

21INT49 Inter/Intra Institutional Internship: All the students admitted to engineering programs under the lateral entry category shall have to undergo a mandatory 21INT49 Inter/Intra Institutional Internship of 03 weeks during the intervening period of III and IV semesters. The internship shall be slated for CIE only and will not have SEE. The letter grade earned through CIE shall be included in the IV semester grade card. The internship shall be considered as a head of passing and shall be considered for vertical progression and for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequently after satisfying the internship requirements. The faculty coordinator or mentor shall monitor the students' internship progress and interact with them for the successful completion of the internship.

Non-credit mandatory courses (NCMC):

(A) Additional Mathematics I and II:

(1) These courses are prescribed for III and IV semesters respectively to lateral entry Diploma holders admitted to III semester of B.E./B.Tech., programs. They shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the course requirements during subsequent semester/s to earn the qualifying CIE marks. These courses are slated for CIE only and has no SEE.

(2) Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

(3) Successful completion of the courses Additional Mathematics I and II shall be indicated as satisfactory in the grade card. Non-completion of the courses Additional Mathematics I and II shall be indicated as Unsatisfactory.

(B) National Service Scheme/Physical Education (Sport and Athletics)/ Yoga:

(1) Securing 40 % or more in CIE, 35 % or more marks in SEE and 40 % or more in the sum total of CIE + SEE leads to successful completion of the registered course.

(2) In case, students fail to secure 35 % marks in SEE, they have to appear for SEE during the subsequent examinations conducted by the University.

(3) In case, any student fails to register for NSS, PE or Yoga/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have not completed the requirements of the course. In such a case, the student has to fulfill the course requirements during subsequent semester/s to earn the qualifying CIE marks.

(4) Successful completion of the course shall be indicated as satisfactory in the grade card. Non-completion of the course shall be indicated as Unsatisfactory.

(5) These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

Ability Enhancement Course - III

21CSL381	Mastering Office	21CS383	
21CS382	Programming IN C++	21CS384	

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B. E.(Common to all branches)

Choice Based Credit System (CBCS) and Outcome-Based Education (OBE)

SEMESTER - III

TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES			
Course Code	21MAT 31	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 objectives: The goal of the course Transform Calculus, Fourier series and Numerical techniques 21MAT 31 is ➤ To have an insight into solving ordinary differential equations by using Laplace transform techniques ➤ Learn to use the Fourier series to represent periodical physical phenomena in engineering analysis. ➤ 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. ➤ To develop proficiency in solving ordinary and partial differential equations arising in engineering applications, using numerical methods			
Module-1: Laplace Transform			
Definition and Laplace transforms of elementary functions (statements only). Problems on Laplace's 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) problems. Laplace transforms of derivatives, solution of differential equations. (8 Hours) Self-study: Solution of simultaneous first-order differential equations. (RBT Levels: L1, L2 and L3)			
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation		
Module-2: Fourier Series			
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. (8 Hours) Self-study: Convergence of series by D'Alembert's Ratio test and, Cauchy's root test. (RBT Levels: L1, L2 and L3)			
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation		
Module-3: Infinite Fourier Transforms and Z-Transforms			
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. (8 Hours) Self Study: Initial value and final value theorems, problems. (RBT Levels: L1, L2 and L3)			
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation		

Module-4: Numerical Solution of Partial Differential Equations	
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. (8 Hours) Self Study: Solution of Poisson equations using standard five-point formula. (RBT Levels: L1, L2 and L3)	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation
Module-5: Numerical Solution of Second-Order ODEs and Calculus of Variations	
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. (8 Hours) Self Study: Hanging chain problem (RBT Levels: L1, L2 and L3)	
Course outcomes: After successfully completing the course, the students will be able to: ➤ To solve ordinary differential equations using Laplace transform. ➤ Demonstrate the Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory. ➤ To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations ➤ To solve mathematical models represented by initial or boundary value problems involving partial differential equations ➤ Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.	

Suggested Learning Resources:**Text Books:**

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. New York, Latested.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", McGraw 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):

- <http://ac.in/courses.php?disciplineID=111>
- [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
- <http://academicearth.org/>
- <http://www.bookstreet.in>
- VTU e-Shikshana Program
- VTU EDUSAT Program

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

- Quizzes
- Assignments
- Seminars

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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:

1. Three Unit Tests each of **20 Marks (duration 01 hour)**
2. First test at the end of 5th week of the semester
3. Second test at the end of the 10th week of the semester
4. Third test at the end of the 15th week of the semester

Two assignments each of 10 Marks

5. First assignment at the end of 4th week of the semester
6. 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)**

7. 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**)

- The question paper will be set for 100 marks and marks scored will be proportionally scaled down to 50 marks
- The question paper will have ten questions. Each question is set for 20 marks.
- 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

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Support the program with functions for each of the above operations.	
Teaching-Learning Process	Problem based learning (Implementation of different programs to illustrate application of arrays and structures. 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. Different representation of expression. Stack Applications: Infix to postfix conversion, Infix to prefix conversion, evaluation of postfix expression, recursion. Queues: Definition, Array Representation of Queues, Queue Operations, Circular Queues, Queues and Circular queues using Dynamic arrays, Dequeues, Priority Queues. Textbook 1: Chapter 3: 3.1 -3.4, 3.6 Textbook 2: Chapter 6: 6.1 -6.4, 6.5, 6.7-6.13	
Laboratory Component:	
- 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) - Push an Element on to Stack - Pop an Element from Stack - Demonstrate <i>Overflow</i> and <i>Underflow</i> situations on Stack - Display the status of Stack - Exit Support the program with appropriate functions for each of the above operations - Design, Develop and Implement a Program in C for the following Stack Applications - Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ - Solving Tower of Hanoi problem with n disks	
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. Textbook 1: Chapter 4: 4.1 – 4.4, 4.5.2, 4.7, 4.8, Textbook 2: Chapter 5: 5.1 – 5.9	
Laboratory Component:	
- Singly Linked List (SLL) of Integer Data - Create a SLL stack of N integer. - Display of SLL - Linear search. Create a SLL queue of N Students Data Concatenation of two SLL of integers. - Design, Develop and Implement a menu driven Program in C for the following operationson Doubly Linked List (DLL) of Professor Data with the fields: ID, Name, Branch, Area of specialization - Create a DLL stack of N Professor's Data. - Create a DLL queue of N Professor's Data Display the status of DLL and count the number of nodes in it.	

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a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a diagraph using DFS/BFS method.	
2. Design and develop a program in C that uses Hash Function $H:K \rightarrow L$ as $H(K)=K \bmod m$ (remainder method) and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.	
Teaching-Learning Process	NPTEL, MOOC etc. courses on trees and graphs. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
Course Outcomes (Course Skill Set) At the end of the course the student will be able to: CO 1. Identify different data structures and their applications. CO 2. Apply stack and queues in solving problems. CO 3. Demonstrate applications of linked list. CO 4. Explore the applications of trees and graphs to model and solve the real-world problem. CO 5. Make use of Hashing techniques and resolve collisions during mapping of key value pairs	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together Continuous Internal Evaluation: Three Unit Tests each of 20 Marks (duration 01 hour) 1. First test at the end of 5 th week of the semester 2. Second test at the end of the 10 th week of the semester 3. Third test at the end of the 15 th week of the semester Two assignments each of 10 Marks 4. First assignment at the end of 4 th week of the semester 5. Second assignment at the end of 9 th week of the semester Practical Sessions need to be assessed by appropriate rubrics and viva-voce method. This will contribute to 20 marks . - Rubrics for each Experiment taken average for all Lab components – 15 Marks. - Viva-Voce– 5 Marks (more emphasized on demonstration topics) The sum of three tests, two assignments, and practical sessions will be out of 100 marks and will be scaled down to 50 marks (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.	
Semester End Examination: Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours) 1. The question paper will have ten questions. Each question is set for 20 marks. 2. There will be 2 questions from each module. Each of the two questions under a module (with a	

III Semester

ANALOG AND DIGITAL ELECTRONICS

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

Course Learning Objectives:

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

Teaching-Learning Process (General Instructions)

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

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

Module-1

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

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

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

Laboratory Component:

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

Teaching-Learning Process

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

Module-2

Karnaugh maps: minimum forms of switching functions, two and three variable Karnaugh maps, four

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. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014. 2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014. 3. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
Reference Books:
1. Gilberg and Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning, 2014. 2. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013 3. A M Tenenbaum, Data Structures using C, PHI, 1989 4. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.
Weblinks and Video Lectures (e-Resources):
1. http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html 2. https://nptel.ac.in/courses/106/105/106105171/ 3. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
• Real world problem solving using group discussion. • Back/Forward stacks on browsers. • Undo/Redo stacks in Excel or Word. • Linked list representation of real-world queues -Music player, image viewer

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

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

Laboratory Component:

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

Teaching-Learning Process

1. Chalk and Board for numerical
2. Laboratory Demonstration

Module-3

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

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

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

Laboratory Component:

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

Teaching-Learning Process

1. Demonstration using simulator
2. Case study: Applications of Programmable Logic device
3. Chalk and Board for numerical

Module-4

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

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

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

Laboratory Component:

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

Teaching-Learning Process

1. Demonstration using simulator
2. Case study: Arithmetic and Logic unit in VHDL
3. Chalk and Board for numerical

Module-5

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

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

Laboratory Component:

- Design and implement a mod-n ($n < 8$) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working. - Design and implement an asynchronous counter using decade counter IC to count up from 0 to n ($n \leq 9$) and demonstrate on 7-segment display (using IC-7447)	
Teaching-Learning Process	- Demonstration using simulator - Project Work: Designing any counter, use LED / Seven-segment display to display the output - Chalk and Board for numerical
Course outcome (Course Skill Set) At the end of the course the student will be able to: - CO 1. Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp. - CO 2. Explain the basic principles of A/D and D/A conversion circuits and develop the same. - CO 3. Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods - CO 4. Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types. - CO 5. Develop simple HDL programs	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together Continuous Internal Evaluation: Three Unit Tests each of 20 Marks (duration 01 hour) - First test at the end of 5th week of the semester - Second test at the end of the 10th week of the semester - Third test at the end of the 15th 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 Practical Sessions need to be assessed by appropriate rubrics and viva-voce method. This will contribute to 20 marks . - Rubrics for each Experiment taken average for all Lab components – 15 Marks. - Viva-Voce– 5 Marks (more emphasized on demonstration topics) The sum of three tests, two assignments, and practical sessions will be out of 100 marks and will be scaled down to 50 marks (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.	
Semester End Examination: Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours) - The question paper will have ten questions. Each question is set for 20 marks. - There will be 2 questions from each module. Each of the two questions under a module (with a	

III Semester

COMPUTER ORGANIZATION AND ARCHITECTURE

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

Course Learning Objectives

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

Teaching-Learning Process (General Instructions)

