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 & BUSINESS SYSTEMS

SECOND YEAR
(III and IV Semester)

2022 - 2023

III Semester (B.E. – CSBS)													
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	21MAB301	Linear Algebra and Statistical Methods	MAT	MAT	2	2	-	03	50	50	100	3
2	PCC	21CBS302	Data Structures and Applications (Integrated)	CSBS	CSBS	3	-	2	03	50	50	100	4
3	PCC	21CBS303	Computer Organization & Architecture (Integrated)	CSBS	CSBS	3	-	2	03	50	50	100	4
4	PCC	21CBS304	Formal Languages and Automata Theory	CSBS	CSBS	2	2	-	03	50	50	100	3
5	PCC	21CBL305	Object Oriented Programming with Java Laboratory	CSBS	CSBS	-	-	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. –CSBS)														
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	21MAB401	Discrete Mathematical Structures	MAT	MAT	2	2		03	50	50	100	3
2	PCC	21CBS402	Operating Systems (Integrated)	CSBS	CSBS	3		2	03	50	50	100	4
3	PCC	21CBS403	Design and Analysis of Algorithms (Integrated)	CSBS	CSBS	3	-	2	03	50	50	100	4
4	PCC	21CBS404	Computational Statistics	CSBS	CSBS	2	2		03	50	50	100	3
5	PCC	21CBL405	Web Programming Laboratory	CSBS	CSBS	-	-	2	03	50	50	100	1
6	UHV	21UHV406	Universal Human Values – II	COM		2		-	02	50	50	100	2
	HSMC	21BFE406	Biology for Engineers	COM									
7	HSMC	21KBK407	Balake Kannada (Kannada for communication)/				2	--	--	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**
10	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.

III - SEMESTER			
Linear Algebra & Statistical Methods			
Course Code	**21MAB301**	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 processes that serve as an essential tool for applications of electronics and communication engineering sciences.

Module-1 **8 Hours**

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).

Module-2 **8 Hours**

Linear Algebra- II

Inner product, length & orthogonality, orthogonal set, orthogonal projection Gram-Schmidt process, QR factorization of matrices, Eigen values and Eigenvectors (Recapitulation). The singular value decomposition.

Module-3 **8 Hours**

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

Module-4 **8 Hours**

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)

Module-5 **8 Hours**

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.

Course Outcomes:

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

21MAB301.1	Use vector spaces in the process of obtaining a matrix of linear transformations.
21MAB301.2	Apply the technique of singular value decomposition for data compression and least-square approximation in solving inconsistent linear systems.
21MAB301.3	Examine the given data for the probability distribution.
21MAB301.4	Apply the correlation and regression analysis to fit a suitable mathematical model for the statistical data.

21MAB301.5	Discover the relation between dependent & independent variablesusing the least square curve fitting method.
21MAB301.6	Demonstrate the validity of testing the hypothesis to arrive at a decision regarding the population through a sample

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 Ed., 2017.
2	Linear Algebra & its applications	David C. Lay	Pearson	3rd Edition
Reference Books				
1	Advanced Engineering Mathematics	C.Ray Wylie, Louis C.Barrett	McGraw- Hill Book Co., New York,	6th Edition, 1995
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, 2010

Web links/Video Lectures/MOOCs

Module 1 and Module 2:

https://youtube.com/playlist?list=PLmPb6ufFFS_zcG2qX3olxex7AsnknV4Z- SVD : https://youtu.be/9quic27dcgY

Module 3:

Correlation and Regression:
https://youtu.be/WMUMc2QJrPQ
Curve fitting: https://youtu.be/kAa5ReiZH6o https://youtu.be/Qy1YAKZDA7k

Module 4:

https://youtu.be/ZfbWC4rqIiE
Conditional probability: https://youtu.be/asxiPIVhj3g
Bayes theorem: https://youtu.be/dY5xhLgfV1A

Module 5: https://youtu.be/l9rfMOZXk0Y

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
21MAB301.1		**3**	**1**									
21MAB301.2		**3**	**1**									
21MAB301.3		**1**		**3**								
21MAB301.4	**3**	**1**										
21MAB301.5	**1**	**3**										
21MAB301.6		**2**	**2**									

Data Structures and Applications (Integrated)

Course Code	**21CBS302**	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 real world
5. Demonstrate sorting and searching algorithm
6. To understand the basic concepts of hashing.

