Scheme of Instruction & Examination

Group B - CSE (AI&ML) & ECE

S. No	Course Code	Course Title	Semester - I						Credits
			Scheme of Instruction				Scheme of Examination		
			Hours Per week			Duration in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
Theory Courses									
1	M24BS102HS	Engineering Mathematics –I	**3**	**1**	**0**	**4**	**40**	**60**	**4**
2	M24BS101HS	Chemistry	**3**	**1**	**0**	**4**	**40**	**60**	**4**
3	M24HS101HS	English	**2**	**0**	**0**	**2**	**40**	**60**	**2**
4	M24ES105CS	Programming for Problem Solving	**3**	**0**	**0**	**3**	**40**	**60**	**3**
Laboratory Courses									
5	M24BS151HS	Chemistry Lab	**0**	**0**	**3**	**3**	**40**	**60**	**1.5**
6	M24HS151HS	English Lab	**0**	**0**	**2**	**2**	**40**	**60**	**1**
7	M24ES154CS	Programming for Problem Solving Lab	**0**	**0**	**2**	**2**	**40**	**60**	**1**
8	M24ES156ME	Engineering Workshop Practice	**0**	**0**	**4**	**4**	**40**	**60**	**2**
9	M24MC104HS	Yoga/NSS/Sports	**0**	**0**	**2**	**2**	**50**	**-**	**0**
		Total	**11**	**2**	**13**	**26**	**370**	**480**	**18.5**

S. No	Course Code	Course Title	Semester - II						Credits
			Scheme of Instruction				Scheme of Examination		
			Hours Per week			Duration in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
Theory Courses									
1	M24BS203HS	Engineering Mathematics –II	3	1	0	4	40	60	4
2	M24BS204HS	Engineering Physics	3	1	0	4	40	60	4
3	M24ES201CS	Data Structures	3	0	0	3	40	60	3
4	M24ES202EE	Fundamentals of Electrical and Electronics Engineering	3	0	0	3	40	60	3
5	M24MC203CE	Environmental Science	2	0	0	2	40	60	0
Laboratory Courses									
6	M24BS252HS	Engineering Physics Lab	0	0	3	3	40	60	1.5
7	M24ES251CS	Data Structures lab	0	0	2	2	40	60	1
8	M24ES252EE	Fundamentals Of Electrical And Electronics Engineering Lab	0	0	2	2	40	60	1
9	M24ES253CE	Engineering Graphics Lab	1	0	4	5	40	60	3
		Total	15	2	11	28	360	540	20.5

Note: In accordance with the National Credit Framework (NCrF), Which defines 1 credit as equivalent to 30 hours of learning, the conventional L: T:P (Lecture: Tutorial: Practical) distribution has been mapped to Notional Hours as reflected in the table below

S. No	Semester - I									Credits
	Course Code	Course Title	Scheme of Instruction					Scheme of Examination		
			Notional Hours					Maximum Marks		
			L	T	P/D	TW/SL	Total Notional Hours	CIE	SEE	
Theory Courses										
1	M24BS103HS	Engineering Mathematics –I	60	15	0	45	120	40	60	4
2	M24BS101HS	Chemistry	60	15	0	45	120	40	60	4
3	M24HS101HS	English	30	0	0	30	60	40	60	2
4	M24ES105CS	Programming for Problem Solving	45	15	0	30	90	40	60	3
Laboratory Courses										
5	M24BS151HS	Chemistry Lab	0	0	45	0	45	40	60	1.5
6	M24HS151HS	English Lab	0	0	30	0	30	40	60	1
7	M24ES154CS	Programming for Problem Solving Lab	0	0	30	0	30	40	60	1
8	M24ES156ME	Engineering Workshop Practice	0	0	60	0	60	40	60	2
9	M24MC104HS	Yoga/NSS/Sports	0	0	30	0	30	50	-	0
		Total	195	45	195	150	585	370	480	18.5

S. No	Semester - II									Credits
	Course Code	Course Title	Scheme of Instruction					Scheme of Examination		
			Notional Hours				Total Notional Hours	Maximum Marks		
			L	T	P/D	TW/SL		CIE	SEE	
Theory Courses										
1	M24BS202HS	Engineering Mathematics –II	60	15	-	45	120	40	60	4
2	M24BS204HS	Engineering Physics	60	15	-	45	120	40	60	4
3	M24ES201CS	Data Structures	45	15	0	30	90	40	60	3
4	M24ES202EE	Fundamentals of Electrical & Electronics Engineering	45	15	0	30	90	40	60	3
5	M24MC203CE	Environmental Science	30	0	0	0	30	40	60	0
Laboratory Courses										
6	M24BS252HS	Engineering Physics Lab	0	0	45	0	45	40	60	1.5
7	M24ES251CS	Data Structures lab	0	0	30	0	30	40	60	1
8	M24ES252EE	Fundamentals of Electrical and Electronics Engineering Lab	0	0	30	0	30	40	60	1
9	M24ES253CE	Engineering Graphics Lab	15	0	60	15	90	40	60	3
		Total	255	60	165	165	645	360	540	20.5

SEMESTER – I

Course Code	Course Title						Core/Elective
M24BS102HS	Engineering Mathematics (Common to CSE, CSE -AI, CSE (AI &ML), ECE EEE, CE & MECH)						Core
Prerequisites	**L**	**T**	**P/PW**	**TW/SL**	**CIE**	**SEE**	**Credits**
Basics of Matrices, Differentiation, Integration &Trigonometric results	**60**	**15**	**-**	**45**	**40**	**60**	**4**

Course Objectives: The objective of this course is to make the student

- Concept of a rank of the matrix and applying this concept to know the consistency and solve the system of linear equations.
- Concept of Eigenvalues and eigenvectors
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- To explain the Partial Derivatives and the extreme values of functions of two variables.
- Concept of Sequence and nature of the series.