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

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

Module-1

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

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

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

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

Module-2

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

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

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

Module-3

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

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

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

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

Reference Books

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

Weblinks and Video Lectures (e-Resources):

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

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

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


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Module-4	
Arithmetic: Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers	
Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Hardwired control, Microprogrammed control	
Textbook 1: Chapter 2-2.1, Chapter 6 – 6.1 to 6.3	
Textbook 1: Chapter 7 – 7.1, 7.2, 7.4, 7.5	
Teaching-Learning Process	Chalk & board, Problem based learning
Module-5	
Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing, Array Processors	
Textbook 2: Chapter 9 – 9.1, 9.2, 9.3, 9.4, 9.6, 9.7	
Teaching-Learning Process	Chalk and board, MOOC
Course Outcomes	
At the end of the course the student will be able to:	
CO 1. Explain the organization and architecture of computer systems with machine instructions and programs	
CO 2. Analyze the input/output devices communicating with computer system	
CO 3. Demonstrate the functions of different types of memory devices	
CO 4. Apply different data types on simple arithmetic and logical unit	
CO 5. Analyze the functions of basic processing unit, Parallel processing and pipelining	
Assessment Details (both CIE and SEE)	
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together	
Continuous Internal Evaluation:	
Three Unit Tests each of 20 Marks (duration 01 hour)	
1. First test at the end of 5 th week of the semester	
2. Second test at the end of the 10 th week of the semester	
3. Third test at the end of the 15 th week of the semester	
Two assignments each of 10 Marks	
4. First assignment at the end of 4 th week of the semester	
5. Second assignment at the end of 9 th week of the semester	
Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)	
6. At the end of the 13 th week of the semester	
The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).	
CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.	
Semester End Examination:	
Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)	
1. The question paper will have ten questions. Each question is set for 20 marks.	
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. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5 th Edition, Tata McGraw Hill
2. M. Morris Mano, Computer System Architecture, PHI, 3 rd Edition
Reference:
1. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson
Weblinks and Video Lectures (e-Resources):
1. https://nptel.ac.in/courses/106/103/106103068/
2. https://nptel.ac.in/content/storage2/courses/106103068/pdf/coa.pdf
3. https://nptel.ac.in/courses/106/105/106105163/
4. https://nptel.ac.in/courses/106/106/106106092/
5. https://nptel.ac.in/courses/106/106/106106166/
6. http://www.nptelvideos.in/2012/11/computer-organization.html
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
• Discussion and literature survey on real world use cases • Quizzes

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	Program: Write a program to generate the resume. Create 2 Java classes Teacher (data: personal information, qualification, experience, achievements) and Student (data: personal information, result, discipline) which implements the java interface Resume with the method biodata().
8	Aim: Demonstrate creation of threads using Thread class and Runnable interface, multi-threaded programming. Program: Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.
9	Aim: Introduce java Collections. Program: Write a program to perform string operations using ArrayList. Write functions for the following a. Append - add at end b. Insert - add at particular index c. Search d. List all string starts with given letter.
10	Aim: Exception handling in java, introduction to throwable class, throw, throws, finally. Program: Write a Java program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.
11	Aim: Introduce File operations in java. Program: Write a java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes
12	Aim: Introduce java Applet, awt, swings. Programs: Develop an applet that displays a simple message in center of the screen. Develop a simple calculator using Swings.
PART B – Practical Based Learning	
01	A problem statement for each batch is to be generated in consultation with the co-examiner and student should develop an algorithm, program and execute the program for the given problem with appropriate outputs.
Course Outcome (Course Skill Set) At the end of the course the student will be able to: CO 1. Use Eclipse/NetBeans IDE to design, develop, debug Java Projects. CO 2. Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP. CO 3. Demonstrate the ability to design and develop java programs, analyze, and interpret object-oriented data and document results. CO 4. Apply the concepts of multiprogramming, exception/event handling, abstraction to develop robust programs. CO 5. Develop user friendly applications using File I/O and GUI concepts.	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE). Continuous Internal Evaluation (CIE): CIE marks for the practical course is 50 Marks. The split-up of CIE marks for record/ journal and test are in the ratio 60:40. Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by	

III Semester

OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY			
Course Code	21CSL35	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	24	Total Marks	100
Credits	1	Exam Hours	03
Course Objectives: CLO 1. Demonstrate the use of Eclipse/Netbeans IDE to create Java Applications. CLO 2. Using java programming to develop programs for solving real-world problems. CLO 3. Reinforce the understanding of basic object-oriented programming concepts.			
Note: two hours tutorial is suggested for each laboratory sessions.			
Prerequisite			
- Students should be familiarized about java installation and setting the java environment. - Usage of IDEs like Eclipse/Netbeans should be introduced.			
Sl. No.	PART A – List of problems for which student should develop program and execute in the Laboratory		
1	Aim: Introduce the java fundamentals, data types, operators in java Program: Write a java program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula.		
2	Aim: Demonstrating creation of java classes, objects, constructors, declaration and initialization of variables. Program: Create a Java class called Student with the following details as variables within it. USN Name Branch Phone Write a Java program to create n Student objects and print the USN, Name, Branch, and Phone of these objects with suitable headings.		
3	Aim: Discuss the various Decision-making statements, loop constructs in java Program: A. Write a program to check prime number B. Write a program for Arithmetic calculator using switch case menu		
4	Aim: Demonstrate the core object-oriented concept of Inheritance, polymorphism Design a super class called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a Java program to read and display at least 3 staff objects of all three categories.		
5	Aim: Introduce concepts of method overloading, constructor overloading, overriding. Program: Write a java program demonstrating Method overloading and Constructor overloading.		
6	Aim: Introduce the concept of Abstraction, packages. Program: Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.		
7	Aim: Introduction to abstract classes, abstract methods, and Interface in java		

III Semester

III Semester

MASTERING OFFICE (Practical based)			
Course Code	21CSL381	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	12T + 12P	Total Marks	100
Credits	01	Exam Hours	02
Course Objectives: CLO 1. Understand the basics of computers and prepare documents and small presentations. CLO 2. Attain the knowledge about spreadsheet/worksheet with various options. CLO 3. Create simple presentations using templates various options available. CLO 4. Demonstrate the ability to apply application software in an office environment. CLO 5. Use MS Office to create projects, applications.			
Teaching-Learning Process (General Instructions) These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. 1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes. 2. Use of Video/Animation to explain functioning of various concepts. 3. Encourage collaborative (Group Learning) Learning in the class. 4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking. 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it. 6. Introduce Topics in manifold representations. 7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them. 8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.			
Module-1 MS-Word -Working with Files, Text – Formatting, Moving, copying and pasting text, Styles – Lists – Bulleted and numbered lists, Nested lists, Formatting lists. Table Manipulations. Graphics – Adding clip Art, add an image from a file, editing graphics, Page formatting - Header and footers, page numbers, Protect the Document, Mail Merge, Macros – Creating & Saving web pages, Hyperlinks.			
Textbook 1: Chapter 2			
Teaching-Learning Process	Chalk and board, Active Learning, practical based learning		
Module-2 MS-Excel - Modifying a Worksheet – Moving through cells, adding worksheets, rows and columns, Resizing rows and columns, selecting cells, Moving and copying cells, freezing panes - Macros – recording and running. Linking worksheets - Sorting and Filling, Alternating text and numbers with Auto fill, Auto filling functions. Graphics – Adding clip art, add an image from a file, Charts – Using chart Wizard, Copy a chart to Microsoft Word.			
Textbook 1: Chapter 3			
Teaching-Learning Process	Active Learning, Demonstration, presentation,		
Module-3 MS-Power Point -Create a Presentation from a template- Working with Slides – Insert a new slide, applying a design template, changing slide layouts – Resizing a text box, Text box properties, delete a text box - Video and Audio effects, Color Schemes & Backgrounds Adding clip art, adding an image from a file, Save as a web page.			

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 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 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

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

Semester End Evaluation (SEE):

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

Suggested Learning Resources:

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

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

Rubrics suggested in Annexure-II of Regulation book

Weblinks and Video Lectures (e-Resources):

1. <https://youtu.be/9VRmgC2GRFE>
2. <https://youtu.be/rJPWi5x0g3I>
3. <https://youtu.be/tcj2BhhCMN4>
4. <https://youtu.be/ubmwp8kbFPc>
5. <https://youtu.be/i6eNvfQ8fTw>
6. <http://office.microsoft.com/en-us/training/CR010047968.aspx>
7. <https://gsuite.google.com/learning-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.

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SOCIAL CONNECT & RESPONSIBILITIES			
Course Code	21SCR36	CIE Marks	50
Teaching Hours week (L:T:P:S)	1: 0: 0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	03
Department	Management Studies / Engineering Department		
Offered for	3 rd Semester		
Prerequisite	Nil		
Objectives: The Course will			
• Enable the student to do a deep drive into societal challenges being addressed by NGO(s), social enterprises & The government and build solutions to alleviate these complex social problems through immersion, design & technology. • Provide a formal platform for students to communicate and connect with their surroundings. • Enable to create of a responsible connection with society.			
Learning Outcomes: The students are expected to have the ability to :			
1. Understand social responsibility 2. Practice sustainability and creativity 3. Showcase planning and organizational skills			
Contents:			
The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large. The course will engage students in interactive sessions, open mic, reading groups, storytelling sessions, and semester-long activities conducted by faculty mentors. In the following a set of activities planned for the course have been listed :			
Module-I			
Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of B.Tech. students. They will also make an excerpt either as a documentary or a photoblog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.			
Module-II			
Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms.			
Module-III			
Organic farming and waste management: usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.			
Module-IV			
Water Conservation: knowing the present practices in the surrounding villages and			

implementation in the campus, documentary or photo blog presenting the current practices.

Module-V

Food Walk City's culinary practices, food lore, and indigenous materials of the region used in cooking.

Activities

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. **Share the experience of Social Connect.** Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSE TOPICS:

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversational will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

A total of 14-20 hrs engagement per semester is required for the 3rd semester of the B.E. /B.Tech. program. The students will be divided into 10 groups of 35 each. Each group will be handled by two **faculty mentors**. Faculty mentors will design the activities (particularly Jamming sessions open mic, and poetry)

Faculty mentors has to design the evaluation system.

Guideline for Assessment Process:

Continuous Internal Evaluation (CIE)

After completion of, the social connect, the student shall prepare, with daily **diary** as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.

Marks allotted for the diary are out of 50.

