ST JOSEPH ENGINEERING COLLEGE

An Autonomous Institution
Vamanjoor, Mangaluru - 575028

Affiliated to VTU – Belagavi & Recognized by AICTE New Delhi
NBA – Accredited: B.E.(CSE,ECE,EEE, ME and CIV) & MBA
NAAC – Accredited with A+

B.E. SCHEME & SYLLABUS
(With effect from 2021-22)

COMPUTER SCIENCE AND ENGINEERING

SECOND YEAR
(III and IV Semester)

2022 - 2023

III Semester (B.E. - CSE Engineering)														
SI. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical /Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	BSC	21MAC301	Mathematical Foundations for Computer Science	MAT	MAT	2	2	-	03	50	50	100	3
2	PCC	21CSE302	Data Structures and Applications (Integrated)	CSE	CSE	3	-	2	03	50	50	100	4
3	PCC	21CSE303	Digital Principles and Design (Integrated)	CSE	CSE	3	-	2	03	50	50	100	4
4	PCC	21CSE304	Computer Organization and Architecture	CSE	CSE	2	2	-	03	50	50	100	3
5	PCC	21CSL305	Object Oriented Programming with Java Lab	CSE	CSE	-	-	2	03	50	50	100	1
6	HSMC	21UHV306	Universal Human Values - II	COM		2	-	-	02	50	50	100	2
		21BFE306	Biology for Engineers	COM									
7	HSMC	21KBK307	Balake Kannada (Kannada for communication)/			-	2	-	02	50	50	100	1
		21KSK307	Saamskrutika Kannada (Kannada for Administration)										
		21CPC307	Constitution of India, Professional Ethics and Cyber Law			1	-	-					
8	SDC	21IEP308	IoT Enabled Prototyping	COM		-	-	2	03	50	50	100	1
9	SDC	21IOT309	Industry Oriented Training – Business Etiquettes	COM		-	-	2	02	50	-	50	-
					Total	12 **OR** **13**	6 **OR** **4**	10	24	**450**	**400**	**850**	**19**
10	HSMC	21ENG310	Business Communication	ENG		-	2	-	02	50	50	100	-
11	MNCC	21MAL301	Additional Mathematics- I	MAT	MAT	2	1	-	03	50	50	100	-

IV Semester (B.E. - CSE Engineering)														
SI. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical /Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	BSC	21MAC401	Linear Algebra & Statistical Methods	MAT	MAT	2	2	-	03	50	50	100	3
2	PCC	21CSE402	Design and Analysis of Algorithms (Integrated)	CSE	CSE	3	-	2	03	50	50	100	4
3	PCC	21CSE403	Database Management System (Integrated)	CSE	CSE	3	-	2	03	50	50	100	4
4	PCC	21CSE404	Operating System	CSE	CSE	2	2	-	03	50	50	100	3
5	PCC	21CSL405	Application Development using Python Lab	CSE	CSE	-	-	2	03	50	50	100	1
6	HSMC	21UHV406	Universal Human Values - II	COM		2	-	-	02	50	50	100	2
		21BFE406	Biology for Engineers	COM									
7	HSMC	21KBK407	Balake Kannada (Kannada for communication)			-	2	-	02	50	50	100	1
		21KSK407	Saamskrutika Kannada (Kannada for Administration)										
		21CPC407	Constitution of India, Professional Ethics and Cyber Law			1	-	-					
8	SDC	21CTE408	Computational Tools for Engineers	COM		-	-	2	03	50	50	100	1
9	SDC	21IOT409	Industry Oriented Training – Computing Skills	COM		-	-	2	02	50	-	50	-
10	INT	21INT410	Summer Internship - I	COM					03	50	50	100	2
					Total	12 **OR** **13**	6 **OR** **4**	10	19	**500**	**450**	**950**	**21**
11	MNCC	21MAL401	Additional Mathematics- II	MAT	MAT	2	1	-	03	50	50	100	-

Note: BSC: Basic Science Courses; ESC: Engineering Science Courses; HSMC: Humanity, Social Science and Management Courses; MNCC = Mandatory Non-Credit Course. INT: Internship, PCC: Professional Core Course; PEC = Professional Elective Course; OEC = Open Elective Course; UHV: Universal Human Values SDC: Ability Enhancement (Skill Development) Course.

One-hour Lecture (L) per week per semester = 1 Credit Two-hour Tutorial (T) per week per semester = 1 Credit Two-hour Practical/Laboratory/Drawing (P) per week per semester = 1 Credit Four hours of Self-study = 1 Credit.

Summer Internship-II: All the students admitted shall have to undergo mandatory internship of minimum 04 weeks during the IV and V semester vacation. Summer Internship shall be Carried Out – based on industrial/ Govt./NGO /MSME/ Rural Internship /Innovation/Entrepreneurship, Credited in V Semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements.

21KBK307/407 Balake Kannada (Kannada for communication) is prescribed for students who have not studied Kannada at any level of schooling (State/Central-CBSC/ICSE) and are not able to speak, write, read and understand Kannada.
21KSK307/407 Saamskrutika Kannada (Kannada for Administration) is prescribed for students who satisfy any one of the following. i. Studied 1 – 10th standard in Kannada medium ii. Studied Kannada as first or second language during high school and cleared SSLC examination iii. Studied Kannada at any level of schooling and are able to speak, write and read Kannada. iv. Passed diploma or certificate course in Kannada conducted by a university established by law in India v. Passed Kava, Jana and Rathna examinations conducted by Kannada Sahithya Parishat vi. Passed the SSLC examination or any other examination declared as equivalent thereto by the state government or any examinations higher than SSLC examination a) in which the question papers on different subjects are answered in Kannada language or b) in which Kannada was the main or second language or an optional subject but not one of the subjects in a composite paper.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs:
(a)The mandatory non – credit courses Additional Mathematics I and Business Communication prescribed for III semester and Additional Mathematics II prescribed for IV semester, to the lateral entry Diploma holders admitted to III semester of BE/B.Tech programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. 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 F grade. In such a case, the students have to fulfil the requirements during subsequent semester/s to appear for SEE. (b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

Courses prescribed to lateral entry B. Sc degree holders admitted to III semester of Engineering programs:
Lateral entrant students from B.Sc. Stream, shall clear the Mandatory non-credit courses Engineering Graphics and Elements of Civil Engineering and Mechanics of the First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

AICTE Activity Points to be earned by students admitted to BE/B.Tech Day College Programs:
Over and above the academic grades, every student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other Universities to fifth semester are required to earn 50 Activity Points from the year of entry. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, minimum hours' requirement should be fulfilled. Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, Eighth Semester Grade Card shall be issued only after earning the required Activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

Mathematical Foundations for Computer Science

Course Code	**21MAC301**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Apply the concepts of a planar graph, Hamiltonian graph, Trees, graph coloring and their properties in the domain of Computer Science Engineering.
2. Demonstrate the Fourier series and DFT to study the behavior of periodic functions and their applications in system communications.
3. Solve the problems on concepts of integers and number theoretic functions which are used in cryptography.

Module 1

Graph Theory – I:

Definition and examples of Graphs, Subgraphs and Isomorphism. Vertex Degree and Hand Shaking Property. Walks and their classification, Euler Trails and Circuits. Planar graphs. Hamilton Paths and Hamilton cycles**.** **8 Hours**

Module 2

Graph Theory – II:

Graph Coloring and Chromatic polynomials. Trees – Definitions, properties and examples. Rooted Trees. Trees and Sorting. Weighted Trees and Prefix codes. **8 Hours**

Module 3

Optimization and matching:

Dijkstra's Shortest-Path Algorithm. Minimal Spanning Trees: The Algorithms of Kruskal and Prim. Matching Theory. **8 Hours**

Module 4

Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions with period 2l. Half range Fourier series for arbitrary period.

Discrete Fourier Transforms (DFT): Introduction to DFT, basic mathematical definition and formula related to DFT and Inverse DFT, DFT as a Linear transformation – simple problems. **8 Hours**

Module 5

Number Theory:

Divisibility, the greatest common divisor, properties of prime numbers, the fundamental theorem of arithmetic, modular arithmetic, remainder arithmetic, multiplicative inverses and cancelling, Euler's theorem. **8 Hours**

Course Outcomes:

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

21MAC301.1	Apply the concepts of different types of graphs in Computer Science Engineering.
21MAC301.2	Explain the concept of Trees and Graph coloring.
21MAC301.3	Find the shortest path and discuss the concept of Matching Theory.
21MAC301.4	Demonstrate the Fourier series to study the behavior of periodic functions.
21MAC301.5	Compute DFT of real and complex discrete signals.
21MAC301.6	Solve the problems on cryptography using the idea of number theory.

Question paper pattern:
Note: The SEE question paper will be set for 100 marks and the marks will be proportionately reduced to 50.

- The question paper will have Part A and Part B. Part A is Mandatory.
- Part A has 10 short answer type questions of two mark each.
- Part B has 10 Full questions. Each full question carries 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module. Students will have to answer 5 full questions, selecting one full question from each module.

Sl No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Discrete and Combinatorial Mathematics- An Applied Introduction	Ralph P. Grimaldi and B V Ramana	Pearson Education, Asia	5th Edition, 2017
2	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	44th Edition, 2015
3	Digital Signal Processing- Principles Algorithms, and Applications	Proakis & Manolakis	Pearson Education	4th Edition, 2007
4	Number Theory	David C Burton	Tata McGraw Hill	7th Edition, 2017
Reference Books				
1	Discrete and Combinatorial Mathematics- An Applied Introduction	Ralph P. Grimaldi and B V Ramana	Pearson Education, Asia	5th Edition, 2017
2	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	44th Edition 2015

Web links/Video Lectures/MOOCs/papers

1. https://www.youtube.com/watch?v=E40r8DWgG40&list=PLEAYkSg4uSQ2fXcfrTGZdPuTmv98bnFY5
2. https://www.youtube.com/watch?v=LGxE_yZYigI
3. https://www.youtube.com/watch?v=19SW3P_PRHQ

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
21MAC301.1		3	1											
21MAC301.2		3	1											
21MAC301.3	1			3										
21MAC301.4	1		3											
21MAC301.5	2		2											
21MAC301.6		3	1											

1: Low 2: Medium 3: High

DATA STRUCTURES AND APPLICATIONS (Integrated)

Course Code	**21CSE302**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:2)	SEE Marks	50
Credits	**04**	Exam Hours	03

Course Learning Objectives:

1. Explain fundamentals of data structures and applications that are essential for programming and problem solving.
2. Analyze linear and non-linear data structures.
3. Design and develop various basic and advanced data structures.
4. To Introduce various techniques for representation of data in the real world.
5. Demonstrate sorting and searching algorithm.
6. To understand the basic concepts of hashing.

Module 1

Basic Concepts: Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions, Polynomials and Sparse Matrices in arrays.

Strings: Basic Terminology, Storing, Operations, and Pattern Matching algorithms. Programming Examples.

Text Book 1: Chapter 2.2, 2.3, 2.4, 2.5, 2.6

Text Book 2: Chapter 2.1, 2.2, 2.3 **8 Hours**

Module 2

Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. Recursion.

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

Text Book 1: Chapter 3.1, 3.2, 3.3, 3.4, 3.6

Text Book 2: Chapter 7.7, 8.4 **8 Hours**

Module 3

Linked Lists: Definition, Representation of linked lists in Memory, linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, header linked lists. Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples

Graphs: Matrix and Adjacency List Representation of Graphs, Elementary Graph operations,Traversal methods: Breadth First Search and Depth First Search.

Text Book 1: Chapter 4.4, 4.7

Text Book 2:Chapter 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 13.1, 13.2, 13.3, 13.5, 13.6 **8 Hours**

Module 4

Trees: Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations,Threaded Binary Trees, Binary Search Trees, Forests Multi-way Search Trees: Introduction, BTrees, B+ Trees.

