruby, TCL, Perl scripting languages

Sl. NO	Experiments
1	Write a Ruby script to create a new string which is n copies of a given string where n is a non-negative integer
2	Write a Ruby script which accept the user's first and last name and print them in reverse order with a space between them
3	Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area
4	Write a Ruby script to print odd numbers from 10 to 1
5	Write a TCL script to find the factorial of a number
6	Write a TCL script that multiplies the numbers from 1 to 10
7	Write a TCL script for Sorting a list using a comparison function
8	Write a Perl script to find the largest number among three numbers
9	Write a Perl script to print the multiplication tables from 1-10 using subroutines
10	Write a Perl script to substitute a word, with another word in a string

Course outcomes (Course Skill Set):

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

- Ability to understand the differences between Scripting languages and programming languages
- Able to gain some fluency programming in Ruby, Perl, TCL

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)

Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

The duration of SEE is 03 hours

Rubrics suggested in Annexure-II of Regulation book

III Semester

MASTERING OFFICE			
Course Code	**21CB382**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	24	Total Marks	100
Credits	01	Exam Hours	01

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 out of 50). 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 Examination (CIE)

Three Tests (preferably in MCQ pattern with 20 questions) 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**

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

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

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

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure minimum of 35% of the maximum marks meant for SEE.

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

C++ PROGRAMMING			
Course Code	**21CB383**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	24	Total Marks	100
Credits	01	Exam Hours	01

Course Objectives:

CLO 1. Understanding about object oriented programming and Gain knowledge about the capabilityto 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)

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)

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 out of 50). 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 Examination (CIE)

Three Tests (preferably in MCQ pattern with 20 questions) 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**

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

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

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

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure minimum of 35% of the maximum marks meant for SEE.

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**

III Semester

INTRODUCTION TO WEB DEVELOPMENT			
Course Code	**21CB384**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	24	Total Marks	100
Credits	01	Exam Hours	01

Course Objectives:

CLO 1. Understand the basics of web works and How web works.
CLO 2. Understand the basics of HTML
CLO 3. Attain the knowledge about CSS and CSS layout.
CLO 4. Attain the knowledge about HTML forms and tables

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 criticalthinking.
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 ratherthan simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encouragethe 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	
How the WebWorks: Definitions and History, Internet Protocols, The Client-Server Model, Where Is the Internet?, Domain Name System, Uniform Resource Locators, HTTP, Web Servers	
Teaching-Learning Process	Chalk and board, Active Learning, practical based learning
Module-2	
Introduction to HTML - What Is HTML and Where Did It Come from?, HTML Syntax, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements	
Teaching-Learning Process	Active Learning, Demonstration, presentation,
Module-3	
Introduction to CSS - What Is CSS?, CSS Syntax, Location of Styles, Selectors,	

Textbook 1: Chapter 5	
Teaching-Learning Process	Demonstration, presentation preparation for case studies
Module-4	
HTML Tables and Forms - Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements	
Teaching-Learning Process	Chalk& board, Practical based learning.
Module-5	
Advanced CSS: Layout - Normal Flow, Positioning Elements, Floating Elements 2, Constructing Multicolumn Layouts, CSS Frameworks.	
Teaching-Learning Process	Chalk and board

Course Outcomes (Course Skill Set):

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

CO 1. Learn regarding the Web works.
CO 2. Learn the CSS and HTML.
CO 3. Regarding the CSS Layouts and forms.

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 out of 50). 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 Examination (CIE)

Three Tests (preferably in MCQ pattern with 20 questions) 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**

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

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

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

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure minimum of 35% of the maximum marks meant for SEE.

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**

15.09.2022

IV Semester

DISCRETE MATHEMATICAL STRUCTURES			

15.09.2022

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 is 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.
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

Textbook Books

1. Kenneth H Rosen, "Discrete Mathematics and its Applications", McGraw Hill publications, 7th edition.
2. John E Hopcroft, Rajeev Motwani and Jaffery D Ullman, "Automata Theory, Language, and Computation", Pearson and Addison Wesley, 3rd Edition.
3. Michael Sipser, "Introduction to Theory of Computation", International Thompson Publishing, 1996.

Reference Books:

1. J.K Sharma, Discrete Mathematics, "Mac Millian Publishers India", 3rd edition, 2011
2. Daniel I.A. Cohen, "Introduction to Computer Theory", John Wiley and Sons, 2009.
3. John C Martin, "Introduction to languages and the Theory of computation", TMH 3, 2007

IV Semester

OPERATING SYSTEMS			
Course Code:	**21CB42**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 Theory + 10 Labs	Total Marks	100
Credits	04	Exam Hours	03

Course Objectives:

CLO 1. Student should identify the concepts, principles and services of operating system
CLO 2. All fundamentals of operating system, abstractions and demonstrate them
CLO 3. Explain protection and security requirements of operating systems analyze basic resource management techniques in job and process scheduling
CLO 4. Compare different memory management techniques and apply concurrency and synchronization techniques to write concurrent programs.

Teaching-Learning Process (General Instructions)

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

1. Lecturer methods (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 analyse 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 to operating systems & their classification: What is an operating system, Mainframe systems, Desktop systems, Multiprocessor system, Distributed system, Clustered system, Real time system, Handheld system, Feature migration, Computing environments, Operating system structures: System components, OS Services, System calls, System programs, System structure, Virtual machines.

Teaching Learning Process	Active learning and problem solving 1. https://www.youtube.com/watch?v=vBURTt97EkA&list=PLBlnK6fEyqRiVhbXDGLXDk_OQAeuVcp2O 2. https://www.youtube.com/watch?v=a2B69vCtjOU&list=PL3-wYxbt4yCjpcfUDz-TgD_ainZ2K3MUZ&index=2

Module-2

Process, Inter process Communication, Threads & CPU Scheduling: Process concept, Process scheduling, Operation on processes, cooperating processes, Inter process communication. Threads - Overview, Multithreading models, Threading issues, P threads, Java threads. CPU scheduling – Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Real time scheduling.

Teaching Learning Process	Active Learning and problem solving 1. https://www.youtube.com/watch?v=HW2Wcx-ktsc 2. https://www.youtube.com/watch?v=9YRxhlvt9Zo

Module-3

Process Synchronization and handling Deadlocks: The Critical section problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, monitors. Deadlock - System model, Deadlock characterization, Methods for handling deadlocks - Deadlock prevention, deadlock avoidance, Deadlock detection and recovery from deadlock.

Teaching Learning Process	Active Learning, Problem solving based on deadlock with animation 1. https://www.youtube.com/watch?v=MYgmmJJfdBg 2. https://www.youtube.com/watch?v=Y14b7_T3AEw&list=PLEJxKK7AcSEGPOCFtQTJh OElU44J_JAun&index=30

Module-4

Storage Management: Main memory management - Background, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging. Virtual memory - Background, Demand paging, Process creation, Page replacement algorithms, Allocation of frames, Thrashing. File System interface - File concept, Access methods, Directory structure, Disk scheduling methods, Disk management, Swap space management.

Teaching Learning Process	Active learning about memory management and File system 1. https://www.youtube.com/watch?v=pJ6qrCB8pDw&list=PLIY8eNdw5tW- BxRY0yK3fYTYVqytw8qhp 2. https://www.youtube.com/watch?v=-orfFhvNBzY

Module-5

Protection and Security : Goals of protection , Domain of protection, Access matrix ,implementation of access matrix, Revocation of access rights, The security problem, Authentication, Program threats, System threats, Securing systems and facilities, Intrusion detection

Teaching Learning Process	Active learning about case studies 1. https://www.youtube.com/watch?v=TTBkc5eiju4 2. https://www.youtube.com/watch?v=8hkvMRGTzCM&list=PLEAYkSg4uSQ2PAch478 muxnoeTNz_QeUJ&index=36 3. https://www.youtube.com/watch?v=mX1FEur4VCw

PRACTICAL COMPONENT OF IPCC

Sl. NO	**Experiments**
1.	Simulate the following CPU scheduling algorithms. a) FCFS b) SJF c) Round Robin d) Priority.
2.	Write a C program to simulate producer-consumer problem using Semaphores
3.	Write a C program to simulate the concept of Dining-philosophers problem.
4.	Write a C program to simulate the following contiguous memory allocation Techniques a) Worst fit b) Best fit c) First fit.
5.	Simulate all page replacement algorithms a)FIFO b) LRU c) OPTIMAL
6.	Simulate all File Organization Techniques a) Single level directory b) Two level directory
7.	Simulate all file allocation strategies a) Sequential b) Indexed c) Linked.
8.	Simulate Bankers Algorithm for Dead Lock Avoidance.
9.	Simulate Bankers Algorithm for Dead Lock Prevention.
10.	Write a C program to simulate disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN

REFERENCE

Course Outcomes (Course Skill Set)

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

CO 1. Describe the importance of computer system resources and the role of operating system in their management

CO 2. Illustrate the process management communication, threads and scheduling of processes by CPU

CO 3. Evaluate the requirement for process synchronization and coordination handled by operating system

CO 4. Implement memory allocation policies and Comprehend the use of different storage management technologies

CO 5. Identify the different aspects of protection, security, authentication and threats

Assessment Details (both CIE and SEE)(IPCC)

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

CIE for the theory component of IPCC

Two Tests each of **20 Marks (duration 01 hour**)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester

Two assignments each of **10 Marks**

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

Scaled-down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test **(duration 02/03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks**.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

SEE for IPCC

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

7. The question paper will have ten questions. Each question is set for 20 marks. Marks scorded shall be proportionally scaled down to 50 Marks
8. 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.
9. The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be proportionally reduced to 50 marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a

CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.

SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in the SEE. Marks scored out of 100 shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th edition, Wiley-India, 2006

Reference Books

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=vBURTt97EkA&list=PLBlnK6fEyqRiVhbXDGLXDk_OQAeuVcp2O
2. https://www.youtube.com/watch?v=783KAB-

tuE4&list=PLIemF3uozcAKTgsCIj82voMK3TMR0YE_f 3. https://www.youtube.com/watch?v=3-ITLMMeeXY&list=PL3pGy4HtqwD0n7bQfHjPnsWzkeR-n6mkO
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Real world problem solving using group discussion. • Role play for process scheduling. • Present animation for Deadlock. • Real world examples of memory management concepts

IV Semester

DESIGN AND ANALYSIS OF ALGORITHMS			
Course Code	**21CB43**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 Theory + 10 Labs	Total Marks	100
Credits	04	Exam Hours	03

Course Learning Objectives:

CLO 1. Explain various computational problem solving techniques.

CLO 2. Apply appropriate method to solve a given problem.

CLO 3. Describe various methods of algorithm analysis.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher 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 HOTS (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 analyse 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

Introduction: What is an Algorithm? (T2:1.1), Algorithm Specification (T2:1.2), Analysis Framework (T1:2.1), Performance Analysis: Space complexity, Time complexity (T2:1.3).), Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Little-oh≠and notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples (T1:2.2, 2.3, 2.4). Important Problem Types: Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. Fundamental Data Structures: Stacks, Queues, Graphs, Trees, Sets and Dictionaries. (T1:1.3,1.4). RBT: L1, L2, L3

Teaching-Learning Process	1. Problem based Learning. 2. Chalk & board, Active Learning. 3. Laboratory Demonstration.

Module-2

Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum (T2:3.1, 3.3, 3.4), Merge sort, Quick sort (T1:4.1, 4.2), Strassen‟s matrix multiplication (T2:3.8), Advantages and Disadvantages of divide and conquer. Decrease and Conquer Approach: Topological Sort. (T1:5.3). Transform and Conquer Approach: Heaps and Heap Sort (T1:6.4). RBT: L1, L2, L3

Teaching-Learning Process	1. Chalk & board, Active Learning, MOOC, Problem based Learning. 2. Laboratory Demonstration.

Module-3

Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines (T2:4.1, 4.3, 4.5). Minimum cost spanning trees: Prim‟s Algorithm, Kruskal‟s Algorithm (T1:9.1, 9.2). Single source shortest paths: Dijkstra's Algorithm (T1:9.3). Optimal Tree problem: Huffman Trees and Codes (T1:9.4). RBT: L1, L2, L3

Teaching-Learning Process	1. Chalk & board, Active Learning, MOOC, Problem based Learning. 2. Laboratory Demonstration.

Module-4

Dynamic Programming: General method with Examples, Multistage Graphs (T2:5.1, 5.2). Transitive Closure: Warshall‟s Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem ((T1:8.2, 8.3, 8.4), Bellman-Ford Algorithm (T2:5.4), Travelling Sales Person problem (T2:5.9), Reliability design (T2:5.8). RBT: L1, L2, L3

Teaching-Learning Process	1. Chalk & board, Active Learning, MOOC, Problem based Learning. 2. Laboratory Demonstration.

Module-5

Backtracking: General method (T2:7.1), N-Queens problem (T1:12.1), Sum of subsets problem (T1:12.1), Graph coloring (T2:7.4), Hamiltonian cycles (T2:7.5). Programme and Bound: Assignment Problem, Travelling Sales Person problem (T1:12.2), 0/1 Knapsack problem (T2:8.2, T1:12.2): LC Programme and Bound solution (T2:8.2), FIFO Programme and Bound solution (T2:8.2). Probabilistic and Randomized Algorithms: Probabilistic Algorithms Randomizing deterministic Algorithms: Randomizing Probelinsrch quicksort, MonteCarlo Algorithm, Biased Monte Carlo Algorithms: A Montecarlo algorithm for testing polynomial quality, Introduction to Las vegas Algorithms (T3:24.1, 24.2,24.3) NP-Complete and NP-Hard problems: Basic concepts, non deterministic algorithms, P,NP, NP-Complete, and NP-Hard classes (T2:11.1). RBT: L1, L2, L3

Teaching-Learning Process	1. Chalk & board, Active Learning, MOOC, Problem based learning. 2. Laboratory Demonstration.

PRACTICAL COMPONENT OF IPCC

Sl. No	Experiment
1	Create a class called Student with the following details as variables within it. (i) USN (ii) Na (iii) Programme (iv) Phone Write a program to create n Student objects and print the US Name, Programme, and Phoneof these objects with suitable headings.
2	Write a program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working
3	Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Inheret this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a C++ program to read and display at least 3 staff objects of all three categories.
4	Write a class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write a functions to read customer data and display.
5	Write a 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.
6	Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/C+ how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
7	Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C/C+ how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
8	Implement the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.

9	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program C/C++
10	Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program

Course outcome (Course Skill Set)

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

CO 1. Describe the basic algorithm design strategies and use them for devising new solutions to various problems

CO 2. Analyse algorithms for time/space complexity

CO 3. Differentiate between deterministic and probabilistic algorithms and use the probabilistic algorithms in appropriate scenariosG

Assessment Details (both CIE and SEE)(IPCC)

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

CIE for the theory component of IPCC

Two Tests each of **20 Marks (duration 01 hour**)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester

Two assignments each of **10 Marks**

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

Scaled-down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test **(duration 02/03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks**.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

SEE for IPCC

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

10. The question paper will have ten questions. Each question is set for 20 marks. Marks scorded shall be proportionally scaled down to 50 Marks
11. 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.
12. The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be proportionally reduced to 50 marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.

SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in the SEE. Marks scored out of 100 shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009. Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.
3. Algorithms, Kenneth A Berman and Jerome L Paul, Cengage Learning India Pvt Ltd, 2002 edition.

Reference Books

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

Web links and Video Lectures (e-Resources):

1. http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS43.html
2. https://nptel.ac.in/courses/106/101/106101060/
3. http://elearning.vtu.ac.in/econtent/courses/video/FEP/ADA.html
4. http://cse01-iiith.vlabs.ac.in/
5. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms

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

1. Real world problem solving and puzzles using group discussion. E.g., Fake coin identification, Peasant, wolf, goat, cabbage puzzle, Konigsberg bridge puzzle etc.,
2. Demonstration of solution to a problem through programming.

IV Semester

OBJECT ORIENTED PROGRAMMING CONCEPTS UING C++			
Course Code	**21CB44**	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. Develop an understanding of the essential principles in object oriented programming
CLO 2. Implement object oriented programming concepts using Object Oriented programmingLanguage
CLO 3. Develop and understand the Constructors and destructors.
CLO 4. Implement the operator overloading using classes.
CLO5. Implementing the File Handling Operations.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher 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 HOTS (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 analyse information rather than simply recallit.
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

Introduction to C++: A Review of Structures, Procedure-Oriented Programming Systems , Object-Oriented Programming Systems , Comparison of C++ with , Console Input/Output in C++ ,Variables in C++ , Reference Variables in C++ , Function Prototyping , Function Overloading 21 , Default Values for Formal Arguments of Functions , Inline Functions.

Classes and Objects: Introduction to Classes and Objects, Member Functions and Member Data, Objects and Functions, Objects and Arrays, Namespaces, Nested Inner Classes.

Teaching-Learning Process	Problem based Learning. Chalk & board, Active Learning.

Module-2

Dynamic Memory Management: Introduction, Dynamic Memory Allocation, Dynamic Memory Deallocation.

Constructors and Destructors: Constructors, Destructors.

Inheritance: Introduction, Base Class and Derived Class Pointers, Function Overriding, Different Kinds of Inheritance.

Teaching-Learning Process	Chalk & board, Active Learning, Problem based Learning.

Module-3

Virtual Functions and Dynamic Polymorphism: Need for Virtual Functions , Virtual Functions ,Mechanism of Virtual Functions, Pure Virtual Functions, Virtual Destructors and VirtualConstructors

Exception Handling: Introduction, C-Style Handling of Error-generating Code, C++-StyleSolution—the try/throw/catch Construct, Limitation of Exception Handling.

Teaching-Learning Process	Chalk & board, Active Learning, Problem based Learning.

Module-4

Operator Overloading, Type Conversion: Operator Overloading, Overloading VariousOperators, Type Conversion, **and Templates**: Introduction, Function Templates, Class Templates.

Teaching-Learning Process	Chalk & board, Active Learning,Problem based Learning.

Module-5

Stream and File Handling: Streams, Hierarchy for Handling Streams, Text and Binary Input/Output, Text Versus Binary Files, Text Output/Input, Binary Output/Input, Opening and Closing Files, File Pointers, Error Handling.

Teaching-Learning Process	Chalk & board, Active Learning, Problem based learning.

Course outcome (Course Skill Set)

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

CO 1. Explain the object-oriented concepts.

CO 2. Develop computer programs to solve real world problems in Java.

CO 3. Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings.

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 out of 50). 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 is 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.
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 Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Text Books

1. Sourav Sahay, "Object Oriented Programming with C++", Oxford University Press,2nd Edition 2006.
2. Herbert Schildt, "Java The Complete Reference", Tata McGraw Hill, 7th Edition, 2007.