Course Outcomes : After completion of the course, the student will be able to

CO1 : **Apply** the Matrix methods to solve the system of linear equations

CO2 : **Find** the Eigenvalues and Eigenvectors and its application to matrices

CO3 : **Solve** functions using the mean value theorems.

CO4 : **Find** the extreme values of functions of two variables with/ without constraints

CO5 : **Analyse** the nature of sequence and series

CO/PO Mapping : (Scale: 1-Slight, 2-Moderate, 3-High)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3		-	-	-	-	-	2	2	-	-
CO2	3	2	-	-	-	-	-	2	2	-	-
CO3	3	3	-	-	-	-	-	2	2	-	-
CO4	3	3	-	-	-	-	-	2	2	-	-
CO5	3		-	-	-	-	-	2	2	-	-

Unit I

Matrices: Rank of a matrix, Echelon form, Normal Form, System of linear Homogenous and non-homogenous equations, Linear dependence, independence of vectors, Linear transformation, Orthogonal transformation

Unit-II

Eigenvalues and Eigenvectors: Eigen values, Eigen vectors, Properties of eigenvalues, Cayley-Hamilton theorem, Diagonalization and LU Decomposition method.

Unit-III

Calculus of one variable: Rolle's Theorem, Lagrange's, Cauchy's Mean value theorems, Taylor's series, Curvature, Radius of curvature (Cartesian form), Circle of Curvature, Envelope of family of curves.

Unit-IV

Multivariable Calculus: Functions of two variables, Limits and continuity, Partial derivatives, Total derivatives and differentiability, Jacobian, Maximum and minimum of values of functions of two variables, Lagrange's method of undetermined multipliers.

Unit-V

Sequence and series: Sequences—General properties of series, Series of positive terms, Comparison test, tests of convergence-D' Alembert's Ratio test, Cauchy's n^{th} root test, Raabe's test, Alternating series, Series of positive and negative terms, Absolute convergence, and Conditional convergence.

Text Books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition, 2014.
2. B.V. Ramana, Higher Engineering Mathematics, 23rd reprint, 2015.
3. Jain & Iyengar, Advance Engineering Mathematics, 5thEdition, Narosa Publications.

References/Suggested Reading :

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9th Edition, 2012.
2. N.P. Bali, M. Goyal, A textbook of Engineering Mathematics, Laxmi Publications, 2010.
3. Dr. Abdul Majeed, N.P. Bali, Engineering Mathematics-I, Laxmi Publications.

https://ekumbh.aicte-india.org/allugcbook.php

Course Code	Course Title						Core/Elective
M24BS101HS	CHEMISTRY (All Branches)						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Electrochemistry & Batteries, Water & Corrosion, Engineering Materials (Polymers), Chemical fuels, Green Chemistry	60	15	-	45	40	60	4

Course Objectives:

The objective of this course is to make the student

- Apply the principles of electrochemistry in storage of electrical energy in batteries
- Rationalize bulk properties and processes using thermodynamic considerations
- Gains knowledge in causes of corrosion and its prevention. Attains knowledge about the disadvantages of hard water and treatment of water for drinking purpose
- Explain the influence of chemical structure on properties of materials and their choice in engineering applications
- Exposed to qualitative and quantitative parameters of chemical fuels

After completion of the course, the student will be able to

CO.1. **Apply** concept of electrode potential in identifying feasibility of electrochemical reaction; illustrate electro analytical techniques and working of batteries.

CO.2. **Identify** the mechanism of corrosion of materials on basis of electrochemical approach and devise corrosion control methods. Physical & Chemical parameters of Quality of Water and explain the process of Water treatment.

CO.3 **Explain** the influence of chemical structure on properties of materials and their choice in engineering applications.

CO.4 **Classify** chemical fuels and grade them through qualitative analysis

CO.5 **Relate** the concept of green chemistry to modify engineering processes and materials. Understand the concepts and applications of spectroscopy

CO/PO Mapping : (Scale:1-Slight, 2-Moderate, 3-High)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	3	-	3	3	-	-
CO2	3	-	-	-	-	3	-	3	3	-	-
CO3	3	-	-	-	-	3	-	3	3	-	-
CO4	3	-	-	-	-	3	-	3	3	-	-
CO5	3	-	-	-	-	2	-	3	3	-	-

Unit-I: (10 Hrs)

Electrochemistry and Batteries:

Electrochemistry: Electrolytic conductance, its types, factors affecting electrolytic conductance. Electrochemical cells, Electrolytic and Galvanic cells-notation, cell notation, cell reaction and cell potentials. Electrodes: Electrode potential and Standard Electrode Potential (SEP). Construction and function of Calomel Quinhydrone and Glass electrodes. Determination of pH of a solution by using Quinhydrone electrode. Thermodynamics of emf, Nernst equation and its derivation. Applications of Nernst equation to electrode potential and emf of cells. Numerical problems.