Text Book 1: Chapter 5.1, 5.2, 5.3, 5.4, 5.5, 5.7, 5.9

Text Book 2: Chapter 11.1, 11.2, 11.3 **8 Hours**

Module 5

Searching and Sorting: Jump Search, Insertion sort, Radix Sort, Shell Sort.

Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions, Collisions, Pros and Cons of Hashing, Applications of Hashing.

Text Book 2: Chapter 14.1, 14.5, 14.8, 14.12, 14.14, 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7 **8 Hours**

List of Laboratory Experiments related to above modules – 2 hours each

1. Design, Develop and Implement a menu driven Program for the following.
   a. Demonstrate dynamic allocation of 2D array of integers (use suitable pointer)
   b. Read m×n sparse matrix into an array.
   c. Compute transpose of m×n sparse matrix using fast transpose algorithm
   d. Display sparse matrix. Support the program with functions for each of the above operations.
2. Design, Develop and Implement a Program for the following operations on Strings.
   a. Read a main String (STR) and a Pattern String (PAT).
   b. Implement KMP algorithm to Perform Pattern Matching Operation: Find the occurrences of PAT in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built in functions.
3. Design, Develop and Implement a Program in C for converting an Infix Expression toPostfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: **+(add), -(sub), *(multiple), /(division), %(Remainder), ^(Power)** and **alphanumeric** operands**.**
4. Design, Develop and Implement a menu driven Program in C for the following operations on **Circular QUEUE** of Characters (Array Implementation of Queue with maximum size **(MAX).**
   a. Insert an Element on to Circular QUEUE.
   b. Delete an Element from Circular QUEUE.
   c. Demonstrate ***Overflow*** and ***Underflow*** situations on Circular QUEUE.
   d. Display the status of Circular QUEUE.
   e. Exit.
   Support the program with appropriate functions for each of the above operations.
5. Design, Develop and Implement a menu driven Program in C for the followingoperations on **Singly Linked List (SLL)** of Student Data with the fields: **USN, Name, Branch, Sem, PhNo.**
   a. Create a **SLL** of **N** Students Data by using ***front insertion***.
   b. Display the status of **SLL** and count the number of nodes in it.
   c. Perform Insertion / Deletion at End of **SLL.**
   d. Perform Insertion / Deletion at Front of **SLL(Demonstration of stack).**
   e. Exit.
6. Design, Develop and Implement a menu driven Program in C for the following operations on **Binary Search Tree (BST)** of Integers.
   a. Create a BST of **N** Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2.
   b. Traverse the BST in Inorder, Preorder and Post Order.
   c. Search the BST for a given element (**KEY**) and report the appropriate message.

e. Exit.

7. Write a C program to perform the following operation:
   a. Insertion into a B-tree.
   b. Implement Radix sort algorithm for sorting a given list of integers in ascending order.
8. Design, develop and Implement a Program for the following operations on Hash Table.Assume that file F is maintained in memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers.
   a. Use Hash function H(K)=K mod m (remainder method), and implement hashing technique to map a given key K to the address space L.
   b. Resolve the collision (if any) using linear probing.

1. **Open-ended experiment covering the concept of an entire syllabus**
   Online shopping application.

Course Outcomes:

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

21CSE302.1	Apply data structures (pointers, arrays, structures and strings) for data organization and traversal.
21CSE302.2	Analyze and implement sorting, searching and data organization using the data structures Stacks, Queues and Linked Lists.
21CSE302.3	Apply trees and graphs for data ordering, data searching and evaluating expressions.
21CSE302.4	Differentiate different data structures.
21CSE302.5	Implement solutions to problems individually or in teams using recursion, searching and sorting algorithms.
21CSE302.6	Apply data structures to implement real life applications involving data storage, access and organization.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Fundamentals of Data Structures in C -	Ellis Horowitz and Sartaj Sahni,	Universities Press	2nd Edition, 2008
2	Data Structures using C	Reema Thareja	Oxford press	2nd Edition, 2014
Reference Books				
1	Data Structures using C	Aaron M.Tenenbaum, YedidyahLangsam, Moshe J.Augenstein	Pearson Education	Low price Edition, 2009
2	Data Structures: A Pseudocode Approach with C	Richard F. Gilberg and Behrouz A. Forouzan	Cengage Learning	2nd Edition, 2005

Web links/Video Lectures/MOOCs/papers

1. https://masterraghu.com/subjects/Datastructures/ebooks/rema thareja.pdf
2. NPTEL :: Computer Science and Engineering - DataStructures And Algorithms

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
21CSE302.1	-	-	-	-	-	2	-	-	-	-	2	-	-	-
21CSE302.2	-	-	-	-	-	-	-	-	2	-		-	-	2
21CSE302.3	-	-	-	-	-	-	-	-	-	-	2	-	-	2
21CSE302.4	-	-	-	-	-	1	-	-	-	-	1	-	-	-
21CSE302.5	-	-	-	-	-	2	-	-	3	-	2	-	1	3
21CSE302.6	-	-	-	-	-	2	-	-	-	-	-	-	-	3

1: Low 2: Medium 3: High

Digital Principles and Design (Integrated)

Course Code	**21CSE303**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:2)	SEE Marks	50
Credits	**04**	Exam Hours	03

Course Learning Objectives:

1. Make use of basic gates and design the logic circuits.
2. Make use of simplifying techniques in the design of combinational circuits
3. Differentiate the combinational and sequential circuits
4. Demonstrate the use of flip-flops in the construction of registers and counters
5. Illustrate how to write simple HDL programs which describe the digital circuits

Module 1

Digital Logic and Principles of combination logic : Review of Basic gates,Universal gates, Positive and Negative logic, Boolean Laws and theorems, minimization of completely and incompletely specified switching functions, Simplifying Max term equations, Sum of product method, Product of sums method, Product of sums simplification.

Text Book 1: Chapter 2.1, 2.2, 2.4, 3.1, 3.2, 3.7, 3.8

Text Book 2: Chapter 4.3, 4.4, 4.5 **8 Hours**

Module 2

Combinational logic circuit design:, Karnaugh map simplification, Don't care conditions, Simplification by QuineMcCluskey method, Determination of Prime implicants, Simplification using map-entered variables, Gate delays and Timing diagrams, Hazard and Hazard covers, Introduction to HDL: Verilog HDL, Describing input/output, writing module body, HDL Implementation models.

Text Book 1: Chapter 3.3-3.6, 3.9, 3.11, 3.12, 3.13

Text Book 2: Chapter 6.1, 6.2, 6.5, 8.3, 10.1, 10.3

8 Hours

Module 3

Data Processing circuits : Multiplexers, De-multiplexers, decoder, BCD to Decimal decoder, seven segment decoder, encoders, Ex-OR gates, Parity generators and checkers, Magnitude comparators, Read only memory, Programmable array logic(PAL), Programmable logic arrays(PLA).

HDL implementation: HDL of data processing circuits, Arithmetic circuits using HDL.

Text Book 1: Chapter 4.1-4.2, 4.4-4.12, 4.14 **8 Hours**

Module 4

Latches and Flip-Flops: RS Flip-Flop, Gated Flip-Flops: Clocked RS and D Flip-Flops, Edge triggered RS Flip-Flops, Edge triggered D Flip-Flops, Edge triggered JK Flip-Flops, JK master slaveFlip-Flop, switch contact bounce circuits, various representation of Flip-Flops, Analysis of sequential circuits.

Text Book 1: Chapter 8.1-8.5, 8.8-8.11 **8 Hours**

Module 5
Registers and Counters: Registers: Types of registers, Application of shift registers HDL implementation: HDL implementation of registers,Asynchronous counters, Decoding gates, Synchronous counters, changing the counter modulus, decade counters, presettable counters, counter design as a synthesis problem, Design of sequential circuits: Design of synchronous sequential circuits, Sequential Parity checker. **Text Book 1: Chapter 9.1, 9.7, 9.8, 10.1-10.7, 11.1-11.7** **Text Book 2: Chapter 13.1** **8 Hours**
List of Laboratory Experiments related to above modules – 2 hours each
1. Design and implementation of a Half adder, Half Substractor and a Full Adder using basicgates. Implement Full Substractor in VHDL. 2. Given a 4-variable logic expression, simplify it using appropriate technique and realize thesimplified logic expression using 8:1 multiplexer IC and implement the same in HDL. 3. Realize a J-K Master / Slave Flip-Flop using NAND gates and verify its truth table. and implement the same in HDL. 4. Design and implement a mod-n (n<8) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working. 5. Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate on a 7-segment display (using IC-7447). 6. Design and Testing Shift Register/Ring Counter/Johnson Counter
7. Open ended experiment covering the concept of entire syllabus ● Design and Testing Sequence Generator ● Use Universal gates and IC's for code conversion and arithmetic Operations ● Design and Verify on Different Counters**.**

Course Outcomes: At the end of the course the student will be able to:	
21CSE303.1	Implement and usage of basic gates and universal gates.
21CSE303.2	Apply the simplification techniques like Karnaugh map and Quine Mc-clusky to describe various logic circuits.
21CSE303.3	Describe the operation and design of various data processing circuits such as multiplexers, de-multiplexers, decoders, encoders ,comparators etc.
21CSE303.4	Differentiate the types of flip-flops and Design different types of counters using flip-flops.
21CSE303.5	Develop simple HDL programs using Verilog.
21CSE303.6	Identify the various components of any analog or digital circuit and explain their Usage.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Digital Principles andApplication	Donald P Leach, Albert Paul Malvino & Goutam Saha	Tata McGrawHill	8th Edition, 2017
2	Analog and Digital Electronics	Charles H Roth and Larry L kinney	Cengage Learning	2019
Reference Books				
1	Fundamentals of Digital Logic Design with VHDL	Stephen Brown, Zvonko Vranesic	Tata McGraw Hill	2nd Edition, 2005
2	Illustrative Approach To Logic Design	R D Sudhaker Samuel	Sanguine-Pearson	2010

Web links/Video Lectures/MOOCs/papers

1.https://cse15-iiith.vlabs.ac.in/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
21CSE303.1	-	-	-	-	2	-	-	-	-	-	-	-	-	-
21CSE303.2	-	-	-	-	2	-	-	-	-	-	-	-	-	-
21CSE303.3	-	-	-	-	2	-	-	-	-	-	-	-	-	-
21CSE303.4	-	-	-	-	2	-	-	-	-	-	-	-	-	-
21CSE303.5	-	-	-	-	-	-	-	2	-	-	-	-	-	-
21CSE303.6	-	-	-	-	2	-	-	-	-	-	-	-	-	-

1: Low 2: Medium 3: High

Computer Organization and Architecture

Course Code	**21CSE304**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Explain the basic subsystems of a computer, their organization, structure, operations and Illustrate the concept of programs as sequences of machine instructions.
2. Demonstrate different ways of communicating with I/O devices .
3. Describe memory hierarchy and multiprocessor architecture.
4. Describe arithmetic operations with integer operands and illustrate organization of a simple processor.
5. Illustrate instruction level parallelism and organization of pipelined processor.

Module 1

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

Machine Instructions and Programs: Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Stacks and Queues, Subroutines, Additional Instructions.

Text book 1: Chapter 1 – 1.3, 1.4, 1.6 (1.6.1 to 1.6.4, 1.6.7)
Chapter2 – 2.2 to 2.6, 2.8 to 2.10 **8 Hours**

Module 2

Input/Output Organization: Basic Input and Output Operations, Accessing I/O Devices, Interrupts-Interrupt hardware, Enabling and disabling of interrupts, Handling multiple devices, Controlling device requests, exceptions, Direct Memory Access- Bus arbitration, Buses-Synchronous and Asynchronous bus.

