UNIVERSITYOF MYSORE
(Re-accredited by NAAC with 'A' Grade)
(NIRF-2022: Ranked 33rd in University Category and 54th in Overall Category)

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Manasagangotri Campus, Mysuru

Prof. D.S. Guru
Chairman, Artificial Intelligence & Machine Learning

Mobile No. 9620228004
Email: dsguruji@gmail.com

No. MUSE/ /2022-23

Dated 13.09. 2022

To
The Registrar,
University of Mysore
Crawford Hall
Mysuru.

Sir,

Sub: **Proceedings of the meeting of the members of the BoS in Artificial Intelligence & Machine Learning-reg**
Ref: No.UA2 /134/2021-22 dated 08.09.2022.

With reference to the above subject, I am herewith enclosing the **Proceedings of the meeting of the members of the Board of Studies in Artificial Intelligence & Machine Learning (AI&ML)** held on **13.09.2022** at 10.00 AM along with (1) **Scheme, Syllabus and Regulations, (2) Panel of Examiners for 2022-23** both **hard and soft copies.**

Yours faithfully

13/9/22

(Prof. D.S. Guru)
Chairman
BoS in Artificial Intelligence & Machine Learning

CHAIRPERSON
BOS IN AI & ML
MUSE
MGM-06

Copy to:
The Dy. Registrar (Academic), University of Mysore, Mysuru.

Proceeding of the meeting of the members of the Board of Studies in Artificial Intelligence & Machine Learning (AI&ML) of Mysore University School of Engineering held on 13th Sept. 2022 at 10.00 AM at Vijnana Bhavan, Manasagangotri, Mysuru – 570 006

Members Present

1	Prof. D.S. Guru	Chairman
2	Prof. Ananthapadmanabha T	Member
3	Prof. Vinutha D C	Member
4	Prof. Rajendra A B	Member
5	Prof. Chethan H K	Member

Members Virtually Present

6	Prof. B.S. Harish	Member
7	Prof. Sharath Kumar Y H	Member
8	Dr. Manjunath S	Member

The Chairman welcomed the members present in the meeting. The following agenda were taken up for discussion.

Agenda 1: Scheme of III and IV Semesters for B.E. in Artificial Intelligence & Machine Learning.

The Chairman explained that the Scheme has been framed on the lines of guidelines of AICTE/VTU and within the framework of NEP – 2020 of III and IV semester. The Scheme to include the Basic Science Courses (BSC), Engineering Science Courses (ESC), Professional Core Courses (PCC), Professional Elective Courses (PEC), Open Elective Courses (OEC), Integrated Professional Core Courses (IPCC), Project Work, Internship (INT), Non-Credit Mandatory Courses (NCMC), Ability Enhancement Course (AEC), Universal Human Value Courses (UHV) and Languages. The Members of the Board examined and approved the Scheme for B.E. Artificial Intelligence & Machine Learning of III Semester and IV Semester within the ambit of 160 credits for the entire B.E. program. The Scheme is enclosed in the **Annexure I**.

Agenda 2: Syllabus for III and IV semesters B.E. Artificial Intelligence & Machine Learning

The Members of the Board has examined, discussed and approved the Syllabus for III and IV semester B.E. Artificial Intelligence & Machine Learning Courses. The Syllabus is enclosed in the **Annexure II**.

13/9/22

Agenda 3: Panel of Examiners for 2022-23

The Board has prepared and approved Panel of Examiners for the year 2022-23 **(Annexure III)**

The meeting ended with vote of thanks.

13/9/22

(Prof. D.S. Guru)
Chairman
BoS in Artificial Intelligence & Machine Learning

CHAIRPERSON
BOS IN A I & M.L
MGM

Sl No.	Name	Chairman/ Member	Signature
1	Prof. D.S. Guru	Chairman	
2	Prof. Ananthapadmanabha T	Member	
3	Prof. Vinutha D C	Member	Vinutha D.C 13/9/2022
4	Prof. Rajendra A B	Member	13/9/22
5	Prof. B.S. Harish	Member	Attended Virtually
6	Prof. Sharath Kumar Y H	Member	-11-
7	Dr. Manjunath S	Member	-11-
8	Prof. Chethan H K	Member	

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination 2021-2022 (As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021–2022)

Artificial Intelligence & Machine Learning(AI&ML)

III SEMESTER													
Sl. No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theory lectures	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT31	Engineering Mathematic-III	Basic Science	Basic Science	2	2	0	03	50	50	100	3
2	IPCC	21CD32	Data Structures and Applications	CS&D	CS&D	3	0	2	03	50	50	100	4
3	IPCC	21CD33	Analog and Digital Electronics	CS&D/ BM&RE	CS&D/ BM&RE	3	0	2	03	50	50	100	4
4	PCC	21CD34	Computer Organization	CS&D	CS&D	2	2	0	03	50	50	100	3
5	PCC	21CD35	Software Engineering	CS & D	CS&D	2	2	0	03	50	50	100	3
6	PCC	21CD36	Discrete Mathematical Structures	CS&D	CS&D	2	2	0	03	50	50	100	3
7	CEE	21CIV37	Environmental Studies	CEE	CEE	1	0	0	NA	50	-	50	1
8	UHV	21UHV38	Universal Human Values and Professional Ethics	Basic Science	Basic Science	1	0	0	NA	50	-	50	1
			Total			16	08	04	18	400	300	700	22

Note: BSC: Basic Science Courses, PCC: Professional Core Courses, IPCC: Professional Lab Courses, CEE: Civil Environmental Engineering, UHV: Universal Human Values, BM&RE: Biomedical and Robotics Engineering, NCMC: Non-credit mandatory course, INT: Internship, IESC: Integrated Engineering Science Course.

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

9	NCMC	21MATDIP31	Additional Mathematics-1	Basic Science	Basic Science	2	2	0	03	50	50	100	0
10	NCMC	21KANDIP32	Technical Kannada	Basic Science	Basic Science	0	2	0	-	50	-	50	0

(a) The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE 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 student has 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

Credit Definition:
1-hour lecture(L) per week per semester = **1 Credit**
2-hour tutorial **(T)** per week per semester = **1 Credit**
2-hour Practical/Drawing **(P)** per week per semester = **1 Credit**

Four-credit courses are to be designed for **50** hours of Teaching-Learning process.
Three credit courses are to be designed for **40** hours of Teaching-Learning process.
Two credit courses are to be designed for **25** hours of Teaching-Learning process.
One credit course is to be designed for **15** hours of Teaching-Learning process.