Batteries: Primary batteries: Zn - Carbon battery. **Secondary batteries**: Pb-Acid cell & battery and Li-Ion cell battery, Applications. **Flow batteries (Fuel cells):** Hydrogen-Oxygen fuel cells & functioning. Applications of batteries.

Unit-II: (10 Hrs)

Water Chemistry-its treatment and corrosion:

Water Chemistry: Hardness of Water-Types and units of hardness, Estimation of temporary and permanent hardness of water by EDTA method. Water softening by Ion exchange process and desalination of water by reverse osmosis method. Numerical problems. Specifications of potable water-Steps involved in treatment of water – Sterilization by Chlorination-Disinfection of water by chlorination and ozonisation. Break Point Chlorination – advantages.

Corrosion: Causes and effects of corrosion. Types of Corrosion- Dry corrosion –
Its types or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism. Concentration cell corrosion. Waterline, Pitting and galvanic corrosion. Factors effecting rate of corrosion.

Unit-III: (10 Hrs)

Engineering Materials:

Polymers: Basics of terms polymers: Monomer functionality, degree of polymerization. Types of Polymerization (i) Addition (ii) Condensation (iii) Co-Polymerization with examples. Classification of polymers - Thermoplastics & Thermosetting resins.

Plastics, Fibres, Elastomers, and their characteristics. Preparation, Properties & Uses of the following polymers: Plastics - PVC and Bakelite, Fibres - Nylon 6:6, and Dacron. Elastomers - Buna-S, Butyl Rubbers.

Conducting polymers: Concept, Classification and Mechanism of conduction in Trans Polyacetylene, Doped Conducting Polymers. Applications of conducting polymers.

Biodegradable polymers: Concept. Preparation, properties and applications of polylactic acid.

Unit-IV: (10 Hrs)

Chemical Fuels: Concept, definition and classification of fuels- Primary and secondary fuels. Solid, liquid and gaseous fuels. Characteristics of a good fuel. Calorific Value – High Calorific Value (HCV) and Low Calorific Value (LCV). Numerical problems.

Solid Fuels: Coal and its types. Analysis of coal - Proximate and Ultimate analysis. Numerical Problems.

Liquid Fuels: Petroleum- Fractional Distillation, Composition of Gasoline, Diesel and Kerosene. Cracking & its Significance- Catalytic cracking by moving bed method, Knocking. Fuel rating – Octane and Cetane numbers.

Gaseous Fuels: LPG, CNG – Composition, characteristics and applications.

Unit-V: (10 Hrs)

Spectroscopy- Description of Electromagnetic spectrum. **Principles of UV-Visible Spectroscopy**: Statement of Beer-Lambert Law. Absorption and intensity shifts: Bathochromic, Hypsochromic, Hyperchromic and Hypochromic shifts with one example each.

Principle and applications of UV

Sensors. UV Disinfection, UV Cure, Food & Beverage industry, Phototherapy, Horticulture and Agriculture.

IR Spectroscopy: Principle of IR Spectroscopy. Principle and applications of IR Sensors

NMR Spectroscopy: Principle of ^{1}H -NMR Spectroscopy. Multiplicity, Chemical Shift.

Green Chemistry: Concept, Mention - Principles of Green chemistry.

Text Books:

T1. P. C. Jain, M. Jain Engineering Chemistry, Dhanapathi Rai &sons (16th edition), New Delhi.

T2. B. R. Puri, L. R. Sharma and M. S. Pathania, "Principles of Physical Chemistry", S. Chand & Company Ltd., revised edition (2013).

T3. Sashi Chawla, -Engineering Chemistry, Dhanpat Rai & Sons, New Delhi, 2017 (1St January 2017)

T4. S. S. Dara and S. S. Umare -Engineering Chemistry, S.N. Chand & Co. New Delhi, 2004

Reference Books:

1. K. P. C. Volhardt and N. E. Schore, Organic Chemistry: Structure and Function
2. P. W. Atkins, Physical Chemistry
3. S. S. Dara and S. S. Umare -Engineering Chemistry , S.N. Chand & Co. New Delhi, 2004 4.
4. https://ekumbh.aicte-india.org/allugcbook.php

Course Code	Course Title						Core/Elective
M24HS101HS	ENGLISH						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Basic Knowledge of English	30		-	30	40	60	2

Course Objectives:

The following are the Objectives of the Course:

To enable and enhance the English language abilities of Engineering students, especially in reading and writing, by -

- Gaining proficiency in language through authentic materials.
- Introducing them to a variety of content-rich text.
- Strengthening their use of Grammar and Vocabulary.
- Improving their Reading and Comprehension skills.
- Honing their writing skills.
- Encouraging them to think creatively and critically.