Text book 1: Chapter 2 –2.7,
Chapter 4 – 4.1, 4.2(4.2.1 to 4.2.5), 4.4, 4.5 **8 Hours**

Module 3

Memory Unit: Memory Hierarchy, Basics of Cache memory, Cache mapping techniques.

Multiprocessor Architecture: Introduction, Centralized shared-memory architecture , Distributed shared-memory architecture.

Basic Scheme for Enforcing Coherence: Snooping coherence protocols, Basic implementation techniques.

Text book 1: Chapter 5 – 5.4 to 5.5 (5.5.1 to 5.5.2)
Text book 2: Chapter 5 – 5.1, 5.2, 5.4 **8 Hours**

Module 4

Integer arithmetic: Numbers, Arithmetic operations and characters, Overflow in integer arithmetic.

Arithmetic unit: Multiplication of two numbers, A signed operand multiplication, Booth algorithm, Fast Multiplication-Bit pair recoding and CSA – integer division.

Basic Processing Unit: Fundamental concepts, Execution of complete instruction, Multiple bus organization. **Text book 1: Chapter 2- 2.1** **Chapter 6 – 6.3 to 6.6,** **Chapter 7- 7.1 to 7.3** **8 Hours**
Module 5
Instruction level parallelism: Introduction and challenges, Data dependencies and Hazards:Data dependencies, Name dependencies, Control Dependencies. **Pipelining:** Introduction, A simple implementation of a RISC instruction set. The classic five-stage pipeline for a RISC processor, Basic performance issues in pipelining. **Text book 2: Chapter 3 – 3.1, Appendix C** **8 Hours**

Course Outcomes:	
At the end of the course the student will be able to:	
21CSE304.1	Describe computer hardware and the basic functionality, interconnection,addressing techniques and instruction sequencing.
21CSE304.2	Explain the basics concepts of I/O, interrupts, direct memory access techniqueand types of buses.
21CSE304.3	Illustrate cache memory mapping techniques, various memory architecturesand protocols for cache coherence.
21CSE304.4	Apply different algorithms to perform arithmetic operations.
21CSE304.5	Illustrate organization of a processor with single and multiple bus for instructionexecution.
21CSE304.6	Appraise the importance of pipelining to achieve instruction level parallelism.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Computer Organization	C Hamacher, Z Vranesic	Tata McGrawHill	5th Edition, 2011
2	Computer Architecture: A Quantitative Approach	John L Hennessy, David A Patterson	Elsevier	5th Edition, 2012
Reference Books				
1	Computer Organization and Design	David A. Patterson, John L.Hennessy	M.K Publishers	4th Edition, 2010
2	Computer Organization and Architecture	William Stallings	Pearson	9th Edition, 2014
3	Computer Organization and Design MIPS Edition	Patterson	Elsevier	6th Edition, 2021
4	Computer Organization and Architecture	J. S. Katre, Harish G,Narula, KhushbooShah	Tech Knowledge Publications	2020

Web links/Video Lectures/MOOCs/papers

1. https://www.coursera.org/learn/comparch
2. https://nptel.ac.in/courses/106103068
3. https://www.youtube.com/watch?v=leWKvuZVUE8&list=PL1A5A6AE8AFC187B7

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
21CSE304.1	-	-	-	-	-	-	-	-	-	-	-	3	-	2
21CSE304.2	-	-	-	-	-	-	2	-	-	-	-	2	-	-
21CSE304.3	-	-	-	-	-	-	3	-	-	-	-	-	-	2
21CSE304.4	-	-	-	-	-	-	-	-	-	-	-	2	-	3
21CSE304.5	-	-	-	-	-	-	-	-	-	-	-	3	-	2
21CSE304.6	-	-	-	-	-	-	2	-	-	-	-	2	-	-

1: Low 2: Medium 3: High

Object Oriented Programming with Java Lab

Course Code	21CSL305	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	**01**	Exam Hours	03

Course Learning Objectives:

1) To build software development skills using java programming for real-world applications.
2) To understand and apply the concepts of classes, packages, interfaces, array list, exception handling Array List processing.
3) To develop applications using generic programming and event handling.

Laboratory Programs:

PART- A

1.	Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows: First 100 units - Rs. 1 per unit. 101-200 units - Rs. 2.50 per unit. 201 -500 units - Rs. 4 per unit. > 501 units - Rs. 6 per unit. If the type of the EB connection is commercial, calculate the amount to be paid as follows: First 100 units - Rs. 2 per unit. 101-200 units - Rs. 4.50 per unit. 201 -500 units - Rs. 6 per unit. > 501 units - Rs. 7 per unit.
2.	Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
3.	Write a program to demonstrate run-time polymorphism by implementing Rectangle and Triangle classes extended from an abstract class Figure.
4.	Write a program to demonstrate usage of multilevel inheritance by implementing Box, Box Weight and Shipment classes with overloaded constructors.
5.	Write a program to demonstrate all combinations of the access control modifiers.
6.	a. Write a program to catch Illegal Access Exception thrown inside a called method. b. Write a program to demonstrate finally block in case of i) No exception. ii) Exception. iii) return statement.

7.	Implement a Java based program to handle all the mouse based events with appropriate display.
8.	Implement a calculator using event-driven programming paradigm of Java having the following operation: 
9.	Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
10.	Write a Java Program to implement producer consumer problem using interthread communication.
	PART B – Problem Based Learning
Case Study: Develop an application using Java concepts.	
Text Book: Herbert Schildt, Java**:** The Complete Reference, 7th Edition, TATA McGraw-Hill publications, 2009.	

Web links/Video Lectures/MOOCs/papers

1. https://www.youtube.com/watch?v=-HafzawNlUo
2. https://www.youtube.com/watch?v=7GwptabrYyk
3. https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in- java/

Course Outcomes: At the end of the course the student will be able to:	
21CSL305.1	Analyze the simple application that makes use of classes, strings and basic datatypes.
21CSL305.2	Implement the concept of arrays and ArrayList.
21CSL305.3	Develop java programs with constructors, method overriding and inheritance.
21CSL305.4	Design the applications using interface and stack operations.
21CSL305.5	Analyze the object-oriented concepts for multithreading and exception handling.
21CSL305.6	Design and develop simple java applications for real world problems.

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
21CSL305.1	3	-	1	-	-	-	-	-	-	-	-	-	-	-
21CSL305.2	-	-	2	-	-	-	-	-	-	-	-	-	2	-
21CSL305.3	3	-	-	-	-	2	-	-	-	-	-	-	-	-
21CSL305.4	3	-	-	-	-	1	-	-	-	-	-	-	1	-
21CSL305.5	3	2	3	-	-	-	-	-	-	-	-	-	-	-
21CSL305.6	1	2	3	3	3	3	-	-	-	-	2	2	-	-

1: Low 2: Medium 3: High

Universal Human Values- II

Course Code	**21UHV306/406**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:0)	SEE Marks	50
Credits	**02**	Exam Hours	02

Course Learning Objectives:

This introductory course input is intended:

1. To help the students appreciate the essential complementarily 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 Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement toward 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 behavior and mutually enriching interaction with Nature.

Module 1

Introduction to Value Education:

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 Fulfill the Basic Human Aspirations.

Activities: Sharing about Oneself, Exploring Human Consciousness and Exploring Natural Acceptance. **5 Hours**

Module 2

Harmony in the Human Being:

Understanding Human beings 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.

Activities: Exploring Sources of Imagination in the Self, Exploring Harmony of Self with the Body and Exploring the difference of Needs of Self and Body. **5 hours**

Module 3

Harmony in the Family and Society:

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.

Activities: Exploring the Feeling of Trust, Exploring the Feeling of Respect and Exploring the Feeling systems to fulfil Human Goal. **5 hours**

Module 4

Harmony in the Nature/Existence

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

Activities: Exploring the Four Orders of Nature and Co-existence in Existence **3 hours**

Module 5

Implications of the Holistic Understanding – a Look at Professional Ethics

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

Activities: Exploring Ethical Human Conduct**,** Humanistic Models in Education and steps of Transition towards Universal Human Order **5 hours**

Course Outcomes:

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

21UHV306.1	Practice the method of self-exploration to understand the basic human aspiration.
21UHV306.2	Distinguish between needs of self and body.
21UHV306.3	Evolve a program for self-regulation and health.
21UHV306.4	Differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them.
21UHV306.5	Realize sustainable solutions to the problems in society and nature
21UHV306.6	Develop competence in professional ethics and strategies for the transition towards a value-based life/profession.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Text Books				
1	Foundation Course in Human Values and Professional Ethics.	R R Gaur, R Asthana, G P Bagaria	Excel Books, New Delhi,	2, 2019
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics.	R R Gaur, R Asthana, G P Bagaria	Excel Books, New Delhi	2, 2019
Reference Books				
1	Jeevan Vidya: Ek Parichaya	A Nagaraj	JeevanVidya Prakashan, Amarkantak	1999
2	Human Values	A.N. Tripathi	New Age Intl. Publishers, New Delhi	2004

Web links/Video Lectures/MOOCs/papers

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
3. Small is Beautiful - E. F Schumacher.
4. Slow is Beautiful - Cecile Andrews
4. Economy of Permanence - J C Kumarappa
5. Bharat Mein Angreji Raj – Pandit Sunderlal
6. Rediscovering India - by Dharampal
7. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
8. India Wins Freedom - Maulana Abdul Kalam Azad
9. Vivekananda - Romain Rolland (English)
10. Gandhi - Romain Rolland (English)

11. UHV-I Teaching material (Presentations, Pre & Post Surveys etc.)
https://fdp-si.aicte-india.org/AicteSipUHV_download.php

12. Details of UHV-II: Universal Human Values – Understanding Harmony and Ethical Human Conduct
https://drive.google.com/file/d/1cznDaqDwKy__EKWmqJLWF94MeY4AXcsU/view?usp=sharing

13. Recorded FDP (Refresher 1 Part 1: Preparing to teach UHV-I in SIP)
https://www.youtube.com/watch?v=kejuD4faDDE&list=PLWDeKF97v9SOjS4RanhaYj4YLiImqm5pj&index=1

14. Resources, including the class notes and presentations
https://drive.google.com/drive/folders/1nh9m5ibEtvMyqekeiexAJtfbdNtmtt6-?usp=sharing

15. Hindi Recording of 5-day UHV FDP
https://www.youtube.com/playlist?list=PLWDeKF97v9SMRfe5PK1HPYnEcrrJOL6K7

16. English Recording of 5-day UHV FDP
https://www.youtube.com/playlist?list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZlGC4

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
21UHV306.1						2			3	2				
21UHV306.2						3	3							
21UHV306.3	2								3			2		
21UHV306.4						3	3	3						
21UHV306.5	2					2			3					
21UHV306.6						3	3			2				

1: Low 2: Medium 3: High

Biology for Engineers

Course Code	**21BFE306**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:0)	SEE Marks	50
Credits	**02**	Exam Hours	02

Course Learning Objectives:

1. To bring awareness of biological concepts to engineering students.
2. To introduce the building blocks of life and their complexity.
3. To encourage interdisciplinary studies and projects.
4. To appreciate the discoveries that mimic nature and its working.
5. To inculcate nature-inspired design and operational principles.