Planning and scheduling the social connect

Information/Data collected during the social connect

Analysis of the information/data and report writing

Considering all above points allotting the marks as mentioned below-

Excellent	80 to 100
Good	60 to 79
Satisfactory	40 to 59
Unsatisfactory and fail	<39

Pedagogy (Guidelines) may differ depending on local resources available for the study

Module	Topic	Content	Group Size	Location	Magnitude	Activity	Reporting	Evaluation
I	Plantation and adoption of a tree	Plantation of a tree that will be adopted for four years by a group of B.Tech. students. They will also make an excerpt either as a documentary or a photoblog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.	03 – 05	Farmers Land or Road side or Community area or institution's campus, any one location to be selected.	One Students must monitor it for three years	Site selection Select suitable species in consultation with horticulture, forest or agriculture department. Interact with NGO/Industry and community to plant Tag the plant for continuous monitoring	Report shall be handwritten or blog with paintings, sketches, poster, video and/or photograph with Geo tag.	Each module is evaluated for 50 Marks and average of all the five modules will be the final marks. CIE Rubrics for 50 M Planning and scheduling the social connect – 15 M Information/Data collected during the social connect – 15 M Analysis of the information/data and report writing – 20 M SEE 50 M: Presentation, Jamming session, Open mic, Group
II	Heritage walk and crafts corner	Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms.	03 - 05	Preferably Within the city where institution is located or home town of the student group	One or two One can be a structure or a heritage building the other can be heritage custom or practise	Survey in the form of questioner by connecting to the people and asking. No standard questioner to be given by faculty and has to be evolved involving students. Questions during survey can be asked in local language but report language is English.		
III	Waste management	Wet waste management in neighbouring villages, and implementation in the campus.	03 - 05 More than one group can be	Preferably in the nearby villages and within the campus.	One	Report on importance and benefits of Waste management. Report on segregation, collection, transportation and disposal.		

Semester End Examination (SEE)

This Jamming session will be conducted at the end of the course for **50 marks**

Jamming session includes -Platform to connect to others. Share the stories with others. **Share the experience of Social Connect.** Exhibit the talent like playing instruments, singing, one-act play, art painting, and fine art.

Faculty mentor has to design the evaluation system for the Jamming session.

Sl. No.	Topic	Content	Class	Duration	Assessment	Remarks
1	Introduction to the course	Introduction to the course, objectives, and outcomes. The course is designed to provide a comprehensive understanding of the subject matter and its relevance to the field of study.	01 - 02	10 - 15	10	10
2	History and Evolution of the subject	History and Evolution of the subject, its significance, and its impact on the society. The course will explore the historical context and the evolution of the subject over time.	03 - 04	10 - 15	10	10
3	Concepts and Theories	Concepts and Theories related to the subject, including the importance of the subject in the field of study. The course will cover the fundamental concepts and theories that form the basis of the subject.	05 - 06	10 - 15	10	10
4	Practical Application	Practical Application of the subject, including the importance of the subject in the field of study. The course will focus on the practical application of the subject matter and its relevance to the field of study.	07 - 08	10 - 15	10	10
5	Conclusion and Future Prospects	Conclusion and Future Prospects of the subject, including the importance of the subject in the field of study. The course will conclude with a summary of the key points and a discussion on the future prospects of the subject.	09 - 10	10 - 15	10	10

			assigned one task based on magnitude of task.			Suggestion for composting. Visit nearby village/location to sensitize farmers and public about waste management and also document current practises.		discussion and debate.
III	Organic farming	Usefulness of organic farming in neighbouring villages, and implementation in the campus.	03 – 05	Visit to farming lands where organic farming is going on Campus Garden Roof top Garden or Vertical Garden or hydroponics if land is scarce.	One	Collect data on organic farming in the vicinity. Like types of crop, methodology etc.,. Suggestion for implementation at selected locations		
IV	Water Conservation	Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices.	03 – 05	Rain water harvesting demonstration available in the campus or surroundings	One	Visit lakes/pond/river/dry well to involve on rejuvenation activity. Or Assessment of Water budget in the campus/village		

						Report on traditional water conservation practices (to minimize wastage)		
V	Food Walk	City's culinary practices, food lore, and indigenous materials of the region used in cooking.	03 - 05	Within the city where institution is located Food culture of student's resident region	One	Survey local food centres and identify the speciality Identify and study the food ingredients Report on the regional foods Report on Medicinal values of the local food grains, and plants.		

**Important recommendations requested; Special Appreciation from institution and university for students who take care of plants for three years.


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BE - III / IV Semester – Common to All

ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage) ಕನ್ನಡ ಕಲಿಕೆಗಾಗಿ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ - (Prescribed Textbook to Learn Kannada)			
ವಿಷಯ ಸಂಕೇತ (Course Code)	21KBK37/47	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು (Continuous Internal Evaluation Marks)	50
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / Week (L:T:P: S))	0:2:0:1	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು (Semester End Examination Marks)	50
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	25 ಗಂಟೆಗಳು	ಒಟ್ಟು ಅಂಕಗಳು (Total Marks)	100
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01	ಪರೀಕ್ಷೆಯ ಅವಧಿ (Exam Hours)	01 ಗಂಟೆ
ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು (Course Learning Objectives): - To Create the awareness regarding the necessity of learning local language for comfortable and healthy life. - To enable learners to Listen and understand the Kannada language properly. - To speak, read and write Kannada language as per requirement. - To train the learners for correct and polite conversation.			
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) : These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. - ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಷಯ ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು. - ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು. - ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು. - ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚೆಗೆ ಡಿಜಿಟಲೀಕರಣ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮಕೈಗೊಳ್ಳುವುದು. ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ. - ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಭೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ ಕಾರ್ಯಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.			
Module-1 - Introduction, Necessity of learning a local language. Methods to learn the Kannada language. - Easy learning of a Kannada Language: A few tips. Hints for correct and polite conversation, Listening and Speaking Activities - Key to Transcription. - ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words			
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.		

Module-2

1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - **Possessive forms of nouns, dubitive question and Relative nouns**
2. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು **Qualitative, Quantitative and Colour Adjectives, Numerals**
3. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು - ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ - (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ)
Predictive Forms, Locative Case

ಬೋಧನೆ ಮತ್ತು

ಕಲಿಕಾ ವಿಧಾನ

ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-3

1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - **Dative Cases, and Numerals**
4. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು - **Ordinal numerals and Plural markers**
5. ನ್ಯೂನ / ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು
Defective / Negative Verbs and Colour Adjectives

ಬೋಧನೆ ಮತ್ತು

ಕಲಿಕಾ ವಿಧಾನ

ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-4

1. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಆರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು
Permission, Commands, encouraging and Urging words (Imperative words and sentences)
2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು
Accusative Cases and Potential Forms used in General Communication
3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - Helping Verbs
"iru and iralla", Corresponding Future and Negation Verbs
6. ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು
ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- **Comparative, Relationship, Identification and Negation Words**

ಬೋಧನೆ ಮತ್ತು

ಕಲಿಕಾ ವಿಧಾನ

ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-5

1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು - **ifferent types of forms of Tense, Time and Verbs**
2. ದ್, -ತ್, -ತು, -ಇತು, -ಆಗಿ, -ಅಲ್ಲ, -ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - **Formation of Past, Future and Present Tense Sentences with Verb Forms**
3. **Kannada Vocabulary List : ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - Kannada Words in Conversation**

ಬೋಧನೆ ಮತ್ತು

ಕಲಿಕಾ ವಿಧಾನ

ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು: **course Outcomes (Course**

Skill Set): At the end of the Course, The Students will be able

1. To understand the necessity of learning of local language for comfortable life.
2. To Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To communicate (converse) in Kannada language in their daily life with kannada speakers.
5. To speak in polite conversation.

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

- a. First test at the end of 5th week of the semester
- b. Second test at the end of the 10th week of the semester
- c. 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

7. 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)**

8. 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**

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

ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯು ಈ ಕೆಳಗಿನಂತಿರುತ್ತದೆ - Semester End Exam (SEE):

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

2. The question paper will have 50 questions. Each question is set for 01 mark.
3. SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

Textbook :

ಬಳಕೆ ಕನ್ನಡ

ಲೇಖಕರು : ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.


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BE - III/IV Semester - Common to all

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ			
ವಿಷಯ ಸಂಕೇತ (Course Code)	21KSK37/47	ನಿರಂತರ ಅಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು	50
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / Week (L:T:P: S))	0:2:0:1	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು	50
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	25 ಗಂಟೆಗಳು	ಒಟ್ಟು ಅಂಕಗಳು	100
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01	ಪರೀಕ್ಷೆಯ ಅವಧಿ	01 ಗಂಟೆ
ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು: 1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು. 2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು. 3. ತಾಂತ್ರಿಕ ವೃತ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು. 4. ಕನ್ನಡ ಶಬ್ದಸಂಪತ್ತಿನ ಪರಿಚಯ ಮತ್ತು ಕನ್ನಡ ಭಾಷೆಯ ಬಳಕೆ ಹಾಗೂ ಕನ್ನಡದಲ್ಲಿ ಪತ್ರ ವ್ಯವಹಾರವನ್ನು ತಿಳಿಸಿಕೊಡುವುದು.			
ಬೋಧನ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) : These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes. 1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು. 2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು, ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು. 3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.			
ಘಟಕ -1 ಲೇಖನಗಳು			
1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ 2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ 3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ			
ಬೋಧನ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಟಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.		

ಘಟಕ -2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ	
1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ, 2. ಕೀರ್ತನೆಗಳು : ಅದರಿದೇನು ಫಲ ಇದರಿದೇನು ಫಲ - ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು 3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ	
1. ದಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಅಯ್ಯ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ 3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ -4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ	
1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ ಎನ್ ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ -5 ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	
1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ 2. ಮೆಗಾನ್ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಪರಿಣಾಮಗಳು (course Outcomes):

1. ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯವಾಗುತ್ತದೆ.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳು ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಆಸಕ್ತಿಯು ಮೂಡುತ್ತದೆ.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.
4. ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.

ಮೌಲ್ಯಮಾಪನದ ವಿಧಾನ (Assessment Details- both CIE and SEE) :

(methods of CIE - MCQ, Quizzes, Open book test, Seminar or micro project)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and 35% marks in SEE to pass. Theory Semester End Exam (SEE) is conducted for 50 marks (01 hour duration). Based on this grading will be awarded.

Continuous Internal Evaluation:

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

- a. First test at the end of 5th week of the semester
- b. Second test at the end of the 10th week of the semester
- c. 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)**

3. 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

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

ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯು ಈ ಕೆಳಗಿನಂತಿರುತ್ತದೆ - Semester End Exam (SEE):

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

1. The question paper will have 50 questions. Each question is set for 01 mark.

SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

ಪಠ್ಯಪುಸ್ತಕ :

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.