Course Outcomes:

After completing the course, student will be able to:

CO1. Read and interpret a variety of written texts.
CO2. Use the right choice of words for effective communication in different contexts.
CO3. Speak and Write grammatically correct English in informal or formal situations or contexts (tenses, articles, prepositions, etc.)
CO4. Create effective paragraphs, essays, letters and SoPs.
CO5. Appreciate and analyze the form and content of the literary texts (prose and poetry).

CO/PO Mapping: (Scale:1-Slight, 2-Moderate, 3-High)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	**3**	-	**3**
CO2	-	-	-	-	-	-	-	-	**3**	-	**3**
CO3	-	-	-	-	-	-	-	-	**3**	-	**3**
CO4	-	-	-	-	-	-	-	**3**	**3**	-	**3**
CO5	-	-	-	-	-	-	3	**2**	**3**	-	**2**

Unit - I: (6 Hrs)

Reading : O. Henry "The Last Leaf"
Vocabulary : Word Formation – Prefixes, Suffixes , Root words
Grammar : Articles, Prepositions, Determiners
Writing : Types of Sentences; Guided Writing (Expanding the Outline / Writing from Verbal Cues)

Unit - II : (6 Hrs)
Reading : Rudyard Kipling, "If"
Vocabulary : Word Formation – Compounding and Blending, Contractions
Grammar : Transitions, Connectives, Question Tags
Writing : Précis & Paragraph Writing

Unit - III : (6 Hrs)
Reading : Martin Luther King Jr. "I Have A Dream"
Vocabulary : Synonyms, Antonyms, One-Word Substitutes
Grammar : Tense
Writing : Letter Writing (Letters to the Editor, Complaint Letters, Request Letters)

Unit - IV : (6 Hrs)
Reading : Martha C. Nussbaum "Silent Crisis" (Chapter – 1)
Vocabulary : Homophones, Homonyms, Homographs
Grammar : Voice
Writing : Reporting Events (Swearing in, Poll-Address, News Events, Visit to Book Exhibition, Annual / Farewell Day)

Unit - V : (6 Hrs)
Reading : Francis Bacon "Of Studies"
Vocabulary : Inclusive Language, Euphemism
Grammar : Narration (Direct – Indirect Speech)
Writing : SOP

Suggested Reading:

- Murphy, Raymond. *Grammar in Use*, Cambridge University Press
- Sudharshana, N. P., and C. Savitha. *English for Engineers*. Cambridge University Press, 2018
- Nussbaum, Martha C, Not for Profit: Why Democracy Needs the Humanities, Princeton University Press (2010)
- McCarthy, Michael, and Felicity Odell. *English Vocabulary in Use*.
- Kumar, E. Suresh. *Engineering English*. Orient Black Swan, 2014.
- https://ekumbh.aicte-india.org/allugcbook.php

Course Code	Course Title						Core / Elective
M24ES105CS	PROGRAMMING FOR PROBLEM SOLVING (Common to all Branches)						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Mathematical Knowledge, Logical and Analytical Thinking	45	15	0	30	40	60	3

Course Objectives:

The objective of this course is to make the student

1. To introduce the basic concepts of Computing environment, algorithms and flowcharts
2. To acquire knowledge about the basic concept of writing a program
3. To understand modular and structured programming constructs in C
4. To learn the usage of structured data types, data handling and memory management using pointers
5. To learn the pre-processor directives and file handling.

Course Outcomes:

After the completion of course the students will be able to:

CO 1. **Formulate** algorithms and learn fundamental program methodologies of C programming.

CO 2. **Apply** control statements to solve problems and **implement** derived data types in mathematical and engineering applications.

CO 3. **Develop** modular programming techniques to solve searching, sorting and file system problems

CO 4. **Implement** pointers and structures concept.

CO 5. **Recognize** pre-processor directives and user defined usage.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	1	-	2	2	3	3
CO2	3	3	2	-	2	-	-	-	1	-	2	2	3	2
CO3	3	3	2	1	3	-	-	-	1	1	2	2	3	3
CO4	3	2	2	-	3	-	-	-	-	-	2	1	3	3
CO5	3	2	2	-	3	-	-	-	1	-	2	2	3	3

UNIT- I

Introduction to Computers: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Algorithm, Flowchart / Pseudo code with examples

Introduction to C Language: History of C, Features, Structure of C program, Character set, Tokens, Variables, Data types, I/O statements, Type conversion, Syntax and Logical Errors in compilation, object and executable code.

UNIT- II

Operators and Control Structures: Operators, Operator precedence, Arithmetic expressions, Conditional Branching and Loops, Writing and valuation of conditionals and consequent branching

Arrays: Arrays (1-D, 2-D), Strings and its library functions.

UNIT- III

Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble and Selection).

Functions: Functions, storage classes, Parameter passing techniques, Passing arrays to functions, Recursion Concept, Command line arguments.

UNIT- IV

Pointers: Idea of pointers, Defining pointers, array of pointers, pointer arithmetic, dynamic memory allocation.