AICTE Activity Points to be earned by students admitted to BE/B.Tech., day college programme (For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines): Over and above the academic grades, every Day College regular 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 the fifth semester are required to earn 50 Activity Points from the year of entry to UoM. 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, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

DIRECTOR
Mysore University
School of Engineering
Manasagangotri, Mysuru - 06

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination 2021-2022 (As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021–2022)

Artificial Intelligence & Machine Learning(AI&ML)

IV SEMESTER

Sl. No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theory lectures	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT41	Engineering Mathematics-IV	Basic Science	Basic Science	2	2	0	03	50	50	100	3
2	IPCC	21CD42	Design and Analysis of Algorithms	CS&D	CS&D	3	0	2	03	50	50	100	4
3	IPCC	21CD43	Operating Systems	CS&D	CS&D	2	2	2	03	50	50	100	4
4	PCC	21CD44	Data Communication	CS&D	CS&D	3	0	0	03	50	50	100	3
5	IPCC	21CD45	Programming in C++	CS&D	CS&D	2	0	2	03	50	50	100	3
6	IPCC	21CD46	Graph Algorithms	CS&D	CS&D	2	0	2	03	50	50	100	3
7	HSMC	21CPH47	Constitution of India, Professional Ethics and Cyber Law	Basic Science	Basic Science	1	0	0	NA	50	-	50	1
8	HSMC	21AEC48	Ability Enhance Course-II	CS&D	CS&D	1	0	0	NA	50	-	50	1
9	INT	21INT49	Summer Internship-II	(To be carried out during the intervening vacations of IV and V semesters)					-	-	-	-	-
			Total			16	04	08	18	400	300	700	22

Note: BSC: Basic Science Courses, PCC: Professional Core Courses, IPCC: Professional Lab Courses, HSMC: Humanity, Social Science and Management Courses. NCMC: Non-credit mandatory course, AEC: Ability Enhancement Course, INT: Internship, IESC: Integrated Engineering Science Course.

Summer Internship-I (21INT58): shall be carried out at industrial (State and Central Government /Non-government organizations (NGOs)/Micro, Small and Medium Enterprise (MSME)/Innovation centres/ Incubation centres. The internship can also be Rural internship. All the students admitted shall have to undergo a mandatory internship of 04 weeks during the intervening vacation of IV and V semesters. A University Viva-Voce examination (Presentation followed by Question & Answer session) shall be conducted during V semester and the prescribed credit shall be included in the V semester. The 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 University examination after satisfying the internship requirements. (The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship.)
Summer Internship-I: SEE shall be through seminar and viva-voce.

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

10	NCMC	21MATDIP41	Additional Mathematics-II	Basic Science	Basic Science	02	02	-	03	50	50	100	0
11	NCMC	21ENGDIP42	Technical English	Basic Science	Basic Science	-	2	-	-	50	-	50	0

(a) The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE 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 student has 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

Credit Definition: 1-hour lecture(**L**) per week per semester = **1 Credit** 2-hour tutorial (**T**) per week per semester = **1 Credit** 2-hour Practical/Drawing (**P**) per week per semester = **1 Credit**	**Four-credit** courses are to be designed for **50** hours of Teaching-Learning process. **Three credit** courses are to be designed for **40** hours of Teaching-Learning process. **Two credit** courses are to be designed for **25** hours of Teaching-Learning process. **One credit** course is to be designed for **15** hours of Teaching-Learning process.

AICTE Activity Points: In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

Engineering Mathematics-III (21MAT31)

Semester III			
No. of Teaching hour/Week	2	CIE Marks	50
No. of Tutorial hours/week	2	SEE Marks	50
Total No. of Lecture hours	40	Exam Hours	03
L:T:P	2:1:0	Credits	03

Modules	Course Content	Teaching Hours
Module 1	**Fourier Series:** Periodic functions, Dirichlet"s condition. Fourier series of periodic functions period 2π and arbitrary period. Half range Fourier series. Application of Practical harmonic analysis.	08 Hours
Module 2	**Fourier Transforms:** Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Problems.	08 Hours
Module 3	**Difference Equations and Z-Transforms:** Difference equations, basic definition, z-transform-definition, Standard z-transforms, Damping and shifting rules, initial value and final value theorems (without proof) and problems, Inverse z-transform and applications to solve difference equations.	08 Hours
Module 4	**Partial Differential Equations (PDE's):** Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one-dimensional heat equation and wave equation. Solution of one-dimensional heat equation and wave equation by the method of separation of variables.	08 Hours
Module 5	**Statistical Methods:** Correlation and regression-Karl Pearson"s coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression –problems. **Curve Fitting:** Curve fitting by the method of least squares-fitting the curves of the form- $y = ax + b, y = ax^b and$ $y = ax^2 + bx + c.$	08 Hours

Course outcomes:

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

- Explain the basic concepts of Fourier Series, Fourier Transforms, Z-Transforms, Partial Differential Equations, Some concepts of statistical analysis and curve fitting.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books:

1. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed. (Reprint), 2017.
2. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2017.
3. Srimanta Pal & Subobh C Bhunia: “Engineering Mathematics”, Oxford University Press, 3rd Reprint, 2016.
4. C.Ray Wylie, Louis C.Barrett : “Advanced Engineering Mathematics", 6th Edition, 2. McGrawHill Book Co., New York, 1995.
5. S.S.Sastry: “Introductory Methods of Numerical Analysis”, 11th Edition, Tata McGraw-Hill, 2010.
6. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
7. N.P.Bali and Manish Goyal, “A Text Book of Engineering Mathematics”, Laxmi Publications. Latest edition, 2014.
8. Chandrika Prasad and Reena Garg “Advanced Engineering Mathematics”, Latest edition, Khanna Publishing, 2018.