H.O.D
Dept. of Computer Science and Design
Alva's Institute of Engg. & Technology
Mijar, Moodubidire - 574 225

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
B.E. in Computer Science and Design
Scheme of Teaching and Examinations 2021
Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021 - 22)

IV SEMESTER												
Sl. No	Course and Course Code	Course Title	Teaching Department (TD) and Question and Answer Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self -Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	S					
1	BSC 21CS41	Mathematical Foundations for Computing	Maths	2	2	0		03	50	50	100	3
2	IPCC 21CS42	Design and Analysis of Algorithms	Any CS Board Department	3	0	2		03	50	50	100	4
3	IPCC 21CS43	Microcontroller and Embedded Systems		3	0	2		03	50	50	100	4
4	PCC 21CS44	Operating Systems		2	2	0		03	50	50	100	3
5	AEC 21BE45	Biology For Engineers	BT, CHE, PHY	2	0	0		02	50	50	100	2
6	PCC 21CSL46	Python Programming Laboratory	Any CS Board Department	0	0	2		03	50	50	100	1
7	HSMC 21KSK37/47	Samskrutika Kannada	HSMC	1	0	0		01	50	50	100	1
	HSMC 21KBK37/47	Balake Kannada										
	OR											
	HSMC 21CIP37/47	Constitution of India & Professional Ethics										
8	AEC 21CS48X/21C SL48X	Ability Enhancement Course- IV	TD and PSB: Concerned department	If offered as theory Course				01	50	50	100	1
				1	0	0						
				If offered as lab. course				02				
				0	0	2						
9	UHV 21UH49	Universal Human Values	Any Department	1	0	0		01	50	50	100	1
10	INT 21INT49	Inter/Intra Institutional Internship	Evaluation By the appropriate authorities	Completed during the intervening period of II and III semesters by students admitted to first year of BE./B.Tech and during the intervening period of III and IV semesters by Lateral entry students admitted to III semester.				3	100	--	100	2
Total									550	450	1000	22

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

1	NCMC 21MATDIP41	Additional Mathematics - II	Maths	02	02	--	--	--	100	--	100	0
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Note: BSC: Basic Science Course, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, AEC –Ability Enhancement Courses, HSMC: Humanity and Social Science and Management Courses, UHV- Universal Human Value Courses.
L –Lecture, T – Tutorial, P- Practical/ Drawing, S – Self Study Component, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.
21KSK37/47 Samskrutika Kannada is for students who speak, read and write Kannada and 21KBK37/47 Balake Kannada is for non-Kannada speaking, reading, and writing students.
Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with Practical's of the same course. Credit for IPCC can be 04 and its Teaching – Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from practical part of IPCC shall be included in the SEE question paper. For more details the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech.) 2021-22 may be referred.

Non – credit mandatory course (NCMC):**Additional Mathematics - II:**

(1) Lateral entry Diploma holders admitted to III semester of B.E./B.Tech., shall attend the classes during the IV semester to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfil the course requirements during subsequent semester/s to earn the qualifying CIE marks. These courses are slated for CIE only and has no SEE.

(2) Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.

(3) Successful completion of the course Additional Mathematics II shall be indicated as satisfactory in the grade card. Non-completion of the courses Additional Mathematics II shall be indicated as Unsatisfactory.

Ability Enhancement Course - IV

21CSL481	Web Programming	21CSL483	R Programming
21CS482	Unix Shell Programming	21CS484	

Internship of 04 weeks during the intervening period of IV and V semesters; 21INT68 Innovation/ Entrepreneurship/ Societal based Internship.

(1) All the students shall have to undergo a mandatory internship of 04 weeks during the intervening period of IV and V semesters. The internship shall be slated for CIE only and will not have SEE. The letter grade earned through CIE shall be included in the VI semester grade card. The internship shall be considered as a head of passing and shall be considered for vertical progression and for the award of degree. Those, who do not take up / complete the internship shall be considered under F (fail) grade and shall have to complete during subsequently after satisfying the internship requirements.

(2) Innovation/ Entrepreneurship Internship shall be carried out at industry, State and Central Government /Non-government organizations (NGOs), micro, small and medium enterprise (MSME), Innovation centers or Incubation centers. Innovation need not be a single major breakthrough; it can also be a series of small or incremental changes. Innovation of any kind can also happen outside of the business world.

Entrepreneurship internships offers a chance to gain hands on experience in the world of entrepreneurship and helps to learn what it takes to run a small entrepreneurial business by performing intern duties with an established company. This experience can then be applied to future business endeavours. Start-ups and small companies are a preferred place to learn the business tack ticks for future entrepreneurs as learning how a small business operates will serve the intern well when he/she manages his/her own company. Entrepreneurship acts as a catalyst to open the minds to creativity and innovation. Entrepreneurship internship can be from several sectors, including technology, small and medium-sized, and the service sector.

(3) Societal or social internship.

Urbanization is increasing on a global scale; and yet, half the world's population still resides in rural areas and is devoid of many things that urban population enjoy. Rural internship, is a work-based activity in which students will have a chance to solve/reduce the problems of the rural place for better living.

As proposed under the AICTE rural internship programme, activities under Societal or social internship, particularly in rural areas, shall be considered for 40 points under AICTE activity point programme.


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B.E COMPUTER SCIENCE AND ALLIED ENGINEERING BRANCHES**Choice Based Credit System (CBCS) and Outcome-Based Education (OBE)**

(Effective from the academic year 2022-2023)

SEMESTER - IV**Mathematical Foundations for Computing, Probability & Statistics**

Course Code	21MATCS41	CIE Marks	50
Teaching Hours/Week (L: T:P)	2:2:0	SEE Marks	50
Total Number of Contact Hours	40	Total Marks	100
Credits	03	Exam Hours	3

Course Objectives:

This course(21MATCS41) will enable students to:

1. Understand an intense foundational introduction to fundamental concepts in discrete mathematics.
2. Interpret, identify, and solve the language associated with logical structure, sets, relations and functions, modular arithmetic.
3. To have insight into Statistical methods, Correlation and regression analysis. Fitting of curves.
4. To develop probability distribution of discrete and continuous random variables. Joint probability distribution occurs in digital signal processing, design engineering and microwave engineering.

Teaching-Learning Process (General Instructions):

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

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
 - As an introduction to new topics (pre-lecture activity).
 - As a revision of topics (post-lecture activity).
 - As additional examples (post-lecture activity).
 - As an additional material of challenging topics (pre-and post-lecture activity).As a model solution for some exercises (post-lecture activity).

Module - 1

Fundamentals of Logic: Basic connectives and truth tables, Logical equivalence - The laws of Logic, Logical implication - Rules of Inference. Fundamentals of Logic contd.: The Use of Quantifiers, Quantifiers, Definitions, and the Proofs of Theorems. **(8 Hours)**

Self-study: Problems on Logical equivalence.

(RBT Levels: L1, L2 and L3)

Pedagogy

Chalk and Board, Problem based learning

Module - 2

Relations and Functions: Cartesian Products and Relations, Functions - Plain and One-to-One, Onto Functions. Function Composition, and Inverse Functions.

Relations: Properties of Relations, Computer Recognition - Zero-One Matrices and Directed Graphs, Partial Orders - Hasse Diagrams, Equivalence Relations and Partitions.

Introduction to Graph Theory: Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits. **(8 Hours)**

Self-study: The Pigeon-hole Principle, problems and its applications

(RBT Levels: L1, L2 and L3)

Pedagogy

Chalk and Board, Problem based learning

Module - 3

Statistical Methods: Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression -problems.

Curve Fitting: Curve fitting by the method of least squares- fitting the curves of the form-
 $y = ax + b$, $y = ax^b$ and $y = ax^2 + bx + c$ **(8 Hours)**

Self-study: Angle between two regression lines, problems. Fitting of the curve $y = ab^x$

(RBT Levels: L1, L2 and L3)

Pedagogy

Chalk and Board, Problem based learning

Module - 4

Probability Distributions: Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples.

Self-study: exponential distribution.

(RBT Levels: L1, L2 and L3)

(8 Hours)

Pedagogy

Chalk and Board, Problem based learning

Module - 5

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance and correlation.

Sampling Theory: Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. **(8 Hours)**

Self-Study: Point estimation and interval estimation.

(RBT Levels: L1, L2 and L3)

Pedagogy

Chalk and Board, Problem based learning

B.E COMPUTER SCIENCE AND ALLIED ENGINEERING BRANCHES**Choice Based Credit System (CBCS) and Outcome-Based Education (OBE)**

(Effective from the academic year 2022-2023)

SEMESTER – IV**Mathematical Foundations for Computing, Probability & Statistics**

Course Code	21MATCS41	CIE Marks	50
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Total Number of Contact Hours	40	Total Marks	100
Credits	03	Exam Hours	3

Course Objectives:

This course(21MATCS41) will enable students to:

1. Understand an intense foundational introduction to fundamental concepts in discrete mathematics.
2. Interpret, identify, and solve the language associated with logical structure, sets, relations and functions, modular arithmetic.
3. To have insight into Statistical methods, Correlation and regression analysis. Fitting of curves.
4. To develop probability distribution of discrete and continuous random variables. Joint probability distribution occurs in digital signal processing, design engineering and microwave engineering.

Teaching-Learning Process (General Instructions):

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

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
 - As an introduction to new topics (pre-lecture activity).
 - As a revision of topics (post-lecture activity).
 - As additional examples (post-lecture activity).
 - As an additional material of challenging topics (pre-and post-lecture activity).As a model solution for some exercises (post-lecture activity).

Textbooks:

1. Ralph P. Grimaldi and B V Ramana, Discrete and Combinatorial Mathematics- An Applied Introduction, Pearson Education, Asia, Fifth edition – 2007. ISBN 978-81-7758-424-0.
2. Higher Engineering Mathematics B. S. Grewal Khanna Publishers 44th Edition, 2017

References:

3. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata – McGraw Hill, Sixth Edition, Sixth reprint 2008. ISBN-(13):978-0-07-064824-1.
4. C. L. Liu and D P Mohapatra, Elementary Discrete Mathematics, Tata- McGraw Hill, Sixth Edition, ISBN:10:0-07-066913-9.
5. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata – McGraw Hill, 35TH reprint 2008. ISBN 13:978-0-07-463113-3.
6. Advanced Engineering Mathematics C. Ray Wylie, Louis C.Barrett McGraw-Hill 6th Edition 1995
7. Higher Engineering Mathematics B. V. Ramana McGraw-Hill 11th Edition, 2010
8. A Text-Book of Engineering Mathematics N. P. Bali and Manish Goyal Laxmi Publications 2014
9. Advanced Engineering Mathematics Chandrika Prasad and Reena Garg Khanna Publishing, 2018

List of NPTEL videos for various topics of Discrete Mathematical Structures

<https://www.youtube.com/watch?v=9AUCdsmBGmA&list=PL0862D1A947252D20&index=10>

<https://www.youtube.com/watch?v=oU60TuGHxe0&list=PL0862D1A947252D20&index=11>

https://www.youtube.com/watch?v=BIKq9Xo_5A&list=PL0862D1A947252D20&index=13

<https://www.youtube.com/watch?v=RMLR2JHHeWo&list=PL0862D1A947252D20&index=14>

https://www.youtube.com/watch?v=nf9e0_yIGdc&list=PL0862D1A947252D20&index=15

<https://www.youtube.com/watch?v=7cTWea9YAJE&list=PL0862D1A947252D20&index=24>

<https://www.youtube.com/watch?v=695iAm935cY&list=PL0862D1A947252D20&index=25>

<https://www.youtube.com/watch?v=ZECJHfsf4Vs&list=PL0862D1A947252D20&index=26>

<https://www.youtube.com/watch?v=Dsi7x-A89Mw&list=PL0862D1A947252D20&index=28>

<https://www.youtube.com/watch?v=xIUfKMKSB3Y&list=PL0862D1A947252D20>

<https://www.youtube.com/watch?v=0uTE24o3q-o&list=PL0862D1A947252D20&index=2>

<https://www.youtube.com/watch?v=DmCltf8ypks&list=PL0862D1A947252D20&index=3>

<https://www.youtube.com/watch?v=iNeISigUCo0&list=PL0862D1A947252D20&index=4>

Course Outcomes

Course Outcomes: At the end of the courses, the students will be able to:

1. Apply the concepts of logic for effective computation and relating problems in the Engineering domain.
2. Analyse the concepts of functions and relations to various fields of Engineering. Comprehend the concepts of Graph Theory for various applications of Computational sciences.
3. Apply discrete and continuous probability distributions in analysing the probability models arising in the engineering field.
4. Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
5. Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

ASSESSMENT PATTERN (BOTH CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 100%. The minimum passing mark for the CIE is 40% of the maximum marks (400 marks out of 100). A student shall be deemed to have satisfied the academic requirements if the student secures not less than 40% (40 Marks out of 100) in the CIE.