Structure: Structures, Defining structures and Array of Structures, self – referential structures, Unions concept, Functions and structures, Enum, Bitfields.

UNIT- V

Pre-processor Directives: File Inclusion, Macros Substitutions, Conditional Compilation.

File Handling: Introduction to File Handling, Types of files, File operations, File input/ output statements.

Text Books:

1. Computer Science A structured programming approach using C, Behrouz A. Forouzan and Richard F. Gilberg, 2nd Edition, Cengage Learning, 2007
2. Schaum's Outline of Programming with C, Byron Gottfried, 4th Edition, McGraw-Hill ,2019
3. Data Structures and Program Design in C, Robert Kruse, Bruce Leung, Tondo, 2nd Edition, Pearson

Reference Books :

1. Brian W Kenningham, Dennis M Ritchie, C Programming Language, Pearson, 2nd Edition
2. R G Dromey, how to solve it by Computer, Pearson Edition
3. https://ekumbh.aicte-india.org/allugcbook.php

Course Code	Course Title						Core/Elective
M24HS151HS	CHEMISTRY LAB						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Higher secondary level Chemistry	-	-	45	-	40	60	1.5

Course Objectives :

The objective of this course is to make the student

- To provide students with a practical approach towards the various techniques used in engineering application
- Practical awareness is inculcated and students are trained both quantitatively and qualitatively during the lab sessions so that their understanding and problem solving abilities can be enhanced
- Conduct experiments, take measurements and analyze the data through hands-on experience in order to demonstrate theoretical concepts of quantitative analysis while working in small groups
- Interpret the electro analytical principles with experimental results graphically
- Demonstrate writing skills through clear laboratory reports

Course Outcomes :

After completing the course, student will be able to :

CO.1. **Perform** accurate redox titrations by preparing and standardizing various solutions

CO.2. **Demonstrate** the ability to work with complexometric titrations and estimate total hardness of water

CO.3. **Calibrate** and use conductometer and perform titrations to estimate unknown concentration of solutions

CO.4. **Calibrate** and use potentiometer to determine unknown concentration of chemical solutions

CO.5. **Execute** colorimetric analysis to validate Beer's Law and to determine the concentration of unknown solutions.

CO/PO Mapping: (Scale:1-Slight, 2-Moderate, 3-High)

PO/ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	3	-	3	3	-	-
CO2	3	-	-	-	-	3	-	3	3	-	-
CO3	3	-	-	-	-	3	-	3	3	-	-
CO4	3	-	-	-	-	3	-	3	3	-	-
CO5	3	-	-	-	-	3	-	3	3	-	-

List of Experiments

1. Introduction to Chemical Analysis and Techniques of Weighing.

Volumetric Analysis

2. Preparation of Standard Mohr's salt solution, Standardization of $KMnO_4$ and Estimation of Ferrous ion.
3. Preparation of Standard $K_2Cr_2O_7$ solution, Standardization of Mohr's Salt Solution and Estimation of dichromate ion. ($Cr_2O_7^{2-}$)

Complexometry

4. Preparation of Standard Magnesium Sulphate Solution, Standardization of EDTA and Estimation of Total Hardness of water.
5. Preparation of Standard Sodium Carbonate Solution, Standardization of HCl and Estimation of Carbonate and Bicarbonate Alkalinity of Water Sample.

Conductometry

6. Estimation of HCl by Conductometry.
7. Estimation of CH_3CO_2H by Conductometry.
8. Estimation of Mixture of Acids by Conductometry.

Potentiometry

9. Estimation of HCl by Potentiometry (acid base titration)
10. Estimation of Fe^{2+} by Potentiometry (redox titration)

pH Metry

11. Estimation of HCl by pH Metry.

Colorimetry

12. Verification of Beers Law using KMnO4 and Estimation of Amount of KMnO4 in the given sample solution.

List of Additional Experiments

1. Estimation of CH_3CO_2H by pH Metry.

References:

1. B. D. Khosla, A. Gulati and V. Garg, -Senior Practical Physical Chemistry, R. Chand & Co., Delhi, 2011.
2. K. K. Sharma and D.S. Sharma, -An Introduction to Practical Chemistry, Vikas Publishers, New Delhi, 1982.

Course Code	Course Title						Core/Elective
M24HS151HS	English Lab						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Understanding of the English Alphabet and the Corresponding Sounds	-	-	30	-	40	60	1

Course Objectives :

The objective of this course is to make the student

- Learn the Sounds of English, Word Stress and Intonation patterns
- Gain knowledge of appropriate use of verbal and non-verbal communication
- Acquire the Techniques to actively Participate and Contribute to Group Discussions
- Hone their Presentation Skills
- Prepare learners to face interviews

Course Outcomes :

After completion of the course, the student will be able to

CO1 - **Use** correct pronunciation, stress and intonation while speaking English

CO2 - **Illustrate** ability to speak English coherently with less MTI

CO3 - **Utilize** appropriate verbal and non-verbal communication skills

CO4 - **Express** communication, interpersonal, leadership and team work skills in Group Discussions