Module-1 **8 Hours**

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.

Module-2 **8 Hours**

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,

Module-3 **8 Hours**

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.

Module-4 **8 Hours**

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.

Module-5 **8 Hours**

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.

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 to Postfix 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 following operations 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.

Resolve the collision (if any) using linear probing

9. **Open ended experiment covering the concept of entire syllabusOnline shopping application**

Course Outcomes:	
At the end of the course the student will be able to:	
21CBS302.1	Apply data structures (pointers, arrays, structures and strings) for data organization and traversal.

21CBS302.2	Analyze and implement sorting, searching and data organization using the data structures Stacks, Queues and Linked Lists.
21CBS302.3	Apply trees and graphs for data ordering, data searching and evaluating expressions.
21CBS302.4	Differentiate different data structures.
21CBS302.5	Implement solutions to problems individually or in teams using recursion, searching and sorting algorithms
21CBS302.6	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 andYear**
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, YedidyahLang sam , MosheJ.Augenstein	Pearson Education	1st edition, 2019
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 – Data Structures and Algorithms

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21CBS302.1						2					2			
21CBS302.2									2					2
21CBS302.3											2			2
21CBS302.4						1					1			
21CBS302.5						2			3		2		1	3
21CBS302.6						2								3

1: Low 2: Medium 3: High

Computer Organization & Architecture (Integrated)			
Course Code	**21CBS303**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:2)	SEE Marks	50
Credits	**04**	Exam Hours	03

Course Learning Objectives:

1. To learn the basic structure, operation of digital computer through Booleanlogic and learn instruction set architectures.
2. To familiarize with the arithmetic and logic unit and implementation of fixedpoint and floating-arithmetic operations.
3. To learn the design of a simple CPU, pipelining and hazards.
4. To understand the input/output systems, interfaces and interrupts.
5. To impart knowledge on memory system organization.

Module-1 **8 Hours**

Digital Principles: Revision of basics in Boolean logic, K-Maps: Standard Forms, simplification using K-Maps, NAND –NOR Implementation, Combinational circuits: Adder, Subtractor, ALU Design, Decoder, Encoder, Multiplexrs, Introduction to Sequential Circuits: Flip-Flops, Registers, Counters.

Module-2 **8 Hours**

Introduction to Instruction Set: Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

Module-3 **8 Hours**

Data Representation and Computer Arithmetic: Signed number representation, fixed and floating point representations, character representation. Computer arithmetic: Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE754 format.

Module-4: **8 Hours**

Processor & Pipelining: Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control, Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent accessto memory and cache coherency.

Module-5: **8 Hours**

Memory And I/O: Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.

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

1. Implementation of 4-bit binary adder/subtractor circuits.
2. Implementation of Boolean functions using Multiplexers.
3. Implementation of any one of the synchronous counters.
4. Design and implement a shift registers (4 bits) using Data Flow architecture andStructural architecture.
5. Design and implement T, D and SR Flip Flop in VHDL using Behavioralarchitecture.
6. Design and implement an ALU (8 bit) using Data Flow architecture.
7. Design and implement different counters(4 bits) using Data Flow architecture

8. Open ended experiment covering the concept of entire syllabus

Simulator based study of Computer architecture

Course Outcomes: At the end of the course the student will be able to:	
21CBS303.1	Apply basics of digital logic and simplifying techniques in the design of optimal combinational and sequential circuits.
21CBS303.2	Demonstrate the basics structure and operations of computers and list theirmachine instructions.
21CBS303.3	Comprehend the various data representation techniques for computer arithmetic.
21CBS303.4	Summarize the concepts of parallel computing hardware technology andvarious stages involved in pipelined design.
21CBS303.5	Describe the concepts of parallel processor technology and memory hierarchy
21CBS303.6	Apply the learned knowledge to conduct computer architecture research using performance simulator

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Digital Design	M. Morris Mano, Michael D. Ciletti	Pearson Education	5th Edition 2013
2	Computer Organization and Design, The hardware /SoftwareInterface	David A. Patterson, John L. Hennessy	Morgan Kaufmann /Elsevier	5th Edition, 2013
Reference Books				
1	Computer Organizationand Embedded Systems	Carl Hamacher, Zvonko Vranesic,Safwat Zaky, Naraig Manjikian,	Tata McGraw-Hill	6th Edition, 2012
2	Computer Organizationand Architecture – Designing forPerformance"	William Stallings,	Pearson Education	10th Edition, 2016
3	Digital Logic and Computer Design	M. Morris Mano	Pearson Education	2008