Module 1

Basic Cell Biology: Introduction to Biology, The cell: the basic unit of life, Expression of genetic information-protein structure and function, Cell metabolism; Cells respond to their external environments, Cells grow and reproduce, Cellular differentiation. **5 Hours**

Module 2

Biochemistry and Molecular Aspects of Life: Biodiversity-Chemical bonds in Biochemistry; Biochemistry and Human biology, Protein synthesis -DNA; RNA, Transcription and translation factors play key roles in protein synthesis, Differences between eukaryotic and prokaryotic protein synthesis, Stem cells and their applications. **5 Hours**

Module 3

Bioinspired Engineering based on human physiology: Circulatory system (artificial heart, pacemaker, stents), Nervous system (Artificial neural network), Respiratory system, sensory system (electronic nose, electronic tongue), Visual and auditory prosthesis (Bionic eye and cochlear implant). **5 Hours**

Module 4

Relevance of Biology as an interdisciplinary approach: Biological observation that led to major discoveries, Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf), Bird flying (aircraft), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro). **5 Hours**

Module 5

Bioinspired Algorithms and Applications: Genetic algorithm, Gene expression modelling, Parallel Genetic Programming: Methodology, History, and Application to Real-Life Problems, Dynamic Updating DNA Computing Algorithms, Bee-Hive: New Ideas for Developing Routing Algorithms Inspired by Honey Bee Behaviour**.**

Course Outcomes:

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

21BFE306.1	Discuss how the cell forms the basic building block of life.
21BFE306.2	Distinguish between transcription and translation.
21BFE306.3	Describe the role played by proteins within the cell.
21BFE306.4	Analyze the role of bioinspired design in novel applications.
21BFE306.5	Apply bioinspired design principles to other domains.
21BFE306.6	Implement a simple genetic algorithm.

Sl No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Biology for Engineers	Thyagarajan.S., Selvamurugan. N., Rajesh.MP, Nazeer RA, Richard W. Thilagaraj, Barathi.S., and Jaganthan.M.K	Tata McGraw Hill	2012
2	Molecular Biology	Robert Weaver	McGraw-Hill	5th Edition, 2012
Reference Books				
1	Lewin's Genes XII	Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick	Jones and Bartlett Learning	2017
2	Bioinspired Engineering	Jenkins, C.H.	Momentum Press	2012
3	Bio mimetics: Nature-Based Innovation	Yoseph Bar-Cohen	CRC Press	1st Edition, 2016
4	A Practical Guide to Bio-inspired Design	Hashemi Farzaneh, Helena, Lindemann, Udo,	Springer	2019

Web links/Video Lectures/MOOCs/papers

1. https://books.google.co.in/books?id=-2LNBQAAQBAJ&printsec=frontcover#v=onepage&q&f=false
2. https://www.aminotes.com/2017/02/biology-for-engineers-module-1-cocepts.html

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
21BFE306.1	2					1								
21BFE306.2		1				1								
21BFE306.3	2					2								
21BFE306.4		2										2		
21BFE306.5	2											2		
21BFE306.6		2										2		

1: Low 2: Medium 3: High

Balake Kannada			
Course Code	**21KBK307/407**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:2:0)	SEE Marks	50
Credits	**01**	Exam Hours	02

Course Learning Objectives:

1. To enable the students to understand, speak, read and write the Kannada language.
2. To communicate in the Kannada language in their daily life with Kannada speakers.
3. To give the overall information about the Kannada language and Karnataka state.

Module 1	
Kannada Aksharamaale haagu Uchchaarane. (Kannada Alphabets and Pronunciation)	**3 Hours**
Module 2	
Sambhashanegaagi Kannada Padagalu. (Usage of Kannada Words in General Communication and Vocabulary)	**3 Hours**
Module 3	
Sambhashaneyalli Kannada. (Usage of Kannada in the proper manner - in Kannada Conversation)	**3 Hours**
Module 4	
Kannadadalli Chatuvatikegalu. (Activities related to the Kannada Language - Development of Skill vocabulary)	**3 Hours**
Module 5	
Karnataka raajya, Kannada Bhashe, Saahithyada bagege Maahithi. (Information about the Karnataka State, Kannada Language and Literature)	**3 Hours**

Course Outcomes:

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

21KBK307.1	Write and read the Kannada alphabet.
21KBK307.2	Communicate Kannada fluently.
21KBK307.3	Communicate in Kannada in his day-to-day life.
21KBK307.4	Build confidence to address large gatherings.
21KBK307.5	Develop skills, vocabulary and fluency.
21KBK307.6	Make use of state language and literature.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Balake Kannada	Dr L Thimmesha	Prasaranga VTU Belagavi	1st Edition, 2020
2	Vyavaharika Kannada	Dr L Thimmesha, Prof V Keshavamoorthy	Prasaranga VTU Belagavi	1st Edition, 2020
Reference Books				
1	Kannada Kali	Lingadevaru Halemane	Kannada University Hampi	4th Edition, 2016
2	Spoken Kannada	N. D Krishnamurthy, Dr S. M. Rameshchandra Swamy, Abdul Rehman Pasha	Kannada Sahithya Parishat	2018

Web links/Video Lectures/MOOCs/papers

1. https://youtu.be/daY6TRvHFB4
2. https://youtu.be/RuRmq7VyCaQ

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
21KBK307.1	2									2				
21KBK307.2	2									2				
21KBK307.3	2									2				
21KBK307.4	2									2				
21KBK307.5	2									2				
21KBK307.6	2									2				

1: Low 2: Medium 3: High

Saamskruthika Kannada

Course Code :	**21KSK307/407**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:2:0)	SEE Marks	50
Credits	**01**	Exam Hours	02

Course Learning Objectives:

1. ಕನ್ನಡ ಸಾಹಿತ್ಯ , ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ
2. ಕನ್ನಡದಲ್ಲಿ ತಾಂತ್ರಿಕ ವಿಜ್ಞಾನಗಳ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ವಿಷಯಗಳ ಪರಿಚಯ
3. ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ , ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತದ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ
4. ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಅರಿವು
5. ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡುಬರುವ ದೋಷಗಳು ಹಾಗೂ ಅವುಗಳ ನಿವಾರಣೆ ಮತ್ತು ಲೇಖನ ಚಿಹ್ನೆಗಳ ಪರಿಚಯ
6. ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು

Module 1

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ; ಹಂಪ ನಾಗರಾಜಯ್ಯ
2.ಕನ್ನಡ ನಾಡು ನುಡಿ
3.ಕನ್ನಡ ಭಾಷೆ – ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ **3 Hours**

Module 2

4.ಕಾವ್ಯ ಭಾಗ- ಆಧುನಿಕ ಪೂರ್ವ
(ವಚನಗಳು, ಕೀರ್ತನೆಗಳು, ತತ್ವಪದಗಳು,ಜನಪದ ಗೀತೆ)
5. ಕಾವ್ಯ ಭಾಗ – ಆಧುನಿಕ
(ಡಿ ವಿ ಜಿ, ದ.ರಾ.ಬೇಂದ್ರೆ, ಕುವೆಂಪು, ಕೆ.ಎಸ್. ಎನ್, ಜಿ.ಎಸ್.ಶಿವರುದ್ರಪ್ಪ, ಚಂದ್ರಶೇಖರ ಕಂಬಾರ, ಸಿದ್ಧಲಿಂಗಯ್ಯ)
3 Hours

Module 3

6.ಭಾಷಾ ಪ್ರಯೋಗದಲ್ಲಾಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ
7. ಲೇಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ
8. ಪತ್ರವ್ಯವಹಾರ - ಆಡಳಿತ ಪತ್ರಗಳು; ಸಾಮಾನ್ಯ, ಸಾರ್ಕಾರಿ ಪತ್ರಗಳು, ಅರೆಸರ್ಕಾರಿ ಪತ್ರಗಳು **3 Hours**

Module 4

9. ಡಾ.ಸರ್ ಎಂ ವಿಶ್ವೇಶ್ವರಯ್ಯ –ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ ; ಎ ಎನ್ ಮೂರ್ತಿರಾವ್
10. ಯುಗಾದಿ; - ವಸುಧೇಂದ್ರ **3 Hours**

Module 5

ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ
11. "ಕ" ಮತ್ತು "ಬ" ಬರಹ ತಂತ್ರಾಂಶಗಳು ಮತ್ತು ಕನ್ನಡ ಟೈಪಿಂಗ್
12. ಕನ್ನಡ – ಕಂಪ್ಯೂಟರ್ ಶಬ್ದಕೋಶ
13. ತಾಂತ್ರಿಕ ಪದಕೋಶ –ತಾಂತ್ರಿಕ ಹಾಗೂ ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು **3 Hours**

Course Outcomes: At the end of the course the student will be able to:	
21KSK307.1	ಕನ್ನಡ ನಾಡು ನುಡಿಯ ಅರಿವು ಹಾಗೂ ಸಂಸ್ಕೃತಿಯ ಹರಿವು.
21KSK307.2	ಕವಿ ಕಾವ್ಯಗಳ ಪರಿಚಯ- ಕವಿತೆಗಳ ಮೂಲಕ ಬದುಕಿನ ನೈಜತೆಯ ಚಿತ್ರಣ.
21KSK307.3	ಶುದ್ಧ ಕನ್ನಡದ ಬಳಕೆ, ಪತ್ರಗಳತ್ತ ಒಲವು, ಸುಲಭ ವ್ಯಾಕರಣ.
21KSK307.4	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ವಿವಿಧ ಪ್ರಕಾರಗಳು- ವ್ಯಕ್ತಿ ಪರಿಚಯ ಹಾಗೂ ಕತೆಯ ತಂತ್ರಗಾರಿಕೆ.
21KSK307.5	ತಂತ್ರಾಂಶಗಳ ಬಳಕೆ, ಪಾರಿಭಾಷಿಕ ಪದಗಳ ಪರಿಚಯ.
21KSK307.6	ಕನ್ನಡ ಭಾಷಾಜ್ಞಾನ, ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	ಆಡಳಿತ ಕನ್ನಡ	ಡಾ.ಎಲ್ .ತಿಮ್ಮೇಶ್ ಪ್ರೊ.ವಿ. ಕೇಶವಮೂರ್ತಿ	ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ	2019
2	ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ	ಡಾ .ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ , ಡಾ.ಎಲ್ .ತಿಮ್ಮೇಶ್	ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ	2020
Reference Books				
1	ಕನ್ನಡ ಸಾಹಿತ್ಯಕೋಶ & ವ್ಯಾಕರಣ ಪುಸ್ತಕ	ರಾಜಪ್ಪ ದಳವಾಯಿ ———	ದಳವಾಯಿ ಪ್ರಕಾಶನ, ಬೆಂಗಳೂರು.	2008
2	ಕನ್ನಡ ಕ್ಲಿಷ್ಟಪದ ಕೋಶ (ಶಬ್ದದ ವ್ಯುತ್ಪತ್ತಿ ಸಹಿತ)	ಪ್ರೊ. ಜಿ. ವೆಂಕಟ ಸುಬ್ಬಯ್ಯ ಹಾಗೂ ರಾಜ್ಯಶ್ರೀ ಸತೀಶ್	ಪ್ರಿಸಮ್ ಬುಕ್ಸ್ ಪ್ರೈ.ಲಿ.	2006

Web links/Video Lectures/MOOCs/papers

1. https://youtu.be/HS8InQR36E4
2. https://youtu.be/C_SF24_ygxQ
3. https://youtu.be/wuT7UED7yuQ
4. https://youtu.be/pxLwNWXhbnQ
5. https://youtu.be/H6FXRSBNO4c

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
21KSK307.1		2										2		
21KSK307.2		2										2		
21KSK307.3		2								2				
21KSK307.4		2										2		
21KSK307.5		2				2								
21KSK307.6						2				2				

1: Low 2: Medium 3: High

Constitution of India, Professional Ethics and Cyber Law

Course Code	**21CPC307/407**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(1:0:0)	SEE Marks	50
Credits	**01**	Exam Hours	02

Course Learning Objectives: To

1. Know the fundamental political codes, structure, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and *the* duties of citizens
2. Understand engineering ethics and their responsibilities; identify their individual roles and ethical responsibilities towards society.
3. Know about cybercrimes and cyber laws for cyber safety measures.

Module-1 **3 Hours**

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 - Preamble and Salient features of the Constitution of India. 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-2 **3 Hours**

Union Executive and State Executive:

Parliamentary System, Federal System, Centre-State Relations. 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. State Executives - Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Articles 370.371,37JJ) for some States.