CO5 - **Create** and demonstrate effective presentations and face interviews confidently

CO/PO Mapping: (Scale:1-Slight, 2-Moderate, 3-High)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
CO1	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	--	3	3	-	3
CO4	-	-	-	-	-	-	3	3	3	-	3
CO5	-	-	-	-	-	-	3	3	3	-	3

List of Experiments:

1. **Ice-breaking Session –** Self introduction and Introducing others
2. **Introduction to English Phonetics:** Organs of Speech: Speech Mechanism
3. **Sounds of English:** Introduction to International Phonetic Alphabet, Classification and Description of English Phonetic Sounds – Vowel & Consonant Sounds; Minimal Pairs; The Syllable
4. **Word Stress:** Primary Stress, Secondary Stress, Functional Stress, Rules of Word Stress
5. **Intonation:** Major Patterns of Intonation in English
6. **Speaking Activity: JAM**: an impromptu speech where the speaker is supposed to express the idea (s) on the given topic, within the duration of a **minute**.
7. **Role Play**: Use of dialogues in a variety of situations and settings
8. **Group Discussion**: Initiating, continuing and concluding a GD, Components and Types of GDs,
9. **Power-Point Presentation: (General Topics)** Making effective presentations, Expressions which can be used in presentations, Use of non-verbal communication, Coping with stage fright, Handling questions

Interview Skills : Facing interviews confidently, Use of suitable expressions during interviews; Mock interviews

Note : A minimum of eight experiments to be done.

Text Books :

T1. E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD).* Revised edition, Cambridge University Press India Pvt. Ltd. 2014

Reference / Suggested Reading :

R1. T. Balasubramanian. *A Text book of English Phonetics for Indian Students.*

Macmillan, 2008.

R2. Edgar Thorpe. *Winning at Interviews*. Pearson Education, 2006.

R3. J. Sethi et al., *A Practical Course in English Pronunciation (with CD).* Prentice Hall of India, 2005.

R4. Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews*. Tata**McGraw Hill, 2006.**

Course Code	Course Title						Core /Elective
M24ES154CS	PROGRAMMING FOR PROBLEM SOLVING LAB (Common to all Branches)						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
-	L	T	P/PW	TW/SL			
	0	0	30	0	40	60	1

Course Objectives:

The objective of this course is to make the student

1. Understand the fundamentals of programming in C Language.
2. Write, compile and debug programs in C.
3. Formulate solution to problems and implement in C.
4. Effectively choose programming components to solve computing problems
5. Implement file handling concepts.

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Choose** appropriate data type for implementing programs in C language

CO2. **Design** and **implement** modular programs involving input output operations, decision making and Looping constructs.

CO3. **Apply** derived data types and **implement** programs to store data in structures

CO4. Explain the concepts of file handling and **implement** programs for file operations

CO5. **Develop** confidence for self-education and ability towards lifelong learning need of computer Languages

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO /COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	-	-	2	3	3
CO2	3	3	3	2	3	-	-	2	2	2	-	2	3	3
CO3	3	2	2	-	2	-	-	1	2	-	-	2	3	3
CO4	2	2	2	2	3	-	-	-	1	-	-	1	2	3
CO5	1	1	-	-	1	-	1	1	1	-	3	1	2	2

LIST OF EXPERIMENTS

1. Finding maximum and minimum of given set of numbers, finding roots of quadratic equation.
2. Sin x and Cos x values using series expansion.
3. Generating Pascal triangle, pyramid of numbers.
4. Factorial, Fibonacci, GCD recursive and non-recursive procedures
5. Linear search and binary search using recursive and non-recursive procedures.
6. Bubble sort and selection sort.
7. Matrix addition and multiplication using arrays,
8. Programs on pointers: pointer to arrays, pointer to functions.
9. Programs on structures, union, enum and string manipulations.
10. File handling programs (Reading, Writing, Copying files)
11. Program illustrating using Command Line Arguments

LIST OF ADDITIONAL EXPERIMENTS:

1. Write a C program to illustrate type casting and type conversion (implicit and explicit) with suitable examples.
2. Implement string library functions manually (strlen, strcat, strcmp, strcpy).

Text Books:

1. Computer Science A structured programming approach using C, Behrouz A. Forouzan and Richard F. Gilberg, 2nd Edition , Cengage Learning , 2007
2. Schaum's Outline of Programming with C, Byron Gottfried, 4th Edition, McGraw-Hill, 2019
3. Data Structures and Program Design in C, Robert Kruse, Bruce Leung, Tondo, 2nd Edition, Pearson

Reference Books:

1. Brian W Kenningham, Dennis M Ritchie, C Programming Language, Pearson, 2nd Edition.
2. R G Dromey, How to solve it by Computer, Pearson Edition.

Course Code	Course Title						Core / Elective
M24ES156ME	Engineering Workshop Practice						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
-	-	-	60	-	40	60	2

Course Objectives :

The objective of the course is to make the students to :

1. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
2. To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
3. To gain basic knowledge on various manufacturing processes used for the production of various engineering products.
4. To gain hands on exposure on computer hardware and working knowledge on computers and software.