Web links/Video Lectures/MOOCs

1. https://nptel.ac.in/courses/106/104/106104073/ 2. 2.
2.https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21CBS303.1		2												
21CBS303.2		2												
21CBS303.3			2											
21CBS303.4		1												
21CBS303.5				1										
21CBS303.6					2									1

1: Low 2: Medium 3: High

Formal Languages and Automata Theory			
Course Code	**21CBS304**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Outline the basic design of machines, the relation between formal languages andprogramming languages, and their applications.
2. Identify the equivalence between finite automata and regular languages, and non-regular languages.
3. Derive ways to simplify context-free grammars.
4. Design pushdown automata, find the equivalence between context-free languages andpushdown automata, and identify non-context-free languages.
5. Describe how Turing machines solve any computational process carried by present-daycomputers, their design, and describe the undecidability concept.

Module-1 **8 Hours**

Why study the Theory of Computation, Languages and Strings: Strings, Languages. A Language Hierarchy, Computation, **Finite State Machines (FSM)**: Deterministic FSM, Regular languages, Designing FSM, Nondeterministic FSMs, From FSMs to Operational Systems, Simulators for FSMs, Minimizing FSMs, Canonical form of Regular languages, Finite State Transducers, Bidirectional Transducers.

Module-2 **8 Hours**

Regular Expressions (RE): what is a RE?, Kleene's theorem, Applications of REs, Manipulating and Simplifying REs. Regular Grammars: Definition, Regular Grammars and Regular languages. Regular Languages (RL) and Non-regular Languages: How manyRLs, To show that a language is regular, Closure properties of RLs, to show some languages are not RLs.

Module-3 **8 Hours**

Context-Free Grammars(CFG): Introduction to Rewrite Systems and Grammars, CFGs and languages, designing CFGs, simplifying CFGs, proving that a Grammar is correct, Derivation and Parse trees, Ambiguity, Normal Forms. Pushdown Automata (PDA): Definition of non-deterministic PDA, Deterministic and Non-deterministic PDAs, Nondeterminism and Halting, alternative equivalent definitions of a PDA, alternatives that are not equivalent to PDA**.**

Module-4 **8 Hours**

Algorithms and Decision Procedures for CFLs: Decidable questions, Un-decidable questions. **Turing Machine**: Turing machine model, Representation, Language acceptability by TM, design of TM, Techniques for TM construction. Variants of Turing Machines (TM), The model of Linear Bounded automata**.**

Module-5 **8 Hours**

Decidability: Definition of an algorithm, decidability, decidable languages, Undecidable languages, halting problem of TM, Post correspondence problem. Complexity: Growth rate of functions, the classes of P and NP, Quantum Computation: quantum computers, Church-Turing thesis. **Applications:** G.1 Defining syntax of programming language, Appendix J: Security**.**

Course Outcomes:

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

21CBS304.1	Apply the core concepts in automata theory and theory of computation to solve real world problems.
21CBS304.2	Compare different models of computation (e.g. Deterministic and Non-deterministic) and deduce optimum solutions for the problems.

21CBS304.3	Illustrate grammars and automata (recognizers) for different language classes by relating it for various application like compiler design, XML syntax etc.
21CBS304.4	Estimate the boundary between context-free and non-context free languages and solve non-context free language problems using formal models like Turing Machines.
21CBS304.5	Design pushdown automata, illustrate equivalence between context-free languages and pushdown automata, and prove the properties of context-free languages and non-context-free languages.
21CBS304.6	Examine the decidable and undecidable problems, the complexity of the problem (P and NP class) and Quantum Computation.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Automata, Computability and Complexity	Elaine Rich	Pearson education	1st Edition 2012/2013
2	Theory of Computer Science	K L P Mishra, N Chandrasekaran	PHI Learning	3rd Edition 2012