Additional Mathematics-I (21MATDIP31)

Semester III			
No. of Teaching hour/Week	2	CIE Marks	50
No. of Tutorial hours/week	2	SEE Marks	50
Total No. of Lecture hours	40	Exam Hours	03
L: T:P	2:1:0	Credits	00

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Complex Variables :** Definitions and properties. Modulus and amplitude of a complex number, Argand"s diagram, De-Moivre"s theorem (without proof). **Vector Algebra:** Scalar and vectors. Addition and subtraction and multiplication of vectors- Dot and Cross products, problems.	**08 Hours**
Module 2	**Differential Calculus**: Review of successive differentiation-illustrative examples. Maclaurin"s series expansions-Illustrative examples. Partial Differentiation: Euler"s theorem-problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobians of order two-Problems.	**08 Hours**
Module 3	**Vector Differentiation**: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems.	**08 Hours**
Module 4	**Numerical Methods:** Finite differences. Interpolation/extrapolation 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)-Illustrative examples. Numerical integration: Simpson"s one third rule and Weddle"s rule (without proof) Problems.	**08 Hours**
Module 5	**Ordinary differential equations (ODE's).** Introduction-solutions of first order and first-degree differential equations: exact, linear differential equations. Equations reducible to exact and Bernoulli"s equation.	**08 Hours**

Course outcomes:

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

- Explain the basic concepts of complex trigonometry, differential calculus and vector differentiation, Numerical methods, Ordinary Differential Equations of first order.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books:

1. S C Chapra and R P Canale, *Numerical Methods for Engineering*, 15th Edition, Tata McGraw Hill
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
3. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
4. B.V. Ramana, *Higher Engineering Mathematics,* Latest edition, Tata McGraw Hill.
5. Srimanta Pal & Subodh C. Bhunia: *"Engineering Mathematics"* Oxford University Press, 3rd Reprint, 2016.
6. N.P Bali and Manish Goyal: *"A textbook of Engineering Mathematics"* Laxmi Publications, Latest edition.
7. H.K.Dass and Er. Rajnish Verma: *"Higher Engineering Mathematics"* S.Chand Publication (2014).

Data Structures and Applications (21CD32)

Semester III			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, dynamically allocated arrays. **Array Operations:** Traversing, inserting, deleting, searching, and sorting. Multidimensional Arrays, Polynomials and Sparse Matrices. **Strings:** Basic Terminology, Storing, Operations and Pattern Matching algorithms. Programming Examples.	**10 Hours**
Module 2	**Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Recursion:** Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function. **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, A Mazing Problem. Multiple Stacks and Queues. Programming Examples.	**10 Hours**
Module 3	**Linked Lists**: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples	**10 Hours**
Module 4	**Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples	**10 Hours**
Module 5	**Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search. **Sorting and Searching:** Insertion Sort, Radix sort, Address Calculation Sort. **Hashing:** Hash Table organizations, Hashing Functions, Static and Dynamic Hashing. **Files and Their Organization:** Data Hierarchy, File Attributes, Text Files and Binary Files, Basic File Operations, File Organizations and Indexing.	**10 Hours**

Sl. No.	List of experiments
1	Design, Develop and Implement a menu driven Program in C for the following array operations. a. Creating an array of N Integer Elements b. Display of array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position (POS) d. Deleting an Element at a given valid Position (POS) e. Exit. Support the program with functions for each of the above operations.
2	Design, Develop and Implement a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.
3	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations
4	Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^(Power) and alphanumeric operands.
5	Design, Develop and Implement a Program in C for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b. Solving Tower of Hanoi problem with n disks
6	Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations
7	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, 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

8	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit
9	Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes a. Represent and Evaluate a Polynomial P(x,y,z) = 6x2y2z-4yz5+3x3yz+2xy5z-2xyz3 b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations
10	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exit
11	Design, Develop and Implement a Program in C for the following operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method
12	Given a File of N employee records with a set K of Keys(4-digit) which uniquely determine the records in file F. 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. Design and develop a Program in C that uses Hash 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.

Course outcomes:

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

- Use stack, Queue, Lists, Trees and Graphs in solving real world problems.
- Implement all data structures in a high-level language for problem solving.
- Analyse and compare various linear and non-linear data structures
- Code, debug and demonstrate the working nature of different types of data structures and their applications
- Implement, analyse and evaluate the searching and sorting algorithms.

Reference Books:

1. Ellis Horowitz and SartajSahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. 2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.
3. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
4. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
5. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
6. A M Tenenbaum, Data Structures using C, PHI, 1989.
7. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

Analog and Digital Electronics (21CD33)

Semester III			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**BJT Biasing:** Introduction, operating point, Fixed-bias configuration, Emitter-bias configuration, Voltage-divider biasing, Collector feedback bias, Emitter follower configuration. Current mirror circuits, Bias stabilization, Application of BJT as Rely Driver, Switch and constant current source.	**10 Hours**
Module 2	**FET Biasing:** Introduction, Fixed-bias configuration, Self-bias configuration, Voltage-divider biasing. **FET Amplifiers:** Introduction, JFET Small signal model, JFET AC equivalent circuit, Fixed- bias configuration, Self-bias configuration with by passed source resistance, Voltage-divider configuration, Source follower configuration.	**10 Hours**
Module 3	**Principles & Design of Combinational Logic:** Theorems and Properties of Boolean algebra, Boolean Functions, Definition of combinational logic, Canonical forms, Generation of switching equations from Truth Tables, Relevant Problems.	**10 Hours**
Module 4	**Karnaugh maps:** Minimum forms of switching functions, two and three variable Karnaugh maps, four variable karnaugh maps, determination of minimum expressions using essential prime implicants, Quine-McClusky Method: determination of prime implicants. Related Problems. **Logic Circuit Design:** Arithmetic Operation Combinational Circuit, Binary Adder, Binary Subtractor, Binary Parallel Adder, The Look-Ahead-Carry Binary Adders, Binary Multipliers, Binary Dividers, Comparator.	**10 Hours**
Module 5	**Power Amplifiers:** Introduction, Series Fed Class A Amplifier, Transformer-Coupled Class A Amplifier, Class B Amplifier operation. **Class B amplifier circuits:** Transformer-Coupled Push-Pull and Complementary–Symmetry circuits, Amplifier Distortion. **Latches and Flip-Flops:** Set Reset Latch, Gated Latches, Edge-Triggered D Flip Flop 3, SR Flip Flop, J K Flip Flop, T Flip Flop, Flip Flop with additional inputs, Relevant Problems.	**10 Hours**

Sl. No.	List of experiments
1	Study and plot the input and output characterises of CE transistor
2	Study and plot the drain and transfer characteristics of FET
3	Find the Efficiency and ripple factor of full-wave bridge rectifier
4	Study the frequency response of CE amplifier with and without bypass capacitor
5	Simplification, realization of Boolean expressions using logic gates and Universal gates.
6	Operational verification of Flip–Flops: (i) T type (ii) D type and iii) J–K Master slave.
7	Realization of half and full adders, half and full subtractor using logic gates.
8	(a) Realization of parallel adder and parallel subtractor using 7483 chip (b) Demonstration of BCD to Excess–3 code conversion and vice versa.
9	Realization of half and full adders, half and full subtractor using logic gates.