Reference Books

1. Mahesh Bhave and Sunil Patekar,"Programming with Java", PearsonEducation, First Edition, 2008.
2. Herbert Schildt, "The Complete Reference C++", Tata McGraw Hill, 4th Edition, 2003.
3. Stanley B.Lippmann, Josee Lajore, "C++ Primer", Pearson Education, 4th Edition, 2005

15.09.2022

IV Semester

OOPS LABORATORY			
Course Code	**21CBL46**	CIE Marks	50
Teaching Hours/Weeks (L: T: P: S)	0: 0: 2: 0	SEE Marks	50
Total Hours of Pedagogy	24	Total Marks	100
Credits	01	Exam Hours	03

Course Objectives:

CLO 1. Asymptotic performance of algorithms.
CLO 2. Linear data structures and their applications such as stacks, queues and lists
CLO 3. Non-Linear data structures and their applications such as trees and graphs
CLO 4. Sorting and searching algorithmsG

Prerequisite

- Students should be familiarized about Python installation and setting Python environment
- Usage of IDLE or IDE like PyCharm should be introduced

Python Installation: https://www.youtube.com/watch?v=Kn1HF3oD19c
PyCharm Installation: https://www.youtube.com/watch?v=SZUNUB6nz3g

Sl. No.	**Experiments**
1.	Write a program to find the sum for the given variables using function with default arguments.
2.	Write a program to swap the values of two variables and demonstrates a function using call by value.
3.	Write a program to create a template function for Bubble Sort and demonstrate sorting of integers and doubles.
4.	Define a STUDENT class with USN, Name, and Marks in 3 tests of a subject. Declare an array of 10 STUDENT objects. Using appropriate functions, find the average of the two better marks for each student. Print the USN, Name and the average marks of all the students.
5.	Write a C++ program to create a class called COMPLEX and implement the following overloading functions ADD that return a complex number: (i) ADD (a, s2) – where 'a' is an integer (real part) and s2 is a complex number (ii) ADD (s1, s2) – where s1 and s2 are complex numbers.
6.	Friend functions and friend classes: a) Write a program to define class name HUSBAND and WIFE that holds the income respectively. Calculate and display the total income of a family using Friend function. b) Write a program to accept the student detail such as name and 3 different marks by get_data() method and display the name and average of marks using display() method. Define a friend class for calculating the average of marks using the method mark_avg()
7.	Create a class called MATRIX using two-dimensional array of integers. Implement the following operations by overloading the operator == which checks the compatibility of two matrices to be added and subtracted. Perform the addition and subtraction by overloading the + and – operators respectively. Display the results by overloading the operator <<. If (m1== m2) then m3 = m1+m2 and m4 = m1- m2 else display error.
8.	Define a class SET with Data members: array of int, int variable to indicate number of elements in a SET object; and Member functions: to read element of a SET object, to print elements of a SET object, to find union of 2 objects of SET using operator overloading (S3=S1+S2), to find intersection of 2 objects of SET using operator overloading (S4= S1*S2). S1, S2, S3 and S4 are objects of SET. Use this class in a main function to show the above operations.
9.	Create an abstract base class EMPLOYEE with data members: Name, EmpID and BasicSal and a pure virtual function Cal_Sal().Create two derived classes MANAGER (with data members: DA and HRA and SALESMAN (with data members: DA, HRA and TA). Write appropriate constructors and member functions to initialize the data, read and write the data and to calculate the net salary. The main() function should create array of base class pointers/references to invoke overridden functions and hence to implement run-time polymorphism.
10.	Write a program to concatenate 2 strings using STL String class functions.

Course Outcomes:

CO 1. Students will gain understanding about the object oriented principles in construction of robust and maintainable programs.

CO 2. A competence to design, write, compile, test and execute programs using high level language.

CO 3. An awareness of the need for a professional approach to design and the importance of good documentation to finish.

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.

- 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 15% 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

IV Semester

INTRODUCTION TO COMPUTER GRAPHICS AND ANIMATION			
Course Code	**21CB481**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	24	Total Marks	100
Credits	01	Exam Hours	01

Course Objectives:

CLO 1. To help the students to understand effective use of Unix concepts, commands and terminology.
CLO 2. Identify, access, and evaluate UNIX file system.
CLO 3. Understand UNIX command syntax and semantics.
CLO 4. Ability to read and understand specifications, scripts and programs.
CLO 5. Analyse Facility with UNIX Process.

Teaching-Learning Process (General Instructions)

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

1. Lecturer method (L) needs 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 analyse 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

Computer Graphics Hardware: Computer Graphics: Basics of computer graphics, Application of Computer Graphics, Video Display Devices: Random Scan and Raster Scan Systems, Graphics Workstation and Viewing Systems, Input Devices, Hard-copy devices, Graphics Networks.

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

Module-2

Computer Graphics Software: Coordinate Representations, Graphics Functions, Software Standards, Other Graphics Package, OpenGL: Introduction to OpenGL

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

Module-3

Graphics Output Primitives- Coordinates References Frames, Specifying a Two Dimensional World coordinates references frame in OpenGL, Open GL Point, Line and Curve Functions.

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

Module-4	
Graphics Output Primitives- Fill Area Primitives, Polygon Fill Areas, Open-GL, Polygon Fill-Area Functions, Open GL Vertex Arrays, Pixel Area Primitives.	
Teaching-Learning Process	Chalk and board, Practical based learning, practical's
Module-5	
Computer Animation: Raster Methods for computer animation, Design of Animation Sequences, Traditional Animation Techniques, OpenGL Animation Procedures.	
Teaching-Learning Process	Chalk and board, Demonstration, problem solving

Course Outcomes (Course Skill Set):

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

- Design and implement algorithms for 2D graphics primitives and attributes.
- Illustrate Geometric transformations on both 2D and 3D objects.
- Apply concepts of clipping and visible surface detection in 2D and 3D viewing, and Illumination Models.
- Decide suitable hardware and software for developing graphics packages using OpenGL.

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 out of 50). 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 Examination (CIE)

Three Tests (preferably in MCQ pattern with 20 questions) 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**

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

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

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

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure minimum of 35% of the maximum marks meant for SEE.

Text Books

1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd / 4th Edition, Pearson Education,2011
2. Edward Angel: Interactive Computer Graphics- A Top Down approach with OpenGL, 5th edition. Pearson Education, 2008.

IV Semester

Fundamentals of Economics			
Course Code	**21CB482**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	24	Total Marks	100
Credits	01	Exam Hours	01

Course Objectives:

CLO 1. To impart knowledge, with respect to concepts, principles of Economics, which govern the functioning of a firm/organization.

CLO 2. To explain the students about concept of production, cost, national income, an aggregate supply and aggregate demand consumption.

Teaching-Learning Process (General Instructions)

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

1. Lecturer method (L) needs not to be only traditional lecture method, but alternative effectiveteaching 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 criticalthinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information ratherthan simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encouragethe 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 of UNIX -Introduction, History, Architecture, Experience the Unix environment, Basic commands ls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, and bc.

Text Book 1: Chapter 1(1.1 to 1.4) , Chapter 2- 2.1

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

Module-2

WELFARE ANALYSIS: Consumers' and Producers' Surplus - Price Ceilings and Price Floors; Consumer Behaviour - Axioms of Choice – Law of diminishing Marginal Utility - Budget Constraints and Indifference Curves; Consumer's Equilibrium - Effects of a Price Change, Income and Substitution Effects -Derivation of a Demand Curve; Applications – Tax and Subsidies - Intertemporal Consumption - Suppliers' Income Effect

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

Module-3

THEORY OF PRODUCTION: Production Function – Types, Return to scale and Iso-quants - Cost Minimization; Cost Curves - Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition

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

Module-4	
INTRODUCTION – MACROECONOMICS BASIC: National Income and its Components - GNP, NNP, GDP, NDP – Methods of measuring National Income; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector - Taxes and Subsidies; External Sector - Exports and Imports, Circular Flow of Money Income.	
Teaching-Learning Process	Chalk and board, Practical based learning, practical's
Module-5	
MONEY – DEFINITIONS: Demand for Money -Transactionary and Speculative Demand; Supply of Money - Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets - IS, LM Model; Business Cycles and Stabilization – Monetary Policy – Objectives, Techniques, Fiscal Policy – Objectives, Types, Instruments, Economic Growth - Central Bank and the Government; The Classical Paradigm - Price and Wage Rigidities - Voluntary and Involuntary Unemployment	
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. Understand basic principles and concepts of Microeconomics and use them to solve real world business problems.

CO 2. Develop an understanding of the basic macroeconomic principles; and appreciate the relationship between key macroeconomic variables such as the investment, savings, inlation, employment, money supply, trade and for ex. etc.

CO 3. Explain the fundamentals of national income and Aggregate supply and aggregate demand consumption.

CO 4. Comprehend the concepts of money and banking.

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 out of 50). 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 Examination (CIE)

Three Tests (preferably in MCQ pattern with 20 questions) 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**

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

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

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

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure minimum of 35% of the maximum marks meant for SEE.

Text Books

1. Robert S.Pindyck, and Daniel L. Rubinfeld, "Microeconomics", Pearson Publishing House, 9th Edition.
2. Dornbusch, Fischer and Startz, "Macroeconomics", McGraw-Hill, 12th Edition.
3. D N Dwivedi, "Macroeconomics: Theory and Policy", McGraw-Hill, 5th Edition.

References:

1. Hal R, Varian,, "Intermediate Microeconomics: A Modern Approach", W W Norton & Co Inc, 8th Edition.
2. N. Gregory Mankiw, "Principles of Macroeconomics", Cengage Learning, 8 th Edition 2017.
3. Paul Anthony Samuelson, William D. Nordhaus, "Economics", McGrawHil, 19th Edition 2011.

IV Semester

UNIX SHELL AND PHP PROGRAMMING			
Course Code	**21CB483**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	24	Total Marks	100
Credits	01	Exam Hours	01

Course Objectives:

CLO 1. To help the students to understand effective use of Unix concepts, commands and terminology.
CLO 2. Identify, access, and evaluate UNIX file system.
CLO 3. Understand UNIX command syntax and semantics.
CLO 4. Ability to read and understand specifications, scripts and programs.
CLO 5. Analyse Facility with UNIX Process.

Teaching-Learning Process (General Instructions)

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

1. Lecturer method (L) needs not to be only traditional lecture method, but alternative effectiveteaching 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 criticalthinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information ratherthan simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encouragethe 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 of UNIX -Introduction, History, Architecture, Experience the Unix environment, Basic commands ls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, and bc.
Text Book 1: Chapter 1(1.1 to 1.4) , Chapter 2- 2.1

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

Module-2

UNIX File System-The file, what's in a filename? The parent-child relationship, pwd, the Home directory, absolute pathnames, using absolute pathnames for a command, cd, mkdir, rmdir, Relative pathnames, The UNIX file system.
Text Book 1: Chapter 4

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

Module-3

Basic File Attributes - Is – l, the –d option, File Permissions, chmod, Security and File Permission, users and groups, security level, changing permission, user masks, changing ownership and group, File Attributes, More file attributes: hard link, symbolic link, umask, find.
Text Book 1: Chapter 6

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

Module-4	
Introduction to the Shell Scripting -Introduction to Shell Scripting, Shell Scripts, read, Command Line Arguments, Exit Status of a Command, The Logical Operators && and ||, exit, if, and case conditions, expr, sleep and wait, while, until, for, $, @, redirection. The here document, set, trap, Sample Validation and Data Entry Scripts. **Text Book 1: Chapter 11,12,14**	
Teaching-Learning Process	Chalk and board, Practical based learning, practical's
Module-5	
Introduction to PHP: Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression. **Text Book 2**	
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 Unix concepts and commands.
CO 2. Evaluate the UNIX file system.
CO 3. Apply Changes in file system.
CO 4. Understand scripts and programs.
CO 5. Analyse Facility with UNIX system process

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 out of 50). 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 Examination (CIE)

Three Tests (preferably in MCQ pattern with 20 questions) 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**

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

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

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

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to

secure minimum of 35% of the maximum marks meant for SEE
Text Books 1. Unix Concepts & Applications 4rth Edition, Sumitabha Das, Tata McGraw Hill 2. Learning PHP, MySQL, books by ' O' riley Press References: 1. Unix Shell Programming, Yashwant Kanetkar 2. Introduction to UNIX by M G Venkatesh Murthy.
Web links and Video Lectures (e-Resources): 3. https://www.youtube.com/watch?v=ffYUfAqEamY 4. https://www.youtube.com/watch?v=Q05NZiYFcD0 5. https://www.youtube.com/watch?v=8GdT53KDIyY 6. https://www.youtube.com/watch?app=desktop&v=3Pga3y7rCgo
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Real world problem solving using group discussion. • Real world examples of Linux operating system Utilizations.

IV Semester

R PROGRAMMING			
Course Code	**21CB484**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0:0	SEE Marks	50
Total Hours of Pedagogy	24	Total Marks	100
Credits	01	Exam Hours	01

Course Objectives:

CLO 1. Explore and understand how R and R Studio interactive environment.
CLO 2. To learn and practice programming techniques using R programming.
CLO 3. Read Structured Data into R from various sources.
CLO 4. Understand the different data Structures, data types in R.
CLO 5. To develop small applications using R Programming

Teaching-Learning Process (General Instructions)

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

1. Lecturer method (L) needs 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 analyse 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

Numeric, Arithmetic, Assignment, and Vectors: R for Basic Math, Arithmetic, Variables, Functions, Vectors, Expressions and assignments Logical expressions.
Text Book 1: Chapter 2(2.1 to 2.7)

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

Module-2

Matrices and Arrays: Defining a Matrix, Sub-setting, Matrix Operations, **Conditions and Looping:** if statements, looping with for, looping with while, vector based programming.
Text Book 1: Chapter 2- 2.8, chapter 3- 3.2 to 3.5

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

Module-3

Lists and Data Frames: Data Frames, **Lists,** Special values, The apply facmily.
Text Book 1: Chapter 6- 6.2 to 6.4

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

Module-4

Functions: Calling functions, scoping, Arguments matching, writing functions: The function command,

Arguments, specialized function. **Text Book 1: Chapter 5- 5.1 to 5.6**	
Teaching-Learning Process	Chalk and board, Practical based learning, practical's
Module-5	
Pointers: packages, frames, de bugging, manipulation of code, compilation of the code. **Text Book 1: Chapter 8- 8.1 to 8.8**	
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. To understand the fundamental syntax of R through readings, practice exercises,
CO 2. To demonstrations, and writing R code.
CO 3. To apply critical programming language concepts such as data types, iteration,
CO 4. To understand control structures, functions, and Boolean operators by writing R programs and through examples
CO 5. To import a variety of data formats into R using R-Studio
CO 6. To prepare or tidy data for in preparation for analyse.

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 out of 50). 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 Examination (CIE)

Three Tests (preferably in MCQ pattern with 20 questions) 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**

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

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

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

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure minimum of 35% of the maximum marks meant for SEE.

Textbooks

1. Jones, O., Maillardet. R. and Robinson, A. (2014). Introduction to Scientific Programming and Simulation Using R. Chapman & Hall/CRC, The R Series.

References:

1. Michael J. Crawley, "Statistics: An Introduction using R", Second edition, Wiley,2015

Web links and Video Lectures (e-Resources):

1. Wickham, H. & Grolemund, G. (2018). for Data Science. O'Reilly: New York. Available for free at http://r4ds.had.co.nz

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

- **Demonstration of simple projects**

V Semester

SOFTWARE ENGINEERING			
Course Code	**21CB51**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning Objectives

CLO 1. Identify ethical and professional issues and explain why they are of concern to software engineers.
CLO 2. Recognize the importance of software maintenance and describe the intricacies involved in software evolution.
CLO 3. Apply estimation techniques, schedule project activities and compute pricing.
CLO 4. Identify software quality parameters and quantify software using measurements and metrics.
CLO 5. Recognize the need for agile software development, describe agile methods, apply agile practices and plan for agility.

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: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. Software Processes: Models: Waterfall Model, Incremental Model and Spiral Model, Process activities. Requirements Engineering: Requirements Engineering Processes. Requirements Elicitation and Analysis, Functional and non-functional requirements. The software Requirements Document, Requirements Specification, Requirements validation, Requirements Management.

Teaching-Learning Process	Chalk and board, Active Learning, Problem based learning
Module-2	
System Models: Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering. Design and Implementation: Introduction to RUP, Design Principles, Object-oriented design using the UML, Design patterns, Implementation issues, Open source development.	
Teaching-Learning Process	Chalk and board, Active Learning, Demonstration
Module-3	
Software Testing: Development testing, Test-driven development, Release testing, User testing, Test Automation. Software Evolution: Evolution processes, Program evolution dynamics, Software maintenance, Legacy system management	
Teaching-Learning Process	Chalk and board, Active Learning, Demonstration
Module-4	
Project management: Risk management, Managing People, Teamwork. Project Planning: Software pricing, Plan-driven development, Project scheduling: Estimation techniques, Quality management: Software quality, Reviews and inspections, Software measurement and metrics, Software standards	
Teaching-Learning Process	Chalk and board, Active Learning, Demonstration
Module-5	
Agile Software Development: Coping with Change, The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref "The SCRUM Primer, Ver 2.0") and Extreme Programming. Plan-driven and agile development. Agile project management, Scaling agile methods.	

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

Course Outcomes

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

CO 1. Design a software system, component, or process to meet desired needs within realistic constraints.

CO 2. Assess professional and ethical responsibility

CO 3.Function on multi-disciplinary teams

CO 4. Use the techniques, skills, and modern engineering tools necessary for engineering practice

CO 5. Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.

Reference Books:

1. Roger S. Pressman, "Software Engineering-A Practitioners approach", Tata McGraw Hil, 7th Edition
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

Weblinks and Video Lectures (e-Resources):

1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2. https://www.youtube.com/watch?v=WxkP5KR_Emk&list=PLrjkTql3jnm9b5nr-ggx7Pt1G4UAHeFlJ
3. http://elearning.vtu.ac.in/econtent/CSE.php
4. http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html
5. https://nptel.ac.in/courses/128/106/128106012/ (DevOps)

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

Case study, Field visit

V Semester

COMPUTER NETWORKS			
Course Code:	**21CB52**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 Theory + 10 Labs	Total Marks	100
Credits	04	Exam Hours	03

Course Objectives:

CLO 1. Fundamentals of data communication networks.
CLO 2. Software and hardware interfaces
CLO 3. Application of various physical components and protocols
CLO 4. Communication challenges and remedies in the networks.

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 to networks: Network hardware, Network software, Reference models,

Physical Layer: Guided transmission media, Wireless transmission

Textbook 1: Ch.1.2 to 1.4, Ch.2.2 to 2.3

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

Module-2

The Data link layer: Design issues of DLL, Error detection and correction, Elementary data link protocols, Sliding window protocols.

The medium access control sublayer: The channel allocation problem, Multiple access protocols.

Textbook 1: Ch.3.1 to 3.4, Ch.4.1 and 4.2

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

Module-3

The Network Layer:
Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, QoS.

Textbook 1: Ch 5.1 to 5.4

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

Module-4

The Transport Layer: The Transport Service, Elements of transport protocols, Congestion control, The internet transport protocols.

Textbook 1: Ch 6.1 to 6.4 and 6.5.1 to 6.5.7

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

Module-5

Application Layer: Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service.

Textbook 2: Ch 2.1 to 2.4

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

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Implement Three nodes point – to – point network with duplex links between them for different topologies. 1Set the queue size, vary the bandwidth, and find the number of packets dropped for various iterations.
2	Implement simple ESS and with transmitting nodes in wire
3	Write a program for error detecting code using CRC
4	Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion in the network.
5	Write a program to find the shortest path between vertices using bellman-ford algorithm.
6	Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
7	Write a program for congestion control using leaky bucket algorithm.

Course Outcomes (Course Skill Set)

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

CO 1. Learn the basic needs of communication system.
CO 2. Interpret the communication challenges and its solution.
CO 3. Identify and organize the communication system network components
CO 4. Design communication networks for user requirements.