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

Course Seminar suitably planned to attain the COs and POs for **20 Marks (duration 01 hours)**

Or

Learning MATHS tools and solving a few problems from each module using MATHS tools (e.g. MATLAB, SciLab etc)

6. Conducting at least 05 labs sessions within the Academic Duration.

The sum of three tests, two assignments, and a seminar/Lab sessions using MATHS tools will be out of 100 marks.

The student shall secure minimum 40% of marks of course to qualify and become eligible for award of degree.

<http://nptel.ac.in/courses.php?disciplineID=111>

<http://www.class-central.com/subject/math/MOOCs>

<http://academicearth.org/>

VTU EDUSAT PROGRAMME - 20

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

- Quizzes
- Assignments
- Seminars



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IV Semester

DESIGN AND ANALYSIS OF ALGORITHMS			
Course Code	21CS42	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 T + 20 P	Total Marks	100
Credits	04	Exam Hours	03
Course Learning Objectives: CLO 1. Explain the methods of analysing the algorithms and to analyze performance of algorithms. CLO 2. State algorithm's efficiencies using asymptotic notations. CLO 3. Solve problems using algorithm design methods such as the brute force method, <i>greedy method</i> , divide and conquer, decrease and conquer, transform and conquer, dynamic programming, backtracking and branch and bound. CLO 4. Choose the appropriate data structure and algorithm design method for a specified application. CLO 5. Introduce P and NP classes.			
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			
Introduction: What is an Algorithm? It's Properties. Algorithm Specification-using natural language, using Pseudo code convention, Fundamentals of Algorithmic Problem solving, Analysis Framework-Time efficiency and space efficiency, Worst-case, Best-case and Average case efficiency.			
Performance Analysis: Estimating Space complexity and Time complexity of algorithms.			
Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ) with examples, Basic efficiency classes, Mathematical analysis of Non-Recursive and Recursive Algorithms with Examples.			
Brute force design technique: Selection sort, sequential search, string matching algorithm with complexity Analysis.			
Textbook 1: Chapter 1 (Sections 1.1,1.2), Chapter 2(Sections 2.1,2.2,2.3,2.4), Chapter 3(Section 3.1,3.2)			
Textbook 2: Chapter 1(section 1.1,1.2,1.3)			
Laboratory Component:			

1. Sort a given set of n integer elements using Selection 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 n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the brute force method works along with its time complexity analysis: worst case, average case and best case.	
Teaching-Learning Process	1. Problem based Learning. 2. Chalk & board, Active Learning. 3. Laboratory Demonstration.
Module-2	
Divide and Conquer: General method, Recurrence equation for divide and conquer, solving it using Master's theorem. , Divide and Conquer algorithms and complexity Analysis of Finding the maximum & minimum, Binary search, Merge sort, Quick sort. Decrease and Conquer Approach: Introduction, Insertion sort, Graph searching algorithms, Topological Sorting. It's efficiency analysis. Textbook 2: Chapter 3(Sections 3.1,3.3,3.4,3.5,3.6) Textbook 1: Chapter 4 (Sections 4.1,4.2,4.3), Chapter 5(Section 5.1,5.2,5.3)	
Laboratory Component:	
1. 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 n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case. 2. 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 n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.	
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, solving Job sequencing with deadlines Problems. Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm with performance analysis. Single source shortest paths: Dijkstra's Algorithm. Optimal Tree problem: Huffman Trees and Codes. Transform and Conquer Approach: Introduction, Heaps and Heap Sort. Textbook 2: Chapter 4(Sections 4.1,4.3,4.5) Textbook 1: Chapter 9(Section 9.1,9.2,9.3,9.4), Chapter 6(section 6.4)	
Laboratory Component:	

Write & Execute C++/Java Program	
1. To solve Knapsack problem using Greedy method. 2. To find shortest paths to other vertices from a given vertex in a weighted connected graph, using Dijkstra's algorithm. 3. To find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program. 4. To find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.	
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. Transitive Closure: Warshall's Algorithm. All Pairs Shortest Paths: Floyd's Algorithm, Knapsack problem, Bellman-Ford Algorithm, Travelling Sales Person problem. Space-Time Tradeoffs: Introduction, Sorting by Counting, Input Enhancement in String Matching-Harspool's algorithm. Textbook 2: Chapter 5 (Sections 5.1,5.2,5.4,5.9) Textbook 1: Chapter 8(Sections 8.2,8.4), Chapter 7 (Sections 7.1,7.2)	
Laboratory Component: Write C++/ Java programs to 1. Solve All-Pairs Shortest Paths problem using Floyd's algorithm. 2. Solve Travelling Sales Person problem using Dynamic programming. 3. Solve 0/1 Knapsack problem using Dynamic Programming method.	
Teaching-Learning Process	1. Chalk & board, Active Learning, MOOC, Problem based Learning. 2. Laboratory Demonstration.
Module-5	
Backtracking: General method, solution using back tracking to N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles Problems. Branch and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem NP-Complete and NP-Hard problems: Basic concepts, non- deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes. Textbook 1: Chapter 12 (Sections 12.1,12.2) Chapter 11(11.3) Textbook 2: Chapter 7 (Sections 7.1,7.2,7.3,7.4,7.5) Chapter 11 (Section 11.1)	
Laboratory Component: 1. Design and implement C++/Java Program to find a subset of a given set $S = \{S_1, S_2, \dots, S_n\}$ of n positive integers whose SUM is equal to a given positive integer d. For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$, there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. Display a suitable message, if the given problem instance doesn't have a solution.	

2. Design and implement C++/Java Program to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.	
Teaching-Learning Process	1. Chalk & board, Active Learning, MOOC, Problem based learning. 2. Laboratory Demonstration.
Course outcome (Course Skill Set) At the end of the course the student will be able to: CO 1. Analyze the performance of the algorithms, state the efficiency using asymptotic notations and analyze mathematically the complexity of the algorithm. CO 2. Apply divide and conquer approaches and decrease and conquer approaches in solving the problems analyze the same CO 3. Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem. CO 4. Apply and analyze dynamic programming approaches to solve some problems. and improve an algorithm time efficiency by sacrificing space. CO 5. Apply and analyze backtracking, branch and bound methods and to describe P, NP and NP-Complete problems.	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together Continuous Internal Evaluation: Three Unit Tests each of 20 Marks (duration 01 hour) 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester 3. Third test at the end of the 15th week of the semester Two assignments each of 10 Marks 4. First assignment at the end of 4th week of the semester 5. Second assignment at the end of 9th week of the semester Practical Sessions need to be assessed by appropriate rubrics and viva-voce method. This will contribute to 20 marks. • Rubrics for each Experiment taken average for all Lab components – 15 Marks. • Viva-Voce– 5 Marks (more emphasized on demonstration topics) The sum of three tests, two assignments, and practical sessions will be out of 100 marks and will be scaled down to 50 marks (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the	

methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

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

Semester End Examination:

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

1. The question paper will have ten questions. Each question is set for 20 marks.
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. Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009. Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press.

Reference Books

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

Weblinks 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, Königsberg bridge puzzle etc.,
2. Demonstration of solution to a problem through programming.


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IV Semester

MICROCONTROLLER AND EMBEDDED SYSTEMS			
Course Code	21CS43	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 T + 20 P	Total Marks	100
Credits	04	Exam Hours	03
Course Learning Objectives:			
CLO 1: Understand the fundamentals of ARM-based systems, including programming modules with registers and the CPSR.			
CLO 2: Use the various instructions to program the ARM controller.			
CLO 3: Program various embedded components using the embedded C program.			
CLO 4: Identify various components, their purpose, and their application to the embedded system's applicability.			
CLO 5: Understand the embedded system's real-time operating system and its application in IoT.			
Teaching-Learning Process (General Instructions)			
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.			
1. The lecturer method (L) does not mean only the traditional lecture method, but different types of teaching methods may be adopted to develop the outcomes. 2. Show video/animation films to explain the 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 multiple 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			
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software.			
ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions			
Textbook 1: Chapter 1 - 1.1 to 1.4, Chapter 2 - 2.1 to 2.5			
Laboratory Component:			
1. Using Keil software, observe the various registers, dump, CPSR, with a simple ALP programme.			
Teaching-Learning Process	1. Demonstration of registers, memory access, and CPSR in a programme module. 2. For concepts, numerical, and discussion, use chalk and a whiteboard, as well as a PowerPoint presentation.		
Module-2			
Introduction to the ARM Instruction Set: Data Processing Instructions , Branch Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants			
C Compilers and Optimization : Basic C Data Types, C Looping Structures, Register Allocation, Function Calls, Pointer Aliasing.			