Reference Books				
1	Introduction to Automata Theory, Languages and Computation	J.P. Hopcroft, Rajeev Motwani, and J.D. Ullman	Pearson Education	3rd Edition, 2013
2	Introduction to the Theory of Computation	Michael Sipser	Cengage learning	3rd Edition, 2013
3	Introduction to languages and theory of computation	John Martin	Tata McGraw Hill	4th Edition, 2013
4	An Introduction to Formal Languages and Automata	Peter Linz	Narosa Publishers	3rd Edition, 1998
5	Formal Languages and Automata theory	Basavaraj S. Anami, Karibasappa K G	Wiley India	2012
6	Formal Languages and Automata Theory	C K Nagpal	Oxford University press	2012

Web links/Video Lectures/MOOCs

1. http://www.jflap.org/
2. https://nptel.ac.in/courses/106/104/106104028/

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21CBS304.1	2	2		3										3
21CBS304.2				3										3
21CBS304.3				3										
21CBS304.4	2	2												
21CBS304.5	2	2												
21CBS304.6														3

1: Low 2: Medium 3: High

Object Oriented Programming with Java Lab			
Course Code	**21CBL305**	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 and exception handling.
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, BoxWeight 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 IllegalAccessException 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 appropriatedisplay.

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.	

Course Outcomes: At the end of the course the student will be able to:	
21CBL305.1	Implement simple applications that makes use of classes, strings and basic data types.
21CBL305.2	Implement java programs with constructors and method overloading concepts.
21CBL305.3	Implement applications using inheritance and method overriding concepts.
21CBL305.4	Implement applications using packages and interfaces enforcing access controls.
21CBL305.5	Implement programs using multithreading and exception handling constructs.
21CBL305.6	Design and develop simple java applications for real world problems.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbook				
1	Java**:** The Complete Reference	Herbert Schildt	TATA McGraw-Hill publications	7th Edition, 2009

Web links/Video Lectures/MOOCs

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 Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21CBL305.1	3		1											
21CBL305.2			2										2	
21CBL305.3	3					2								
21CBL305.4	3					1							1	
21CBL305.5	3	2	3											
21CBL305.6	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				

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	-	-	-	-

1: Low 2: Medium 3: High

SEMESTER – IV			
Discrete Mathematical Structures			
Course Code	**21MAB401**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Use propositional logic in knowledge representation.
2. Apply principles of counting in computer applications
3. Find relation between different sets
4. Apply recurrence relations in real life problems
5. Use graph theory in computer applications

Module-1	**8 Hours**
Fundamentals of Logic: Basic Connectives and Truth Tables, Logical Equivalence: The laws of logic, Rules of inference. Open Statement, Quantifiers.	
Module-2	**8 Hours**
Fundamental Principles of Counting: Method of mathematical induction, The Rule of Sum andProduct, Permutations, Combinations, The Binomial Theorem.	
Module-3	**8 Hours**
Relations and Functions: Cartesian Products and Relations, Properties of relations, Equivalence Relations and Partitions. Functions, Function composition and Inverse function.	
Module-4	**8 Hours**
Enumeration and Generating Functions: Inclusion-exclusion principle, rook polynomials. First order linear recurrence relation, Second order linear homogeneous recurrence relations with constant coefficients.	
Module-5	**8 Hours**
Graph Theory: Graphs and sub graphs, Graph Isomorphism, Vertex degree, Planar Graphs, GraphColoring, Trees and Sorting, and Prefix Codes.	

C**ourse Outcomes:**

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

21MAB401.1	Apply knowledge of propositional logic in truth verification
21MAB401.2	Demonstrate the application of discrete structures in different fields of computer applications
21MAB401.3	Recognize relations in real life applications
21MAB401.4	Find applications of equivalence relation
21MAB401.5	Apply inclusion principle, rook polynomial in computer applications
21MAB401.6	Use graph theory in computer science

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Discrete and Combinatorial Mathematics	Ralph P. Grimaldiand B V Ramana	Pearson Education, Asia	5th Edition 2017
Reference Books				
1	Discrete Mathematical structures with Applications to Computer Science	J.P. Tremblayand R. Manohar	Tata – McGraw Hill	1st Edition 2017
2	Discrete Mathematicsand its Applications	Kenneth H. Rosen	Tata – McGraw Hill	7th Edition 2017
3	Topics in Algebra	I N Herstein	Wiley Eastern Limited	3rd Edition 2003