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

CIE for the theory component of IPCC

Two Tests each of **20 Marks (duration 01 hour**)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester

Two assignments each of **10 Marks**

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

Scaled-down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test **(duration 03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks**.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

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SEE for IPCC

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

1. The question paper will have ten questions. Each question is set for 20 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.
3. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.

SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in the SEE. Marks secured will be scaled down to 50.

Suggested Learning Resources:

Textbooks:

1. Computer-Networks- Andrew S. Tanenbaum and David J. Wetherall, Pearson Education, 5th-Edition. (www.pearsonhighered.com/tanenbaum)
2. Computer Networking A Top-Down Approach -James F. Kurose and Keith W. RossPearson Education 7th Edition.

Reference Books:

1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill,Indian Edition
2. Larry L Peterson and Brusce S Davie, Computer Networks, fifth edition, ELSEVIER

Weblinks and Video Lectures (e-Resources):

1. https://www.digimat.in/nptel/courses/video/106105183/L01.html
2. http://www.digimat.in/nptel/courses/video/106105081/L25.html
3. https://nptel.ac.in/courses/106105081
4. VTU e-Shikshana Program

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

Simulation of Personal area network, Home area network, achieve QoS etc.

Note: For the Simulation experiments modify the topology and parameters set for the experiment and take multiple rounds of reading and analyze the results available in log files. Plot necessary graphs and conclude using NS2. Installation procedure of the required software must be demonstrated, carried out in groups, and documented in the report. Non simulation programs can be implemented using Java

V Semester

DATA BASE MANAGEMENT SYSTEMS			
Course Code	**21CB53**	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. Provide a strong foundation in database concepts, technology, and practice.
CLO 2. Practice SQL programming through a variety of database problems.
CLO 3. Demonstrate the use of concurrency and transactions in database
CLO 4. Design and build database applications for real world problems.

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 Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications.

Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema
architecture and data independence, database languages, and interfaces, The Database System environment.

Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, Examples

Textbook 1: Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.7

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

Module-2

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.

Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra.

Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping.

Textbook 1:, Ch 5.1 to 5.3, 8.1 to 8.5, 9.1;

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

Module-3

SQL: SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL.

Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL.
Database

Application Development: Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop.

Textbook 1: Ch 6.1 to 6.5, 7.1 to 7.4; Textbook 2: 6.1 to 6.6;

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

Module-4

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. Examples on normal forms.

Normalization Algorithms: Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms

Textbook 1: Ch 14.1 to -14.7, 15.1 to 15.6

Teaching-Learning Process	Chalk& board, Problem based learning

Module-5

Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL.

Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking.

Textbook 1: Ch 20.1 to 20.6, 21.1 to 21.7;

Teaching-Learning Process	Chalk and board, MOOC

Course Outcomes

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

CO 1. Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS

CO 2. Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.

CO 3. Design and build simple database systems and *relate* the concept of transaction, concurrency control and recovery in database

CO 4. Develop application to interact with databases, relational algebra expression.

CO 5. Develop applications using tuple and domain relation expression from queries.

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 out of 50). 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 is 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.

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 Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

Reference Books:

NIL

Weblinks and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=3EJlovevfcA
2. https://www.youtube.com/watch?v=9TwMRs3qTcU
3. https://www.youtube.com/watch?v=ZWl0Xow304I
4. https://www.youtube.com/watch?v=4YilEjkNPrQ
5. https://www.youtube.com/watch?v=CZTkgMoqVss
6. https://www.youtube.com/watch?v=Hl4NZB1XR9c
7. https://www.youtube.com/watch?v=EGEwkad_llA
8. https://www.youtube.com/watch?v=t5hsV9lC1rU

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

Demonstration of real time Database projects - E-commerce Platform, Inventory Management, Railway System, College Data Management, Library Data Management, Solution for Saving Student Records, Hospital Data Management, Blood Donation Management.

V Semester

BUSINESS COMMUNICATION ANDVALUE SCIENCE – II			
Course Code	**21CB54**	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. Develop effective writing, reading, presentation and group discussion skills. Motivate students to look within and create a better version of self. Help students identify personality traits and evolve as a better team player.

CLO 2. Introduce them to key concepts of Morality, Behavior and beliefs and Diversity & Inclusion Identification of common errors in written communication and ways of rectification

CLO 3. Understanding speed reading techniques – Skimming and Scanning, application of reading and writing skills, Analyzing personality traits and team player style and understanding the concepts of Morality, Diversity and Inclusion

CLO 4. Creation of communication material and Experiencing diversity and organizing events to support inclusion

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

Identification of common errors in written communication and ways of rectification - Understanding speed reading techniques – Skimming and Scanning - Application of reading and writing skills.

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

Module-2

Analyzing personality traits - team player style - Understanding the concepts of Morality - Diversity and Inclusion - Application of these concepts.

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

Module-3

Creation of communication material – Experiencing diversity - Organizing events to support inclusion - Assignment – Assimilation of concepts and present them effectively.

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

Module-4

Self - Assessment, Self - Appraisal, SWOT, Goal setting - Personal & career- Self-Assessment, SelfAwareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self - appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting, and prioritization.

Teaching-Learning Process	Chalk& board, Problem based learning

Module-5

Corporate grooming and dressing, etiquettes in social and office Setting-Understand the importance of professional behavior at the work place, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities

Teaching-Learning Process	Chalk and board, MOOC

Course Outcomes

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

CO 1. Understand tools of structured written communication and basics of presentation skills.
CO 2. Apply the basic concept of speed reading, skimming and scanning.
CO 3. Understand and identifying the individual personality types and their role in a team along with the concept ofmorality and diversity.
CO 4. Recognize the concept of outward behavior and internal behavior.
CO 5. Organize an event to generate awareness and get support for a cause through communicative ability.

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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 Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Sandra Moriaty, Nancy D.Mitchell, William D.Wells, "Advertising & IMC: Principles and Practice", Pearson Education India, 15 June 2016.
2. Simon Sinek, "Start With Why: How GreatLeaders Inspire Everyone toTake Action", Penguin Publishers., 2011.
3. Peter H. Diamandis &Steven Kotler, "Abundance: The Future isBetter Than You Think", Simon &Schuster., 2012.

Reference Books:

1. Dr. A.P.J. Abdul Kalam, & Arun Tiwari, "Guiding Souls: Dialogues on the purpose of life", Ocean Books Pvt.Ltd, 2005.
2. Dr. A.P.J. Abdul Kalam & Acharya Mahapragya, "The Family and the Nation", HarperCollins Publishers India,a joint venture with India Today, New Delhi, 2015.
3. Dr. A.P.J Abdul Kalam & Y.S. Rajan, "The Scientific Indian: A Twenty First Century Guide to the WorldAround Us", Penguin Viking, 2011.
4. Dr.A.P.J. Abdul, Kalam, "Forge Your Future: Candid, Forthright, Inspiring", Rajpal & Sons, 2014

V Semester

DATABASE MANAGEMENT SYSTEM LABORATORY			
Course Code	**21CBL55**	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	01	Exam Hours	03

Course Learning Objectives:

CLO 1. Foundation knowledge in database concepts, technology and practice to groom students into well-informed database application developers.

CLO 2. Strong practice in SQL programming through a variety of database problems.

CLO 3. Develop database applications using front-end tools and back-end DBMS..

Sl. No.	PART-A: SQL Programming (Max. Exam Marks. 50)
	Design, develop, and implement the specified queries for the following problems using Oracle, MySQL, MS SQL Server, or any other DBMS under LINUX/Windows environment. Create Schema and insert at least 5 records for each table. Add appropriate database constraints.
1	Aim: Demonstrating creation of tables, applying the view concepts on the tables. ProgramConsider the following schema for a Library Database: **BOOK(Book_id, Title, Publisher_Name, Pub_Year)** **BOOK_AUTHORS(Book_id, Author_Name)** **PUBLISHER(Name, Address, Phone)** **BOOK_COPIES(Book_id, Programme_id, No-of_Copies)** **BOOK_LENDING(Book_id, Programme_id, Card_No, Date_Out, Due_Date)** **LIBRARY_PROGRAMME(Programme_id, Programme_Name, Address)** Write SQL queries to 1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc. 2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017. 3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query. 5. Create a view of all books and its number of copies that are currently available in the Library. Reference: https://www.youtube.com/watch?v=AaSU-AOguls https://www.youtube.com/watch?v=-EwEvJxS-Fw
2	Aim: Discuss the various concepts on constraints and update operations. Program: Consider the following schema for Order Database: **SALESMAN(Salesman_id, Name, City, Commission)** **CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id)** **ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)** Write SQL queries to Count the customers with grades above Bangalore's average. 2. Find the name and numbers of all salesman who had more than one customer. 3. List all the salesman and indicate those who have and don't have customers in their cities (Use UNION operation.) 4. Create a view that finds the salesman who has the customer with the highest order of a day. 5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted. Reference: https://www.youtube.com/watch?v=AA-KL1jbMeY

	https://www.youtube.com/watch?v=7S_tz1z_5bA
3	Aim: Demonstrate the concepts of JOIN operations. Program: Consider the schema for Movie Database: **ACTOR(Act_id, Act_Name, Act_Gender)** **DIRECTOR(Dir_id, Dir_Name, Dir_Phone)** **MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)** **MOVIE_CAST(Act_id, Mov_id, Role)** **RATING(Mov_id, Rev_Stars)** Write SQL queries to 1. List the titles of all movies directed by 'Hitchcock'. 2. Find the movie names where one or more actors acted in two or more movies. 3. List all actors who acted in a movie before 2000 and also in a movie after 2015(use JOIN operation). 4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title. 5. Update rating of all movies directed by 'Steven Spielberg' to 5. Reference: https://www.youtube.com/watch?v=hSiCUNVKJAo https://www.youtube.com/watch?v=Eod3aQkFz84
4	Aim: Introduce concepts of PLSQL and usage on the table. Program: Consider the schema for College Database: **STUDENT(USN, SName, Address, Phone, Gender)** **SEMSEC(SSID, Sem, Sec)** **CLASS(USN, SSID)** **COURSE(Subcode, Title, Sem, Credits)** **IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)** Write SQL queries to 1. List all the student details studying in fourth semester 'C' section. 2. Compute the total number of male and female students in each semester and in each section. 3. Create a view of Test1 marks of student USN '1BI15CS101' in all Courses. 4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students. 5. Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = 'Outstanding' If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA< 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C section students. Reference: https://www.youtube.com/watch?v=horURQewW9c https://www.youtube.com/watch?v=P7-wKbKrAhk
5	Aim: Demonstrate the core concepts on table like nested and correlated nesting queries and also EXISTS and NOT EXISTS keywords. Program: Consider the schema for Company Database: **EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo)** **DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate)** **DLOCATION(DNo,DLoc)** **PROJECT(PNo, PName, PLocation, DNo)** **WORKS_ON(SSN, PNo, Hours)** Write SQL queries to Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.

	Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator). For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs.6,00,000. **Reference:** https://www.youtube.com/watch?v=Dk8f3ejqKts

Course Outcomes:

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

CO 1. Create, Update and query on the database.

CO 2. Demonstrate the working of different concepts of DBMS

CO 3. Implement, analyze and evaluate the project developed for an application.

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 an 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)
- 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

Textbooks:

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

Suggested Weblinks/ E Resource

https://www.tutorialspoint.com/sql/index.htm

V Semester

SOFTWARE DESIGN AND DESIGN THINKING			
Course Code:	**21CB581**	CIE Marks	50
Teaching Hours/Week	0:2:0:0	SEE Marks	50
Total No. of Hours	24	Total Marks	100
Credits	01	Exam Hours	01

Course Learning Objectives: The student should be made to:

CLO 1. To know the correctness of software design as per the requirement.
CLO 2. To learn the design components like data structures, modules, and external interfaces.
CLO 3. To explain the concept of design thinking for product and service development.
CLO 4. To explain the fundamental concept of innovation and design thinking.
CLO 5. To discuss the methods of implementing design thinking in the real world.

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 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

Design Pattern Catalog: Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy. Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Template Method

Textbook 1 and RBT

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

Module-2

Interactive systems and the MVC architecture:
Introduction, The MVC architectural pattern, analyzing a simple drawing program, designing the system, designing of the subsystems, getting into implementation, implementing undo operation, drawing incomplete items, adding a new feature, pattern-based solutions.

Textbook 1 and RBT

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

Module-3

Designing with Distributed Objects:
Client server system, java remote method invocation, implementing an object-oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.

Textbook 1 and RBT

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

Module-4

PROCESS OF DESIGN: Understanding Design thinking: Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping

Textbook 1 and RBT

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

Module-5

Tools for Design Thinking Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design.

Textbook 1 and RBT	
Teaching-Learning Process	Chalk and board, Active Learning, practical based learning

Course Outcomes (Course Skill Set)

- At the end of the course the student will be able to:
  CO 1. Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary.
  CO 2. Be able to select and apply suitable patterns in specific contexts
  CO 3. Appreciate various design process procedure
  CO 4. Generate and develop design ideas through different technique
  CO 5. Identify the significance of reverse Engineering to Understand products

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 out of 50). 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 Examination (CIE)

Three Tests (preferably in MCQ pattern with 20 questions) 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**

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

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

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

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure minimum of 35% of the maximum marks meant for SEE.

Suggested Learning Resources:

Textbooks

1. Erich Gamma, Richard Helan, Ralph Johman,John Vlissides, “Design Patterns”, Pearson Publication, 2013.
2. Brahma Dathan, Sarnath Rammath, “Object-oriented analysis, design and implementation”, Universities Press, 2013.
3. Plattner, “Design Thinking: Understand Improve – Apply”, Springer, 2011.

Reference Books

1. Frank Bachmann, ReginеMeunier, Hans Rohnert, “Pattern Oriented Software Architecture”, Universities Press, Volume 1, 1996.
2. William J Brown et al, “Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis”, John Wiley, 1998.

Weblinks and Video Lectures (e-Resources):

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

- Demonstration of simple projects

V Semester

FINANCIAL MANAGEMENT			
Course Code:	**21CB582**	CIE Marks	50
Teaching Hours/Week	0:2:0:0	SEE Marks	50
Total No. of Hours	24	Total Marks	100
Credits	01	Exam Hours	1

- **Course Learning Objectives:** The student should be made to:
  CLO 1. To familiarize the students with basic concepts of financial management
  CLO 2. To understand concept of time value of money and its uses.
  CLO 3. To evaluate the investment proposals.
  CLO 4. To analyze capital structure and dividend decision.

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 ratherthan simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different logic and encourage the 0students 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
9. improve the students' understanding.

Module-1	
Financial Management – Introduction to financial management, objectives , Functions and Goals of financial management. Finance – Profit Maximisation, Wealth Maximisation, Financial Decisions. Sources of Financing - Shares, Debentures, Term loans, Lease financing, Hybrid financing, Venture Capital, Angel investing and private equity,(Theory only)	
Teaching-Learning Process	Chalk and board, Active Learning, practical based learning
Module-2	
Time value of money –Future value of single cash flow & annuity, present value of single cash flow, annuity & perpetuity. Simple interest & Compound interest. (Theory & Problem). Working capital management – factors influencing working capital requirements - Current asset policy and current asset finance policyDetermination of operating cycle and cash cycle - Estimation of working capital requirements of a firm. (Theory & Problem).	
Teaching-Learning Process	Chalk and board, Active Learning, practical based learning
Module-3	
Capital Structure : Meaning of Capital structure – optimum Capital Structure ; Factors determining capital structure – Leverages – Operating leverage, Financial Leverage and Combined Leverage – EPS analysis – (Theory & Problem).	
Teaching-Learning Process	Chalk and board, Active Learning, practical based learning
Module-4	
Investment decisions – Meaning and significance of Capital Budgeting. Investment evaluation criteria- Pay-back period, Net Present Value, Accounting Rate of Return. Internal Rate of Return- (Theory & Problem).	
Teaching-Learning Process	Chalk and board, Active Learning, practical based learning
Module-5	
Dividend Decisions : Meaning - Dividend policy ,Types of Dividend policies -– Factors affecting the dividend policy - Dividend decisions. (Theory only)	
Teaching-Learning Process	Chalk and board, Active Learning, practical based learning

Course Outcomes (Course Skill Set)

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

CO 1. Understand the basic financial concepts.
CO 2. Apply time value of money.
CO 3. Evaluate the investment decisions.
CO 4. Analyze the capital structure and dividend decisions.
CO 5. Estimate working capital requirements.

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 out of 50). 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 Examination (CIE)

Three Tests (preferably in MCQ pattern with 20 questions) 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**

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

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

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

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure minimum of 35% of the maximum marks meant for SEE.

Suggested Learning Resources:
Textbooks M Y Khan ,P K Jain, "Financial Management", Tata Mc Graw –Hill PublishingCompany Limited, 4th Edition Prasanna Chandra, "Financial Management", Tata Mc Graw –Hill PublishingCompany Limited, 9th Edition **Reference Books** I.M. Pandey, "Essentials of FinancialManagement", Vikas PublishingHouse PvtLimited. S.C. Kucchal, "Financial Management", Vikas PublishingHouse PvtLimited.
Weblinks and Video Lectures (e-Resources):
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Demonstration of simple projects

Semester -V

ANGULAR JS			
Course Code	**21CSL581/ 21CBL583**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Total marks	100
Examination type (SEE)	PRACTICAL		

Course objectives:

- To learn the basics of Angular JS framework.
- To understand the Angular JS Modules, Forms, inputs, expression, data bindings and Filters
- To gain experience of modern tool usage (VS Code, Atom or any other] in developing Web applications

Sl.NO	Experiments
1	Develop Angular JS program that allows user to input their first name and last name and display their full name. **Note**: The default values for first name and last name may be included in the program.
2	Develop an Angular JS application that displays a list of shopping items. Allow users to add and remove items from the list using directives and controllers.**Note**: The default values of items may be included in the program.
3	Develop a simple Angular JS calculator application that can perform basic mathematical operations (addition, subtraction, multiplication, division) based on user input.
4	Write an Angular JS application that can calculate factorial and compute square based on given user input.
5	Develop AngularJS application that displays a details of students and their CGPA. Allow users to read the number of students and display the count. **Note**: Student details may be included in the program.
6	Develop an AngularJS program to create a simple to-do list application. Allow users to add, edit, and delete tasks.**Note**: The default values for tasks may be included in the program.
7	Write an AngularJS program to create a simple CRUD application (Create, Read, Update, and Delete) for managing users.
8	DevelopAngularJS program to create a login form, with validation for the username and password fields.
9	Create an AngularJS application that displays a list of employees and their salaries. Allow users to search for employees by name and salary. **Note**: Employee details may be included in the program.
10	Create AngularJS application that allows users to maintain a collection of items. The application should display the current total number of items, and this count should automatically update as items are added or removed. Users should be able to add items to the collection and remove them as needed. **Note**: The default values for items may be included in the program.
11	Create AngularJS application to convert student details to Uppercase using angular filters. **Note**: The default details of students may be included in the program.
12	Create an AngularJS application that displays the date by using date filter parameters

NOTE: Include necessary HTML elementsand CSS for the above Angular applications.

Course outcomes (Course Skill Set):

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

1. Develop Angular JS programs using basic features
2. Develop dynamic Web applications using AngularJS modules
3. Make use of form validations and controls for interactive applications
4. Appy the concepts of Expressions, data bindings and filters in developing Angular JS programs
5. Make use of modern tools to develop Web applications

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). The student has to secure a minimum of 40% (40 marks out of 100) in the sum totaloftheCIE(ContinuousInternalEvaluation)andSEE (SemesterEndExamination)takentogether.