Course outcomes:
At the end of the course the students will be able to:

- Design and implement a biasing circuit for BJT and FET
- Model the FET amplifier for ac analysis.
- Ability to apply the knowledge of mathematics and science to understand the operation of logic circuits and performance parameters.
- Ability to apply the simplification techniques/methods to optimize and implement the digital functions/circuits.
- Acquire the knowledge of classifications of Power amplifier, operation, and design power amplifier.
- Ability to analyse the given logic circuit based on the knowledge of digital elements.

Reference books:

1. Robert L Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 10th Edition, Pearson Prentice Hall, 2009
2. Charles H. Roth. Jr, Larry L. Kenny, “Fundamentals of Logic Design”, 7th edition, Cengage Learning, ISBN: 978-1133628477.
3. Morris Mano, Digital Logic and Computer Design, Pearson, 2016, ISBN: 9789332542525.
4. Charles H Roth and Larry L Kinney and Raghunandan., G H Analog and Digital Electronics, Cengage Learning,2019.

Computer Organization (21CD34)

Semester III			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Basic Structure of Computers:** Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. **Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions	**08 Hours**
Module 2	**Input/Output Organization:** Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB.	**08 Hours**
Module 3	**Memory System:** Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations.	**08 Hours**
Module 4	**Arithmetic:** Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division.	**08 Hours**
Module 5	**Basic Processing Unit:** Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Micro programmed Control. Pipelining: Basic concepts of pipelining.	**08 Hours**

Course Outcome:

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

- Explain the basic organization of a computer system.
- Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
- Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.
- Design and analyse simple arithmetic and logical units.

Reference Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2002.
2. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015.R. S. Sedha, “A Text book of Applied Electronics,” 7th Edition, S. Chand and Company Ltd., 2011.

Software Engineering (21CD35)

Semester III			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. Software Processes: Models: Waterfall Model, Incremental Model and Spiral Model. Process activities. **Requirements Engineering:** Requirements Engineering Processes, Requirements Elicitation and Analysis. Functional and non-functional requirements. The software Requirements Document. Requirements Specification. Requirements validation. Requirements Management.	**08 Hours**
Module 2	What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. **Introduction, Modelling Concepts and Class Modelling:** What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. Class Modelling: Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models;	**08 Hours**
Module 3	**System Models:** Context models. Interaction models. Structural models. Behavioral models, Model-driven engineering. **Design and Implementation:** Introduction to RUP, Design Principles. Object-oriented design using the UML. Design patterns. Implementation issues. Open-source development.	**08 Hours**
Module 4	**Software Testing:** Development testing, Test-driven development, Release testing, User testing. Test Automation. **Software Evolution:** Evolution processes. Program evolution dynamics. Software maintenance. Legacy system management.	**08 Hours**
Module 5	**Project Planning:** Software pricing. Plan-driven development. Project scheduling: Estimation techniques. **Quality management:** Software quality. Reviews and inspections. Software measurement and metrics. Software standards	**08 Hours**

Course outcomes:
At the end of the course the students will be able to:

- Design a software system, component, or process to meet desired needs within realistic constraints.
- Assess professional and ethical responsibility
- Function on multi-disciplinary teams
- Use the techniques, skills, and modern engineering tools necessary for engineering practice
- Analyse, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems.

Reference Books:

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.
2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005.
3. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
4. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

Discrete Mathematical Structures (21CD36)

Semester III			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Sets:** Set basics, Venn diagrams, Union, intersection, set difference, complement, Cartesian product, Power sets, Cardinality of finite sets. **Relation:** Reflexivity, symmetry, antisymmetry, transitivity, Equivalence relations, partial orders. **Function:** Domain, target, and range/image of a function, surjection, injections, bijections, inverses, composition.	**08 Hours**
Module 2	**Basic Logic:** Propositional logic, Logical connectives, Truth tables, Disjunctive normal form, Validity of a well-formed formula, Propositional inference rules, Universal and existential quantifiers and their negations. **Proof Techniques:** Proof by Induction.	**08 Hours**
Module 3	**Counting:** The basics of counting, the pigeonhole principle, permutations and combinations, recurrence relations, solving recurrence relations, generating functions, inclusion-exclusion principle and application of inclusion-exclusion, Basic modular arithmetic.	**08 Hours**
Module 4	**Discrete Probability:** Finite probability space, events, Properties of events, Conditional probability, Bayes‟ theorem, Independence. **Statistical Distribution:** Discrete Distribution, Binomial distribution, Gamma distribution, Beta distribution, Chi-square distribution, Univariate normal distribution.	**08 Hours**
Module 5	**Group theory**: Groups, subgroups, generators and evaluation of powers, cosets and Lagrange's theorem, permutation groups and Burnside's theorem, isomorphism, automorphisms, homomorphism, monoids, concepts of rings, fields. Introduction to vector space.	**08 Hours**

Course outcomes:

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

- Perform the operations associated with sets, functions, and relations.
- Convert logical statements from informal language to propositional (and quantified) logic expressions.
- Use the rules of inference to construct proofs in propositional logic.
- Identify the proof technique used in a given proof.
- Apply each of the proof techniques correctly in the construction of a sound argument.

- Make a probabilistic inference in a real-world problem using Bayes‟ theorem to determine the probability of a hypothesis given evidence.
- Model a variety of real-world problems in computer science using appropriate forms of graphs and trees, such as representing a network topology or the organization of a hierarchical file system.

Reference Books:

1. Edgar Goodaire and Michael Parmenter, Discrete Mathematics with Graph Theory, Third Edition, PHI, ISBN-13-9750131679955.
2. S. Lipschutz, Discreate Mathematics, TMH, ISBN 0-07-066932-0
3. Bernard Kolman C,Busby and Sharon Ross, Discrete Mathematical Structures, 2007, ISBN - 81-203-2082-4, Publication PHI.
4. Rosen, K.H., Discrete Mathematics and its Applications, 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.