Web links/Video Lectures/MOOCs

1. https://www.youtube.com/watch?v=xlUFkMKSB3Y&t=643s
2. https://www.youtube.com/watch?v=3y6kXA9YEpA
3. https://www.youtube.com/watch?v=nKsC70MtzkY
4. https://www.youtube.com/watch?v=rSfEF9gaFGc

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 1 2
21MAB401.1	3		1									
21MAB401.2		2	2									
21MAB401.3	2	2										
21MAB401.4		3	1									
21MAB401.5	2	2										
21MAB401.6		3	1									

1: Low 2: Medium 3: High

Operating System (Integrated)

Course Code	**21CBS402**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:2)	SEE Marks	50
Credits	**04**	Exam Hours	03

Course Learning Objectives:

1. Learn basics of operating system and concept of virtual machine
2. Understand the concepts of process, scheduling and synchronization
3. Acquire knowledge about deadlocks and concurrent programming
4. To study about the various memory management schemes
5. Know about the I/O, file and disk management

Module-1 **8 Hours**

Introduction: Concept of Operating Systems (OS) - Generations of OS - Types of OS - OS Services - Interrupt handling and System Calls- Basic architectural concepts of an OS- Concept of VirtualMachine - Resource Manager view- process view - hierarchical view of an OS.

Module-2 **8 Hours**

Process Management: Processes – Concept-Process Scheduling – Threads-Types - Concept of multithreads – CPU Scheduling- – Scheduling algorithms- FCFS - SJF - RR - Multiprocessor scheduling – Real Time scheduling- RM and EDF – Inter-process Communication- Concurrent processes, precedence graphs, Critical Section- Race Conditions- Mutual Exclusion- Hardware Solution- Semaphores- Strict Alternation- Peterson's Solution- The Producer / Consumer Problem- Event Counters- Monitors- Message Passing – Classical IPC Problems - Reader's & Writer Problem - Dinning Philosopher Problem - Barber's shop problem.

Module-3 **8 Hours**

Deadlock and Concurrent Programming: Deadlocks – Necessary and sufficient conditions for Deadlock - Deadlock Prevention -Deadlock Avoidance - Banker's algorithm- Deadlock detection and Recovery – Concurrent Programming -Critical region - Conditional critical region – Monitors - Concurrent languages – Communicating Sequential Process (CSP).

Module-4 **8 Hours**

Memory Management: Memory Management – Basic concept - Logical and Physical address maps- Memory allocation– Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction– Virtual Memory- Basics of Virtual Memory – Hardware and control structures – Locality of reference- Page allocation- Partitioning- Paging- Page fault- Working Set- Segmentation- Demand paging– Page Replacement algorithms- Optimal- First in First Out (FIFO)- Second Chance (SC)- Not recently used (NRU)- Least Recently used (LRU).

Module-5 **8 Hours**

File and I/O Management: I/O Hardware -I/O devices, Device controllers, Direct Memory Access, Principles of I/O Concept of File - Access methods - File types - File operation - Directory structure - File System structure - Allocation methods (contiguous, linked, indexed) - Free-space management (bit vector, linked list, grouping) - directory implementation (linear list, hash table) - efficiency and performance -Disk structure - Disk scheduling - FCFS - SSTF - SCAN - C-SCAN - Disk reliability - Disk formatting - Boot-block - Bad blocks - Case Study: Unix File System.

List of Laboratory Experiments related to above modules – 2 hours each
1. Implement shell scripts with filters and pipes (grep, sort, uniq, cut, tr) 2. Implement shell script for system monitoring with email alert 3. Inter-process communication using shared memory 4. Write C programs to implement the various CPU Scheduling – FCFS, SJF, Priority and RR. 5. Producer Consumer problem solution using semaphores 6. Implement Bankers algorithm for deadlock avoidance 7. Implementation of the following Memory Allocation Methods for fixed partition a) First Fit b) Worst Fit c) Best Fit 8. Implementation of the following Page Replacement Algorithms a) FIFO b) LRU c) LFU
9. **Open ended experiment covering the concept of entire syllabus** **CASE STUDY:** Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS - iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