Module-3 **3 Hours**

Elections, Amendments and Emergency Provisions:

Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments - 7,9, 10,12,42,44,61,73,74,75,86, and 91,94,95,100,101,118 and some important Case Studies. Emergency Provisions, types of Emergencies and their consequences.

Constitutional special provisions:

Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.

Module-4 **3 Hours**

Professional/ Engineering Ethics:

Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, and Professional Responsibility. Clash of Ethics, Conflicts of Interest. Responsibilities in Engineering Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, TPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering

Module-5	**3 Hours**
Internet Laws, Cyber Crimes and Cyber Laws: Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship. Cybercrimes and enforcement agencies.	

Course Outcomes: At the end of the course the student will be able to:	
21CPC407.1	Discuss the constitutional knowledge and legal literacy
21CPC407.2	Review the Indian constitution
21CPC407.3	Analyze the role and functions of Union and state executives
21CPC407.4	Review the Electoral Process, the System of Election Commission and its functions
21CPC407.5	Discuss professional ethics and responsibilities of engineers
21CPC407.6	Analyze the cybercrimes and cyber laws for cyber safety measures

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Constitution of India, Professional Ethics and Human Rights	Shubham Singles, Charles E. Haries, et al	Cengage Learning India	2018
2	Cyber Security and Cyber Laws	Alfred Basta and et al	Cengage Learning India	2018
Reference Books				
1	Introduction to the Constitution of India	Durga Das Basu	Prentice -Hall,	2008
2	Engineering Ethics	M. Govindarajan, S. Natarajan, V. S. Senthilkumar	Prentice - Hall,	2004

Web links/Video Lectures/MOOCs/papers
1.https://www.constitutionofindia.net/constitution_of_india
2. https://infosecawareness.in/cyber-laws-of-india

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
21CPC307.1						2		2						
21CPC307.2								2				2		
21CPC307.3						2		2				2		
21CPC307.4						2		2						
21CPC307.5						2		2						
21CPC307.6								2				2		

1: Low 2: Medium 3: High

IoT Enabled Prototyping			
Course Code:	**21IEP308**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	01	Exam Hours	03

Course Learning Objectives:

1. Understand the IoT concepts such as sensing, actuation, and communication.
2. Development of Internet of Things (IoT) prototypes—including devices for sensing, actuation, processing, and communication and Protocols
3. Understand the significance of Project Management and the different techniques of planning
4. To introduce fundamental aspects of intellectual property rights, Govt. policies on IPR, and patentability search techniques.

Module 1 **4** Hours

Internet of Things – Hardware / System Design

Introduction to IoT fundamentals, Introduction to sensors, Difference between analog and Digital sensors, Interfacing Temperature, Light and Humidity sensor with Arduino, Interfacing Motors with Arduino, A simple program to control actuator based on the analog sensor.

Module 2 **4** Hours

Internet of Things

Networking in IoT:

Introduction to wireless communication, Wifi Module ESP8266 interface with Arduino, Machine to Machine (M2M) communication using WiFi module. A simple demonstration of sensing temperature from one device and control actuator on a second device (M2M)

IoT in Web/ Cloud Platform:

Introduction to a web server - XAMPP(windows), A simple interactive web page using HTML5, Bootstrap (or CSS), and Java script. Interfacing ESP8266 with webserver, Thing Speak API, and MQTT protocol, A simple project to demonstrate the status of two IoT devices communicating with a Web Server.

Module 3 **4** Hours

Project Planning and Management

Project initiation, Project charter, Project planning, and implementation, Scheduling and costing, Project monitoring and control, Project closure and reports.

Module 4 **4** Hours

Intellectual Property Rights

Introduction and the need for intellectual property right (IPR) – Kinds of Intellectual Property Rights, Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application, Non - Patentable Subject Matter, Registration Procedure, Patentability search methods, Patent landscape, Freedom-to-market, National IPR Policy, Govt. initiatives and scheme in promoting IPR.

Course Project

Develop IoT-based prototypes (solutions) to solve any industrial or societal problems. The prototype building is teamwork of 3-5 students. The goals should be clearly defined and should use robust technologies and rigorous testing.

Course Outcomes:

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

21IEP308.1	Analyze the basics of IoT and protocols

21IEP308.2	Develop IoT-based prototypes to solve industrial and societal problems
21IEP308.3	Apply appropriate approaches to plan a new project and develop a project schedule.
21IEP308.4	Discuss the ethical aspects in IPR, Govt. policies on IPR, and conducting patentability searches
21IEP308.5	Inculcate the teamwork and communication skills

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Reference Books				
1	Internet of Things (A Hands-on-Approach)	Vijay Madisetti and Arshdeep Bahga	Orient Blackswan Private Limited - New Delhi	1st Edition, 2015
2	Fundamentals of Intellectual Property	Dr. Kalyan C. Kankanala	Asia Law House	1st Edition, 2012
3	Project Management Absolute Beginner's Guide	Greg Horine	Pearson Education (US)	4th Edition, 2017

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
21IEP308.1			2		2				2	2				
21IEP308.2			2								3			
21IEP308.3					2						2			
21IEP308.4								1		2				
21IEP308.5								1	2	2				
21IEP308.6														

1: Low 2: Medium 3: High

Industry Oriented Training - Business Etiquettes			
Course Code	**21IOT309**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	02

Course Learning Objectives:

6. Know the components of self-introduction
7. Develop a resume with the inclusion of core competencies
8. Involve and contribute to group discussions
9. Develop effective communication to succeed in the professional career
10. Know the etiquettes of digital communication

Module-1 Self Introduction &Essentials of grooming

Self Introduction: Learn the secret to introducing Yourself, Things to avoid when introducing yourself. Activity: Video record the self-introduction. **Essentials of grooming:** Creating the first impression, what does the well-dressed man wear? What does the well-dressed woman wear? Personal hygiene and habits

4 Hours

Module-2 Resume Writing

Purpose, Identifying Relevant Competencies, Understanding Applicant Tracking Systems, Lists of Competencies, Writing Accomplishment/ Objective Statements, Finding the Right Words- Action verbs, The Most Popular Resume Format, Other Popular Resume Formats, Do's and Don'ts. Activity: Students have to submit a copy of their resume

4 Hours

Module-3 Group Discussion

Types, process, Evaluation criteria, Do's and Don'ts Activity: Group discussions have to be held during the training sessions

4 Hours

Module-4 Communicate effectively

Build a Story, Just a Minute, Group Activities, Team building activities, Role Play, Presentation Skills**4 Hours**

Module-5 Digital right and wrong

Virtual Communication: Agenda, being prepared, Dressing appropriately, background, Use Microphone and camera the right way, restraining from off tasks during virtual meetings, protecting confidential data during online presentations, time management

4 Hours

Course Outcomes:

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

21IOT309.1	Articulate the essential components required for self-introduction in any business or a networking event
21IOT309.2	Recognize the need to dress appropriately for a successful career in the corporate

21IOT309.3	Develop a resume inclusive of core competencies, action verbs which are compatible with Applicant Tracking Systems
21IOT309.4	Recognize the types, process and evaluation of Group Discussion and carry out effective group discussions
21IOT309.5	Develop skills required for effective communication
21IOT309.6	Associate and be accustomed to the etiquettes to be followed during online meetings

Sources

1. English for Common Interactions in the Workplace: Basic Level: Coursera: https://www.coursera.org/learn/english-common-interactions-workplace-basic-level
2. Personal Communication-Introduce Yourself With Confidence: https://www.udemy.com/course/how-to-introduce-yourself/
3. Professionalism, Grooming and Etiquette: https://www.edx.org/course/professionalism-grooming-and-etiquette
4. How to Write a Resume: https://www.coursera.org/learn/how-to-write-a-resume#syllabus
5. Group Discussion Strategies: https://www.udemy.com/course/group-discussion-strategies/
6. Communication Strategies for a Virtual Age: https://www.coursera.org/learn/communication-strategies-virtual-age#syllabus

References

1. https://simplifytraining.com/course/personal-hygiene-and-good-grooming/
2. https://www.udemy.com/course/group-discussion-strategies/
3. https://www.educba.com/course/group-discussion/
4. https://getrafiki.ai/meetings/rules-of-virtual-meeting-etiquette-every-sales-professional-should-follow/
5. https://thedigitalworkplace.com/articles/online-meeting-etiquette-for-attendees/
6. https://rigorousthemes.com/blog/virtual-meeting-etiquette-guidelines-ground-rules/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
21IOT309.1									2	3		1		
21IOT309.2										3		1		
21IOT309.3									2	3	1	1		
21IOT309.4									2	3	1	1		
21IOT309.5									2	3	1	1		
21IOT309.6									2	3	1	1		

1: Low 2: Medium 3: High

ADDITIONAL MATHEMATICS - I

(A Bridge course for Lateral Entry students of BE programmes)

(Common to all Programmes)

Course Code	**21MAL301**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:1:0)	SEE Marks	50
Credits	**00**	Exam Hours	03

Course Learning Objectives:

1. To familiarize concepts of Mathematics required for engineering study
2. To equip the students with standard concepts and tools to solve problems in their discipline of engineering.

Module-1 **4 Hours**

Complex Trigonometry: Complex Numbers, Definitions and properties. Modulus and amplitude of a complex number, De Moivre's Theorem, Argand diagram,
Vector Algebra: Scalars and vectors. Addition and subtraction and multiplication of vectors- Dot and Cross products, problems.

Module-2 **4 Hours**

Trigonometry: Trigonometric ratios, quadrant rule, trigonometric ratios of standard angles, compound angles, Sum and product formula and Hyperbolic functions
Partial fraction: Type 1- Denominator is a product of non repeated linear factors, Type 2 - repeated linear factors and Type 3: Quadratic factors.

Module-3 **4 Hours**

Differentiation: Derivative of a function, Derivative of a composite function, Differentiation of Implicit function, Differentiation of inverse trigonometric function, product formula, Quotient formula, Chain rule, nth derivative, Leibnizs Rule, angle between radius vector and tangent (only formula), angle between polar curves.

Module-4 **4 Hours**

Integration: Definition, standard formulae, Integration by substitution, , Integration by partial fraction method, Integration by parts, Bernoulli's rule ,$\int e^{ax} \sin bx\, dx$ and $\int e^{ax} \cos bx\, dx$ Definite Integrals and properties of definite integrals. Application- Definite integral as an area.

Module-5 **4 Hours**

Linear Algebra: Rank of matrices - Rank of a matrix by Echelon form, consistency of system of linear equations - homogeneous and non-homogeneous equations, Gauss – Elimination and Gauss - Seidel methods. Eigen values and Eigenvectors-properties, largest Eigenvalue by Rayleigh's power method. Diagonalization of a square matrix of order two.

Course Outcomes:

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

21MAL301.1	Apply complex numbers and vectors in Engineering Applications
21MAL301.2	Apply trigonometry in real life applications
21MAL301.3	Resolve the Rational fraction into partial fractions.
21MAL301.4	Compute derivative of different functions
21MAL301.5	Compare and different methods integration and select appropriate method to solve given problem
21MAL301.6	Analyze given problem and use appropriate method of solving given set of equations

Question paper pattern:

Note: The SEE question paper will be set for 100 marks and the marks will be

proportionately reduced to 50

- The question paper will have Part A and Part B. Part A is Mandatory
- Part A has 10 short answer type questions of two mark each
- Part B has 10 Full questions. Each full question carries 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module. Students will have to answer 5 full questions, selecting one full question from each module.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Higher Engineering Mathematics	Dr B.S. Grewal	Khanna Publishers	44th Edition, 2017
2	NCERT Text Book for Mathematics I PUC and II PUC	NCERT	NCERT	Reprint 2007
3	Higher Engineering Mathematics	H.K Dass and R Verma	C. Chand and Company	1st Edition 2011
Reference Books				
1	Advanced Engineering Mathematics – Volume I	E. Kreyszig John Wiley & Sons	Wiley Precise Textbook Series	10th Edition 2010
2	"Higher Engineering Mathematics"	B.V.Ramana 11th Edition	Tata McGraw-Hill	11th Edition, 2010

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21MAL301.1	3	1										
21MAL301.2	3	1										
21MAL301.3	3		1									
21MAL301.4	3		1									
21MAL301.5	3		1									
21MAL301.6	3		1									

1: Low 2: Medium 3: High

Business Communication			
(A Bridge course for Lateral Entry students BE programmes)			
Course Code	**21ENG310/410**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:2:0)	SEE Marks	50
Credits	**00**	Exam Hours	02

Course Learning Objectives:

1. To enable the learner to communicate effectively in real-life situations.
2. To review English grammar effectively for study purposes across the curriculum.
3. To enhance English vocabulary and language proficiency.
4. To achieve better writing and presentation skills.