Environmental Studies (21CIV37)

Semester III (Common to all branches)			
No. of Lecture hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	00
Total No. of Lecture hours	16	**Exam Hours**	00
L: T:P	1:0:0	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Environment - Components of Environment **Ecosystem:** Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, And Economic & Social Security. **Impacts:** Impacts of Agriculture & Housing Impacts of Industry, Mining & Transportation Environmental Impact Assessment, Sustainable Development.	**03 Hours**
Module 2	**Natural Resources, Water resources** – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water Mineral resources, Forest Wealth Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulphur Cycle. **Energy** – Different types of energy, Conventional sources & non-conventional sources of energy Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy.	**04 Hours**
Module 3	**Environmental Pollution** – Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. **Global Environmental Issues:** Population Growth, Urbanization, Land Management, Water & Waste Water Management	**03 Hours**
Module 4	**Air Pollution & Automobile Pollution:** Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures. **Solid Waste Management,** E –Source, Segregation, Transportation, and Waste Treatment and Management &Biomedical Waste Management - Sources, Characteristics & Disposal methods.	**03 Hours**
Module 5	Applications of GIS & Remote Sensing and Smart Technologies in Environmental Engineering Practices. **Environmental Legislations**: Acts, Rules& Regulations, Role of government, Legal aspects, Role of Nongovernmental Organizations (NGOs), Environmental Education & Women Education.	**03 Hours**

Course outcomes:

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

- Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
- Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment,

- Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components
- Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.
- Build inquisitiveness to protect environment through societal interventions.

Reference Books:

1. Benny Joseph (2005), “Environmental Studies”, Tata McGraw – Hill Publishing Company Limited.
2. R.J.Ranjit Daniels and Jagadish Krishnaswamy, (2009), “Environmental Studies”, Wiley India Private Ltd., New Delhi.
3. R Rajagopalan, “Environmental Studies – From Crisis to Cure”, Oxford University Press, 2005,
4. Aloka Debi, “Environmental Science and Engineering”, Universities Press (India) Pvt. Ltd. 2012.
5. Raman Sivakumar, “Principals of Environmental Science and Engineering”, Second Edition, Cengage learning Singapore, 2005
6. P. Meenakshi, “Elements of Environmental Science and Engineering”, Prentice Hall of India Private Limited, New Delhi, 2006
7. S.M. Prakash, “Environmental Studies”, Elite Publishers Mangalore, 2007
8. Erach Bharucha, “Text Book of Environmental Studies”, for UGC, University press, 2005
9. G.Tyler Miller Jr., “Environmental Science – working with the Earth”, Tenth Edition, Thomson Brooks /Cole, 2004
10. G.Tyler Miller Jr., “Environmental Science – working with the Earth”, Eleventh Edition, Thomson Brooks /Cole, 2006
11. Dr.Pratiba Sing, Dr.AnoopSingh and Dr.Piyush Malaviya, “Text Book of Environmental and Ecology”, Acme Learning Pvt. Ltd. New Delhi.

UNIVERSAL HUMAN VALUE & PROFESSIONAL ETHICS (21UHV38)

Semester III (Common to all branches)			
No. of Lecture hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	00
Total No. of Lecture hours	16	**Exam Hours**	00
L: T:P	1:0:0	**Credits**	01

Modules	Course Content	Teaching Hours
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 Fulfil the Basic Human Aspirations	**03 Hours**
Module 2	**Harmony in the Human Being:** Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	**03 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	**03 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	**03 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	**04 Hours**

Course outcomes:

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

- Holistic vision of life.
- Socially responsible behaviour and environmentally responsible work.
- Ethical human conduct.
- Having Competence and Capabilities for Maintaining Health and Hygiene.

- Appreciation and aspiration for excellence (merit) and gratitude for all.

Reference Books:

1. R R Gaur, R Asthana, G P Bagaria, The Textbook “A Foundation Course in Human Values and Professional Ethics”, 2ndRevised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 447-1 b.
2. R R Gaur, R Asthana , The Teacher‟s Manual for “A Foundation Course in Human Values and Professional Ethics”.

Engineering Mathematics-IV (21MAT41)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	**Course Content**	**Teaching Hours**
Module 1	**Calculus of complex functions:** Review of function of a complex variables, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms and consequences. **Construction of analytic functions:** Milne-Thomson method-Problems.	**08 Hours**
Module 2	**Conformal transformations:** Introduction. Discussion of transformations: $w = z^2$, $w = e^z$, $w = z + \frac{1}{z}(z \text{ G } 0)$. Bilinear transformations- Problems. **Complex integration:** Line integral of a complex function-Cauchy‟s theorem and Cauchy‟s integral formula and problems.	**08 Hours**
Module 3	**Numerical Solutions of Ordinary Differential Equations (ODE's):** Numerical solution of ODE‟s of first order and first degree- Taylor‟s series method, Modified Euler‟s method. Runge -Kutta method of fourth order, Milne‟s predictor and corrector method (No derivations of formulae)-Problems. Numerical Solution of Second Order ODE‟s - Runge-Kutta method and Milne‟s predictor and corrector method. (No derivations of formulae).	**08 Hours**
Module 4	**Probability Distributions:** Review of basic probability theory. Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions- problems (No derivation for mean and standard deviation)-Illustrative examples.	**08 Hours**
Module 5	**Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation and covariance. **Sampling Theory:** Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student‟s t-distribution, Chi-square distribution as a test of goodness of fit.	**08 Hours**

Course outcomes:

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

- Explain the concepts of integral calculus, Higher order differential equations, Laplace transforms, Probability and Linear Algebra.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2016
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017
3. Srimanta Pal et al , Engineering Mathematics, Oxford University Press, 3rd Edition, 2016.
4. C.Ray Wylie, Louis C.Barrett , Advanced Engineering Mathematics, McGraw-Hill Book Co, 6th Edition, 1995
5. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India, 4th Edition 2010
6. B.V.Ramana, Higher Engineering Mathematics, McGraw-Hill, 11th Edition,2010
7. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 6th Edition, 2014.

Additional Mathematics-II (21MATDIP41)

Semester IV			
No. of Lecture hour/Week	2	CIE Marks	50
No. of Tutorial hours/week	2	SEE Marks	50
Total No. of Lecture hours	40	Exam Hours	03
L: T:P	2:1:0	Credits	00

Modules	Course Content	Teaching Hours
Module 1	**Integral Calculus:** Review of elementary integral calculus. Reduction formulae for sin^nx, cos^nx (with proof) and sin^mxcos^nx (without proof) and evaluation of these with standard limits-Examples. Double integrals- Simple examples. Beta and Gamma functions- Simple problems	**08 Hours**
Module 2	**Higher order ODE's:** Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. [Particular Integral restricted to$R(x) = e^{ax}$, sin ax / cos $ax$for$f(D)y = R(x)$].	**08 Hours**
Module 3	**Laplace Transform:** Definition and Laplace transforms of elementary functions (statements only)-problems. Inverse Laplace Transform: Inverse Laplace transforms by method of partial fractions, Convolution theorem to find the inverse Laplace transforms. Solution of linear differential equations using Laplace transforms.	**08 Hours**
Module 4	**Introduction to Probability:** Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability, Bayes‟s theorem, problems.	**08 Hours**
Module 5	**Linear Algebra:** Introduction - rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations - Gauss elimination method. Eigen values and Eigen vectors of a square matrix. Problems.	**08 Hours**

Course outcomes:

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

- Explain the concepts of integral calculus, Higher order differential equations, Laplace transforms, Probability and Linear Algebra.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
2. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
3. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata McGraw Hill.
4. Srimanta Pal & Subodh C. Bhunia: *"Engineering Mathematics"* Oxford University Press, 3rd Reprint, 2016.
5. N.P Bali and Manish Goyal: *"A textbook of Engineering Mathematics"* Laxmi Publications, Latest edition.
6. H.K.Dass and Er. Rajnish Verma: *"Higher Engineering Mathematics"* S.Chand Publication (2014).