Course Outcomes: At the end of the course the student will be able to:	
21CBS402.1	Demonstrate the understanding of operating system design and its impact on system performance
21CBS402.2	Establish the role of multi-threading and process scheduling in increasing the throughput of the system
21CBS402.3	Investigate the processes used by operating systems to synchronize process, handle deadlocks and manage memory.
21CBS402.4	Discuss the performance issues of storage management and describe the algorithms and structures introduced to resolve the same
21CBS402.5	Compare and Contrast the various disk scheduling algorithms.
21CBS402.6	Work individually or in teams to analyse a given operating system problem and develop solutions to solve it

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, PeterBaer Galvin and Greg Gagne	John Wiley andSons Inc	9th Edition, 2012.
Reference Books				
1	Operating Systems – ASpiral Approach	Ramaz Elmasri, A.Gil Carrick,David Levine	Tata McGraw Hill	2010
2	Modern Operating Systems	Andrew S. Tanenbaum	Pearson Education	2nd Edition, 2004
3	Understanding the Linux kernel	Daniel P Bovet and MarcoCesati	O'Reilly	3rd Edition, 2005

Web links/Video Lectures/MOOCs

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**
21CBS402.1	2			1										
21CBS402.2			2											
21CBS402.3			2											
21CBS402.4				2										
21CBS402.5					1									
21CBS402.6									2					1

1: Low 2: Medium 3: High

Design and Analysis of Algorithms (Integrated)			
Course Code	**21CBS403**	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 **8 Hours**

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**.**

Module-2 **8 Hours**

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.

Module-3 **8 Hours**

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

Module-4 **8 Hours**

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

Module-5 **8 Hours**

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

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

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:	
21CBS403.1	Interpret the time and space complexity of algorithms which provides solutions to the given problem
21CBS403.2	Identify the problems from the set that can be solved using divide and conquer techniques and apply the technique to obtain the solutions.
21CBS403.3	Apply the technique of greedy algorithms in real life applications to get the optimal solution
21CBS403.4	Apply the dynamic programming design technique to solve various problems
21CBS403.5	Differentiate the problems that can be solved using backtracking method and other general design techniques for given set of problems
21CBS403.6	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 Design and 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	PHI Learning	3rd Edition, 2010
2	Computer Algorithms	Ellis Horowitz, Satraj Sahni and Rajasekaran	PHI Learning	2nd Edition 2019

Web links/Video Lectures/MOOCs

- NPTEL Design and Analysis of Algorithms by Prof. Madhavan Mukund,https://nptel.ac.in/courses/106106131
- NPTEL Fundamental Algorithms: Design and Analysis by Prof. Sourav Mukhopadhyay, https://on HYPERLINK "https://onlinecourses.nptel.ac.in/noc22_cs01/preview"linecourses.nptel.ac.in/noc22 _cs 01/preview
- GeekforGeeks, Algorithms https://www.geeksforgeeks.org/fundamentals-of-algorithms/
- Turorialspoint, Design and Analysis of Algorithms Tutorial https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.h

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		3										3
21CSE403.2		3	3										2	
21CSE403.3			3										2	
21CSE403.4			3										2	
21CSE403.5				3									2	
21CSE403.6				3										3

1: Low 2: Medium 3: High

Computational Statistics

Course Code	**21CBS404**	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 study the mean, variance, linear regression models and error term for use in Multivariate data analysis.
2. To understand the relationship of the data collected for decision making.
3. To study the statistical analysis by using discriminant analysis.
4. To know the concept of principal components, factor analysis and cluster analysis for profiling and interpreting
5. To understand different types of clustering and correlation factors.
6. To study different models used for estimating data.

Module-1 **8 Hours**

Multivariate Normal Distribution: Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

Module-2 **8 Hours**

Discriminant Analysis: Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis

Module-3 **8 Hours**

Principal Component Analysis: deciding on how many principal components to retain, H-plot. **Factor Analysis:** Factor analysis model, extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

Module-4 **8 Hours**

Cluster Analysis: Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering-Profiling and Interpreting Clusters

Module-5 **8 Hours**

R statistical programming language: Introduction to R, Functions, Control flow and Loops, Working with Vectors and Matrices, Reading in Data, Writing Data, Working with Data, Manipulating Data, Simulation, Linear model, Data Frame, Graphics in R

Course Outcomes:

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

21CBS404.1	Analyze means and variances of the individual variables in a multivariate set and also the correlations between those variables.
21CBS404.2	Find discriminants, rules to optimally assign new objects to the labelled classes.
21CBS404.3	Apply the principal component techniques to reduce data and to interpret.
21CBS404.4	Outline the concept of reducing the number of variables in regression models using Factor analysis