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 practicalsession.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximummarks).
- Weightage to be given for neatness and submission of record/write-up ontime.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8$^{t^}$ week of the semester and the second test shall be conducted after the 14$^{'h}$ week of thesemester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% forviva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulationbook
- 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 50Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by theUniversity
- All laboratory experiments are to be included for practicalexamination.
- (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 byexaminers.
- Students can pick one question (experiment) from the questions lot prepared by theinternal/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, write up -20%, Conduction procedureand 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 bythe examiners)
- The duration of SEE is 02hours

Rubrics suggested in Annexure-lI of Regulation book

Suggested Learning Resources:

Textbooks

1. ShyamSeshadri, Brad Green —"AngularJS: Up and Running: Enhanced Productivity with Structured Web Apps", Apress, 0'Reilly Media,Inc.
2. AgusKurniawan–"AngularJS Programming by Example", First Edition, PE Press, 2014

Weblinks and Video Lectures (e-Resources):

1. Introduction to Angular JS :https://www.youtube.com/watch?v=HEbphzK-0xE
2. Angular JS Modules :https://www.youtube.com/watch?v=gWm0KmgnQkU
3. https://www.youtube.com/watch?v=zKkUN-mJtPQ
4. https://www.youtube.com/watch?v=ICl7_i2mtZA
5. https://www.youtube.com/watch?v=Y2Few_nkze0
6. https://www.youtube.com/watch?v=QoptnVCQHsU

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

- Demonstration of simpleprojects/applications (course project)

Semester -V

C# PROGRAMMING			
Course Code	21CSL582/ 21CBL584	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0/ 24 Hours	SEE Marks	50
Credits	01	Total marks	100
Examination type (SEE)	PRACTICAL		

Course objectives:

- To learn basic features of C# programming
- To understand C# support for OOP with programming examples
- To gain experience of modern tool usage (VS Code, Visual Studio or any other] in developing C# programs

Sl.NO	Experiments
1	Develop a C# program to simulate simple arithmetic calculator for Addition, Subtraction, Multiplication, Division and Mod operations. Read the operator and operands through console.
2	Develop a C# program to print Armstrong Number between 1 to 1000.
3	Develop a C# program to list all substrings in a given string. [Hint: use of Substring() method]
4	Develop a C# program to demonstrate Division by Zero and Index Out of Range exceptions.
5	Develop a C# program to generate and printPascal Triangle using Two Dimensional arrays.
6	Develop a C# program to generate and print Floyds Triangle using Jagged arrays.
7	Develop a C# program to read a text file and copy the file contents to another text file.
8	Develop a C# C# Program to Implement Stack with Push and Pop Operations [Hint: Use class, get/set properties, methods for push and pop and main method]
9	Design a class "Complex" with data members, constructor and method for overloading a binary operator '+'. Develop a C# program to read Two complex number and Print the results of addition.
10	Develop a C# program to create a class named shape. Create three sub classes namely: circle, triangle and square, each class has two member functions named draw () and erase (). Demonstrate polymorphism concepts by developing suitable methods, defining member data and main program.
11	Develop a C# program to create an abstract class Shape with abstract methods calculateArea() and calculatePerimeter(). Create subclasses Circle and Triangle that extend the Shape class and implement the respective methods to calculate the area and perimeter of each shape.
12	Develop a C# program to create an interface Resizable with methods resizeWidth(int width) and resizeHeight(int height) that allow an object to be resized. Create a class Rectangle that implements the Resizable interface and implements the resize methods

Course outcomes (Course Skill Set):

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

1. Develop programs involving basic features of C# programming language
2. Make use of exception handling features to safeguard program against runtime anomalies
3. Apply concepts of OOP in developing solutions to problems
4. Develop programs to illustrate handling of text files
5. Make use of modern tools to develop C# programs and applications

Updated as Practical Course on 03.11.2023

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). The student has to secure 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 to gether.

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 10marks.
- 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 ontime.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8^{t}^ week of the semester and the second test shall be conducted after the 14'^{h} week of thesemester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% forviva-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

Semester End Evaluation (SEE):

- SEE marks for the practical course is 50Marks.
- 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, write up -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 02hours

Rubrics suggested in Annexure-lI of Regulation book

Suggested Learning Resources:

Textbooks

1. Herbert Schildt, "The Complete Reference: C# 4.0", Tata McGraw Hill, 2012
2. Andrew Troelsen, "Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010.

Weblinks and Video Lectures (e-Resources):

1. Introduction to C#: https://www.youtube.com/watch?v=ItoIFCT9P90
2. .NET FRAMEWORK: https://www.youtube.com/watch?v=h7huHkvPoEE
3. https://www.tutorialsteacher.com/csharp
4. https://www.w3schools.com/cs/index.php
5. https://www.javatpoint.com/net-framework

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

- Demonstration of simple projects (course project)

VI Semester

MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY			
Course Code	**21CB61**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3

Course Learning Objectives:

CLO 1. Explain the principles of management, organization and entrepreneur.

CLO 2. Discuss on planning, staffing, ERP and their importance

CLO 3.Infer the importance of intellectual property rights and relate the institutional support

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 ratherthan simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encouragethe 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 - Meaning, nature and characteristics of management, scope and Functional areas of management, goals of management, levels of management, brief overview of evolution of management theories,. Planning- Nature, importance, types of plans, steps in planning, Organizing- nature and purpose, types of Organization, Staffing- meaning, process of recruitment and selection

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

Module-2

Directing and controlling- meaning and nature of directing, leadership styles, motivation Theories, Communication- Meaning and importance, Coordination- meaning and importance, Controlling- meaning, steps in controlling, methods of establishing control.

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

Module-3

Entrepreneur – meaning of entrepreneur, characteristics of entrepreneurs, classification and types of entrepreneurs, various stages in entrepreneurial process, role of entrepreneurs in economic development, entrepreneurship in India and barriers to entrepreneurship. Identification of business opportunities, market feasibility study, technical feasibility study, financial feasibility study and social feasibility study.

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

Module-4

Preparation of project and ERP - meaning of project, project identification, project selection, project report, need and significance of project report, contents, formulation, guidelines by planning commission for project report, Enterprise Resource Planning: Meaning and Importance- ERP and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation

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

Module-5

Micro and Small Enterprises: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in establishing micro and small enterprises, Government of India indusial policy 2007 on micro and small enterprises, case study (Microsoft), Case study(Captain G R Gopinath),case study (N R Narayana Murthy & Infosys), Institutional support: MSME-DI, NSIC, SIDBI, KIADB, KSSIDC, TECSOK, KSFC, DIC and District level single window agency, Introduction to IPR.

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

Course outcome (Course Skill Set): At the end of the course the student will be able to :

CO 1. Define management, organization, entrepreneur, planning, staffing, ERP and outline their importance in entrepreneurship

CO 2. Utilize the resources available effectively through ERP

O 3. Make use of IPRs and institutional support in entrepreneurship

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 out of 50). 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 is 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.
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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. P. C. Tripathi, P. N. Reddy, "Principles of Management", Tata McGrawHill, 4th / 6th Edition.
2. Vasant Desai, "Dynamics of Entrepreneurial Development & Management", Himalaya Publishing House.
3. Poornima M Charantimath, "Entrepreneurship Development -SmallBusiness Enterprises", Pearson Education, 2006.
4. Kanishka Bedi, "Management andEntrepreneurship", Oxford UniversityPress, 2017.

Reference Books

1. Management Fundamentals -Concepts, Application, Skill Development Robert Lusier – Thomson.
2. Entrepreneurship Development -S S Khanka -S Chand & Co.
3. Management -Stephen Robbins -Pearson Education /PHI -17th Edition, 2003

Web links and Video Lectures (e-Resources):

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

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VI Semester

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING WITH PYTHON			
Course Code	**21CB62**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 Theory + 10 Labs	Total Marks	100
Credits	04	Exam Hours	03

Course Learning Objectives:

CLO 1. Explain Artificial Intelligence and Machine Learning

CLO 2. Illustrate AI and ML algorithm and their use in appropriate applications

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various courseoutcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effectiveteaching 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 criticalthinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information ratherthan 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 withtheir 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

What is artificial intelligence?, Problems, problem spaces and search, Heuristic search techniques

Texbook 1: Chapter 1, 2 and 3

RBT: L1, L2

Teaching-Learning Process	Problem based learning

MODULE-2

Knowledge representation issues, Predicate logic, Representaiton knowledge using rules. Concpet Learning: Concept learning task, Concpet learning as search, Find-S algorithm, Candidate Elimination Algorithm, Inductive bias of Candidate Elimination Algorithm.

Texbook 1: Chapter 4, 5 and 6

Texbook2: Chapter 2 (2.1-2.5, 2.7)

RBT: L1, L2, L3

Teaching-Learning Process	. Problem based learning

MODULE-3

Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems, ID3 algorith. Aritificil Nueral Network: Introduction, NN representation, Appropriate problems, Perceptrons, Backpropagation algorithm.

Texbook2: Chapter 3 (3.1-3.4), Chapter 4 (4.1-4.5)

RBT: L1, L2, L3

Teaching-Learning Process	Problem based learning

MODULE-4

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting, MDL principle, Bates optimal classifier, Gibbs algorithm, Navie Bayes classifier, BBN, EM Algorithm Texbook2: Chapter 6 RBT: L1, L2, L3	
Teaching-Learning Process	Problem based learning

MODULE 5

Instance-Base Learning: Introduction, k-Nearest Neighbour Learning, Locally weighted regression, Radial basis function, Case-Based reasoning. Reinforcement Learning: Introduction, The learning task, Q-Learning. Texbook 1: Chapter 8 (8.1-8.5), Chapter 13 (13.1 – 13.3) RBT: L1, L2, L3	
Teaching-Learning Process	Problem based learning

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Implement A* Search algorithm.
2	Implement AO* Search algorithm.
3	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
4	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
5	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
6	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
7	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
8	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

Course outcomes (Course Skill Set):

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

CO 1. Appaise the theory of Artificial intelligence and Machine Learning.
CO 2. Illustrate the working of AI and ML Algorithms.
CO 3. Demonstrate the applications of AI and ML.

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

CIE for the theory component of IPCC

Two Tests each of **20 Marks (duration 01 hour**)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester

Two assignments each of **10 Marks**

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

Scaled-down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The**15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test **(duration 03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks**.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

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SEE for IPCC

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

1. The question paper will have ten questions. Each question is set for 20 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.
3. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in the SEE. Marks secured will be scaled down to 50.

Suggested Learning Resources:

Textbooks

1. Tom M Mitchell,"Machine Lerning",1 st Edition, McGraw Hill Education, 2017.
2. Elaine Rich, Kevin K and S B Nair, "Artificial Inteligence", 3 rd Edition, McGraw Hill Education, 2017.

Reference Books

1. Saroj Kaushik, Artificial Intelligence, Cengage learning
2. Stuart Rusell, Peter Norving , Artificial Intelligence: A Modern Approach, Pearson Education 2nd Edition
3. AurÈlienGÈron,"Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, andTechniques to Build Intelligent Systems", 1st Edition, Shroff/O'Reilly Media, 2017.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition,springer series in statistics.
5. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press

Srinvivasa K G and Shreedhar, " Artificial Intelligence and Machine Learning", Cengage

Web links and Video Lectures (e-Resources):

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

BUSINESS STRATEGY			
Course Code	**21CB63**	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 concept and process of strategic management.
CLO 2. Expose the students to analyze the internal and external environments of strategic management.
CLO 3. Get insights of creating and formulation of strategies and implementation of strategies.
CLO 4. Obtain awareness through different case studies and contemporary business strategies.

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.
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

Strategic management: Introduction, What is strategic management? The main topics covered in strategy, Core areas of strategic management, Context, content and process, Process: linking the three core areas. (Case Studies are excluded)

A review of theory and practice: Introduction, Prescriptive strategic management in theory and practice, Emergent strategic management in theory and practice, Some prescriptive theories of strategic Management, Some emergent theories of strategic management, The purpose of the organisation: shareholders, stakeholders and 'above average returns'. (Case Studies are excluded)

Textbook: Chapter 1, 2

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Analysing the strategic environment: Introduction, Exploring the competitive environment, Strategic environment – the basics, Degree of turbulence in the environment, Analysing the general environment, Analysing the stages of market growth, Key factors for success in an industry, Analysing the competitive industry environment – the contribution of Porter, Analysing the co-operative environment, Analysing one or more immediate competitors in depth, Analysing the customer and market segmentation. (Case Studies are excluded)

Analysing resources and capabilities: Introduction, Analysing resources and capabilities, Why does an organization possess any resources at all? The make-or-buy decision, Resource analysis and adding value, Adding value: the value chain and the value system – the contribution of Porter, Resource analysis and competitive advantage – the resource-based view (RBV), Identifying which resources and capabilities deliver sustainable competitive advantage Resource and capability analysis – improving competitive advantage, Analysing other important company resources: especially human resources. (Case Studies are excluded)

Textbook: Chapter 3, 4

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Developing business-level strategy options: Introduction, Purpose and the SWOT analysis – the contribution of Andrews, Environment-based options: generic strategies – the contribution of Porter, Environment-based strategic options: the market options matrix, Environment-based strategic options: the expansion method matrix, Resource-based strategic options: the resource-based view, Resource-based strategic options: cost reduction. (Case Studies are excluded)

Developing corporate-level strategy options: Introduction, Corporate-level strategy: the benefits and costs of diversifying, Corporate options: degrees of diversification, Corporate strategy and the role of the centre – the

principle of parenting, Corporate strategy: decisions about the company's diversified portfolio of products, The tools of corporate-level options: from acquisitions to restructuring. (Case Studies are excluded)

Textbook: Chapter 8, 9

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Implementing and controlling the strategic plan: Introduction, The nature and limitations of the implementation process, Objectives, task setting and communicating the strategy, Resource allocation, Information, monitoring and control, The Balance Scorecard: the contribution of Kaplan and Norton, Prescriptive strategic planning. (Case Studies are excluded)

Green strategy and sustainability: Introduction, Green strategy and sustainability: the main topics, Green strategy: environmental analysis, Green strategy: analysing resources and capabilities, Green strategy: stakeholders and organisational purpose, Green strategy: knowledge, technology and innovation, Green strategy: strategic options and choice, Implementing green strategies. (Case Studies are excluded)

Textbook: Chapter 13, 14

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Strategic leadership: Introduction, What is strategic leadership? What makes a successful leader? How leadership roles change over time, How leaders cope with power, Successful strategic leadership. (Case Studies are excluded)

Entrepreneurial strategy: Introduction, Entrepreneurial strategy: theory and practice, Entrepreneurial strategy: personal aspects and risk taking, The four drivers of entrepreneurial strategy: imagination, ideas, invention and innovation, Entrepreneurial strategy: competitive advantage and ownership, Implementing entrepreneurial strategy. (Case Studies are excluded)

Strategy and business models: Introduction, What is a business model? Identifying the elements of the business Model, The benefits and problems of the business model, Strategic management and business models. (Case Studies are excluded)

Textbook: Chapter 16, 17, 20

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Course Outcomes

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

CO 1. Explain the role and fundamental concepts of strategic management for business organizations.
CO 2. Summarize the analysis of strategic environment, resources and capabilities.
CO 3. Illustrate options to develop business-level and corporate-level strategies.
CO 4. Develop mechanism for Implementing and controlling the strategic plan.
CO 5. Demonstrate strategic leadership and entrepreneurial strategy for business modes.

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**

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

Seminar with a brief write-up (report) on Case studies from the textbook (not limited to) may be planned to attain the COs and POs for **20Marks** (**duration 01 hours**)

1. 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.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Textbooks

1. Richard Lynch: Strategic Management, 7th Edition, Pearson, 2015.

Reference:

1. Robert Grant, Peter A. Murray, Stuart Orr, Bella Butler and Pieter-Jan Bezemer: Strategic management essentials, Wiley, 2021.
2. J. David Hunger, Thomas L. Wheelen, ESSENTIALS OF STRATEGIC MANAGEMENT, 5th Edition, prentice Hall (Pearson), 2011.

Weblinks and Video Lectures (e-Resources):

1. https://archive.nptel.ac.in/courses/110/108/110108047/

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

Textbook: Case study (not Limited to) 1.1-1.3, 2.1-2.4, 3.1-3.5, 4.1-4.3, 8.1-8.4, 9.1-9.3, 13.1-13.4, 14.1-14.3, 16.1-16.3, 17.1-17.3, 20.1- 20.3.

VI Semester

HUMAN RESOURCE MANAGEMENT			
Course Code	**21CB641**	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 managerial roles in human resource affairs;
CLO 2. Understand HRM approaches to staffing, performance, compensation, and strategic issues;
CLO 3. Develop a clear understanding of the specific functions and activities of HRM by analyzing real life business problems/issues;
CLO 4. Provide knowledge of contemporary issues and practical techniques associated with effective practice of HRM.

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

Perspectives In Human Resource Management: Evolution of human resource management – The importance of the human factor – Challenges – Inclusive growth and affirmative action -Role of human resource manager – Human resource policies – Computer applications in human resource management – Human resource accounting and audit.

Teaching-Learning Process	Chalk and board, Problem based learning.

Module-2

The Concept Of Best Fit Employee: Importance of Human Resource Planning – Forecasting human resource requirement –matching supply and demand – Internal and External sources. Recruitment – Selection – induction – Socialization benefits

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

Module-3

Training and Executive Development: Types of training methods –purpose- benefits- resistance. Executive development programmes – Common practices – Benefits – Self-development – Knowledge management.

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

Module-4

Sustaining Employee Interest: Compensation Plan – Reward – Motivation – Application Of Theories Of Motivation – Career Management – Development Of Mentor – Protégé Relationships.

Teaching-Learning Process	Chalk& board, Problem based learning, Demonstration

Module-5

Performance Evaluation And Control Process**: Method Of Performance Evaluation – Feedback – Industry Practices. Promotion, Demotion, Transfer And Separation – Implication Of Job Change. The Control Process – Importance – Methods – Requirement Of Effective Control Systems Grievances – Causes – Implications – Redressal Methods.**

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

Course Outcomes

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

CO 1. Apply the knowledge of concepts of finance and cost accounting in construction.
CO 2. Analyze the financial accounting and cost of construction projects.
CO 3. Assess the financial position to investment in a project

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Gary Dessler, Biju Varkkey, Human Resource Management, 11th Edition, Pearson Prentice Hall.
2. H John Bernardin, Human Resource Management, Second Edition, 4th edition 2010, Tata McGraw Hill

Reference Books:

1. Decenzo and Robbins, "Human Resource Management", Wiley

Weblinks and Video Lectures (e-Resources):

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

VI Semester

INTRODUCTION TO INNOVATION IP MANAGEMENT AND ENTREPRENEURSHIP			
Course Code	**21CB642**	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. To study the fundamentals of technology innovation, intellectual property rights and entrepreneurship.
CLO 2. To identify and discover market needs.
CLO 3. To create, protect and assetize and commercialize intellectual property.
CLO 4.To learn the opportunities and challenges for entrepreneurs.
CLO 5.To learn the fundamentals of a business model based on technology innovation.

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 alternativeeffective 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 promotescritical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, developdesign 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 andencourage 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

INNOVATION

A primer on Innovation, IP Rights and Entrepreneurship - Types of Innovation - incremental, disruptive, Lifecycle of Innovation - idea, literature survey, PoT, PoC, Challenges in Innovation - time, cost, data, infrastructure- Case study.