Module-1	**2 Hours**
Subject Verb Agreement, Sequences of tenses, Active and Passive, Reported speech, Articles, Preposition.	
Module-2	**2 Hours**
Vocabulary, One word substitutes, Confused words, Phrasal Verbs, Idioms and Phrases, Analogies.	
Module-3	**2 Hours**
Technical vocabulary, Homophones, Homographs, Homonyms, Synonyms and Antonyms, Common errors in the English language, and Phrasal verbs.	
Module-4	**2 Hours**
Formal letter writing, Covering letter with Resume, Email Etiquette Cloze passage.	
Module-5	**2 Hours**
Communication skills: Group discussion, Etiquette of the job interview, Dialogues in various situations, Telephonic conversation.	

Course Outcomes:

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

21ENG310.1	Analyze the concepts of grammar and its usage
21ENG310.2	Identify the nuances of phonetics, intonation and flawless pronunciation
21ENG310.3	Implement English vocabulary and language proficiency.
21ENG310.4	Apply the forms of writing skills at the professional level.
21ENG310.5	Demonstrate speaking ability in terms of fluency and comprehensibility.
21ENG310.6	Demonstrate competence in the four modes of literacy: Writing, Reading, Speaking and listening.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Communication skills	Sanjay Kumar and Pushp Lata	Oxford University Press	Second Edition, 2015
2	High School English Grammar and Composition	Wren and Martin	S Chand and Company Ltd	2015
Reference Books				

1	Practical English Usage	Michael Swan	Oxford University Press	2016
2	English Grammar in Use	Raymond Murphy	Cambridge University Press	2nd Edition, 1994

Web links/Video Lectures/MOOCs

1.https://englishforeveryone.org
2.https://owl.purdue.edu
3.http://guidetogrammar.org

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ENG310.1	2	-	-	-	-	-	-	-	-	3	-	-	-	-
21ENG310.2	2	-	-	-	-	-	-	-	-	3	-	-	-	-
21ENG310.3	2	-	-	-	-	-	-	-	-	3	-	-	-	-
21ENG310.4	2	-	-	-	-	-	-	-	-	3	-	-	-	-
21ENG310.5	2	-	-	-	-	-	-	-	-	3	-	-	-	-
21ENG310.6	2	-	-	-	-	-	-	-	-	3	-	-	-	-

IV Semester

Linear Algebra & Statistical Methods

Course Code	**21MAC401**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To learn principles of advanced engineering mathematics through linear algebra.
2. To understand probability theory and random process that serve as an essential tool for applications of electronics and communication engineering sciences.

Module-1

Linear Algebra- I

Vector spaces & subspaces, null spaces, Column spaces & linear transformations, Linearly independent sets; basis, Coordinate systems, The dimension of a vector space, Rank:Rank and nullity theorem (without proof). **8 Hours**

Module-2

Linear Algebra- II

Inner product, length & orthogonality, orthogonal set, orthogonal projection Gram-Schmidt process, QR factorization of matrices, Eigen values and Eigenvectors (Recapitulation). Diagonalization of Symmetric matrics The Singular Value Decomposition.(SVD) **8 Hours**

Module-3

Statistical Methods and Curve Fitting:

Correlation and regression-Karl Pearson's coefficient of 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^2+ bx + c and y = ax^b

8 Hours

Module-4

Probability Distributions:

Random variables (discrete and continuous), probability mass/density functions, cumulative density function. Binomial, Poisson, exponential and normal distributions-problems (No derivation for mean and standard deviation) **8 Hours**

Module-5

Sampling theory:

Introduction, sampling distributions, Testing of hypothesis for means, level of significance, confidence limits, Sampling of variables, central limit theorem, confidence limits for unknown mean, student's **t**-distribution, Chi-square distribution as a test of goodness of fit. **8 Hours**

Course Outcomes:

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

21MAC401.1	Make use of vector spaces in the process of obtaining a matrix of linear transformations.
21MAC401.2	Apply the technique of singular value decomposition for data compression and least-square approximation in solving inconsistent linear systems.

21MAC401.3	Examine the given data for the probability distribution.
21MAC401.4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
21MAC401.5	Discover the relation between dependent & independent variables using the least square curve fitting method.
21MAC401.6	Demonstrate the validity of testing the hypothesis to arrive at a decision regarding the population through a sample

Question paper pattern:

Note: The SEE question paper will be set for 100 marks and the marks will be proportionately reduced to 50

- The question paper will have Part A and Part B. Part A is Mandatory
- Part A has 10 short answer type questions of two mark each
- Part B has 10 Full questions. Each full question carries 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module. Students will have to answer 5 full questions, selecting one full question from each module.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	44th Edition 2017.
2	Linear Algebra & its applications	David C. Lay	Pearson	3rd Edition, 2014
3	Introductory Probability and Statistical Applications	B L Mayer	Wiley Eastern Limited	2nd Edition, 2017
Reference Books				
1	Advanced Engineering Mathematics	C.Ray Wylie, Louis C.Barrett	McGraw- Hill Book Co., New York, 1995	6th Edition 2003
2	Linear Algebra & its applications	Gilbert Strang	Cengage Learning India Edition	4th Edition 2006
3	Schaum's Outline of Linear Algebra	Seymour Lipschutz and Marc Lipson	McGraw Hill Education	5th Edition, 2012
4	Higher Engineering Mathematics	B.V.Ramana	Tata McGraw-Hill	11th Edition, 2017

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
21MAC401.1		3	1											
21MAC401.2		3	1											
21MAC401.3		1		3										
21MAC401.4	3	1												
21MAC401.5	1	3												
21MAC401.6		2	2											

1: Low 2: Medium 3: High

Design and Analysis of Algorithms (Integrated)

Course Code	**21CSE402**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:2)	SEE Marks	50
Credits	**04**	Exam Hours	03

Course Learning Objectives:

1. Apply appropriate methods to solve a given problem and validate its correctness.
2. Ability to analyze time complexity of the algorithms.
3. Implementation of various algorithmic techniques like Greedy strategy, Divide and Conquer approach, Dynamic Programming and Backtracking.
4. Synthesize efficient algorithms in common engineering design situations.
5. Understand the limitations of the algorithmic power

Module 1

Introduction: What is an Algorithm? Fundamentals of Algorithmic Problem Solving, Important Problem Types. **Analysis:** Analysis Framework, Asymptotic Notations and Basic Efficiency classes, Mathematical analysis of Non-Recursive and Recursive Algorithms with Examples. Empirical Analysis of Algorithms**.**

Chapter 1: 1.1-1.3, Chapter 2: 2.1-2.4, 2.6

8 Hours

Module 2

Divide and Conquer: General method, Recurrence equation, Master Theorem, Merge sort, Quick sort, Strassen's matrix multiplication. **Decrease and Conquer:** Binary search. **Transform and Conquer:** AVL Trees, Heaps and Heap sort.

Chapter 5: 5.1, 5.2, 5.4 Chapter 4: 4.1, Chapter 6: 6.3, 6.4

8 Hours

Module 3

Greedy method: General method. **Minimum cost spanning trees:** Prim's Algorithm, Kruskal's Algorithm. **Single source shortest paths:** Dijkstra's Algorithm. **Optimal Tree Problem:** Huffman Trees and Codes. **Space and Time Tradeoffs:** Sorting by Counting, B-Trees.

Chapter 9: 9.1-9.4, Chapter 7: 7.1, 7.4

8 Hours

Module 4

Dynamic programming: Knapsack problem with memory functions, Optimal Binary Search Trees, Transitive Closure-Warshall's Algorithm, All Pairs Shortest Paths-Floyd's Algorithm. **Limitations of Algorithm Power:** P, NP and NP- Complete Problems.

Chapter 8: 8.2-8.4, Chapter 11: 11.3

8 Hours

Module 5

Backtracking: N-Queens problem, Hamiltonian circuit Problem, Sum of subsets problem. **Branch and Bound:** Assignment problem, Knapsack problem, Travelling Sales Person problem

Chapter 12: 12.1, 12.2

8 Hours

List of Laboratory Experiments related to above modules – 2 hours each
Implement the specified algorithms for the following problems using Java. IDE's such as NetBeans / Eclipse can be used for development and demonstration. 1. Binary Search: To search a key in the list of n integers. 2. Merge Sort: To sort n randomly generated integers. 3. Quick Sort: To sort n randomly generated integers. 4. Prim's algorithm: To find the Minimum Spanning Tree of an undirected graph. 5. Kruskal's Algorithm: To find the Minimum Spanning Tree of an undirected graph. 6. Floyd's Algorithm: To find all pairs shortest distance in a graph. 7. Knapsack Problem: To solve 0/1 Knapsack problem using dynamic programming 8. Subset problem: To solve the sum of subset problem using branch and bound method.
9. Open ended experiment covering the concept of entire syllabus

Course Outcomes:	
At the end of the course the student will be able to:	
21CSE402.1	Interpret the time and space complexity of algorithms which provides solutions to the given problem
21CSE402.2	Identify the problems from the set that can be solved using divide and conquer techniques and apply the technique to obtain the solutions.
21CSE402.3	Apply the technique of greedy algorithms in real life applications to get the optimal solution.
21CSE402.4	Apply the dynamic programming design technique to solve various problems
21CSE402.5	Differentiate the problems that can be solved using backtracking method and other general design techniques for given set of problems
21CSE402.6	Analyze the limitations of algorithm power

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Introduction to the Designand Analysis of Algorithms	Anany Levitin	Pearson	3rd Edition, 2012
Reference Books				
1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest,Clifford Stein	Prentice Hall India	3rd Edition, 2010
2	Computer Algorithms	Ellis Horowitz,Satraj Sahni and Rajasekaran	Prentice Hall India	2nd Edition, 2007

Web links/Video Lectures/MOOCs/papers

1. NPTEL Design and Analysis of Algorithms by Prof. Madhavan Mukund, https://nptel.ac.in/courses/106106131
2. NPTEL Fundamental Algorithms: Design and Analysis by Prof. Sourav Mukhopadhyay, https://onlinecourses.nptel.ac.in/noc22_cs01/preview
3. GeekforGeeks, Algorithms https://www.geeksforgeeks.org/fundamentals-of-algorithms/
4. Turorialspoint, Design and Analysis of Algorithms Tutorial https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21CSE402.1	-	2	-	3	-	-	-	-	-	-	-	-	-	3
21CSE402.2	-	3	3	-	-	-	-	-	-	-	-	-	2	-
21CSE402.3	-	-	3	-	-	-	-	-	-	-	-	-	2	-
21CSE402.4	-	-	3	-	-	-	-	-	-	-	-	-	2	-
21CSE402.5	-	-	-	3	-	-	-	-	-	-	-	-	2	-
21CSE402.6	-	-	-	3	-	-	-	-	-	-	-	-	-	3

1: Low 2: Medium 3: High

Database Management System (Integrated)			
Course Code	**21CSE403**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:2)	SEE Marks	50
Credits	**04**	Exam Hours	03

Course Learning Objectives:

1. Provide a strong foundation in database concepts, technology, and practice.
2. Practice SQL programming through a variety of database problems.
3. Demonstrate the use of concurrency and transactions in the database.
4. Design and build database applications for real world problems.
5. Develop applications to interact with databases.