Design and Analysis of Algorithms (21CD42)

Semester IV			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Introduction to** Algorithm, Algorithm Specification, Analysis Framework, Performance Analysis: Space complexity, Time complexity. Asymptotic Notations: Mathematical analysis of non-recursive and recursive Algorithms with Examples. Important Problem Types: Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. **Fundamental Data Structures:** Stacks, Queues, Graphs, Trees, Sets and Dictionaries.	**10 Hours**
Module 2	**Divide and Conquer:** General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum, Merge sort, Quick sort, Strassen‟s matrix multiplication, Advantages and Disadvantages of divide and conquer. Decrease and Conquer Approach: Topological Sort.	**10 Hours**
Module 3	**Greedy Method:** General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines. Minimum cost spanning trees: Prim‟s Algorithm, Kruskal‟s Algorithm. Single source shortest paths: Dijkstra's Algorithm. Optimal Tree problem: Huffman Trees and Codes. Transform and Conquer Approach: Heaps and Heap Sort.	**10 Hours**
Module 4	**Dynamic Programming:** General method with Examples, Multistage Graphs. Transitive Closure: Warshall‟s Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem, Bellman-Ford Algorithm, Travelling Sales Person problem, Reliability design.	**10 Hours**
Module 5	**Backtracking:** General method, N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles. Branch and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem: LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Complete and NP-Hard problems: Basic concepts, nondeterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.	**10 Hours**

Annexure-II

Sl. No.	List of experiments
1	a. Create a Java class called ***Student*** with the following details as variables within it. (i) USN (ii) Name (iii) Branch (iv) Phone Write a Java program to create *n Student* objects and print the USN, Name, Branch, and Phone of these objects with suitable headings. b. Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.
2	***a.***Design a superclass called ***Staff*** with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely ***Teaching*** (domain, publications), ***Technical*** (skills), and ***Contract*** (period). Write a Java program to read and display at least 3 *staff* objects of all three categories. b. Write a Java class called ***Customer*** to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as "/".
3	a. Write a Java program to read two integers *a*and*b*. Compute *a*/*b* and print, when *b* is not zero. Raise an exception when *b* is equal to zero. b. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square ofthe number and prints; third thread will print the value of cube of the number.
4	Sort a given set of ***n*** integer elements using **Quick Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000 and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5	Sort a given set of ***n*** integer elements using **Merge Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000, and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case,average case and best case.
6	Implement in Java, the **0/1 Knapsack** problem using (a) Dynamic Programming method (b) Greedy method.
7	From a given vertex in a weighted connected graph, find shortest paths to other vertices using **Dijkstra's algorithm**. Write the program in Java.
8	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal'salgorithm.** Use Union-Find algorithms in your program
9	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Prim's algorithm**..
10	Write Java programs to (a) Implement All-Pairs Shortest Paths problem using **Floyd's algorithm**. (b) Implement **Travelling Sales Person problem** using Dynamic programming.

11	Design and implement in Java to find a **subset** of a given set **S** = {Sl, S2,. ... ,Sn} of ***n*** positive integers whose SUM is equal to a given positive integer ***d***. For example, if S ={1, 2,5, 6, 8} and ***d***= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.
12	Design and implement in Java to find all **Hamiltonian Cycles** in a connected undirected Graph G of *n* vertices using backtracking principle.

Course Outcome:

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

- Describe computational solution to well-known problems like searching, sorting etc.
- Estimate the computational complexity of different algorithms.
- Devise an algorithm using appropriate design techniques (brute-force, greedy, dynamic programming, backtracking) for problem solving.
- Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high-level language to solve real-world problems.
- Analyse and compare the performance of algorithms using language features.

Reference Books:

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 2rd Edition, 2009. Pearson.
2. Ellis Horowitz, Satraj Sahni and Rajasekaran, Computer Algorithms/C++, 2nd Edition, 2014, Universities Press.
3. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, Introduction to Algorithms, 3rd Edition, PHI.
4. S. Sridhar, Design and Analysis of Algorithms, Oxford (Higher Education).

Operating System (21CD43)

Semester IV			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Introduction to operating systems, System structures:** What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot. **Process Management:** Process concept, Process scheduling; Operations on processes; Inter process communication	**10 Hours**
Module 2	**Multi-threaded Programming:** Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling. Process Synchronization: Synchronization: The critical section problem; Peterson‟s solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.	**10 Hours**
Module 3	**Deadlocks:** Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.	**10 Hours**
Module 4	**Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. File System, Implementation of File System: File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.	**10 Hours**
Module 5	**Secondary Storage Structures, Protection:** Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability- Based systems. Case Study: The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.	**10 Hours**

Sl.	List of Experiments

No	
1	Simulate the following CPU scheduling algorithms: a) FCFS b) SJF c)Round Robin d)Priority
2	Simulate the following Memory management Techniques a) Multi Programming with Fixed Number of Tasks (MFT) b) Multi Programming with Variable Number of Tasks (MVT)
3	Write a C program to stimulate the following contiguous memory allocation techniques a) Worst-fit b) Best fit c) First fit
4	Simulate Paging Technique of memory management
5	Simulate following page replacement Algorithms a) FIFO b) LRU c) LFU
6	Simulate Producer-Consumer Problem Using Semaphores
7	Write a C program to simulate the concept of Dining-Philosophers problem.
8	Write a C program to stimulate the disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN
9	Simulate Bankers Algorithm for Deadlock Avoidance
10	Simulate the file allocation strategies: a) Sequential b) Indexed c) Linked
11	Simulate all File Organization techniques a) Single level directory b) Two level c) Hierarchical

Course Outcome:

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

- Demonstrate need for OS and different types of OS
- Apply suitable techniques for management of different resources
- Realize the different concepts of OS in platform of usage through case studies
- Design and solve synchronization problems.
- Simulate and implement operating system concepts such as scheduling, deadlock management, file management, and memory management.