Course Outcomes:

After completion of the course, student will be able to:

CO1. **Handle** and demonstrate the usage of different tools in various manufacturing trades by following safety procedures.

CO2. **Perform** and execute basic jobs in engineering workshop trades such as fitting, carpentry, sheet metal, house wiring, welding, and foundry.

CO3. **Demonstrate** the setup and working of various machine tools and perform basic operations such as machining, injection moulding, casting, and 3D printing.

CO4. **Demonstrate** the operation of advanced machining processes such as CNC and rapid prototyping techniques.

CO5. **Assemble**, disassemble, and install various computer hardware components and operating systems such as Windows or Linux.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	-	3	3	3	1	3	3		3	-	2	1	2
CO2	2	1	2	-	-	-	3	3	2	-	-	3	1	2
CO3	3	-	1	2	1	3	1			2	3	3	3	-
CO4	-	2	-	-	1	2	-	3	3		2	2	1	1
CO5	-	1	-	3	1	-	-	-	2	1	-	-	1	-

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

List of Experiments:

A. TRADES FOR EXERCISES:

1. **CARPENTRY:** Sawing and Grooving, T-lap joint, Dove-tail Joint.
2. **FITTING:** Step Cutting & Filing, Drilling & Tapping, V-Fitting
3. **HOUSE WIRING**: Parallel & Series, Two-Way Switch.
4. **SHEET METAL WORKING:** Open Scoop, Funnel, Rectangle Tray.
5. **BLACK SMITHY:** Upsetting, Fullering, S-Hook
6. **WELDING:** Lap joint, Single V-butt joint, Corner joint
7. **PLUMBING:** Practice of External Pipe Threading, Pipe Fitting, Tap and Shower connections.

B. TRADES FOR DEMONSTRATION AND EXPOSURE:

1. Machines (lathe and drilling)
2. Injection Moulding
3. Mould making and Casting
4. 3D Printing

C. PRESENTATIONS AND VIDEOS LECTURES:

1. Manufacturing Methods
2. Glass Cutting
3. 3D Printing
4. CNC Lathe

D. IT-WORKSHOP : Computer hardware, Identification of parts, disassembling and assembling of computer, Computer output diagram, Operating System Installation.

Reference Books:

1. S. K. Hajra Choudhury, A. K. Hajra Choudhury, and Nirjhar Roy, Elements of Workshop Technology, Vol. I: Manufacturing Processes, Media Promoters, 16th Edition, 2021.
2. R.K.Jain, Production Technology, Vol. I & II, Khanna Publishers, 19th Edition, 2020.
3. Scott Mueller, Upgrading and Repairing PCs, Pearson Education, 22nd Edition, 2015.

SEMESTER - II

Course Code	Course Title						Core/Elective
M24BS203HS	Engineering Mathematics – II (Common to CSE, CSE -AI, CSE (AI &ML), ECE EEE, CE & MECH)						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Basics of Matrices, Differentiation, Integration &Trigonometric results.	60	15	-	45	40	60	4

Course Objectives:

It is intended to make the students to learn:

- To explain the relevant methods to solve first order differential equations.
- To explain the relevant methods to solve higher order differential equations
- The basic properties of vector valued functions and evaluate Double and Triple Integrals.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.
- To learn Laplace transforms its properties and its applications.

Course Outcomes:

After completing the course, student will be able to:

CO1: **Calculate** the solutions of first order linear differential equations.

CO2: **Calculate** the solutions of higher order linear differential equations.

CO3: **Apply** the vector differential operator to scalar and vector functions and evaluate multiple integrals

CO4: **Evaluate** the line, surface and volume integrals and converting them from one to another using Greens, Stokes and Gauss divergence theorems.

CO5: **Apply** properties of Laplace & inverse Laplace transforms to solve ordinary differential equations.

CO/PO Mapping Table : (Scale: 1-Slight, 2-Moderate, 3-High)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**3**	-	-	-	-	-	**2**	**2**	-	-
CO2	**3**	**2**	-	-	-	-	-	**2**	**2**	-	-
CO3	**3**	**3**	-	-	-	-	-	**2**	**2**	-	-
CO4	**3**	**3**	-	-	-	-	-	**2**	**2**	-	-
CO5	**3**	**2**	-	-	-	-	-	**2**	**2**	-	-

Unit-I

Differential Equations of First Order: Exact Differential Equations, Integrating Factors, Linear differential Equations, Bernoulli's Equation, Riccati's differential equations, Orthogonal Trajectories of a given Family of Curves.

Unit-II

Differential Equations of Higher Order: Solutions of second and higher order linear Homogenous Equations with Constant Coefficients, Solutions of non-homogeneous linear differential equations, Method of Variation of Parameters, Solution of Euler-Cauchy Equation. L-R & L-C-R circuits.

Unit-III

Vector Calculus: Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Double Integrals, Triple Integrals, Change of order of integration in double integral.

Unit-IV

Vector Integral Calculus: Line, Surface and Volume integrals, Green's theorem in a plane, Gauss's divergence theorem, Stoke's theorem (without proofs) and their verification.