Module 1

Introduction to Databases: Introduction, Simplified database system environment, Characteristics of database approach, Actors on the scene, Workers behind the scene, Advantages of using the DBMS approach.

Database Concepts and Architectures: Data Models, Schemas and Instances. Three schema architecture and data independence, database languages and interfaces, Componentmodules of a DBMS and their Interactions.

Data Model: Main phases of a Database Design Process, Entity Types, Entity Sets, Attributes, Keys, Relationship Types, Sets, Roles and Structural Constraints, ER diagramNotations and examples.

(**Chapter No: 1.1, 1.3 to 1.6, 2.1 to 2.4.1, 3.1, 3.3.1, 3.3.2, 3.4, 3.7**) **8 Hours**

Module 2

Relational Model: Relational Model Concepts, Relational Model Constraints and schemas,Update Operations and Dealing with Constraint violations.

SQL: SQL data definition and data types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, More Complex SQL Retrieval Queries, Specifying Constraints as Assertions and Triggers, Views in SQL, SchemaChange Statements in SQL.

(**Chapter No: 5.1 to 5.3, 6.1 to 6.4, 7.1 to 7.4**) **8 Hours**

Module 3

Relational Algebra & Design: Unary and Binary relational operations, Relational Algebra Operations, Additional Relational Operations, Examples of Queries in Relational Algebra. **Database Application Development:** Embedded SQL, Dynamic SQL, SQLJ, Database Programming with Function calls: SQL and JDBC, Database Stored Procedures.

(Chapter No. 8.1 to 8.5, 10.2 to 10.4) 8 Hours

Module 4

Normalization and its Algorithms: Informal design guidelines for relation schema, Functional Dependency (Inference Rules, Equivalence, and Minimal Cover) , Normal Formsbased on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Dangling tuples.

(Chapter No: 14.1 to 14.7, 15.2 to 15.4) 8 Hours

Module 5

Transaction Processing: Introduction to Transaction Processing, Transaction and Systemconcepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Two-phase locking techniques for Concurrency control.

Database Recovery Protocols: Recovery Concepts, NO-UNDO/REDO algorithm, Recoverytechniques based on immediate update, Shadow paging, ARIES recovery algorithm.

Database Security: Database security issues-Types of security and control measures, SQLInjection, Challenges to Maintaining Database Security.

(**Chapter No: 20.1 to 20.5, 21.1, 22.1 to 22.5, 30.1, 30.4, 30.9) 8 Hours**

List of Laboratory Experiments related to above modules – 2 hours each

1. Design a Database for e.g. Bank Database, College Database. Mention the actors onthe scene and workers behind the scenes for these two database applications. Write the scheme diagram of these databases. Design a suitable interface for each categoryof users. (Drawing tool like "**drawio"** can be explored if required)
2. Write an ER diagram for e.g. Bank Database, College Database. Create requiredtables. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables. Insert sample data into each table.
3. Demonstrate mapping of ER-diagram to Relational schema model. (Chapter No. 9.1)
4. Perform the operation for demonstrating the insertion, updation and deletion using thereferential integrity constraints. Write the query to create the view, Altering the existing view and dropping view.
5. Write a SQL statement for implementing ALTER, UPDATE and DELETE. Write thequery for implementing the aggregate functions like: MAX(), MIN(), AVG(), COUNT(), SUM().
6. Perform queries involving predicates LIKE, BETWEEN, IN etc. Write the queries toimplement different types of joins.
7. Write queries to solve the concept of nested query, correlated query and Group byclauses.
8. Write a suitable query for Assertion, Triggers and Cursor.
9. Study transaction control commands like Commit, Rollback, Save point, Set Transaction and perform its execution. Write the query for creating the users and theirrole.
10. Demonstrating Database Connectivity in java, php, python (using anyone of these).

Course Outcomes:

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

21CSE403.1	Identify the various elements of Database Management Systems and to draw an E-R diagram.
21CSE403.2	Solve a given problem statement, analyze the entities, its types and their relations.
21CSE403.3	Take part in writing queries using Relational Algebra, SQL and PL/SQL.
21CSE403.4	Examine the normalizations for the development of application software.
21CSE403.5	Determine the concepts of transaction, concurrency control, recovery and security in the database.
21CSE403.6	Develop a database application system using advanced SQL tools and interfaces with appropriate documentation.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Fundamentals of Database Systems	Ramez Elmasri and Shamkant B. Navathe	Pearson	7th Edition, 2017
Reference Books				
1	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudharshan	McGraw Hill	6th Edition, 2011
2	Database management systems	Ramakrishnan, and Gehrke	McGraw Hill	3rd Edition, 2014
3	Modern Database Management	Hoffer, Ramesh, Topi	Pearson	13th Edition, 2021

Web links/Video Lectures/MOOCs/papers

1. https://www.tutorialspoint.com/dbms/
2. https://www.w3schools.com/sql/
3. https://www.codecademy.com/learn/learn-sql
4. https://in.udacity.com/
5. https://www.geeksforgeeks.org/dbms/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21CSE403.1	2	2	-	-	1	-	-	-	-	-	-	-	-	1
21CSE403.2	2	-	-	-	-	2	-	-	-	-	-	-	-	-
21CSE403.3	-	2	2	-	-	-	-	-	-	-	-	-	-	1
21CSE403.4	-	-	-	-	-	1	-	-	-	-	-	-	-	1
21CSE403.5	-	-	2	-	-	-	1	-	-	-	-	-	1	1
21CSE403.6	-	-	-	-	-	1	-	-	1	-	-	-	1	-

1: Low 2: Medium 3: High

Operating System			
Course Code	**21CSE404**	**CIE Marks**	50
Teaching Hours/Week (L:T:P)	(2:2:0)	**SEE Marks**	50
Credits	**03**	**Exam Hours**	03

Course Learning Objectives:

1. Demonstrate the need for Operating system, types and services.
2. Apply suitable techniques for the management of various resources.
3. Use Processor, Memory, Storage and File system commands.
4. Demonstrates the use of Memory and Virtual memory management.
5. Analyze the concept of Deadlock and Process synchronization.

Module 1

Introduction to operating systems, System structures: What Operating Systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; 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.

Chapters: 1.1-1.5, 1.7-1.9, 1.11 **8 Hours**

Module 2

Process Management Process concept; Process scheduling; Operations on processes; Interprocess communication.

Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling.

Chapters: 3.1 - 3.4, 4.1, 4.3, 4.4, 4.6, 6.1 - 6.5 **8 Hours**

Module 3

Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

Deadlocks : Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

Chapters: 5.1-5.4, 5.6-5.8, 7.1- 7.7 **8 Hours**

Module 4

Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.

Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

Chapters: 8.1 - 8.6, 9.1 - 9.6 **8 Hours**

Module5

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.

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.

Chapters: 11.1 - 11.6, 12.1 - 12.5, 10.1 - 10.6, 14.1 - 14.8 **8 Hours**

Course Outcomes: At the end of the course the student will be able to:	
21CSE404.1	Ability to analyze the design of Operating System operations and Services.
21CSE404.2	Demonstrates Process Management and Multi-threaded programming.
21CSE404.3	Illustrate the mechanism of Process Synchronization and Deadlock.
21CSE404.4	Illustrate Memory and Virtual Memory Management.
21CSE404.5	Implementation of File System and Space allocation method.
21CSE404.6	Interpret the concepts of Secondary Storage Structure and Protection.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	Wiley-India	9th Edition, 2012
Reference Books				
1	Operating Systems: Internals and Design Principles	William Stallings	Pearson	6th Edition, 2012
2	Modern Operating Systems	Andrew S. Tannenbaum and Herbert Bos	Pearson	4th Edition, 2015
3	Understanding Operating System	Ann Mc Hoes Ida M Flynn	Cengage Learning	6th Edition, 2017
4	Operating Systems: A Concept Based Approach	D.M Dhamdhere	McGraw- Hill	3rd Edition, 2013
5	An Introduction to Operating Systems: Concepts and Practice	P.C.P. Bhatt	PHI(EEE)	4th Edition, 2014

Web links/Video Lectures/MOOCs/papers

1. https://www.geeksforgeeks.org/operating-systems
2. https://www.codingninjas.com/courses/operating-system

3. https://www.udacity.com/course/introduction-to-operating-systems--ud923

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21CSE404.1														2
21CSE404.2		2												
21CSE404.3		2												
21CSE404.4						2								2
21CSE404.5						2								2
21CSE404.6			2											

1: Low 2: Medium 3: High

Application Development using Python Lab

Course Code	21CSL405	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	**01**	Exam Hours	03

Course Learning Objectives:

1) Learn the syntax and semantics of Python programming language.
2) Illustrate the process of structuring the data using lists, tuples and dictionaries.
3) Understand the String manipulation methods and operators
4) Demonstrate the use of built-in functions to read/write files.
5) Interpret the concepts of Object-Oriented Programming as used in Python.

Laboratory Programs:

PART- A

1	a) Write a program for checking the given number is even or odd. b) Write a program for comparing two numbers. c) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero
2	a) Write a program using a for loop to print factorial of a given number b) Write a python program to find area of square, rectangle and circle using user defined functions. Take input from the user and print the results.
3	a) Guess the Number: Write a program that tells the player that it has come up with a secret number and will give the player six chances to guess it. The codethat lets the player enter a guess and checks that guess is in a for loop that willloop at most six times. Collatz Sequence: Write a function named collatz() that has one parameter named number. If number is even, then collatz() should print number // 2 and return this value. If number is odd, then collatz() should print and return 3 * number + 1. Then write a program that lets the user type in an integer and that keeps calling collatz() on that number until the function returns the value 1.
4	a) Write a python program to accept N numbers from the user. Find and display sum of all even numbers and product of all odd numbers in entered list. b) For a given list num=[45,22,14,65,97,72], write a python program to replace all the integers divisible by 3 with “ppp” and all integers divisible by 5 with “qqq” and replace all the integers divisible by both 3 and 5 with “pppqqq” and display the output.
5	a) Write a program to calculate the total number of an item being brought by all the guests given in the below list. allGuests = {'Alice': {'apples': 5, 'pretzels': 12}, 'Bob': {'ham sandwiches': 3, 'apples': 2}, 'Carol': {'cups': 3, 'apple pies': 1}} Output:

	`` Number of things being brought: - Apples 7 - Cups 3 - Cakes 0 - Ham Sandwiches 3 - Apple Pies 1 ``` b) Write a function named displayInventory(inventory) that would take any possible "inventory" (for example, {'rope': 1, 'torch': 6, 'gold coin': 42, 'dagger': 1, 'arrow': 12}) and display it like the following: Inventory: 12 arrow 42 gold coin 1 rope 6 torch 1 dagger Total number of items: 62 Write a function named addToInventory(inventory, addedItems) that receives inventory (ex: {'rope': 1, 'torch': 6, 'gold coin': 42, 'dagger': 1, 'arrow': 12}) and addedItems (ex: ['gold coin', 'dagger', 'gold coin', 'gold coin', 'ruby']) and return a dictionary that represents the updated inventory. Inventory: 45 gold coin 1 rope 1 ruby 1 dagger Total number of items: 48
6	Write a program to play tic-tac-toe board game.
7	c) Write a Python program that accepts a sentence and finds the number of words, digits, uppercase letters and lowercase letters. d) Write a program that repeatedly asks users for their phone number (10 digits) and a password (letters and numbers only, at least 8 characters long) until they provide valid input.
8	a) Write a program that take the account's name—for instance, email or blog from the command line arguments and copies the account's password to the clipboard so that the user can paste it into a Password field. b) Write a program that will get the text from the clipboard, add a star and space to the beginning of each line, and then paste this new text to the clipboard.
9	Write a python program to create 3 files file1.txt, file2.txt and file3.txt in a folder. Write the content in file1.txt as "VTU" and in file2.txt as "UNIVERSITY". Open and merge contents of file1.txt and file2.txt and write the merged content in file3.txt.
10	Write a python program to demonstrate__init__,__str_and__add__methods.