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th edition, Wiley-India, 2006.
2. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
3. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw-Hill, 2013.
4. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
5. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

Data Communication (21CD44)

Semester IV			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Data Communications, Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer-1: Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance. SLE: Internet History, Standards and Administration	**08 Hours**
Module 2	**Digital Transmission:** Digital to digital conversion: Line coding- Polar, Bipolar, Manchester coding, AMI, Pseudo ternary, Physical Layer-2: Analog to digital conversion, Pulse Code Modulation, Delta Modulation, Transmission Modes, Analog Transmission: Digital to analog conversion. SLE: Bandwidth Utilization: Multiplexing	**08 Hours**
Module 3	**Transmission Media:** Introduction, Guided Media: Twisted Pair Cable, Coaxial Cable, Fiber Optics Cable, switching: Introduction, Circuit Switched Networks and Packet switching, Data Link Layer: Error Detection and Correction: Introduction, Block Coding, Cyclic Code. SLE: Checksum	**08 Hours**
Module 4	**Data link control:** DLC Services: Framing, Flow Control, Error Control, Connectionless and Connection Oriented, Data link layer protocols, High Level Data Link Control (HDLC), Media Access control: Random Access, Controlled Access. SLE: Channelization	**08 Hours**
Module 5	**Introduction to Network Layer:** Network Layer Services, Packet Switching, Network Layer Performance, IPv4 Addresses. SLE: IPv6	**08 Hours**

Course Outcome:

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

- Explain the fundamentals of data communication.
- Illustrate the techniques for digital transmission and bandwidth utilization using various transmission media.
- Analyse the principles of protocol layering in modern communication systems.
- Demonstrate the working of physical, data link and network layer services using simulation tools such as Cisco packet tracer, Wireshark and so on (Additional CO).

Reference Books:

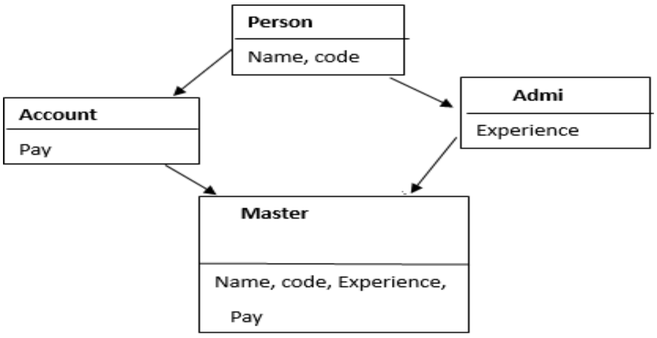
1. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2019
2. Nader F. Mir: Computer and Communication Networks, 2nd Edition, Pearson Education, 2015
3. William Stallings, Data and Computer Communication 10th Edition, Pearson Education, Inc., 2014

Programming in C++ (21CD45)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:0:1	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction to C++:** Introduction to Procedure-oriented programming vs. object-oriented programming, concepts of object-oriented programming. Overview of C++, Sample C++ program, Different data types, operators, expressions, and statements, arrays and strings, pointers & user-defined types Function Components, argument passing, inline functions, function overloading, recursive functions.	**08 Hours**
Module 2	**Classes, Objects and Polymorphism:** Class Specification, Class Objects, Scope resolution operator, Access members, Defining member functions, Data hiding, Constructors, Destructors, Static data members and functions. Constant data members and functions, mutable data members. Friend functions, Passing objects as arguments, Returning objects, Arrays of objects, Dynamic objects, Pointers to objects, Generic functions and classes, Operator overloading and their applications such as +, - , pre-increment, post-increment, [ ] etc.	**08 Hours**
Module 3	**Inheritance:** Introduction to Inheritance, Different types of Inheritances, Inheritance and protected members, protected base class inheritance, Constructors and Destructors in Inheritance, Granting access, Virtual base classes.	**08 Hours**
Module 4	**Run-time polymorphism and Exception handling:** Virtual functions and Polymorphism: Introduction to Virtual functions, calling a Virtual function through a base class reference, Inheritance of virtual attributes, Hierarchy of virtual functions, Pure virtual functions and Abstract classes, Early and late binding. **Exception Handling:** Exception handling fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived-Class Exceptions, Exception handling options: Catching All Exceptions, Restricting Exceptions & Re-throwing an Exception, user defined exceptions, Applying Exception Handling.	**08 Hours**
Module 5	**I/O System Basics and Standard template library:** I/O System Basics: The C++ I/O system basics: C++ stream classes, Formatted I/O, I/O manipulators; C++ file I/O: fstream and the File classes, File operations. STL: An overview, the container classes, general theory of operations, vectors, lists, maps.	**08 Hours**

Sl.	Experiments

No.	
1	Write a function using reference variables as arguments to swap the values of pair of integers.
2	Write a program to perform the addition of two complex numbers using friend function (use constructor function to initialize data members of complex class).
3	Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.
4	Write a C++ program to display names, roll no and grades of 3 students appeared in the examination. Declare the class containing the name, roll no and grade.
5	Define a class string and overload == to compare two strings and + operator for concatenation two strings.
6	Write a program to perform matrix addition using operator overloading concept.
7	Write a program to compute square root of a number. The input value must be tested for validity. If it is negative, the user defined function my_sqrt() should raise an exception.
8	Consider the class network diagram of Figure 1. Define all the four classes and write a program to create, update and display the information contained in Master objects.  Person Name, code Account Pay Admi Experience Master Name, code, Experience, Pay Figure 1
9	Create a class called STACK which represents one dimensional numeric array. Implement operations on the stack using integer and double data types. Use exception handling mechanism to handle overflow and underflow exceptions.
10	Write a C++ program to perform the following operations a) Read from the File b) Write into a File c) Copy contents from one file to another

Course Outcomes:

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

- Understand the features of C++ supporting object-oriented programming.
- Understand the relative merits of C++ as an object-oriented programming language.
- Understand how to apply the major object-oriented concepts to implement object-oriented programs in C++, encapsulation, inheritance and polymorphism.
- Understand advanced features of C++ specifically stream I/O, templates and operator overloading.
- Develop applications for a range of problems using object-oriented programming techniques using C++.