Teaching-Learning Process	Chalk and board, Problem based learning.

Module-2

INTELLECTUAL PROPERTY RIGHT

Types of IPR - patents, copyrights, trademarks, Geographical Indication, Lifecycle of IP -creation, protection, assetization, monetization, Balancing IP risks & rewards - Right Access and Right Use of Open Source and 3rd party products, technology transfer & licensing, IP valuation - methods, examples, limitations- Case study.

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

Module-3

ENTREPRENEURSHIP

Opportunity identification in technology entrepreneurship - customer pain points, competitive context, Market research, segmentation & sizing, Product positioning & pricing, go-to market strategy, Innovation assessment - examples, patentability analysis.

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

Module-4

BUSINESS MODELS
Start-up business models - fund raising, market segments, channels, co-innovation and open innovation - academia, startups and corporates, Technology innovation – Case study.

Teaching-Learning Process	Chalk& board, Problem based learning, Demonstration

Module-5

INNOVATION, INCUBATION & ENTREPRENEURSHIP IN CORPORATE CONTEXT
Innovation, Incubation & Entrepreneurship in Corporate Context, Technology-driven Social Innovation & Entrepreneurship, Manage innovation, IP and Entrepreneurship Programs- Processes, Governance and Tools.

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

Course Outcomes
At the end of the course the student will be able to:
CO 1. Understand the innovation life cycle and types of innovation.
CO 2.Gain knowledge on the importance of intellectual property rights and procedure of filing an IPR.
CO 3. Interpret the market needs and analyze the marketing strategy.
CO 4. Build a business model based on technology innovation
CO 5. Convert an innovative idea into a venture and protect it through intellectual property rights.

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**

1. First assignment at the end of 4th week of the semester
2. 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**)
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.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Tidd, John Bessant, Managing Innovation: Integrating Technological, Market and Organizational Change, Sixth Edition, John Wiley & Sons Limited, 2018.
2. John Bessant and Joe Tidd, Innovation and Entrepreneurship, Third Edition, John Wiley & Sons Limited, 2015.
3. Vivien Irish, Intellectual Property Rights for Engineers, Second Edition, The Institution of Engineering and Technology, 2015.

Reference Books:

1. Social Innovation: A Guide to Achieving Corporate and Societal Value (Insight Report, World Economic Forum, 2016)
2. Valuation and Deal making of Technology-Based Intellectual Property: Principles, Methods and Tools, http://razgaitis.com/books/dealmaking/ Indian Patent Act, 1970

Weblinks and Video Lectures (e-Resources):

1 www.lead-innovation.com

2 www.tatainnovista.com

3 www.wipo.int

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

Real world problem solving: Demonstration of projects developed using JAVA

VI Semester

OPERATION RESEARCH			
Course Code	**21CB643**	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. Formulate optimization problem as a linear programming problem.
CLO 2. Solve optimization problems using simplex method.
CLO 3. Formulate and solve transportation and assignment problems.
CLO 4. Apply game theory for decision making problem.

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, Linear Programming: Development of Operations Research, Definition of Operations Research, Characteristics of Operations Research, Scientific Method in Operations' Research, Necessity of Operations research in Industry, Scope of OR, OR and Decision Making, Phases and Models in OR, classification schemes of Model, Characteristics of a Good Model, Advantages of a Model, Limitations of Model, Constructing the Model, Approximations in OR Models, Types of Mathematical Models, Role of Computers in OR, Difficulties in OR, Limitations of OR.

Introduction to Linear Programming Problem (LPP): Requirements for a LPP, Assumptions of LPP, Formulation of LPP and Graphical method of solution with various examples.

Teaching-Learning Process	Chalk and board, Problem based learning.

Module-2

Simplex Method – 1: Theory of Simplex method, Some important definitions, Analytical method or trial and error method, The simplex method, Artificial variable Techniques, Big M method, Two phase method. ,Solutions of Simultaneous Equations by Simplex Method, Computational Efficiency of the Simplex Techniques

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

Module-3

The Transportation Model: Introduction to the Model, Assumption in the Transportation Model, Definition of the Transportation Model, Matrix Terminology, Formulation and solution of Transportation Models, Variants in Transportation Problems, Additional Problems, Least Time Transportation Problems, Post Optimality Analysis in Transportation, The Trans-Shipment Problem, Dual of the Transportation Problem.

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

Module-4

Assignment Problems: Definition of the Assignment Model, Mathematical representation of the assignment Model, Comparison with the Transportation, Solution of the Assignment Models, The Hungarian Method for solution of the assignment Problems, Formulation and solution of the Assignment Models, variations of the Assignment Problems, Additional problems, Sensitivity Analysis in the Assignment Problems

Teaching-Learning Process	Chalk& board, Problem based learning, Demonstration

Module-5

Decision Theory: Steps in decision Theory Approach, Decision Making Environments, Decision Making under Conduction of Certainty, Decision Making under Conditions of Uncertainty, Decision making under Condition of Risk, Maximum Likelihood Criterion, Expected Value Criteria for Continuously Distributed random variables. Additional Examples.

Game Theory: The Theory of games, Characteristics of Games, game models, Definitions, Rules for Game Theory, Rule1: Look for a Pure Strategy,Rule2:Reduce Game by Dominance, Rule 3: Solve for a Mixed Strategy, Mixed Strategies(2x2 games),Limitations of Game theory.

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

Course Outcomes

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

CO 1. Select and apply optimization techniques for various problems.
CO 2. Model the given problem as transportation and assignment problem and solve.
CO 3. Apply game theory for decision support system

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. D.S. Hira and P.K. Gupta, Operations Research, 2014, y S. Chand & Company Ltd

Reference Books:

1. S Kalavathy, Operation Research, 01-Aug-2002, Vikas Publishing House Pvt Limited
2. S D Sharma, Operation Research, Kedar Nath Ram Nath Publishers

Weblinks and Video Lectures (e-Resources):

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

EXPERT SYSTEM AND DECISION SUPPORT SYSTEM			
Course Code	21CB644	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. Introduce the concepts of Expert Systems

CLO 2. Introduce the concepts of Decision Support Systems

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

What is Expert System? Nature of expertise, The Characteristics of expert systems, Fundamental topics in expert systems, acquiring knowledge, representing knowledge, controlling reasoning, Explaining solutions.

The representation of Knowledge: Principles and techniques, The STRIPS planner, Operator tables and means-ends analysis, Assessment of STRIPS representation and control, Sub-goaling in MYCIN, treating blood infections, MYCIN's knowledge base, MYCIN's control structure, Evaluating and comparing expert systems, Evaluation of MYCIN, Comparison with STRIPS.

Textbook 1: Chapter 1, 3

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-2

Rule Based Systems: Canonical systems, Production system for problem solving, the syntax of rules, The working memory, Controlling behavior of interpreter, Conflict resolution, Forward and backward chaining, Rules and meta-rules.

Associative Nets and Frame systems: Graphs, trees, networks, the raise of associative networks, the type token distinction and cognitive economy, Assessing the adequacy of associative nets, representing typical objects and situations, Introduction to frame concepts, Complex nodes in a network, Defaults and demons, Multiple inheritance and ambiguity, Comparing nets and frames.

Textbook 1: Chapter 5, 6

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3

Management Support Systems: Managerial Decision-Making and Information Systems, Managers and Computer Support, Computerized Decision Support and the Supporting Technologies, A Framework for Decision Support, The Concept of Decision Support Systems, Group Support Systems, Enterprise Information Systems, Knowledge Management Systems, Expert Systems, Artificial Neural Networks, Advanced Intelligent Decision Support Systems, Hybrid Support Systems.

Decision-Making Systems, Modeling, and Support: Decision-Making-Introduction and Definitions, Systems, models.

Textbook-2: Chapter 1, Chapter 2 (2.1-2.4)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-4

Decision-Making Systems, Modeling, and Support (Contd…): Phases of the decision-making process, Decision making-Intelligence phase, Decision making-design phase, Decision making-Choice phase, Decision making-Implementation phase.

Decision support systems – Overview: DSS Configurations, What is a DSS?, Characteristics and Capabilities of DSS, Components of DSS, The Data Management Subsystem, The Model Management Subsystem, The User Interface (Dialog) Subsystem, The Knowledge-Based Management Subsystem, The User, DSS Hardware, DSS Classifications.

Textbook-2: Chapter 2 (2.5-2.9), Chapter 3 (3.2-3.12)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-5

Collaborative Computing Technologies - Group Support System: Group Decision-Making, Communication, and Collaboration Communication Support Collaboration Support: Computer-Supported Cooperative Work, Group Support Systems, Group Support Systems Technologies, Group Systems Meeting room and Online, The GSS Meeting Process, Distance Learning, Creativity and Idea.

Textbook-2: Chapter 7

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Course Outcomes

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

CO 1. Explain the role of expert systems in different domains.
CO 2. Illustrate declarative rules, associative nets and Frame systems.
CO 3. Explain frameworks of Management Support Systems.
CO 4. Explain Decision-Making Systems and decision-support systems.
CO 5. Compare Collaborative Computing Technologies for Group Support System.

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**

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

Seminar with a brief write-up (report) on Case studies from the textbook-2 (not limited to) may be planned to attain the COs and POs for **20Marks** (**duration 01 hours**)

1. 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.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Textbooks

1. Peter Jackson, "Introduction to Expert systems", Pearson Education, 2001.
2. Efraim Turban and Jay E. Aronson, "Decision Support Systems and Intelligent Systems", Prentice Hall, Seventh Edition, 2005.

Reference Books:

1. Durkin J, "Expert Systems Design and Development", Prentice Hall, 1994.
2. Dan. W. Patterson, "Introduction to Artificial Intelligence and Expert systems", Prentice Hall, 2003

Weblinks and Video Lectures (e-Resources):

1. **https://www.youtube.com/watch?v=lyrFcgqFmIk**
2. **https://www.youtube.com/watch?v=wkizk7vTEF0**
3. **https://archive.nptel.ac.in/courses/106/106/106106140/**
4. **https://archive.nptel.ac.in/courses/110/105/110105147/**

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

Case studies/Case applications from the Textbook-2 (Chapter-1, 2, 3 and 7)

VI Semester

SOFT AND EVOLUTIONARY COMPUTING			
Course Code	**21CB645**	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. Basics of artificial neural network.
CLO 2. Concepts of modelling and control of neural and fuzzy control schemes.
CLO 3. Features of hybrid control schemes.

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 alternativeeffective 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 promotescritical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, developdesign 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 andencourage 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

Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm (BPA) – Recurrent Neural Network (RNN) – Adaptive Resonance Theory (ART) based network – Radial basis function network – online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning.

Teaching-Learning Process	Chalk and board, Problem based learning.

Module-2

Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture– Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox.

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

Module-3

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

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

Module-4

Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy systems – Familiarization with fuzzy logic toolbox.

Teaching-Learning Process	Chalk& board, Problem based learning, Demonstration

Module-5

Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron– GA – Optimization of membership function and rule base using Genetic Algorithm – Introduction to other evolutionary optimization techniques, support vector machine– Case study – Familiarization with ANFIS toolbox.

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

Course Outcomes

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

CO 1. Understand Ability to understand the concepts of ANN, different features of fuzzy logic and their modelling, control aspects and different hybrid control schemes.
CO 2. Ability to understand the basics of artificial neural network.
CO 3. Ability to get knowledge on modelling and control of neural.
CO 4. Ability to get knowledge on modelling and control of fuzzy control schemes.
CO 5. Ability to acquire knowledge on hybrid control schemes.
C0 6. Ability to understand the concepts of Adaptive Resonance Theory

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Laurence Fausett, Fundamentals of Neural Networks, 1992 print, Prentice Hall, Englewood Cliffs, N.J.
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, McGraw Hill Inc.

Reference Books:

1. Goldberg, Genetic Algorithm in Search, Optimization and Machine learning, 1989 print Addison Wesley Publishing Company Inc
2. Millon W.T., Sutton R.S. and Webrose P.J, Neural Networks for Control, 1992 print, MIT press.

Weblinks and Video Lectures (e-Resources):
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

VI Semester

OPERATION MANAGEMENT			
Course Code	**21CB646**	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. Formulate optimization problem as a linear programming problem.
CLO 2. Solve optimization problems using simplex method.
CLO 3. Formulate and solve transportation and assignment problems.
CLO 4. Apply game theory for decision making problems.

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 alternativeeffective 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 promotescritical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, developdesign 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 andencourage 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 OR -Definition, scope of Operations Research, characteristics, advantages and limitations. Quantitative approach to decision making models
Introduction, Linear Programming(LPP) Mathematical formulation of problem –LPP by Graphical Methods, problems on Maximization and Minimization

Teaching-Learning Process	Chalk and board, Problem based learning.

Module-2

Assignment problems - Introduction, General structure. Formulation, Solutions to assignment problems by Hungarian method, Special cases in assignment problems, unbalanced, Maximization assignment problems. Travelling Salesman Problem (TSP). Difference between assignment and T.S.P

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

Module-3

Simulation: simulation concepts, simulation of a queuing system using event list, pseudo random numbers, multiplication congenital algorithm, basic ideas of Monte-Carlo simulation
Game Theory -Formulation of game models, Two person Zero sum games & their solution, 2 x N and M x 2 games, pure strategy games with saddle point, Limitations of game theory.

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

Module-4

Transportation Problems: The transportation problem, Initial Basic Feasible Solution (IBFS) by North West Corner Rule method, Least Cost Method, Vogel's Approximation Method. Optimal solution by Modified Distribution Method (MODI).

Teaching-Learning Process	Chalk& board, Problem based learning, Demonstration

Module-5

Project Management: Structure of projects, phases of project management-planning, scheduling, controlling phase, work breakdown structure, project control charts, network planning, PERT & CPM, Network components & precedence relationships, critical path analysis, probability in PERT analysis, Theory of crashing.

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

Course Outcomes

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

CO 1. Select and apply optimization techniques for various problems.

CO 2. Model the given problem as transportation and assignment problem and solve.

CO 3. Apply game theory for decision support system.

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. D.S.Hira and P.K.Gupta, "Operations Research", Y S. Chand & Company Ltd, 2014.
2. Taha A Hamdy, "Operation Research Introduction", PHI Private Limited, 7th Edition.

Reference Books:

1. J K Sharma, "Operations Research Theory & Applications", Macmillan India Ltd, 2007.
2. P. K. Gupta and D. S. Hira, "Operation Research", S. Chand & co., 2007

Weblinks and Video Lectures (e-Resources):

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

VI Semester

INTRODUCTION TO BUSINESS COMMUNICATION AND VALUE SCIENCE			
Course Code	**21CB651**	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. The course aims to augment student's overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals.

CLO 2. The English language topics for this semester focus on the development of basic fluency in English, usage of words and also introduce them to the concept and importance of interpersonal skills so as to effectively present their personalities innovation.

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 alternativeeffective 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 promotescritical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, developdesign 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 andencourage 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

Essential Grammar – I: Tenses: Basic forms and use, sentence formation (general & Technical), Common errors, Parts of speech through context, Direct and reported speech structures and voices.
Vocabulary Enrichment: Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary

Teaching-Learning Process	Chalk and board, Problem based learning.

Module-2

Phonetic: Pronunciation, Reduction of MTI in spoken English, Question formation with emphasis on common errors made during conversation
Written Communication – I: Letter Writing –Formal and Informal letter writing, Application letters, Report writing academic and business report, Job application letter

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

Module-3

Communication Skills: Importance of effective communication, types of communication- verbal and non - verbal, barriers of communication, effective communication, Listening Skills: Law of nature- Importance of listening skills, Difference between listening and hearing, Types of listening.

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

Module-4

Self - Awareness & Self Development: Self - Assessment, Self - Appraisal, SWOT, Goal setting - Personal & career- Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self - appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting, and prioritization.
Socio-Cultural and Cross-Cultural Sensitivities at the Workplace: What is Inclusion? Women's

contributions in Industry, work issues faced by women, what is sexual harassment, what is appropriate behavior for everyone at work.

Teaching-Learning Process	Chalk& board, Problem based learning, Demonstration

Module-5

Interpersonal Skills – I: Team work, Team effectiveness, Group discussion, Decision making - Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics. Multicultural team activity 18 Computer Science and Business Systems.

Time Management: The Time management matrix, apply the Pareto Principle (80/20 Rule) to time management issues, to prioritize using decision matrices, to beat the most common time wasters, how to plan, how to handle interruptions, to maximize your personal effectiveness, how to say "no" to Time wasters.

Values of a good manager: Understanding Corporate Values and behavior; Personal / Human Values; Pride and grace in Nationalist

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

Course Outcomes

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

CO 1: Speak fluently in English without errors in tenses and hence present themselves as effective English communicators. They will be able to learn the 12 tenses and use them appropriately.

CO 2: Differentiate between active and passive vocabulary and be able to use the 60 words discussed in class for their daily conversation and 40 words also given as assignments.

CO 3: The ability to process their ideas and thoughts (verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 100-150 words for paragraph writing.

CO 4: Present them in a certain manner by using the 50-55 phrases discussed in class appropriately for group discussions, personal interviews during the campus recruitment process/competitive exams.

CO 5:Enhance their communication skills by acquainting with the 2 important aspects of communication and helping them to overcome the 10 most common barriers of communication. Learn the 7 different types of listening skills; differentiate effective listening skills and understand the importance of it through 5 activities held in class and implement them in professional life.

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Dr. Saroj Hiremath, Managing Business Communication, 2nd Edition, 2012, Tata Mc Graw – Hill.
2. Alan McCarthy and O'Dell, English vocabulary in use, 3rd Edition, 2018, Pristine Publishing House, Mangalore

Reference Books:

1. Strategic Writing by Charles Marsh
2. The Seven Basic Plots by Christopher Booker

Weblinks and Video Lectures (e-Resources):

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

VI Semester

Introduction to Statistical Software (MATLAB and SPSS)			
Course Code	**21CB652**	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: To use statistical software include being free from manual tasks, saving time, dealing with large amounts of data, having more flexibility, and obtaining valid and reliable results.
CLO 2: Integrate all the data sets from different parts of the business and then get insights that can help to make decisions that are most appropriate for the specific situation.
CLO 3: Data sets from across the business can be analyzed using different approaches.
CLO 4:Data cleansing is done when the analytics software automatically cleans the data sets of invalid records and out-of-date information.

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 alternativeeffective 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 promotescritical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, developdesign 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 andencourage 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, What Is Statistical Learning? Why Estimate f? How Do We Estimate f? The Trade-Off Between Prediction Accuracy and Model Interpretability, Supervised Versus Unsupervised Learning Regression Versus Classification Problems.
Assessing Model, Measuring the Quality of Fit, The Bias-Variance Trade-Off , The Classification Setting.

Teaching-Learning Process	Chalk and board, Problem based learning.

Module-2

Linear Regression : Simple Linear Regression, Estimating the Coefficients , Assessing the Accuracy of the Coefficient Estimates, Assessing the Accuracy of the Model , Multiple Linear Regression , Estimating the Regression Coefficients .
Case Study: Linear Regression - Libraries , Simple Linear Regression , Multiple Linear Regression , Non-linear Transformations of the Predictors , Qualitative Predictors, Writing Functions.