PART- B-Problem based learning

Case Study:

Generating Random Quiz Files:

Say you're a geography teacher with 35 students in your class and you want to give a pop quiz on US state capitals. Alas, your class has a few bad eggs in it, and you can't trust the students not to cheat. You'd like to randomize the order of questions so that each quiz is unique, making it impossible for anyone to crib answers from anyone else. Of course, doing this by hand would be a lengthy and boring affair and hence we need a python program to automate the task.

Here is what the program does:

Creates 35 different quizzes.

Creates 50 multiple-choice questions for each quiz, in random order.

Provides the correct answer and three random wrong answers for each question, in random order.

Writes the quizzes to 35 text files.

Writes the answer keys to 35 text files.

After you run the program, this is how your capitalsquiz1.txt file will look, though of course your questions and answer options may be different from those shown here, depending on the outcome of your random.shuffle() calls:

```
Name:

Date:

Period:

                    State Capitals Quiz (Form 1)

1. What is the capital of West Virginia?
    A. Hartford
    B. Santa Fe
    C. Harrisburg
    D. Charleston

2. What is the capital of Colorado?
    A. Raleigh
    B. Harrisburg
    C. Denver
    D. Lincoln

--snip--
```

Web links/Video Lectures/MOOCs/papers:

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/)

Course Outcomes: At the end of the course the student will be able to:	
21CSL405.1	Demonstrate proficiency in handling of conditions, loops and creation of functions.
21CSL405.2	Identify the methods to create and manipulate lists and tuples.
21CSL405.3	Identify the methods to create and manipulate dictionaries.
21CSL405.4	Identify the methods to create and manipulate Strings.
21CSL405.5	Discover the commonly used operations involving file systems.
21CSL405.6	Interpret the concepts of Object-Oriented Programming as used in Python.

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21CSL405.1	-	-	-	-	-	2	-	-	-	-	2	-	2	-
21CSL405.2	-	-	-	-	-	2	-	-	-	-	2	-	2	-
21CSL405.3	-	-	-	-	-	2	-	-	-	-	2	-	2	-
21CSL405.4	-	-	-	-	-	2	-	-	-	-	2	-	2	-
21CSL405.5	-	-	-	-	-	2	-	-	-	2	-	-	2	-
21CSL405.6	-	-	-	-	-	2	-	-	-	2	-	-	2	-

1: Low 2: Medium 3: High

COMPUTATIONAL TOOLS FOR ENGINEERS			
Course Code:	**21CTE408**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	01	Exam Hours	03

Course Learning Objectives:

1. Apply modeling and simulation tools for a wide range of engineering problems.
2. Understand the analysis of data in Excel with statistics.
3. Use MATLAB and Simulink to perform engineering system analysis.

The engineering design process heavily relies on modeling and simulation. Modern simulation techniques enable the development of multi-physical, holistic system models that account for all system interactions. These digital models speed up the design and testing processes, saving time and money.

Module 1 **6** Hours

Engineering Design Analysis

Need for engineering design analysis. Product and system design. Introduction to analysis parameters – stress, deformation, acceleration, internal force and stability. Static structural analysis of engineering design using finite element method (case studies). Heat transfer and fluid dynamics modeling and simulation using CFD software (case studies).

Module 2 **4** Hours

Data Analysis with EXCEL

Calculate Mean, Median, Mode, Minimum, Maximum, Quartiles, Variance and Standard Deviation from some numbers. Analyze a population using data samples. Group data, build XY charts, apply Logarithmic Scale and Trend Line on a chart, forecast from some data, and calculate running averages. Normal Distribution, Exponential Distribution, Uniform Probabilities, Binomial Distribution, and Poisson Distribution.

Module 3 **6** Hours

MATLAB and Simulink for Engineers

Applications of MATLAB and Simulink in electrical engineering, electrical machines and power system projects, simulation of rectifiers, inverters, choppers, and cycloconverters

Course Project

Solve complex engineering problems via modeling and simulation. The project work is teamwork of 3-5 students. The goals should be clearly defined, use any software tool, and rigorous validation of the mathematical model should be done (experimental or theoretical).

Course Outcomes: At the end of the course, the student will be able to:	
21CTE408.1	Apply the Finite Element Method to solve engineering problems
21CTE408.2	Solve statistical problems using Excel
21CTE408.3	Perform system-level analysis using MATLAB and Simulink
21CTE408.4	Build mathematical models for any given engineering problem.
21CTE408.5	Demonstrate teamwork and communication skills

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Reference Books				
1	MATLAB and Simulink for Engineers	Agam Kumar Tyagi	Oxford University Press,	2012
2	Practical Finite Element Analysis	Nitin S.Gokhale	Finite To Infinite	2020
3	Excel Crash Course for Engineers	Eklas Hossain	Springer	2021

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
21CTE408.1	1				1	1								
21CTE408.2		1			2				2					
21CTE408.3		1			2									
21CTE408.4					2	2								
21CTE408.5	1								2					
21CTE408.6														

Industry Oriented Training - Computing Skills			
Course Code	**21IOT409**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	02

Course Learning Objectives:

1. Use logical conditions for problem-solving and also introduce the concepts of arrays
2. Know functions, function calls, and parameter passing
3. Introduce algorithms and appreciate their importance in problem-solving
4. Introduce the core concepts of OOPs
5. Differentiate between front-end & back-end development and recognize the use of database management

Module-1 Introduction to computing constructs

Logical conditions: For Loops, Nested For Loops, While Loops, Do-While Loops, Nesting and Boxes, and combine/negate several logical conditions using logic operations AND, OR, and NOT.

Arrays & strings: Create arrays of characters (strings), use the null terminator, and manipulate strings

4 Hours

Module-2 Functions & Pointers

Introduction to Functions, Returning Data From a Function, Passing Data Into a Function, Getting Valid User Input, Changing Parameter Values, Pointer Basics, Changing the Pointed to Value, Walking an Array with Pointers, Dynamic Memory Allocation, Getting More Memory, Pointers to Structure

4 Hours

Module-3 Algorithm analysis

Introduction to Algorithm Analysis, Big-O, Big-O Examples, Dynamic Array Operations, Bubble Sort, Selection Sort, Insertion Sort, Recursion, Recursive Binary Search, Merge Sort

4 Hours

Module-4 Object-oriented programming

Designing for Object-Oriented Programming, Core Concepts of OO Programming: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object-oriented programming paradigm.

4 Hours

Module-5 Frontend and backend development

UI, Database management: DBMS overview, Relational Data Model and the CREATE TABLE Statement, Basic Query Formulation with SQL

4 Hours

Course Outcomes:

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

21IOT409.1	Illustrate the use of logical conditions, declare and manipulate data into arrays
21IOT409.2	Implement functions, function calls, and parameter passing
21IOT409.3	Design, implement, and evaluate an algorithm to meet desired needs
21IOT409.4	Describe the core concepts of OOP's

21IOT409.5	Recognize the concepts of front-end development
21IOT409.6	Use the concepts of database management

Sources

1. Computational Thinking with Beginning C Programming Specialization: https://www.coursera.org/learn/simulation-algorithm-analysis-pointers?specialization=computational-thinking-c-programming#syllabus
2. Simulation, Algorithm Analysis, and Pointers: https://www.coursera.org/lecture/simulation-algorithm-analysis-pointers/big-o-examples-pdCan
3. Programming Fundamentals: https://www.coursera.org/learn/programming-fundamentals?specialization=c-programming#syllabus
4. Object-Oriented Programming Concepts: https://www.coursera.org/learn/concepts-of-object-oriented-programming#syllabus
5. Introduction to Back-End Development: https://www.coursera.org/learn/introduction-to-back-end-development

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
21IOT409.1	2	1	1											
21IOT409.2	2	1	1											
21IOT409.3	1	1	2											
21IOT409.4	2		1											
21IOT409.5	2	1	1											
21IOT409.6	2	1	1											

1: Low 2: Medium 3: High

ADDITIONAL MATHEMATICS - II

(A Bridge course for Lateral Entry students BE programmes)

(Common to all Programmes)

Course Code	**21MAL401**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:1:0)	SEE Marks	50
Credits	**00**	Exam Hours	03

Course Learning Objectives:

1. To familiarize the techniques of differential equations, vector analysis and linear algebra to engineering students.
2. To equip the students with standard concepts and tools that will help them in solving problems in their discipline of engineering.

Module-1 **8 Hours**

Partial Differentiation: Partial derivatives, Problems on Euler's theorem. Total derivative
Partial differential equations: Introduction, Formation of PDE, Solution of PDE by direct integration method.

Module-2 **8 Hours**

First order ordinary differential equations: Introduction**,** Variable Separable, Homogeneous, Linear Exact and reducible to exact, Bernoulli's equations, Orthogonal Trajectories in polar form.

Module-3 **8 Hours**

Linear Ordinary Differential Equations of Higher Order: Standard form of higher order linear differential equation with constant coefficients, Concept of different types of solutions. Solution of homogeneous equations. Non homogeneous equations- Concept of Inverse differential operator
(P.I restricted to R(x) = $e^{ax}, sinax \ or \ cosax \ for \ f(D)y = R(x)$.)

Module-4 **8 Hours**

Vector differentiation: Vector functions of a single variable, derivative of a vector function, velocity and acceleration, unit tangent. Scalar and vector functions, gradient of a scalar field, directional derivative, divergence of a vector field, solenoidal vector, curl of a vector field, irrotational vector

Module-5 **8 Hours**

Numerical Methods: Finite differences. Interpolation using Newton‟s forward and backward difference formulae (Statements only)-problems. Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods (only formulae, Numerical integration: Simpson‟s one third rule and three eighth rule (without proof) Problems.

Course Outcomes:

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

21MAL401.1	Apply Euler's theorem for partial differentiation
21MAL401.2	Compare different methods of forming partial differential equations
21MAL401.3	Classify the given first order differential equations
21MAL401.4	Solve higher order differential equations
21MAL401.5	Differentiate between solenoidal and irrotational vectors.
21MAL401.6	Find root of a transcendental equation

Question paper pattern:

Note: The SEE question paper will be set for 100 marks and the marks will be proportionately reduced to 50

- The question paper will have Part A and Part B. Part A is Mandatory
- Part A has 10 short answer type questions of two mark each
- Part B has 10 Full questions. Each full question carries 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module. Students will have to answer 5 full questions, selecting one full question from each module.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Higher Engineering Mathematics	Dr B.S. Grewal	Khanna Publishers	44th Edition, 2017
3	Higher Engineering Mathematics	H.K Dass and R Verma	C. Chand and Company	First Edition 2011
Reference Books				
1	Advanced Engineering Mathematics – Volume I	E. Kreyszig John Wiley & Sons	Wiley Precise Textbook Series	10th Edition 2015
2	Advanced Engineering Mathematics – Volume II	E. Kreyszig John Wiley & Sons	Wiley Precise Textbook Series	First Edition, 2014
3	"Higher Engineering Mathematics"	B.V.Ramana	Tata McGraw-Hill,	First Edition 2017

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21MAL401.1		3	1									
21MAL401.2		3	1									
21MAL401.3	3	1										
21MAL401.4	3		1									
21MAL401.5		3	1									
21MAL401.6		3	1									

1: Low 2: Medium 3: High