Reference Books:

1. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.
2. Stanley B.Lippmann, JoseeLajore: C++ Primer, 4th Edition, Pearson Education, 2005.
3. E Balagurusamy: Object Oriented Programming with C++, 7th Edition, Tata Mcgraw Hill Education, 2017
4. Paul J Deitel, Harvey M Deitel: C++ for Programmers, Pearson Education, 2009.
5. K R Venugopal, RajkumarBuyya, T Ravi Shankar: Mastering C++, Tata McGraw Hill, 2017
6. Yashavant P. Kanetkar: Let Us C++, 2nd Edition, BPB Publications.

Graph Algorithms (21CD46)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:0:1	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Graph Theory:** Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits.	**08 Hours**
Module 2	**Introduction to Graph Theory contd.:** Planar Graphs, Hamilton Paths and Cycles, Graph Colouring, and Chromatic Polynomials	**08 Hours**
Module 3	**Trees:** Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes	**08 Hours**
Module 4	**Optimization and Matching:** Dijkstra"s Shortest Path Algorithm, Minimal Spanning Trees - The algorithms of Kruskal and Prim, Transport Networks - Max-flow, Min-cut Theorem, Matching Theory	**08 Hours**
Module 5	**The Principle of Inclusion and Exclusion:** The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements - Nothing is in its Right Place, Rook Polynomials.	**08 Hours**

Sl. No.	List of Experiments
1	Obtain the Topological ordering of vertices in a given digraph.
2	Compute the transitive closure of a given directed graph using Warshall's algorithm.
3	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra"s algorithm
4	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm
5	Print all the nodes reachable from a given starting node in a digraph using BFS method.
6	Check whether a given graph is connected or not using DFS method.
7	Find Minimum Cost Spanning Tree of a given undirected graph using Prim"s algorithm
8	Find a subset of a given set S = {sl, s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1,2,6} and {1,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
9	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved.

Course Outcomes:

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

- Explain what a graph is and how it is used.
- Learn how to use algorithms to explore graphs, compute shortest distance, min spanning tree, and connected components.
- Implement a variety of algorithms such as topological sorting, prims, kruskals and Dijkstra's etc., in a high-level language to solve real-world problems.
- Implement the transitive closure of a directed graph using Warshall's algorithm.
- Analyse and differentiate DFS and BFS, prims and kruskals through high level programming languages.
- Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.

Reference Books:

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2004.
2. D.S. Chandrasekharaiah: Graph Theory and Combinatorics, Prism, 2020.
3. Chartrand Zhang: Introduction to Graph Theory, TMH, 2006.
4. Richard A. Brualdi: Introductory Combinatorics, 6th Edition, Pearson Education, 2018.
5. Geir Agnarsson & Raymond Geenlaw: Graph Theory, Pearson Education, 2018.

CONSTITUTION OF INDIA, PROFESSIONAL ETHICS & CYBER LAW (21CPH47)

Semester IV (Common to all branches)			
No. of Lecture hour/Week	1	CIE Marks	50
No. of Tutorial hours/week	0	SEE Marks	00
Total No. of Lecture hours	16	Exam Hours	00
L: T:P	1:0:0	Credits	01

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Indian Constitution:** Definition ofConstitution, Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the ConstituentAssembly. Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.	03 Hours
Module 2	**Fundamental Rights (FR's), Directive Principles of State Policy (DPSP's) and Fundamental Duties (FD's):**Fundamental Rights and its Restriction and limitations in different Complex Situations. DPSP"s and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation building.	03 Hours
Module 3	**Union Executive:** Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.	03 Hours
Module 4	**State Executive & Elections, Amendments and Emergency Provisions:** State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (Why and How) and Important Constitutional Amendments till today. Emergency Provisions.	03 Hours
Module 5	**Professional Ethics:** Definition of Ethics & Values. Professional & Engineering Ethics. Positive and Negative aspects of Engineering Ethics. **Cyber Laws:** Salient features of the IT Act, 2000, various authorities under IT Act and their powers. ; Penalties & Offences, amendments. **Computer & Cyber Security:** (a) Types of Attacks, (b) Network Security (c) Overview of Security threats, (d) Hacking Techniques, (e) Password cracking (f) Insecure Network connections, (g) Malicious code (h) Concept of Fire wall Security	04 Hours

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Course Outcomes:

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

- Have constitutional knowledge and legal literacy.

- Understand Engineering and Professional ethics and responsibilities of Engineers.
- Understand cyber threats & cyber laws, acts and their powers.

Reference Books:

1. Shubham Singla, „Constitution of India, Professional Ethics & Human Rights", CENGAGE Publications 2018.
2. Cyber Law & Cyber Crimes by Advocate Prashant Mali; Snow White publications, Mumbai.
3. Cyber Law in India by Farooq Ahmad; Pioneer Books.

ABILITY ENHANCEMENT COURSE II (21AEC48)

Semester IV (Common to all branches)			
No. of Lecture hour/Week	1	CIE Marks	50
No. of Tutorial hours/week	0	SEE Marks	00
Total No. of Lecture hours	16	Exam Hours	00
L: T:P	1:0:0	Credits	01

Modules	Course Content	Teaching Hours
Module 1	**Technical Report Writing:** Introduction to Technical writing process, Understanding of writing process, Introduction to various Technical Report writing.	03 Hours
Module 2	**Art of condensation and Paragraph Writing:** Introduction and importance, Types and principles of condensation. Importance of paragraph writing, Features and its construction styles.	03 Hours
Module 3	**Business Report Writing:** Introduction, Definition and Salient features of Business reports. Significance and types of report writing. (Formal and Informal). Resume building and Types of resumes. (Samples of resumes)	03 Hours
Module 4	**Technical Articles and Proposals:** Nature and significance, Types of technical Articles Journal articles and conference papers. Elements of technical articles. Introduction to technical proposal writing, Purpose, importance, structure and types of technical proposals.	04 Hours
Module 5	**Social media posts and Blog Writing:** Ethics and practices of social media posts, Principles and fundamentals, Guiding principles for composition of articles, some common pitfalls. Maintaining common etiquette. Blogs and Blog writings strategies.	03 Hours

Course Outcomes:

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

- Effectively communicate in technical matters.
- Practice preparation of gist, abstract and notes from a technical article.
- Prepare a business proposals and reports.
- Write and respond in social media and write blogs.

Reference Books:

1. Sanjay Kumar and Pushpalata, „Communication Skills", Oxford University Press. 2018.
2. M. Ashraf Rizvi, „Effective Technical Communication", McGraw Hill, 2018.
3. Gajendra Singh Chauhan and et.al. „Technical Communication", Cengage Publication, 2018.
4. Meenakshi Raman and Sangeeta Sharma, Technical Communication Principles and Practice, Oxford University Press, 2018.

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