Textbook 1: Chapter 3: Sections 3.1 to 3.6 (Excluding 3.5.2), Chapter 5	
Laboratory Component:	
- Write a program to find the sum of the first 10 integer numbers. - Write a program to find the factorial of a number. - Write a program to add an array of 16 bit numbers and store the 32 bit result in internal RAM. - Write a program to find the square of a number (1 to 10) using a look-up table. - Write a program to find the largest or smallest number in an array of 32 numbers.	
Teaching-Learning Process	- Demonstration of sample code using Keil software. - Laboratory Demonstration
Module-3	
C Compilers and Optimization : Structure Arrangement, Bit-fields, Unaligned Data and Endianness, Division, Floating Point, Inline Functions and Inline Assembly, Portability Issues.	
ARM programming using Assembly language: Writing Assembly code, Profiling and cycle counting, instruction scheduling, Register Allocation, Conditional Execution, Looping Constructs	
Textbook 1: Chapter-5,6	
Laboratory Component:	
- Write a program to arrange a series of 32 bit numbers in ascending/descending order. - Write a program to count the number of ones and zeros in two consecutive memory locations. - Display "Hello World" message using Internal UART.	
Teaching-Learning Process	- Demonstration of sample code using Keil software. - Chalk and Board for numerical
Module-4	
Embedded System Components: Embedded Vs General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, purpose of embedded systems.	
Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7 segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (onboard and external types), Embedded firmware, Other system components.	
Textbook 2: Chapter 1 (Sections 1.2 to 1.6), Chapter 2 (Sections 2.1 to 2.6)	
Laboratory Component:	
- Interface and Control a DC Motor. - Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction. - Determine Digital output for a given Analog input using Internal ADC of ARM controller. - Interface a DAC and generate Triangular and Square waveforms. - Interface a 4x4 keyboard and display the key code on an LCD. - Demonstrate the use of an external interrupt to toggle an LED On/Off. - Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.	
Teaching-Learning Process	- Demonstration of sample code for various embedded components using keil. - Chalk and Board for numerical and discussion
Module-5	
RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Multiprocessing and Multitasking, Task Communication (without any program), Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any	

IV Semester

MICROCONTROLLER AND EMBEDDED SYSTEMS			
Course Code	21CS43	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 T + 20 P	Total Marks	100
Credits	04	Exam Hours	03
Course Learning Objectives:			
CLO 1: Understand the fundamentals of ARM-based systems, including programming modules with registers and the CPSR.			
CLO 2: Use the various instructions to program the ARM controller.			
CLO 3: Program various embedded components using the embedded C program.			
CLO 4: Identify various components, their purpose, and their application to the embedded system's applicability.			
CLO 5: Understand the embedded system's real-time operating system and its application in IoT.			
Teaching-Learning Process (General Instructions)			
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.			
1. The lecturer method (L) does not mean only the traditional lecture method, but different types of teaching methods may be adopted to develop the outcomes. 2. Show video/animation films to explain the 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 multiple 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			
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software.			
ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions			
Textbook 1: Chapter 1 - 1.1 to 1.4, Chapter 2 - 2.1 to 2.5			
Laboratory Component:			
1. Using Keil software, observe the various registers, dump, CPSR, with a simple ALP programme.			
Teaching-Learning Process		1. Demonstration of registers, memory access, and CPSR in a programme module. 2. For concepts, numerical, and discussion, use chalk and a whiteboard, as well as a PowerPoint presentation.	
Module-2			
Introduction to the ARM Instruction Set: Data Processing Instructions , Branch Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants			
C Compilers and Optimization : Basic C Data Types, C Looping Structures, Register Allocation, Function Calls, Pointer Aliasing,			

program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques, target hardware debugging, boundary scan.

Textbook 2: Chapter-10 (Sections 10.1, 10.2, 10.3, 10.4, 10.7, 10.8.1.1, 10.8.1.2, 10.8.2.2, 10.10 only), Chapter 12, Chapter-13 (block diagram before 13.1, 13.3, 13.4, 13.5, 13.6 only)

Laboratory Component:

1. Demonstration of IoT applications by using Arduino and Raspberry Pi

Teaching-Learning Process

1. Chalk and Board for numerical and discussion
2. Significance of real time operating system[RTOS] using raspberry pi

Course outcome (Course Skill Set)

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

- CO 1. Explain C-Compilers and optimization
- CO 2. Describe the ARM microcontroller's architectural features and program module.
- CO 3. Apply the knowledge gained from programming on ARM to different applications.
- CO 4. Program the basic hardware components and their application selection method.
- CO 5. Demonstrate the need for a real-time operating system for embedded system 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
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

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

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

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

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

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

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

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question

papers for the subject (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
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. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008.
2. Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education, Private Limited, 2nd Edition.

Reference Books

1. Raghunandan. G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 2019
2. The Insider's Guide to the ARM7 Based Microcontrollers, Hitex Ltd., 1st edition, 2005.
3. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015.
4. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008.

Weblinks and Video Lectures (e-Resources):

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


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1. Demonstration of IoT applications by using Arduino and Raspberry Pi

Teaching-Learning Process

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

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

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

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

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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

IV Semester

OPERATING SYSTEMS			
Course Code:	21CS44	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 Objectives:			
CLO 1. Demonstrate the need for OS and different types of OS			
CLO 2. Apply suitable techniques for management of different resources			
CLO 3. Use processor, memory, storage and file system commands			
CLO 4. Realize the different concepts of OS in platform of usage through case studies			
Teaching-Learning Process (General Instructions)			
These are sample Strategies, which teachers 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 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 operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments.			
Operating System Services: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.			
Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication			
Textbook 1: Chapter - 1,2,3			
Teaching-Learning Process		Active learning and problem solving 1. https://www.youtube.com/watch?v=vBURTt97EkA&list=PLBlnK6fEyqRiVhbXDGLXDK_OQAeuVcp20 2. https://www.youtube.com/watch?v=a2B69vCtjOU&list=PL3-wYxht4yCjpcfUDz-TgD_ainZ2K3MUZ&index=2	
Module-2			
Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor			

scheduling; Thread scheduling.	
Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.	
Textbook 1: Chapter - 4,5	
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	
Deadlocks: Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.	
Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.	
Textbook 1: Chapter - 7,8	
Teaching-Learning Process	Active Learning, Problem solving based on deadlock with animation 1. https://www.youtube.com/watch?v=MYgmmJlfdBg 2. https://www.youtube.com/watch?v=Y14b7_T3AEw&list=PLEjxKK7AcSEGPOCFtQTJhOEIU44J_JAun&index=30
Module-4	
Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.	
File System, Implementation of File System: File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.	
Textbook 1: Chapter - 9,10,11	
Teaching-Learning Process	Active learning about memory management and File system 1. https://www.youtube.com/watch?v=pl6qrCB8pDw&list=PLIY8eNdw5tW-BxRY0yK3fYTYVqytw8qhp 2. https://www.youtube.com/watch?v=-orfFhvNBzY
Module-5	
Secondary Storage Structures, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability- Based systems.	
Case Study: The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.	
Textbook 1: Chapter - 2,21	
Teaching-Learning Process	Active learning about case studies 1. https://www.youtube.com/watch?v=TTBkc5eju4 2. https://www.youtube.com/watch?v=8hkvMRGTzCM&list=PLEAYkSg4uSQ2PAch478muxnoeTNz_QeUJ&index=36 3. https://www.youtube.com/watch?v=mX1FEur4VCw
Course Outcomes (Course Skill Set)	
At the end of the course the student will be able to:	
CO 1. Identify the structure of an operating system and its scheduling mechanism.	

- CO 2. Demonstrate the allocation of resources for a process using scheduling algorithm.
 CO 3. Identify root causes of deadlock and provide the solution for deadlock elimination
 CO 4. Explore about the storage structures and learn about the Linux Operating system.
 CO 5. Analyze Storage Structures and Implement Customized Case study

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. 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 Dhamdhare, 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.

Weblinks and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=vBURt97EkA&list=PLBlnK6fEqqRiVhbXDGLXDk_OQAeuVcp20
2. <https://www.youtube.com/watch?v=783KAB->

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- tuE4&list=PLlemF3uozcAKTgsClj82voMK3TMR0YE_f
3. <https://www.youtube.com/watch?v=3-ITLMMecXY&list=PL3pGy4HtqwD0n7bQfHjPnsWzkeR-n6mkQ>

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


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- CO 2. Demonstrate the allocation of resources for a process using scheduling algorithm.
 CO 3. Identify root causes of deadlock and provide the solution for deadlock elimination
 CO 4. Explore about the storage structures and learn about the Linux Operating system.
 CO 5. Analyze Storage Structures and Implement Customized Case study

Assessment Details (both CIE and SEE)

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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

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Continuous Internal Evaluation:

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

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Two assignments each of **10 Marks**

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

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1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhare, 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.

Weblinks and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=vBURTt97EkA&list=PLBlnK6fEyqRiVhbXDGLXDk_OQAeuVcp2Q
2. <https://www.youtube.com/watch?v=783KAB->

BIOLOGY FOR ENGINEERS			
Course Code	21BE45	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:2:0:0 / 2:0:0:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	02	Exam Hours	02
Course objectives: ➤ To familiarize the students with the basic biological concepts and their engineering applications. ➤ To enable the students with an understanding of biodesign principles to create novel devices and structures. ➤ To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems. ➤ To motivate the students develop the interdisciplinary vision of biological engineering.			
Teaching-Learning Process (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. ✓ Explanation via real life problem, situation modelling, and deliberation of solutions, hands-on sessions, reflective and questioning /inquiry-based teaching. ✓ Instructions with interactions in classroom lectures (physical/hybrid). ✓ Use of ICT tools, including YouTube videos, related MOOCs, AR/VR/MR tools. ✓ Flipped classroom sessions (~10% of the classes). ✓ Industrial visits, Guests talks and competitions for learning beyond the syllabus. ✓ Students' participation through audio-video based content creation for the syllabus (as assignments). ✓ Use of gamification tools (in both physical/hybrid classes) for creative learning outcomes. ✓ Students' seminars (in solo or group) /oral presentations.			
Module-1 (5 Hours)			
BIOMOLECULES AND THEIR APPLICATIONS (QUALITATIVE): Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics), Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19, Forensics – DNA fingerprinting), Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins), lipids (biodiesel, cleaning agents/detergents), Enzymes (glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching).			
Module-2 (5 Hours)			
HUMAN ORGAN SYSTEMS AND BIO DESIGNS - 1 (QUALITATIVE): Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease). Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye). Heart as a pump system (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators).			
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NATURE-BIOINSPIRED MATERIALS AND MECHANISMS (QUALITATIVE): Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perfluorocarbons (PFCs).			
Module-5 (5 Hours)			
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Course outcomes (Course Skill Set)

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

- Elucidate the basic biological concepts via relevant industrial applications and case studies.
- Evaluate the principles of design and development, for exploring novel bioengineering projects.
- Corroborate the concepts of biomimetics for specific requirements.
- Think critically towards exploring innovative biobased solutions for socially relevant problems.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

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

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester
- Third test at the end of the 15th 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

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 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)**

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 2 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.