21CBS404.5	Apply the techniques of clustering methods for massive amounts of data.
21CBS404.6	Apply the different concepts learnt to generate a statistical report using R Programming.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	”An Introduction to Multivariate Statistical Analysis	T.W. Anderson	Wiley	Third edition, 2003
2	Applied Multivariate Data Analysis	J.D. Jobson,	Volume I & II, Springer texts in statistics, New York	Fourth Edition 1999.
3	R for Everyone: Advanced Analytics and Graphics	Jared P. Lander	Pearson Education India	2nd Edition 2014
Reference Books				
1.	”Introduction to Linear Regression Analysis”	Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining	Wiley	5th Edition, 2012.
2.	“Applied Multivariate Statistical Analysis”	Johnson R.A. &Wichern, D.W	Pearson	Sixth Edition, 2018
3.	“Cluster Analysis for Applications”	M.R. Anderberg	Academic Press	

Web links/Video Lectures/MOOCs/papers

1. https://in.coursera.org/specializations/compstats
2. Regression Diagnostics , Identifying Influential Data and Sources of Collinearety, D.A. Belsey, E. Kuh and R.E. Welsch

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21CBS404.1			2	1										
21CBS404.2	2		1											
21CBS404.3	1		2											
21CBS404.4		2												
21CBS404.5		1	2											
21CBS404.6		2	3											

1: Low 2: Medium 3: High

Web Programming Lab

Course Code	**21CBL405**	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 Design and develop static and dynamic web pages.
2. To create web pages using HTML and Javascripts.
3. To develop and understand the use of XML document to create web pages
4. To apply the concept of PHP program to display student information.
5. To apply the concept of pearl script in creating web pages.
6. To develop any web application.

PART-A

1. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
2. Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt.
3. Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:
   a. Parameter: A string
   b. Output: The position in the string of the left-most vowel
   c. Parameter: A number
   d. Output: The number with its digits in the reverse order
4. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
5. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
6. Write the PHP programs to do the following:
   a. Implement simple calculator operations.
   b. Find the transpose of a matrix.
   c. Multiplication of two matrices.
   d. Addition of two matrices.
7. Write a PHP program to sort the student records which are stored in the database using selection sort.
8. Write a Perl script to find the largest number among three numbers
8. Write a Perl script to print the multiplication tables from 1-10 using subroutines
9. Write a Perl script to substitute a word, with another word in a string

PART-B

Develop a web application using the learnt concepts.

Course Outcomes:

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

21CBL405.1	Create visually appealing, dynamic web pages using the concepts of HTML5, CSS, JavaScript, XML, PHP and develop Javascript programs.
21CBL405.2	Develop XML program to display student information using CSS
21CBL405.3	Develop PHP program to keep track of the number of visitors visiting the web page, Digital Clock, simple calculator, matrix addition, multiplication, transpose
21CBL405.4	Develop the PHP programs to sort the student records stored in database using selection sort, string manipulations
21CBL405.5	Write Perl programs to handle form data, and also to retrieve web server information.
21CBL405.6	Develop a web application by using the learnt concepts in the laboratory

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	"Fundamentals of Web Development"	Randy Connolly, Ricardo Hoar	Pearson Education India.	4th Edition, 2016
2	"Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5"	Robin Nixon	4thEdition, O"Reilly Publications	4th Edition, 2015
Reference Books				
1	PHP and MySQL Web Development	Luke Welling, Laura Thomson	Pearson Education	5th Edition, 2016
2	Professional JavaScript for Web Developers	Nicholas C Zakas	Wrox/Wiley India	3rd Edition, 2012
3	JavaScript & jQuery: The Missing Manual	David Sawyer Mcfarland	O"Reilly/Shroff Publishers & Distributors Pvt Ltd	1st edition, 2014
4	Murach's HTML5 and CSS3	Zak Ruvalcaba Anne Boehm	Murachs/Shroff Publishers & Distributors Pvt Ltd,	3rd Edition, 2016.

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21CBL405.1			1		2									1
21CBL405.2			3	1										1
21CBL405.3			3	1										
21CBL405.4			3	1										
21CBL405.5		1		2										1
21CBL405.6									3	1	2		1	

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					

1: Low 2: Medium 3: High

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

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