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

Module-3

Classification: An Overview of Classification, Why Not Linear Regression, Logistic Regression, The Logistic Model Estimating the Regression Coefficients , Making Predictions , Multiple Logistic Regression, Logistic Regression for Response.
Case Study: The Stock Market Data, Logistic Regression

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

Module-4

Resampling Methods: Cross-Validation -The Validation Set Approach , Leave-One-Out Cross-Validation, k-Fold Cross-Validation , Bias-Variance Trade-Off for k-Fold.
Case Study: The Validation Set Approach , Leave-One-Out Cross-Validation , k-Fold Cross-Validation

Teaching-Learning Process	Chalk& board, Problem based learning, Demonstration

Module-5

Tree-Based Methods : The Basics of Decision Trees , Regression Trees , Classification Trees, Trees Versus Linear Models , Advantages and Disadvantages of Trees, Bagging, Random Forests, Boosting .

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

Case studies must be carried out in MATLAB

Course Outcomes

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

CO 1. Understand the basics of Matlab
CO 2. Break a complex task up into smaller, simpler tasks
CO 3. Gain proficiency in using statistical software for data analysis
CO 4. Undrstand the concepts of Regression, classification, Resampling, Tree-based methods for data

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 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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Gareth James Daniela Witten Trevor Hastie Robert Tibshirani, An Introduction to Statistical Learning, 8th edition, 2017, Springer.
2. C. Henry Edwards David E. Penney, David Calvis, Differential Differential Equations Equations And Boundary And Boundary Value Problems, 5th Edition, Pearson.

Reference Books:

1. Peter I. Kattan, MATLAB for Beginners (A Gentle Approach), Petra Books

Weblinks and Video Lectures (e-Resources):

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

VI Semester

INTRODUCTION TO WEB TECHNOLOGY			
Course Code	**21CB653**	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: Illustrate the Semantic Structure of HTML and CSS
CLO 2: Compose forms and tables using HTML and CSS
CLO 3: Design Client-Side programs using JavaScript and Server-Side programs using PHP
CLO 4: Infer Object Oriented Programming capabilities of PHP
CLO 5: Examine JavaScript frameworks such as jQuery and Backbone

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 alternativeeffective 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 promotescritical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, developdesign 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 andencourage 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 HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.

Teaching-Learning Process	Chalk and board, Problem based learning.

Module-2

HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.

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

Module-3

JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server‟s Responsibilities, Quick Tour of PHP, Program Control, Functions.

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

Module-4

PHP Arrays and Superglobals, Arrays, $_GET and $_POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling.

Teaching-Learning Process	Chalk& board, Problem based learning, Demonstration

Module-5

Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript PseudoClasses, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone 10 MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services

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

Course Outcomes

At the end of the course the student will be able to:
CO 1: Adapt HTML and CSS syntax and semantics to build web pages.
CO 2: Construct and visually format tables and forms using HTML and CSS.
CO 3:Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
CO 4: Appraise the principles of object oriented development using PHP
CO 5:Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Randy Connolly, Ricardo Hoar, Fundamentals of Web Development, 1st Edition, Pearson Education India

Reference Books:

2. Robin Nixon, Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5, 4th Edition, O"Reilly Publications.
3. Luke Welling, Laura Thomson, PHP and MySQL Web Development, 5th Edition.

Weblinks and Video Lectures (e-Resources):

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

VI Semester

PROGRAMMING IN JAVA			
Course Code	**21CB654**	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. Learn fundamental features of object oriented language and JAVA.
CLO 2. To create, debug and run simple Java programs.
CLO 3. Learn object oriented concepts using programming examples.
CLO 4. Study the concepts of importing of packages and exception handling mechanism.
CLO 5. Discuss the String Handling examples with Object Oriented concepts.

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 alternativeeffective 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 promotescritical thinking.
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6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic andencourage 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

An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries.

Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings

Textbook 1:Ch 2,Ch 3.

Teaching-Learning Process	Chalk and board, Problem based learning.

Module-2

Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses,

Control Statements: Java's Selection Statements, Iteration Statements, Jump Statements.

Textbook 1:Ch 4,Ch 5.

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

Module-3

Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, A Stack Class.

A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer

Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited. **Inheritance:** Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding.

Textbook 1: Ch 6, Ch 7.1-7.9,Ch 8.1-8.5

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

Module-4

Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces.

Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Using Exceptions

Textbook 1: Ch 9,Ch 10.

Teaching-Learning Process	Chalk& board, Problem based learning, Demonstration

Module-5

Enumerations :Enumerations, Type Wrappers.

String Handling: The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using valueOf( ), Changing the Case of Characters Within a String , Additional String Methods, StringBuffer, StringBuilder.

Textbook 1: Ch 12.1,12.2,Ch 15.

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

Course Outcomes

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

CO 1. Develop JAVA programs using OOP principles and proper program structuring.
CO 2. Develop JAVA program using packages, inheritance and interface.
CO 3. Develop JAVA programs to implement error handling techniques using exception handling
CO 4. Demonstrate string handling concepts using JAVA.

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007. (Chapters 2, 3, 4, 5, 6,7, 8, 9,10, 12,15)

Reference Books:

1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806.
2. Rajkumar Buyya,SThamarasiselvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited.
3. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.
4. Anita Seth and B L Juneja, JAVA One step Ahead, Oxford University Press, 2017.

Weblinks and Video Lectures (e-Resources):

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

Real world problem solving: Demonstration of projects developed using JAVA

VI Semester

SOFTWARE DESIGN WITH UML LABORATORY			
CourseCode	21CBL66	CIEMarks	50
TeachingHours/Week(L:T:P:S)	0:0:2:0	SEEMarks	50
TotalHoursofPedagogy	24	TotalMarks	100
Credits	01	ExamHours	03

CourseLearningObjectives:

CLO1. Foundation knowledge in UML and UML diagrams.
CLO2. Strong practice in UML tools through a variety of software design problems.

Note:
1. The sessions on basics of UML diagrams shall be organized before commencement of the lab.
2. A suitable visual tool (Open source or other tools) shall be used to develop the UML diagrams.

Sl.No.	Experiment Title
1	DevelopUML use-case diagramsthat modelATM System and Stock Maintenance System.
2	Develop UML class diagrams that model ATM System and Stock Maintenance System.
3	Develop UML activity diagrams that model ATM System and Stock Maintenance System.
4	Develop UML sequence diagrams that model ATM System and Stock Maintenance System.
5	Develop UML object diagrams that model ATM System and Stock Maintenance System.
6	Develop UML state-chart diagrams that model ATM System and Stock Maintenance System.
7	Develop UML collaboration diagrams that model ATM System and Stock Maintenance System.
8	Develop UML component diagrams that model ATM System and Stock Maintenance System.
9	Develop UML deployment diagrams that model ATM System and Stock Maintenance System.

Course Outcomes:
At the end of the course the student will be able to:
CO 1. Develop behavioral UML diagrams for different application design problems.
CO 2. Build structural UML diagrams for different software design problems.
CO 3. Make use of modern visual tools to develop UML diagrams.

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 out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 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 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 (CIE):

- CIE marks for the practical course are **50 Marks**.
- The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.
- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are 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 down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a 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.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).
- The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- **SEE shall be conducted by the two examiners. One from the same institute as an internal examiner and another from a different institute as an external examiner, appointed by the university.**
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of 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 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)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Textbooks:

Grady Booch, James Rumbaugh andIvar Jacobson, The Unified Modeling Language User Guide, 2nd Edition, Addison-Wesley Professional.

SuggestedWeblinks/EResource

https://www.geeksforgeeks.org/unified-modeling-language-uml-introduction/
https://www.tutorialspoint.com/uml/index.htm
https://www.javatpoint.com/uml

VII Semester

BUSINESS INTELLIGENCE AND DATA ANALYTICS			
Course Code	**21CB71**	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. Explain the Decision Support systems and Business Intelligence framework.

CLO 2. Illustrate the significance of computerized Decision Support, and understand the mathematical modelling behind decision support.

CLO 3.Explain Data warehousing, its architecture and Extraction, Transformation, and Load (ETL) Processes.

CLO 4. Explore knowledge management, explain its activities, approaches and its implementation.

CLO 5. Understand the knowledge of mathematics to explain the concept of data Analytics.

CLO 6. Design Supervised and unsupervised ML to predict the class for a given data.

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

Decision Support and Business Intelligence: Opening Vignette, Changing Business Environments andComputerized Decision Support, Managerial Decision Making, Computerized Support for Decision Making, AnEarly Framework for Computerized Decision Support, The Concept of Decision Support Systems (DSS), Aframework for Business Intelligence (BI), A Work System View of Decision Support.

Text Book 1: Chapter 1 RBT: L1, L2

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

Computerised Decision Support: Decision Making, Models, Phases of the DecisionMaking Process, TheIntelligence Phase, The Design Phase, The Choice Phase, The Implementation Phase, How Decisions AreSupported.Modelling and Analysis:Structure of Mathematical Models for Decision Support, Certainty, Uncertainty, andRisk, Management Support Systems, Multiple Goals, Sensitivity Analysis, What-If Analysis, andGoal Seeking

Text Book 1: Chapter 2 RBT: L1, L2

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

Data Warehousing: Data Warehousing Definitions and Concepts, Data Warehousing Process Overview, DataWarehousing Architectures, Data Integration and the Extraction, Transformation, and Load (ETL) Processes. Text Book 1: Chapter 5 RBT: L1, L2	
Teaching-Learning Process	Chalk and board, Demonstration
Module-4	
SciPy Library for statistics: Basic statistics, Parameter techniques for computing means, Non parameter techniques for computing means, The ndimage sub-package. Time series object, Determining stationarity, making time series Stationary, ARIMA modelling Text Book 3: Chapter 9, Chapter 11 RBT: L3, L4	
Teaching-Learning Process	Chalk and board
Module-5	
Supervised Machine learning Ensemble techniques: Bagging, random Forest, Extra trees, Ada Boosting, Gradient Boosting Text Book 3: Chapter 15 RBT: L3, L4	
Teaching-Learning Process	Chalk and board
Course outcome (Course Skill Set) At the end of the course the student will be able to: CO 1. Apply the basics of data and business to understand Decision Support systems and Business Intelligence framework. CO 2. Describe the significance of 106omputerized Decision Support, apply the basics of mathematics to understand the mathematical modelling behind decision support. CO 3. Explain Data warehousing, its architecture and Extraction, Transformation, and Load (ETL) Processes. CO 4. Apply the knowledge of mathematics to explain the concept of data analytics CO 5. Develop models of supervised and Un supervised ML techniques	

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. RameshSharda,DursunDelden, Efraim Turban," Business Intelligence and Analytics: Systems for decision support", Pearson, 10th Edition.
2. R N Prasad, Seema Acharya, "Fundamentals of Business Analytics", Wiley India, 2011.
3. Bharti Motwani, "Data Analytics using Python", 2020.

Reference Books

1. Berry M.&Linoff G, "Data Mining Techniques. For Marketing, Sales and Customer Relationship Management", Wiley, 2004.
2. Foster Provost and Tom Fawcett, "Data Science for Business", O'Reilly Media, 2013.
3. Cathy O'Neil and Rachel Schutt, "Doing Data Science", O'Reilly, 2014.
4. Hector Cuesta, "Practical Data Analysis", PACKT, 2013.

Web links and Video Lectures (e-Resources):
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

VII Semester

INTERNET OF THINGS			
Course Code	**21CB72**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	02	Exam Hours	02

Course Learning Objectives:

CLO 1. Assess the genesis and impact of IoT applications, architectures in real world.

CLO 2. Compare different Application protocols for IoT.

CLO 3. Infer the role of Data Analytics and Security in IoT.

CLO 4. Analysis the IoT in business

CLO 5. Understand the application of IoT in different areas.

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 ofteaching 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 criticalthinking.
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 withtheir 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

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.
Textbook 1: Ch.1, 2 RBT: L1, L2, L3

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.
Textbook 1: Ch.5, 6 RBT: L1, L2, L3

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment
Textbook 1: Ch.7, 8 RBT: L1, L2, L3

Teaching-Learning Process	Chalk and board, Demonstration

Module-4	
IoT in Industry An introduction to connected Manufacturing, An architecture fro the connected factory, industrial automation control protocols, connected factory security IoT and M2M Introduction,M2M,Difference between IoT and M2M,SDN and NFV for IoT Textbook:1 Ch.9 Textbook 2:Ch.3	
Teaching-Learning Process	Chalk and board

Module-5	
Home Automation smart Lighting, Smart Appliances ,Intrusion Detection, Smoke/Gas detectors, Cities: Smart Parking, Smart Lighting, Smart Roads, Structure Health Monitoring, Surveillance, Emergency response Environment Weather Monitoring Air Pollution Monitoring Noise Pollution Monitoring Forest Fire Detection River Floods detection, Energy Smart grids, Renewable Energy systems ,Prognostics Retail Inventory Management ,Smart Payments, Smart Vending Machines Logistics, Route Generation and Scheduling Fleet Tracking Shipment Monitoring, remote Vehicle Diagnostics Agriculture Smart Irrigation Green House Control Industry machine Diagnosis and Prognosis Indoor air Quality Monitoring Health and Life style Health and Fitness Monitoring Wearable Electronics Textbook 2:Ch .2	
Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Interpret the impact and challenges posed by IoT networks leading to new architectural models.

CO 2. Appraise the role of IoT protocols for efficient network communication.

CO 3. Elaborate the need for Data Analytics and Security in IoT.

CO 4. Model the Internet of things to business

CO 5. Understand the practical knowledge through different case studies

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 out of 50). 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 (CIE):

CIE will same as 1 credit theory course for the 1st and 2nd semester; however, for **higher** semesters depending upon the type of the course, the CIE pattern may be MCQ type (100 questions) or the same as other core theory courses.

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

Semester End Examination(SEE):

SEE paper will be set for 100 questions each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 120 minutes. Marks scored are scaled down to 50 Marks.
The suggested question paper pattern is MCQ for the 1st and 2nd semester however, for higher semester/s depending on the type of the course SEE may be a written examination, a pattern similar to other theory courses

For non-MCQ pattern of CIE and SEE

Continuous Internal Evaluation (CIE):

At the beginning of the semester, the instructor/faculty teaching the course has to announce the methods of CIE for the course.

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 is 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.

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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", Pearson Education (Cisco Press Indian Reprint), 1st Edition, ISBN: 978-9386873743.
2. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands- on Approach)", Universities Press, 1st Edition.

Reference Books

1. Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017.
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", McGraw Hill Education, 1st Edition, ISBN: 978- 9352605224.

Web links and Video Lectures (e-Resources):

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

VII Semester

MARKETING MANAGEMENT & MARKETING RESEARCH			
Course Code	21CB731	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning Objectives:

CLO 1. Understand the basic concepts and functions of marketing management and analyse marketing environment impacting the business.

CLO 2. Segment the market and understand the consumer behavior and Describe 7 p's of service marketing mix.

CLO 3. Describe the 4 p's of marketing and also strategize marketing mix

CLO 4. To understand the Introduction to marketing research and sampling design Data collection and data analysis and its presentation

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 ofteaching 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 criticalthinking.
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 withtheir 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 marketing and understanding the marketing environment:

Introduction to Marketing management, Meaning and Definition, Concepts of Marketing, Approaches to Marketing, Functions of Marketing. Recent trends in Marketing-E- business, Tele-marketing, M-Business, Green Marketing, Relationship Marketing, Concept Marketing, Digital Marketing, social media marketing and E-tailing.

Micro & Macro Environmental analysis – The company, suppliers, marketing intermediaries competitors, public and customers; Macro Environment- Demographic, Economic, Natural, Technological, Political, Legal, Socio-Cultural Environment.

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

Market segmentation, consumer behaviour & services marketing:

Introduction to market segmentation: Meaning and Definition, Bases of Market Segmentation, Targeting marketing and positioning.

Introduction to Consumer Behavior-Factors influencing Consumer Behavior; Buying Decision Process. Service marketing: Meaning and definition of services, difference between goods and services, features of services, seven P's of services marketing (only concept to be covered).

Teaching-Learning Process	Chalk and board, Active Learning

Module-3	
Marketing mix: Introduction to Marketing Mix: Meaning, Elements of Marketing Mix (Four P's) – Product, Price, Place, Promotion. Product-Product Mix, Product Line, Product Lifecycle, New Product Development, Reasons for Failure of New Product, Branding, Packing and Packaging, Labeling, Pricing – Objectives, Factors influencing Pricing Policy, Methods of Pricing; Physical Distribution–Meaning, Factors affecting Channel Selection, Types of Marketing Channels. Promotion – Meaning and Significance of Promotion, Personal Selling and Advertising (Meaning Only to be covered)	
Teaching-Learning Process	Chalk and board, Demonstration
Module-4	
Introduction to marketing research and sampling design: Introduction to marketing research: What is Marketing Research? Scope of Marketing Research, The Stages in the Research Process, Research Design: Formulating the Research Problem, Choice of Research Design, Types of Research Design, Sources of Experimental Errors. Sample and Sampling Design: Some basic terms, Advantages and Limitation of Sampling, Sampling process, Types of Sampling, Types of Sample Designs, Determining the Sample Size, Sampling Distribution of the Mean. Scaling Techniques: The concept of Attitude, Difficulty of Attitude Measurement, Types of Scales, and Applications of Scaling in Marketing Research.	
Teaching-Learning Process	Chalk and board
Module-5	
Data collection and data analysis: Data Collection: Secondary Data, Sources of Secondary Data, Primary Data, Collection of Primary Data, Methods of Data Collection- Observation, Questionnaire, Designing of Questionnaire. Data Processing and Tabulation: Editing, Coding and Tabulation. Data Analysis: Testing of Hypothesis, Measurement of Central Tendency, Dispersion, Univariate Analysis, Multiple Regression, Factor Analysis, Cluster Analysis, Multidimensional Scaling, Conjoint Analysis; Interpretation and Report Writing, Types of Research Reports	
Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Develop an ability to assess the impact of the environment on marketing function.

CO 2. To formulate marketing strategies that incorporate psychological and sociological factors which influence buying

CO 3. Understand concept of Branding, development of product and significance of market segmentation, targeting and positioning, Identifying marketing channels and the concept of product distribution.

CO 4. Comprehend the objectives of Market research & its application in solving marketing problems.

CO 5. Appreciate the use of different data collection methods, sampling design techniques, measurement methods to analyze the data and Generalize and interpret the data with the help of various measurement techniques.

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 out of 50). 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 is 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.
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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Philip Kotler, "Marketing Management", Prentice Hall, 2014.
2. S.L. Gupta, "Marketing Research", Google Books
3. Saxena, Rajan, "Marketing Management", Tata-McGraw Hill,New Delhi.

Reference Books

1. Suja R. Nair, "Marketing Research (Text with Cases)", Himalaya Publishing House, 2 revised edition 2014.
2. Nargundkar, Rajendra, "Marketing Research", McGraw Hill Education.

Web links and Video Lectures (e-Resources):

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

VII Semester

WEB AND MOBILE APPLICATIONDEVELOPMENT			
Course Code	21CB732	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. To know Structure and implement HTML/CSS.

CLO 2. Apply intermediate and advanced web development practices.

CLO 3. Implement basic JavaScript.

CLO 4. To facilitate students to understand android SDK

CLO 5. To help students to gain a basic understanding of Android application development

CLO 6. To inculcate working knowledge of Android Studio development tool

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 ofteaching 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 criticalthinking.
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 withtheir 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 HTML: Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling. HTML Tables and Forms.

Textbook: T1

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

JAVASCRIPT: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions.

Textbook: T1

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

MANAGING STATE: Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript PseudoClasses, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services.