The SEE question paper will be set for 100 marks and marks scored will be proportionately reduced to 50 marks

Suggested Learning Resources:

- Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
- Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
- Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
- Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
- Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
- Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
- Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
- Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
- 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
- Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

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- Blood Substitutes, Robert Winslow, Elsevier, 2005

Web links and Video Lectures (e-Resources):

- VTU EDUSAT / SWAYAM / NPTEL / MOOCS / Coursera / MIT-open learning resource
- <https://nptel.ac.in/courses/121106008>
- <https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists>
- <https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009>
- <https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006>
- <https://www.coursera.org/courses?query=biology>
- https://onlinecourses.nptel.ac.in/noc19_ge31/preview
- <https://www.classcentral.com/subject/biology>
- <https://www.futurelearn.com/courses/biology-basic-concepts>

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

- Group Discussion of Case studies
- Model Making and seminar/poster presentations
- Design of novel device/equipment like Cellulose-based water filters, Filtration system mimicking the kidney, Bioremediation unit for E-waste management, AI and ML based Bioimaging,


H.O.D

Dept. of Computer Science and Design
Alva's Institute of Engg. & Technology
Mijar, Moodubidire - 574 225

IV Semester

PYTHON PROGRAMMING LABORATORY			
Course Code	21CSL46	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. Demonstrate the use of IDLE or PyCharm IDE to create Python Applications			
CLO 2. Using Python programming language to develop programs for solving real-world problems			
CLO 3. Implement the Object-Oriented Programming concepts in Python.			
CLO 4. Appraise the need for working with various documents like Excel, PDF, Word and Others			
CLO 5. Demonstrate regular expression using python programming			
Note: two hours tutorial is suggested for each laboratory sessions.			
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.	PART A – List of problems for which student should develop program and execute in the Laboratory		
1	Aim: Introduce the Python fundamentals, data types, operators, flow control and exception handling in Python a) Write a python program to find the best of two test average marks out of three test's marks accepted from the user. b) Develop a Python program to check whether a given number is palindrome or not and also count the number of occurrences of each digit in the input number. Datatypes: https://www.youtube.com/watch?v=gCCVsvgR2KU Operators: https://www.youtube.com/watch?v=v5MR5JnKcZI Flow Control: https://www.youtube.com/watch?v=PqFKRqpHrjw For loop: https://www.youtube.com/watch?v=0ZvaDa8eT5s While loop: https://www.youtube.com/watch?v=HZARImviDxg Exceptions: https://www.youtube.com/watch?v=6SPDvPK38tw		
2	Aim: Demonstrating creation of functions, passing parameters and return values a) Defined as a function F as $F_n = F_{n-1} + F_{n-2}$. Write a Python program which accepts a value for N (where $N > 0$) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed. b) Develop a python program to convert binary to decimal, octal to hexadecimal using functions. Functions: https://www.youtube.com/watch?v=BVfCWuca9nw Arguments: https://www.youtube.com/watch?v=ijXMGpoMkhQ Return value: https://www.youtube.com/watch?v=nuNXiEDnM44		
3	Aim: Demonstration of manipulation of strings using string methods a) Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters.		

	b) Write a Python program to find the string similarity between two given strings Sample Output: Original string: Python Exercises Python Exercises Python Exercises Similarity between two said strings: 1.0 Sample Output: Original string: Python Exercises Python Exercise Similarity between two said strings: 0.967741935483871 Strings: https://www.youtube.com/watch?v=ISltwlnF0eU String functions: https://www.youtube.com/watch?v=9a3CxJyTq00
4	Aim: Discuss different collections like list, tuple and dictionary a) Write a python program to implement insertion sort and merge sort using lists b) Write a program to convert roman numbers in to integer values using dictionaries. Lists: https://www.youtube.com/watch?v=Eaz5e6M8tL4 List methods: https://www.youtube.com/watch?v=8-RDVWGktul Tuples: https://www.youtube.com/watch?v=bdS4dHIJGBc Tuple operations: https://www.youtube.com/watch?v=TItKabcTTQ4 Dictionary: https://www.youtube.com/watch?v=4Q0pW8XB0kc Dictionary methods: https://www.youtube.com/watch?v=oLeNHuORpNY
5	Aim: Demonstration of pattern recognition with and without using regular expressions a) Write a function called isphonenum() to recognize a pattern 415-555-4242 without using regular expression and also write the code to recognize the same pattern using regular expression. b) Develop a python program that could search the text in a file for phone numbers (+919900889977) and email addresses (sample@gmail.com) Regular expressions: https://www.youtube.com/watch?v=LnzFnZfHLS4
6	Aim: Demonstration of reading, writing and organizing files. a) Write a python program to accept a file name from the user and perform the following operations 1. Display the first N line of the file 2. Find the frequency of occurrence of the word accepted from the user in the file b) Write a python program to create a ZIP file of a particular folder which contains several files inside it. Files: https://www.youtube.com/watch?v=vuyb7CxZgbU https://www.youtube.com/watch?v=FqcjKewJTQ0 File organization: https://www.youtube.com/watch?v=MRuq3SRXses
7	Aim: Demonstration of the concepts of classes, methods, objects and inheritance a) By using the concept of inheritance write a python program to find the area of triangle, circle and rectangle.

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	b) Write a python program by creating a class called Employee to store the details of Name, Employee_ID, Department and Salary, and implement a method to update salary of employees belonging to a given department. OOP's concepts: https://www.youtube.com/watch?v=qiSCMNBIP2g Inheritance: https://www.youtube.com/watch?v=Cn7AkDb4pIU
8	Aim: Demonstration of classes and methods with polymorphism and overriding a) Write a python program to find the whether the given input is palindrome or not (for both string and integer) using the concept of polymorphism and inheritance. Overriding: https://www.youtube.com/watch?v=CcTzTulsoFk
9	Aim: Demonstration of working with excel spreadsheets and web scraping a) Write a python program to download the all XKCD comics b) Demonstrate python program to read the data from the spreadsheet and write the data in to the spreadsheet Web scraping: https://www.youtube.com/watch?v=ng2o98k983k Excel: https://www.youtube.com/watch?v=nsKNPHJ9iPc
10	Aim: Demonstration of working with PDF, word and JSON files a) Write a python program to combine select pages from many PDFs b) Write a python program to fetch current weather data from the JSON file PDFs: https://www.youtube.com/watch?v=q70xzDG6nls https://www.youtube.com/watch?v=JhQVD7Y1bsA https://www.youtube.com/watch?v=FcrW-ESdY-A Word files: https://www.youtube.com/watch?v=ZU3cSI51jWE JSON files: https://www.youtube.com/watch?v=9N6a-VLBa2I
Python (Full Course): https://www.youtube.com/watch?v=_uQrj0TkZlc	
Pedagogy	For the above experiments the following pedagogy can be considered. Problem based learning, Active learning, MOOC, Chalk &Talk
PART B – Practical Based Learning	
A problem statement for each batch is to be generated in consultation with the co-examiner and student should develop an algorithm, program and execute the program for the given problem with appropriate outputs.	
Course Outcomes:	
CO 1. Demonstrate proficiency in handling of loops and creation of functions. CO 2. Identify the methods to create and manipulate lists, tuples and dictionaries. CO 3. Discover the commonly used operations involving regular expressions and file system. CO 4. Interpret the concepts of Object-Oriented Programming as used in Python. CO 5. Determine the need for scraping websites and working with PDF, JSON and other file formats.	
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 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 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

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

Semester End Evaluation (SEE):

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

Rubrics suggested in Annexure-II of Regulation book

Textbooks:

1. Al Sweigart, "Automate the Boring Stuff with Python", 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <https://automatetheboringstuff.com/>)
2. Reema Thareja "Python Programming Using Problem Solving Approach" Oxford University Press.
3. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at <http://greenteapress.com/thinkpython2/thinkpython2.pdf>)

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III/IV Semester

Constitution of India and Professional Ethics (CIP)

Course Code	21CIP37/47	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	L:0,T:2,P:0 = 02 Hours	SEE Marks	50
Total Hours of Pedagogy	02 Hours/Week	Total Marks	100
Credits	01	Exam Hours	01 Hours

Course objectives: This course will enable the students

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

- (i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills.

Module - 1

Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.

Module - 2

FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.

Module - 3

Union Executive : Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India. Judicial Reviews and Judicial Activism.

Module - 4

State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.

Module-5

Professional Ethics: Ethics & Values. Types of Ethics. Scope & Aims of Professional & Engineering Ethics. Positive and Negative Faces of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.

Course outcome (Course Skill Set) :

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

C01	Analyse the basic structure of Indian Constitution.
C02	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
C03	know about our Union Government, political structure & codes, procedures.
C04	Understand our State Executive & Elections system of India.
C05	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

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

Total CIE : 1A $20 \times 3 = 60$, Assignment $10 + 10 = 20$, Quiz $20 = 100 / 2 = 50$

(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:

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject **(duration 02 hours)**

1. The question paper will have 50 questions. Each question is set for 01 mark.
2. Semester End Exam (SEE) Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks (60 minutes duration).

Suggested Learning Resources:**Textbook:**

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions. Bengaluru. - 2022.
2. "Engineering Ethics", M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice -Hall, 2004.

Reference Books:

1. "Samvidhana Odu" - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.
2. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al; published by Cengage Learning India, Latest Edition - 2019.
3. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu); Prentice -Hall, 2008.
4. "The Constitution of India" by Merunandan K B; published by Merugu Publication, Second Edition, Bengaluru.


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Constitution of India and Professional Ethics (CIP)

Course Code	21CIP37/87	CIP Marks	50
Teaching Hours/Week (L:T:P:S)	1:0:1:2:P:0 = 02 Hours	SEE Marks	50
Total Hours of Pedagogy	02 Hours/Week	Total Marks	100
Credits	01	Exam Hours	01 Hours

Course objectives: This course will enable the students

1. To know about the basic structure of Indian Constitution
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures
4. To know the State Executive & Elections system of India
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching-Learning more effective. Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools

- (i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills.

Module - 1

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Union Executive : Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.

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Course outcome (Course Skill Set) :

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

C01	Analyse the basic structure of Indian Constitution.
C02	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
C03	know about our Union Government, political structure & codes, procedures.
C04	Understand our State Executive & Elections system of India.
C05	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

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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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
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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

Total CIE : IA $20 \times 3 = 60$, Assignment $10 + 10 = 20$, Quiz $20 = 100 / 2 = 50$

(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:

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject **(duration 02 hours)**

1. The question paper will have 50 questions. Each question is set for 01 mark.
2. Semester End Exam (SEE) Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks (60 minutes duration).

Suggested Learning Resources:**Textbook:**

1. **"Constitution of India" (for Competitive Exams)** - Published by Naidhruva Edutech Learning Solutions. Bengaluru. – 2022.
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Reference Books:

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4. **"The Constitution of India"** by Merunandan K B; published by Merugu Publication, Second Edition, Bengaluru.

III/IV Semester

Constitution of India and Professional Ethics (CIP)

Course Code	21CIP37/47	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	L:0,T:2,P:0 = 02 Hours	SEE Marks	50
Total Hours of Pedagogy	02 Hours/Week	Total Marks	100
Credits	01	Exam Hours	01 Hours

Course objectives: This course will enable the students

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching – Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

- (i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills.

Module - 1

Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.

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FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.

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Course outcome (Course Skill Set) :

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

C01	Analyse the basic structure of Indian Constitution.
C02	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
C03	know about our Union Government, political structure & codes, procedures.
C04	Understand our State Executive & Elections system of India.
C05	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

IV Semester

R PROGRAMMING (Practical based)			
Course Code	21CSL483	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2	SEE Marks	50
Total Hours of Pedagogy	12T + 12P	Total Marks	100
Credits	01	Exam Hours	02
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 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			
Numeric, Arithmetic, Assignment, and Vectors: R for Basic Math, Arithmetic, Variables, Functions, Vectors, Expressions and assignments Logical expressions.			
Textbook 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.			
Textbook 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 family.			
Textbook 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.			
Textbook 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.	
Textbook 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 analyze.	
Assessment Details (both CIE and SEE)	
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).	
Continuous Internal Evaluation (CIE):	
NOTE: List of experiments to be prepared by the faculty based on the syllabus mentioned above	
CIE marks for the practical course is 50 Marks .	
The split-up of CIE marks for record/ journal and test are in the ratio 60:40 .	
- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session. - Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks. - Total marks scored by the students are scaled 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 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.	

27.09.2022

- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- The duration of SEE is 02 hours

Rubrics suggested in Annexure-II of Regulation book

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

Weblinks 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


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SAMPLE TEMPLATE

IV Semester

UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY and ETHICAL HUMAN CONDUCT

Course Code	21UHV49	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:0:0	SEE Marks	50
Total Hours of Pedagogy	20	Total Marks	100
Credits	01	Exam Hours	01

Course objectives:

This introductory course input is intended:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

This course is intended to provide a much-needed orientational input in value education to the young enquiring minds.

Teaching-Learning Process (General Instructions)

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

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. The course is in the form of 20 lectures (discussions)
3. It is free from any dogma or value prescriptions.
4. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation – the whole existence is the lab and every activity is a source of reflection.
5. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.
6. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

Module-1

Introduction to Value Education (4 hours)

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations

Teaching-Learning Process	Introduction to Value Education- Chalk and talk method, Discussion, Sharing of experiences, Live Examples and videos
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SAMPLE TEMPLATE

Module-2	
Harmony in the Human Being (4 hours) Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	
Teaching-Learning Process	Introduction to the concepts- Chalk and talk method, Discussion, Sharing of experiences, Live Examples and videos
Module-3	
Harmony in the Family and Society (4 hours) Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order	
Teaching-Learning Process	Introduction to the concepts- Chalk and talk method, Discussion, Sharing of experiences, Live Examples and videos
Module-4	
Harmony in the Nature/Existence (4 hours) Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence	
Teaching-Learning Process	Introduction to the concepts- Chalk and talk method, Discussion, Sharing of experiences, Live Examples and videos
Module-5	
Implications of the Holistic Understanding – a Look at Professional Ethics (4 hours) Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	
Teaching-Learning Process	Introduction to the concepts- Chalk and talk method, Discussion, Sharing of experiences, Live Examples and videos
Course outcome (Course Skill Set) By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	

SAMPLE TEMPLATE

IV Semester

UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY and ETHICAL HUMAN CONDUCT

Course Code	21UHIV49	CIE Marks	40
Teaching Hours/Week (L:T:P: S)	2:0:0	SEE Marks	60
Total Hours of Pedagogy	20	Total Marks	100
Credits	01	Exam Hours	60

Course objectives:

This introductory course input is intended:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'QUALITY' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

This course is intended to provide a much-needed orientational input in value education to the young, enquiring minds.

Teaching-Learning Process (General Instructions)

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

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. The course is in the form of 20 lectures (discussions)
3. It is free from any dogma or value prescriptions.
4. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation – the whole existence is the lab and every activity is a source of reflection.
5. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.
6. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

Module-1

Introduction to Value Education (4 hours)

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations

Teaching-Learning Process	Introduction to Value Education- Chalk and talk method, Discussion, Sharing of experiences, Live Examples and videos
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Therefore, the course and further follow up is expected to positively impact common graduate attributes like:

1. Holistic vision of life
2. Socially responsible behaviour
3. Environmentally responsible work
4. Ethical human conduct
5. Having Competence and Capabilities for Maintaining Health and Hygiene
6. Appreciation and aspiration for excellence (merit) and gratitude for all

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 01 hours**)

1. The question paper will have 50 questions. Each question is set for 01 marks.
2. The students have to answer all the questions, selecting one full question from each module

Suggested Learning Resources:

Books

-READINGS:

Text Book and Teachers Manual

- a. The Textbook
A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

- b. The Teacher's Manual

Teachers' Manual for *A Foundation Course in Human Values and Professional Ethics*, P. R. Gaur, P. Asthana, G

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F. Schumacher.
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8. Bharat Mein Angreji Raj - Pandit Sunderlal
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10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)
14. Susan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
15. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
16. A Nagaraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
17. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
18. A N Tripathy, 2003, Human Values, New Age International Publishers.
19. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
20. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
21. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
22. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
23. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Web links and Video Lectures (e-Resources):

1. Value Education websites, <https://www.uhv.org.in/uhv-ii>, <http://uhv.ac.in>, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology - the Untold Story
6. Gandhi A., Right Here Right Now, Cyclewala Productions
7. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEKQw
8. https://fdp-si.aicte-india.org/8dayUHV_download.php
9. <https://www.youtube.com/watch?v=8ovkLRYXlJE>
10. <https://www.youtube.com/watch?v=OgdNx0X923I>
11. <https://www.youtube.com/watch?v=nGRcbRpvGoU>
12. <https://www.youtube.com/watch?v=sDxGX0gYEKM>

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

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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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5. IIT Delhi, Modern Technology - the Untold Story
6. Gandhi A., Right Here Right Now, Cyclewala Productions
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8. https://fdp-si.aicte-india.org/8dayUHV_download.php
9. <https://www.youtube.com/watch?v=8ovkLRYXlJE>
10. <https://www.youtube.com/watch?v=OgdNx0X923I>
11. <https://www.youtube.com/watch?v=nGRcbRpvGoU>
12. <https://www.youtube.com/watch?v=sDxGX0gYEKM>

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

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H.O.D

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ADDITIONAL MATHEMATICS-II

(Mandatory Learning Course: Common to all Programme)

A bridge course for Lateral Entry Students under Diploma quota to BE/B.Tech. programme

Course Code:	21MATDIP41	CIE Marks	100
Teaching Hours/Week (L:T:P: S):	3:0:0	Total Marks	100
Total Hours of Pedagogy:	40 hours	Credits:	0

Course objectives:

The mandatory course **21MATDIP41** viz., **Additional Mathematics –II** aims to provide essential concepts of Linear algebra, Second and higher-order differential equations, insight into Elementary probability theory and Numerical methods.

Teaching-Learning Process (General Instructions)

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

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

Module-1: Linear Algebra

Introduction, Rank of a matrix by elementary row operations, Consistency of system of linear equations, Solution by Gauss Elimination method, Eigenvalues and eigenvectors of a square matrix. Problems.

RBT Levels: L1, L2 and L3**8 hours****Teaching-Learning Process**

Chalk and talk method/ Powerpoint presentation

Module-2: Higher-Order Differential Equations

Linear homogeneous/nonhomogeneous differential equations of second and higher-order with constant coefficients. Solution by using the inverse differential operator method. [Particular Integrals restricted to $R(x) = e^{ax}$, $\sin ax$ / $\cos ax$, x^n]

RBT Levels: L1, L2 and L3**8 hours****Teaching-Learning Process**

Chalk and talk method/ Powerpoint presentation

Module-3: Probability Theory

Introduction, Sample space and Events, Axioms of Probability, Addition and Multiplication theorem, Conditional Probability, Independent events, Baye's theorem, Problems.

RBT Levels: L1, L2 and L3**8 hours****Teaching-Learning Process**

Chalk and talk method/ Powerpoint presentation

Module-4: Numerical Method -I

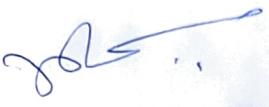
Finite differences, Interpolation/extrapolation using Newton's forward and Backward difference formulae (No derivation), Problems. Solution of polynomial and transcendental equations by Newton-Raphson and Regula-Falsi methods (no derivation), Problems. Numerical Integration: Simson's 1/3 rd rule and 3/8 rule, problems.

RBT Levels: L1, L2 and L3**8 hours**

Teaching-Learning Process	Chalk and talk method/ Powerpoint presentation
Module-5: Numerical Method -II	
Numerical solution of first-order ordinary differential equations: Taylor's series method, Modified Euler's method, Runge-Kutta method of order 4, Milne's predictor-corrector method. Problems	
RBT Levels: L1, L2 and L3	8 hours
Teaching-Learning Process	Chalk and talk method/ Powerpoint presentation
Course outcome (Course Skill Set) At the end of the course the student will be able to: CO1: Test for consistency and solve the system of linear equations CO2: Solve higher order differential equations CO3: Apply elementary probability theory and solve related problems CO4: To interpolate/extrapolate from the given data CO5: Apply the knowledge of numerical methods in modelling and solving engineering problems	
Assessment Details (CIE) Continuous Internal Evaluation: Three Unit Tests each of 20 Marks (duration 01 hour) 1. The first test at the end of 5 th week of the semester 2. The second test at the end of the 10 th week of the semester 3. Third test at the end of the 15 th week of the semester Two assignments each of 10 Marks 4. First assignment at the end of the 4 th week of the semester 5. Second assignment at the end of the 9 th week of the semester Course Seminar suitably planned to attain the COs and POs for 20 Marks (duration 01 hours) . The sum of three tests, two assignments, and a seminar will be out of 100 marks The student shall secure a minimum of 40% of marks of the course to qualify and become eligible for the award of a degree.	
Suggested Learning Resources: Text Book 1. Higher Engineering Mathematics: B. S. Grewal, Khanna Publishers, New Delhi, 43 rd Ed., 2015.	
Reference Books: 1. Higher Engineering Mathematics: V. Ramana, McGraw-Hill Education, 11th Ed. 2. Engineering Mathematics: Srimanta Pal & Subodh C. Bhunia, Oxford University Press, 3 rd Reprint, 2016. 3. A textbook of Engineering Mathematics: N.P Bali and Manish Goyal, Laxmi Publications, Latest edition. 4. Higher Engineering Mathematics: H.K. Dass and Er. Rajnish Verma, S. Chand Publication (2014).	
Weblinks and Video Lectures (e-Resources): 1. http://www.class-central.com/subject/math(MOOCs) 2. http://academicearth.org/ 3. http://www.bookstreet.in 4. VTU e-Shikshana Program 5. VTU EDUSAT Program	

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

- Quizzes
- Assignments
- Seminars


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