Textbook: T1

Teaching-Learning Process	Chalk and board, Demonstration

Module-4

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

Textbook:T2 and Reference books

Teaching-Learning Process	Chalk and board

Module-5

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents. Testing Android applications, Publishing Android application, Using Android preferences, Managing

Application resources in a hierarchy, working with different types of resources.

Textbook:T2 and Reference books

Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Adapt HTML and CSS syntax and semantics to build web pages.

CO 2. Construct and visually format tables and forms using HTML and CSS

CO 3. Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.

CO 4. Create, test and debug Android application by setting up Android development environment.

CO 5. Implement adaptive, responsive user interfaces that work across a wide range of devices.

CO 6. Analyze performance of android applications and understand the role of permissions and security

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson Education India, 1st Edition.
2. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd Edition

Reference Books

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd, 1st Edition.
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd, 1st Edition.

Weblinks and Video Lectures (e-Resources):

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

VII Semester

DOT NET FRAMEWORK FOR APPLICATION DEVELOPMENT			
Course Code	21CB733	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. Inspect Visual Studio programming environment and toolset designed to build applications for Microsoft Windows

CLO 2. Understand Object Oriented Programming concepts in C# programming language.

CLO 3. Interpret Interfaces and define custom interfaces for application.

CLO 4. Build custom collections and generics in C#

CLO 5. Construct events and query data using query expressions

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 ofteaching 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 criticalthinking.
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 withtheir 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

Introducing Microsoft Visual C# and Microsoft Visual Studio 2015: Welcome to C#, Working with variables, operators and expressions, Writing methods and applying scope, Using decision statements, Using compound assignment and iteration statements, Managing errors and exceptions T1: Chapter 1 – Chapter 6 RBT: L1, L2

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

Understanding the C# object model: Creating and Managing classes and objects, Understanding values and references, Creating value types with enumerations and structures, Using arrays

Textbook 1: Ch 7 to 10 RBT: L1, L2

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

Understanding parameter arrays, Working with inheritance, Creating interfaces and defining abstract classes, Using garbage collection and resource management

Textbook 1: Ch 11 to 14 RBT: L1, L2

Teaching-Learning Process	Chalk and board, Demonstration

Module-4

Defining Extensible Types with C#: Implementing properties to access fields, Using indexers, Introducing generics, Using collections

Textbook 1: Ch 15 to 18 RBT: L1, L2

Teaching-Learning Process	Chalk and board

Module-5

Enumerating Collections, Decoupling application logic and handling events, Querying in memory data by using query expressions, Operator overloading

Textbook 1: Ch 19 to 22 RBT: L1, L2

Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Build applications on Visual Studio .NET platform by understanding the syntax and semantics of C#

CO 2. Demonstrate Object Oriented Programming concepts in C# programming language

CO 3. Design custom interfaces for applications and leverage the available built-in interfaces in building complex applications.

CO 4. Illustrate the use of generics and collections in C#

CO 5. Compose queries to query in-memory data and define own operator behaviour

Assessment Details (both CIE and SEE)

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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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. John Sharp, "Microsoft Visual C# Step by Step", PHI Learning Pvt. Ltd, 8th Edition, 2016.

Reference Books

1. Christian Nagel, "C# 6 and .NET Core 1.0", Wiley India Pvt Ltd, 1st Edition, 2016.
2. Andrew Stellman and Jennifer Greene, "Head First C#", O"Reilly Publications, 2013.
3. Mark Michaelis, "Essential C# 6.0", Pearson Education India, 5th Edition, 2016.
4. Andrew Troelsen, "Prof C# 5.0 and the .NET 4.5 Framework", Apress and Dreamtech Press, 6th Edition, 2012

Weblinks and Video Lectures (e-Resources):

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

VII Semester

ENTERPRISE SYSTEMS			
Course Code	21CB734	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 concept of Simple Web Applications using MVC.

CLO 2. Be exposed to different models in SOA and ERP.

CLO 3. Be exposed to CRM models.

CLO 4. Be exposed to interactive networks and applications.λ Be familiar with configuration of networking

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 ofteaching 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 criticalthinking.
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 withtheir 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

WEB APPLICATIONS USING MVC

Overview of Database Management Systems; Overview of Model - View - Control (MVC); Control (MVC) method of software development in a 3 tier environment - Tools and Technologies; Brief overview of the following : Java server pages; Related Java Technologies; Microsoft .NET framework; PHP; Ruby on Rails; JavaScript; Ajax; Angular/React JS.

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

SOA AND ERP MODELS

Service Oriented Architecture (SOA); Principles of loose coupling, encapsulation; Inter-operatibility; Web Services as the implementation vehicle protocols, usage; Enterprise Resource Planning (ERP); systems and their architecture; Overview of SAP and Oracle Applications; Generic ERP Modules : Finance; HR; Materials Management; Investment, etc. ; Examples of Domain Specific Modules.

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

CRM MODELS

Electronic Data Exchange; Customer Relationship Management (CRM); Customer Relationship Management (CRM); Supplier Relationship Management (SRM) ; Security Issues - Authentication,

Authorisation, Access control ; Roles; single-sign-on ; Directory servers, Audit trails; Digital signatures; Encryption: review of IPSec, SSL and other technologies; Simple Applications Demo; Case study	
Teaching-Learning Process	Chalk and board, Demonstration
Module-4	
INTERACTIVE NETWORK AND APPLICATION Overview of : MPLS ; Virtual Private Networks (VPN) ; Firewalls ; Network monitoring and enforcement of policies ; Software Acquisition Process ; Tendering; conditions of contract ; Commercial off the shelf software (COTS) versus Bespoke Implementations; Total cost of ownership; Issues on using Open source software or free software; Licensed software; Case study	
Teaching-Learning Process	Chalk and board
Module-5	
CONFIGURATION OF NETWORKING Hardware Architectures for Enterprise Systems; Servers; Clustering; Storage area networks; Storage units; Back-up strategies; Local Area Network (LAN) technologies and products; Data Centres; Disaster recovery site design and implementation issues; Hardware Acquisition Issues; Case study	
Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Design and deploy Simple Web Applications using MVC.

CO 2. Design SOA and ERP models.

CO 3. Design of CRM models.

CO 4. Design interactive network and application.

CO 4. Manage, Maintain and configuration of Networking.

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1 Alexis Leon, "Enterprise Resource Planning", Tata McGraw Hill, 3rd Edition, 2017.

2 Alexis Leon, "Enterprise Resource Planning – Diversified",TMH, 2 nd Edition.

Reference Books

1 Ravi Shankar & S. Jaiswal, Galgotia, "Enterprise Resource Planning", 1 st Edition, 1999.

2 Dr. Ravi Kalakota, "E-Business Network Resource planning using SAP R/3 Baan and Peoples soft: A Practical Roadmap For Success", Pearson, 2nd Edition, 2001.

Weblinks and Video Lectures (e-Resources):

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

VII Semester

CLOUD COMPUTING			
Course Code	21CB735	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. Introduce the rationale behind the cloud computing revolution and the business drivers
CLO 2. Introduce various models of cloud computing
CLO 3. Introduction on how to design cloud native applications, the necessary tools and the design tradeoffs.
CLO 4. Realize the importance of Cloud Virtualization, Abstraction`s and Enabling Technologies and cloud security

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 ofteaching 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 criticalthinking.
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 withtheir 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:
Introduction ,Cloud Computing at a Glance, Historical Developments, Building Cloud Computing Environments, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjrasoft Aneka

Textbook 1: Chapter 1: 1.1,1.2 and 1.3

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

Virtualization: Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples

Textbook 1 : Chapter 3: 3.1 to 3.6

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

Cloud Computing Architecture: Introduction, Cloud Reference Model, Types of Clouds, Economics of the Cloud, Open Challenges

Textbook 1: Chapter 4: 4.1 to 4.5

Teaching-Learning Process	Chalk and board, Demonstration

Module-4

Cloud Security: Risks, Top concern for cloud users, privacy impact assessment, trust, OS security, VM Security, Security Risks posed by shared images and management OS.

Textbook 2: Chapter 9: 9.1 to 9.6, 9.8, 9.9

Teaching-Learning Process	Chalk and board

Module-5

Cloud Platforms in Industry
Amazon web services: - Compute services, Storage services, Communication services, Additional services. Google AppEngine: - Architecture and core concepts, Application life cycle, Cost model, Observations.

Textbook 1: Chapter 9: 9.1 to 9.2

Cloud Applications:
Scientific applications: - HealthCare: ECG analysis in the cloud, Biology: gene expression data analysis for cancer diagnosis, Geoscience: satellite image processing. Business and consumer applications: CRM and ERP, Social networking, media applications.

Textbook 1: Chapter 10: 10.1 to 10.2

Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO 1. Understand and analyze various cloud computing platforms and service provider.
CO 2. Illustrate various virtualization concepts.
CO 3. Identify the architecture, infrastructure and delivery models of cloud computing.
CO 4. Understand the Security aspects of CLOUD.
CO 5. Define platforms for development of cloud applications

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
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Two assignments each of **10 Marks**

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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

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(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).

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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.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Rajkumar Buyya, Christian Vecchiola, and Thamrai Selvi Mastering Cloud Computing McGraw Hill Education.
2. Dan C. Marinescu, Cloud Compting Theory and Practice, Morgan Kaufmann, Elsevier 2013

Reference Books

1. Toby Velte, Anthony Velte, Cloud Computing: A Practical Approach, McGraw-Hill Osborne Media.
2. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publication.
3. John Rhoton, Cloud Computing Explained: Implementation Handbook for Enterprises, Recursive Press.

Weblinks and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=1N3oqYhzHv4
- https://www.youtube.com/watch?v=RWgW-CgdIk0

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

VII Semester

COMPUTATIONAL FINANCE MODELING			
Course Code	21CB736	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. To make the students to understand how the techniques in computational finance applied in risk hedging and pricing of options.

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 ofteaching 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 criticalthinking.
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 withtheir 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

NUMERICAL METHODS AND MODELS

Numerical methods relevant to integration, differentiation and solving the partial differential equations of mathematical finance- examples of exact solutions including Black Scholes and its relatives. Finite difference methods including algorithms and question of stability and convergence. Treatment of near and far boundary conditions-the connection with binomial models- interest rate model- early exercise- the corresponding free boundary problems. Introduction to numerical methods for solving multi-factor models.

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

BLACK-SCHOLES FRAMEWORK

Black-Scholes PDE: simple European calls and puts; put-call parity. The PDE for pricing commodity and currency options. Discontinuous payoffs - Binary and Digital options. Option Greeks and their role in hedging. The mathematics of early exercise - American options: perpetual calls and puts; optimal exercise strategy and the smooth pasting condition. Volatility considerations - actual, historical, and implied volatility; local volatility surfaces. Simulation including random variable generation, variance reduction methods and statistical analysis of simulation output. Pseudo random numbers, Linear congruential generator, Mersenne twister RNG. The use of Monte Carlo simulation in solving applied problems on derivative pricing discussed in the current finance literature. The technical topics addressed include importance sampling, Monte Carlo integration, Simulation of Random walk and approximations to diffusion processes, martingale control variables, stratification, and the estimation of the "Greeks."

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

FINANCIAL PRODUCTS AND MARKETS

Introduction to the financial markets and the products which are traded in them: Equities, indices, foreign exchange, and commodities. Options contracts and strategies for speculation and hedging.

Teaching-Learning Process	Chalk and board, Demonstration

Module-4

APPLICATION AREAS

The pricing of American options- pricing interest rate dependent claims, and credit risk. The use of importance of sampling for Monte Carlo simulation of VaR for portfolios of options.

Teaching-Learning Process	Chalk and board

Module-5

STATISTICAL ANALYSIS OF FINANCIAL RETURNS

Fat-tailed and skewed distributions, outliers, stylized facts of volatility, implied volatility surface, and volatility estimation using high frequency data. Copulas, Hedging in incomplete markets, American Options, Exotic options, Electronic trading, Jump Diffusion Processes, High-dimensional covariance matrices, Extreme value theory, Statistical Arbitrage.

Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Understand existing financial models in a quantitative and mathematical way.

CO 2. Apply these quantitative tools to solve complex problems in the areas of portfolio management, risk management and financial engineering.

CO 3. Explain the approaches required to calculate the price of options.

CO 4. Identify the methods required to analyse information from financial data and trading systems.

CO 5. Understand the various statistical methods to analyse the financial data.

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1 R. Seydel, "Tools for Computational Finance", 2nd edition, Springer-Verlag, New York, 2004

2 P. Glasserman, "Monte Carlo Methods in Financial Engineering", Springer-Verlag, New York, 2004.

3 W. Press, S. Teukolsky, W. Vetterling and B. Flannery, "Numerical Recipes in C: The Art of Scientific Computing", 1997. Cambridge University Press, Cambridge, UK. Available on-line at: http://www.nr.com/

4 A. Lewis, " Option Valuation under Stochastic Volatility", Finance Press, Newport Beach, California, 2000

5 A. Pelsser, "Efficient Methods for Valuing Interest Rate Derivatives", Springer-Verlag, New York, 2000.

VII Semester

USABILITY DESIGN OF SOFTWARE			
Course Code	21CB741	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. To know the knowledge of user- centered design, user -centered methods in design.

CLO 2. To make graphic design on screens, simulation and prototyping techniques,

CLO 3. To provide usability testing methods, interface technologies and user centered design in corporate perspective.

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 ofteaching 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 criticalthinking.
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 withtheir 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

THE USER INTERFACE: The User Interface-Introduction, Overview, The importance of user interface – Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design.

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

THE USER INTERFACE DESIGN PROCESS: The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, Basic business functions, Design standards.

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

SYSTEM MENUS AND NAVIGATION SCHEMES: System menus and navigation schemes- Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices, Navigating menus, Kinds of graphical menus.

Teaching-Learning Process	Chalk and board, Demonstration

Module-4

Windows: Windows - Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations, Web systems, Characteristics of device based controls.

Teaching-Learning Process	Chalk and board

Module-5

SCREEN BASED CONTROLS - Screen based controls- Operable control, Text control, Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests.

Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Design the User Interface, design, menu creation, windows creation and connection between menus and windows.

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum 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. Marks scored out of 100 shall be reduced proportionally to 50 marks
Suggested Learning Resources:
Textbooks Wilbert O. Galitz, "The Essential Guide to User Interface Design", John Wiley & Sons, 2nd Edition 2002. **Reference Books** Ben Sheiderman, "Design the User Interface", Pearson Education, 1998. Alan Cooper, "The Essential of User Interface Design", Wiley- Dream Tech Ltd, 2002.
Weblinks and Video Lectures (e-Resources):
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

VII Semester

CRYPTOGRAPHY AND NETWORK SECURITY			
Course Code	21CB742	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. To understand Cryptography, Network Security and its principlesCLO 2. To Analyze different Cryptography algorithms
CLO 3. To Illustrate Public and Private key cryptography
CLO 4. To Explain Key management, distribution and certification
CLO 5. To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher 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 encryption techniques 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

Classical Encryption Techniques: Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad.

Block Ciphers and the Data Encryption Standard: Traditional block Cipher structure, Stream Ciphers and Block Ciphers, Motivation for the Feistel Cipher structure, the Feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm

Textbook 1: Chapter 2, 3

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

Module-2

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA.

Other Public-Key Cryptosystems: Diffie-Hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems.

Textbook 1: Chapter 9, 10

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

Module-3

Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates.

Textbook 1: Chapter 14.1 – 14.3

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

Module-4

X-509 certificates. Certificates, X-509 version 3

Public key infrastructure.

User Authentication: Remote user Authentication principles, Mutual Authentication, one-way authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one-way Authentication,

Kerberos, Motivation, Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one-way Authentication.

Textbook 1: Chapter 14.4 – 15.4

Teaching-Learning Process	Chalk& board, Problem based learning

Module-5

Electronic Mail Security: Pretty good privacy, S/MIME,

IP Security: IP Security overview, IP Security policy, Encapsulating Security payload, Combining security associations, Internet key exchange.

Textbook 1: Chapter 19.1, 19.2, 20.1 – 20.5

Teaching-Learning Process	Chalk and board, Problem based learning

Course Outcomes

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

CO 1. Understand Cryptography, Network Security theories, algorithms and systems
CO 2. Apply different Cryptography and Network Security operations on different applications
CO 3. Analyze different methods for authentication and access control
CO 4. Evaluate Public and Private key, Key management, distribution and certification
CO 5. Design necessary techniques to build protection mechanisms to secure computer networks

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Textbooks

1. William Stallings: Cryptography and Network Security, Pearson 6th edition.

Reference:

1. V. K Pachghare: Cryptography and Information Security, PHI 2nd Edition
2. BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.

Weblinks and Video Lectures (e-Resources):

https://nptel.ac.in/courses/106105031
https://onlinecourses.nptel.ac.in/noc21_cs16
https://www.digimat.in/nptel/courses/video/106105031
https://www.youtube.com/watch?v=DEqjC0G5KwU
https://www.youtube.com/watch?v=FqQ7TWvOaus
https://www.youtube.com/watch?v=PHsa_Ddgx6w

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

Project based learning:

1. Implement classical, symmetric and asymmetric algorithms in any preferred language
2. Evaluate network security protocol using any simulator available
3. Conduct a comprehensive literature survey on the protocols and algorithms
4. Identify the security threats and models of security threats
5. Implement factorization algorithms and evaluate their complexity, identify a technologies to factorize a large prime number.

VII Semester

DATA MINING AND DATA WAREHOUSING			
Course Code	21CB743	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. To teach the basic principles, concepts and applications of data warehousing and data mining

CLO 2. To introduce the task of data mining as an important phase of knowledge recovery process

CLO 3. To familiarize Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment

CLO 4. To impart knowledge of the fundamental concepts that provide the foundation of data mining

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 ofteaching 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 criticalthinking.
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 withtheir 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 DATA MINING: Motivation, Importance, Definition of Data Mining, Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of A Data Mining System With A Database or Data Warehouse System, Major Issues In Data Mining, Types of Data Sets and Attribute Values, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity. PREPROCESSING: Data Quality, Major Tasks in Data Preprocessing, Data Reduction, Data Transformation and Data Discretization, Data Cleaning and Data Integration.

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

DATA WAREHOUSING AND ON-LINE ANALYTICAL PROCESSING: Data Warehouse basicconcepts, Data Warehouse Modeling - Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction. DATA CUBE TECHNOLOGY: Efficient Methods for Data Cube Computation, Exploration and Discovery in Multidimensional Databases.

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Are All the Pattern Interesting, Pattern Evaluation Methods, Applications of frequent pattern and associations. FREQUENT PATTERN AND ASSOCIATION MINING: A Road Map, Mining Various Kinds of Association Rules, Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns.

Teaching-Learning Process	Chalk and board, Demonstration

Module-4

CLASSIFICATION: Basic Concepts, Decision Tree Induction, Bayesian Classification Methods, Rule- Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification, Bayesian Belief Networks, Classification by Neural Networks, Support Vector Machines, Pattern-Based Classification, Lazy Learners (or Learning from Your Neighbors), Other Classification Methods.

Teaching-Learning Process	Chalk and board

Module-5

CLUSTER ANALYSIS: Basic Concepts of Cluster Analysis, Clustering structures, Major Clustering Approaches, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model Based Clustering - The Expectation-Maximization Method, Other Clustering Techniques, Clustering High- Dimensional Data, Constraint-Based and User-Guided Cluster Analysis. OUTLIER ANALYSIS: Why outlier analysis, Identifying and handling of outliers, Distribution Based Outlier Detection: A Statistics- Based Approach, Classification-Based Outlier Detection, Clustering-Based Outlier Detection, Deviation- Based Outlier Detection, Isolation-Based Method: From Isolation Tree to Isolation Forest.

Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Design a data mart or data warehouse for any organization

CO 2. Develop skills to write queries using DMQL

CO 3. Extract knowledge using data mining techniques

CO 4. Adapt to new data mining tools.

CO 5. Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Jiawei Han, MichelineKamber, Jian Pei, "Data Mining: Concepts and Techniques", Elsevier, United States of America, 3rd edition.

Reference Books

1. Thomas J. Mowbray, "Cyber security: Managing Systems, Conducting Testing, and Investigating Intrusions", John Wiley & Sons, 2006.
2. Amitesh Sinha, "Data Warehousing, Thomson Learning", Thomson Learning, India, 2007.
3. Xingdong Wu, Vipin Kumar, "Top Ten Algorithms in Data Mining", CRC Press, 2009.

Weblinks and Video Lectures (e-Resources):

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

VII Semester

BEHAVIORAL ECONOMICS			
Course Code	21CB744	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. To understand the concept and theory of economics.
CLO 2. To acquire knowledge on the choices and behavior of firms, households and other economics entities.
CLO 3. To learn the behavioral science perspective in economics.
CLO 4. To know the current ideas and concepts regarding decision making in economics.
CLO 5. To study the inter temporal choice in economics.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher 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 encryption techniques 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
The neoclassical/standard model and behavioral economics in contrast; historical background; behavioral economics and other social sciences; theory and evidence in the social sciences and in behavioral economics; applications – gains and losses, money illusion, charitable donation.

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

Module-2

BASICS OF CHOICE THEORY
Revisiting the neoclassical model; utility in economics and psychology; models of rationality; connections with evolutionary biology and cognitive neuroscience; policy analysis – consumption and addiction, environmental protection, retail therapy; applications – pricing, valuation, public goods, choice anomalies.

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

Module-3

BELIEFS, HEURISTICS AND BIASES
Revisiting rationality; causal aspects of irrationality; different kinds of biases and beliefs; self-evaluation and selfprojection; inconsistent and biased beliefs; probability estimation; trading applications – trade in counterfeit goods, financial trading behavior, trade in memorabilia, policy analysis – norms and markets, labor markets, market clearing, public goods; applications – logic and knowledge, voluntary contribution, compensation design.

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

Module-4

CHOICE UNDER UNCERTAINTY
Background and expected utility theory; prospect theory and other theories; reference points; loss aversion; marginal utility; decision and probability weighting; applications – ownership and trade, income and consumption, performance in sports. Strategic choice-Review of game theory and Nash equilibrium – strategies, information, equilibrium in pure and mixed strategies, iterated games, bargaining, signalling, learning; applications – competitive sports, bargaining and negotiation, monopoly and market entry.

Teaching-Learning Process	Chalk& board, Problem based learning

Module-5

INTERTEMPORAL CHOICE
Geometric discounting; preferences over time; anomalies of inter-temporal decisions; hyperbolic discounting; instantaneous utility; alternative concepts – future projection, mental accounts, heterogeneous selves, procedural choice; policy analysis – mobile calls, credit cards, organization of government; applications – consumption and savings, clubs and membership, consumption planning. Individual preferences; choice anomalies and inconsistencies; social preferences; altruism; fairness; reciprocity; trust; learning; communication; intention; demographic and cultural aspects; social norms; compliance and punishment; inequity aversion.

Teaching-Learning Process	Chalk and board, Problem based learning

Course Outcomes
At the end of the course the student will be able to:
CO 1. Understand and apply various concepts in traditional and modern Microeconomics.
CO 2. Focus on decision making, and develop a holistic understanding of these concepts and their interconnections.
CO 3. Explore the knowledge on behavioural science perspective in Economics.
CO 4. Understand current ideas and concepts regarding decision making in Economics.
CO 5. Students will be able to understand the intertemporal choice in Economics.

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 **20Marks** (**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 marksand 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.
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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Textbooks
1 N. Wilkinson and M. Klaes , "An Introduction to Behavioral Economics", 2017.
2 Paul A. Samuelson, William D. Nordhaus, Sudip Chaudhuri and AnindyaSen, "Economics", 19th edition, Tata McGraw Hill, 2010.
3 M.L.Trivedi, "Managerial Economics:Theory & Applications", Tata McGraw-Hill Education, 4 th Edition, 2002.
4 Robert H. Frank, 2014, "Microeconomics and Behaviour", McGraw-Hill, 9 th Edition, 2014.
5 Philip Corr, Anke Plagnol, "Behavioral Economics: The Basic", Routledge; 1st edition, 2018.
Reference:

1 William Boyes and Michael Melvin, “Textbook of Economics”, DTECH, 6th Edition, 2004.
2 N. Gregory Mankiw, “Principles of Economics”, Thomson learning, 3rd Edition, 2003.
3 Richard Lipsey and Alec Charystal, “Economics”, Oxford, University Press, 12th Edition, 2011.

VII Semester

WEB AND CYBER SECURITY			
Course Code	21CB745	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. To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.

CLO 2. To develop graduates that can plan, implement, and monitor cyber security mechanisms to help ensure the protection of information technology assets

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 ofteaching 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 criticalthinking.
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 withtheir 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

TRANSPORT LAYER SECURITY: Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify and Finished Messages, Cryptographic Computations, and Padding. HTTPS Connection Initiation, Connection Closure. Secure Shell(SSH) Transport Layer Protocol, User Authentication Protocol, Connection Protocol.

TextBook:T1

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

IP Security: IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations.

TextBook:T1

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

TextBook:T2

Teaching-Learning Process	Chalk and board, Demonstration

Module-4

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

Reference Book 1

Teaching-Learning Process	Chalk and board

Module-5

Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation

TextBook:T2

Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.
CO 2. Design, develop, test and evaluate secure software.
CO 3. Demonstrate cyber security cybercrime and forensics.
CO 4. Infer legal issues in cybercrime

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. William Stallings, "Cryptography and Network Security", Pearson, 6th Edition.

2. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley Pvt India Ltd, 2013.

Reference Books

1. Thomas J. Mowbray, "Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions", John Wiley & Sons.

Weblinks and Video Lectures (e-Resources):

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

VII Semester

BLOCKCHAIN TECHNOLOGY			
Course Code	21CB746	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. Explain the fundamentals of distributed computing and blockchain
CLO 2. Discuss the concepts in bitcoin
CLO 3. Demonstrate Ethereum platform

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

Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.
Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations.
Textbook 1: Chapter 1, 2

Teaching-Learning Process	Chalk and board, Active Learning – Oral presentations.

Module-2

Introduction to Cryptography & Cryptocurrencies: Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency,
How Bitcoin Achieves Decentralization: Distributed consensus, Consensus without identity using a block chain, Incentives and proof of work, Putting it all together,
Textbook 2: Chapter 1, 2

Teaching-Learning Process	Chalk and board, Demonstration

Module-3

Mechanics of Bitcoin: Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bitcoin network, Limitations and improvements
How to Store and Use Bitcoins: Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets
Textbook2: Chapter 3,4

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

Module-4

Bitcoin Mining: The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies,
Bitcoin and Anonymity: Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash,
Textbook2: Chapter 5,6

Teaching-Learning Process	Chalk& board, Problem based learning, MOOC

Module-5

Smart Contracts and Ethereum 101:

Smart Contracts: Definition, Ricardian contracts.

Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.

Textbook 1: Chapter 10

Teaching-Learning Process	Chalk and board, MOOC, Practical Demonstration

Course Outcomes

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

CO 1. Describe the concepts of Distrbuted computing and its role in Blockchain
CO 2. Describe the concepts of Cryptography and its role in Blockchain
CO 3. List the benefits, drawbacks and applications of Blockchain
CO 4. Appreciate the technologies involved in Bitcoin
CO 5. Appreciate and demonstrate the Ethereum platform to develop blockchain application.

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1-78712-544-5, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, Steven Goldfeder and Jeremy Clark., Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction. Princeton University Press, 2016.

Reference:

1. Mastering Bitcoins: Unlocking Digital Cryptocurrencies by Andreas Antonopoulos. O'Reilly Media, Inc, 2013.

Weblinks and Video Lectures (e-Resources):
1. http://bitcoinbook.cs.princeton.edu/?_ga=2.8302578.1344744326.1642688462-86383721.1642688462 2. https://nptel.ac.in/courses/106/105/106105184/ 3. https://ethereum.org/en/developers/ 4. https://developer.ibm.com/components/hyperledger-fabric/tutorials/
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

VII Semester

USER INTERFACE DESIGN			
Course Code	21CB751	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. To study the concept of menus, windows, interfaces

CLO 2. To study about business functions

CLO 3. To study the characteristics and components of windows and the various controls for the windows.

CLO 4. To study about various problems in windows design with color, text, graphics and To study

the testing 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) does not mean only traditional lecture method, but different type ofteaching 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 criticalthinking.
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 withtheir 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

The User Interface-Introduction, Overview, The importance of user interface – Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design

Textbook 1: Ch. 1,2 RBT: L1, L2

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, Basic business functions, Design standards.

Textbook 1: Part-2 RBT: L1, L2

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

System menus and navigation schemes- Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices, Navigating menus, Kinds of graphical menus.

Textbook 1: Part-2 RBT: L1, L2	
Teaching-Learning Process	Chalk and board, Demonstration

Module-4

Windows - Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations, Web systems, Characteristics of device based controls.

Textbook 1: Part-2 RBT: L1, L2

Teaching-Learning Process	Chalk and board

Module-5

Screen based controls- Operable control, Text control, Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests.

Textbook 1: Part-2 RBT: L1, L2

Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Design the User Interface, design, menu creation, windows creation and connection between menus and windows.

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Wilbert O. Galitz, "The Essential Guide to User Interface Design", John Wiley & Sons, Second Edition 2002.

Reference Books

1. Ben Sheiderman, "Design the User Interface", Pearson Education, 1998.
2. Alan Cooper, "The Essential of User Interface Design", Wiley- Dream Tech Ltd, 2002.

Weblinks and Video Lectures (e-Resources):

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

VII Semester

INTRODUCTION TO CLOUD COMPUTING			
Course Code	21CB752	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 cloud computing bascis, infrastructure, services.

CLO 2. Understand the cloud computing technology.

CLO 3. Understand the Saas.

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 ofteaching 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 criticalthinking.
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 withtheir 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

Cloud Computing Basics: Cloud Computing Overview, Applications, Intranets and the cloud, First Movers in the cloud. Your Organization and Cloud Computing: When you can use Cloud Computing, Benfits, Limitations, Security Concerns. Cloud Computing with the titans: Google, EMC, NetApp, Microsoft, Amazon, IBM. The Business Case for going to the cloud: Cloud Computing services, how those applications help your business, Deleting your data center.

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

Hardware and Infrastructure: Clients, Security, Network, Services. Accessing the cloud: Platforms, Web Applications, Web APIs, Web Browsers. Cloud Storage: Overview, Cloud Storage Providers

Teaching-Learning Process	Chalk and board, Active Learning

Module-3

Software as a service: Overview, Driving Forces, Company Offerings, Induistries. Software plus services: Overview, Mobile Device Integration, Providers, Microsoft Online.

Teaching-Learning Process	Chalk and board, Demonstration

Module-4

Developing Applications: Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect, Development, Troubleshooting, Application Management. Local Clouds and Thin Clients: Virtualization in Your Organization, Server Solutions, Thin Clients, Case Study.

Teaching-Learning Process	Chalk and board

Module-5

Migrating to the Cloud: Cloud Services for industries, Cloud Services aimed at the Mid-Market, Enterprise-Class Cloud Offerings, Migration. Best Practices and the future of cloud computing: Analyze your service, Best Practices, How cloud computing Might Evolve.

Teaching-Learning Process	Chalk and board

Course outcome (Course Skill Set)

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

CO 1. Describe Cloud Models, Cloud Infrastructure

CO 2. Discuss the key dimensions and challenges of Cloud Computing and Architecture and Workflow.

CO 3. Discuss about the Cloud Computing Technology and Software as a service

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 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Antony T Velte, "Cloud Computing : A Practical Approach", McGrawHill.
2. Dan C Marinescu, "Cloud Computing Theory and Practice", Elsevier(MK), 2013.

Reference Books

1. Larry L. Peterson and Bruce S Davie, "Computer Networks: A Systems Approach", Elsevier, 5th Edition, 2011.
2. Tanenbaum, "Computer Networks", Pearson Education/PHI, 4th Edition, 2003.
3. William Stallings, "Data and Computer Communications", Pearson Education, 8th Edition, 2012.

Weblinks and Video Lectures (e-Resources):

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

VII Semester

PROGRAMMING IN PYTHON			
Course Code	21CB753	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. To understand why Python is a useful scripting language for developers
CLO 2. To read and write simple Python programs
CLO 3. To learn how to identify Python object types.
CLO 4. To learn how to write functions and pass arguments in Python.
CLO 5. To use Python data structures –- lists, tuples, dictionaries.

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 DATA, EXPRESSIONS, STATEMENTS:08 Hours
Introduction: Creativity and motivation, understanding programming, Terminology: Interpreter and compiler, Running Python, The First Program; Data types: Int, float, Boolean, string, and list, variables, expressions, statements, Operators and operands.

Textbook 1: Chapter 1.1,1.2,1.3,1.6, Chapter 2.1-2.6
Textbook 2: Chapter 1

Teaching-Learning Process	Chalk and board, Active Learning

Module-2

CONTROL FLOW, LOOPS:
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: while, for, break, continue, pass statement.

Textbook 1: Chapter 3.1-3.6, chapter 5

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

Module-3

FUNCTIONS AND STRINGS:
Functions: Function calls, adding new functions, definition and uses, local and global scope, return values. Strings: strings, length of string, string slices, immutability, multiline comments, string functions and methods;

Textbook 1: Chapter 6
Textbook 2: Chapter 3

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

Module-4

LISTS, TUPLES, DICTIONARIES:08 Hours

Lists: List operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, listparameters, list comprehension;

Tuples: tuple assignment, tuple as return value, tuple comprehension;

Dictionaries: operations and methods, comprehension;

Textbook 2: Chapter 10,11,12

Teaching-Learning Process	Chalk& board, Active Learning

Module-5

REGULAR EXPRESSIONS,FILES AND EXCEPTION:

Regular expressions: Character matching in regular expressions, extracting data using regular expressions, Escape character

Files and exception: Text files, reading and writing files, command line arguments, errors andexceptions, handling exceptions, modules.

Textbook 1: Chapter 11.1,11.2,11.4
Textbook 2: Chapter 14

Teaching-Learning Process	Chalk and board, MOOC

Suggested Course Outcomes

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

CO 1. Understand Python syntax and semantics and be fluent in the use of Python flow control and functions.
CO 2. Demonstrate proficiency in handling Strings and File Systems.
CO 3. Represent compound data using Python lists, tuples, Strings, dictionaries.
CO 4. Read and write data from/to files in Python 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

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.
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. Marks scored out of 100 shall be reduced proportionally to 50 marks

Textbooks

1. Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1st Edition, CreateSpace Independent Publishing Platform, 2016. http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2ndEdition, Green Tea Press, 2015. (Chapters 15, 16, 17) http://greenteapress.com/thinkpython2/thinkpython2.pdf

REFERENCE BOOKS:

1. R. Nageswara Rao, "Core Python Programming", dreamtech
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming , Reema theraja, OXFORD publication

Weblinks and Video Lectures (e-Resources):

1. https://www.w3resource.com/python/python-tutorial.php
2. https://data-flair.training/blogs/python-tutorials-home/
3. https://www.youtube.com/watch?v=c235EsGFcZs
4. https://www.youtube.com/watch?v=v4e6oMRS2QA
5. https://www.youtube.com/watch?v=Uh2ebFW8OYM
6. https://www.youtube.com/watch?v=oSPMmeaiQ68
7. https://www.youtube.com/watch?v=_uQrJ0TkZlc
8. https://www.youtube.com/watch?v=K8L6KVGG-7o

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

Real world problem solving: Demonstration of projects developed using python language

VII Semester

INTRODUCTION TO DATA SCIENCE			
Course Code	21CB754	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. To provide a foundation in data Science terminologies
CLO 2. To familiarize data science process and steps
CLO 3. To Demonstrate the data visualization tools
CLO 4. To analyze the data science applicability in real time 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 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

PREPARING AND GATHERING DATA AND KNOWLEDGE

Philosophies of data science - Data science in a big data world - Benefits and uses of data science and big data - facts of data: Structured data, Unstructured data, Natural Language, Machine generated data, Audio, Image and video streaming data - The Big data Eco system: Distributed file system, Distributed Programming framework, Data Integration frame work, Machine learning Framework, NoSQL Databases, Scheduling tools, Benchmarking Tools, System Deployment, Service programming and Security.

Textbook 1: Ch 1.1 to 1.4

Teaching-Learning Process	Chalk and board, Active Learning, PPT Based presentation

Module-2

THE DATA SCIENCE PROCESS-Overview of the data science process- defining research goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory data analysis, Build the models, presenting findings and building application on top of them.

Textbook 1:,Ch 2

Teaching-Learning Process	Chalk and board, Active Learning, PPT Based presentation

Module-3

MACHINE LEARNING: Application for machine learning in data science- Tools used in machine learning- Modeling Process – Training model – Validating model – Predicting new observations –Types of machine learning Algorithm : Supervised learning algorithms, Unsupervised learning algorithms.

Textbook 1: Ch 3.1 to 3.3

Teaching-Learning Process	Chalk and board, Active Learning, PPT Based presentation, Video

Module-4

VISUALIZATION–Introduction to data visualization – Data visualization options – Filters – MapReduce – Dashboard development tools.

Textbook 1: Ch 9

Teaching-Learning Process	Chalk and board, Active Learning, PPT Based presentation, MOOC

Module-5

CASE STUDIES Distributing data storage and processing with frameworks - Case study: e.g, Assessing risk when lending money.

Textbook 1: Ch 5.1, 5.2

Teaching-Learning Process	Chalk and board, Active Learning, PPT Based presentation, Video

Course Outcomes

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

CO 1. Describe the data science terminologies
CO 2. Apply the Data Science process on real time scenario.
CO 3. Analyze data visualization tools
CO 4. Apply Data storage and processing with frameworks

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The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be reduced proportionally to 50 marks

Textbooks

1. Introducing Data Science, Davy Cielen, Arno D. B. Meysman and Mohamed Ali,Manning Publications, 2016.

Reference Books

1. Doing Data Science, Straight Talk from the Frontline, Cathy O'Neil, Rachel Schutt, O' Reilly, 1st edition, 2013.
2. Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Cambridge University Press, 2nd edition, 2014
3. An Introduction to Statistical Learning: with Applications in R, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer, 1st edition, 2013
4. Think Like a Data Scientist, Brian Godsey, Manning Publications, 2017.

Weblinks and Video Lectures (e-Resources):

1. https://www.simplilearn.com/tutorials/data-science-tutorial/what-is-data-science
2. https://www.youtube.com/watch?v=N6BghzuFLIg
3. https://www.coursera.org/lecture/what-is-datascience/fundamentals-of-data-science-tPgFU
4. https://www.youtube.com/watch?v=ua-CiDNNj30

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

Real world problem solving using Data science techniques and demonstration of data visualization methods with the help of suitable project.