Unit-V

Laplace Transforms: Laplace Transforms, Inverse Laplace Transforms, Properties of Laplace Transforms and inverse Laplace Transforms, Convolution Theorem (without proof). Solution of ordinary differential Equations using Laplace Transforms.

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition, 2014.
2. B.V. Ramana, Higher Engineering Mathematic s, 23rd reprint, 2015.
3. Advance Engineering Mathematics by Jain & Iyengar,5 Edition, Narosa Publications

References/Suggested Reading:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9th Edition, 2012.
2. N.P.Bali, M. Goyal, A textbook of Engineering Mathematics, Laxmi Publications, 2010.
3. Dr. Abdul Majeed, N.P.Bali, Engineering Mathematics-I, Laxmi Publications.
4. https://ekumbh.aicte-india.org/allugcbook.php

Course Code	Course Title						Core / Elective
M24BS204HS	ENGINEERING PHYSICS						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Basics of electron theory, Semiconductors, magnetic materials, basics of black body radiation.	60	15	-	45	40	60	4

Course Objectives: The objective of this course is to make the student

- To study about the apply their basic principles of laser systems and optical fibers
- Familiarize about crystal structure and study the properties of dielectric Magnetic and Superconducting materials for engineering applications.
- To study about wave function, de-Broglie's hypothesis and Schrodinger wave equation and its applications, quantum computing.
- Familiarize with classical and quantum electron theories and use band theory to classify solids.
- Acquire knowledge of preparation of thin films and basic concepts of Nano materials

Course Outcomes: After completion of the course, the student will be able to

CO1. **Explain** the lasing action in lasers, propagation of light in optical fibers and compile their applications in Engineering fields.

CO2. **Explain** the impact of crystallography on modern science. Analyze the properties of dielectric, magnetic, and superconducting materials for engineering applications.

CO3. **Apply** the principles of quantized energy levels, de-Broglie's hypothesis, and wave functions to solve problems and model applications in real-world quantum technologies

CO4. **Comprehend** the concept of energy bands and band gaps in solids. understanding of the principles, properties, and applications of semiconductors, preparing them for advanced studies and careers in electronics, materials science, and related fields

CO5. **Demonstrate** the preparation of thin films and nanomaterials to produce new functional materials for engineering applications.

CO/PO Mapping: (Scale:1-Slight, 2-Moderate, 3-High)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
CO1	3	2	-			2	3	3	3	-	2
CO2	3	1	-			3	3	3	2	-	2
CO3	3	2	-			3	1	3	2	-	1
CO4	3	2	-			3	2	3	2	-	2
CO5	3	1	-			3		3	2	-	2

Unit 1: (8 hrs)

Lasers: Characteristics of Lasers – monochromatic, directionality, coherence, divergence, Basic concepts of transitions - absorption, spontaneous and stimulated emissions, Einstein's theory of matter and radiation interaction (A & B coefficients), Concepts of meta stable states, population inversion and pumping, Components of lasers, Types of lasers- Ruby laser, CO_2 Laser, Semiconductor laser and Applications of lasers.

Fiber optics: Introduction to Optical fiber, structure of an optical fiber, Basic principle – total internal reflection, Concept of Numerical Aperture (NA) and acceptance angle, Derivation of Numerical Aperture – problems. Types of optical fibers – Step Index and Graded Index fibers (w.r.t to refractive index and mode of propagation), Fiber drawing process (Double crucible method), Applications of optical fibers.

Unit-II: (11 Hrs)

Crystallography: Introduction, Types of crystal systems, Space Lattice, Bravais lattices, Lattice planes and Miller Indices (Cubic system), Inter planar 'd' spacing (Cubic system) – problems.

Dielectric materials: Introduction, Types of dielectric polarizations – Expression for electronic polarizability, Frequency and temperature dependence of dielectric polarizations, Ferro electricity – Structure of Barium Titanate – Applications of ferroelectrics.

Magnetic materials: Classification of magnetic materials – Dia, para, ferro, antiferro and ferri magnetic materials. Domain theory of Ferromagnetism (qualitative), Hysteresis curve, Soft and hard magnetic materials and their applications.

Superconductivity: General properties of superconductors- Meissner effect, Type I and Type II superconductors, Applications of superconductors – magnetic levitation, SQUID.

Unit III (12 Hrs)

Quantum Mechanics: Introduction to Planck's Theory, de-Broglie's concept – wave nature of particles (de-Broglie wavelength), properties of wave function and its physical significance, Schrodinger's Time independent and Time dependent wave equations, Application of Schrodinger's Time independent - Particle in a 1D box. Tunnelling phenomena (qualitative)

Principles of Quantum Information & Quantum Computing: Introduction to Quantum Computing, Moore's law & its end, Differences between Classical & Quantum computing. Concept of qubit and its properties. Representation of qubit by Bloch sphere. Single and Two qubits. Extension to N qubits (qualitative)

Unit-IV: (11 Hrs)

Band theory of solids: Classical free electron theory and its limitations, Band theory – Kronig penny model (qualitative treatment), Energy bands in solids, Classification of materials as conductors, semiconductors and insulators.

Semiconductors: Introduction, Intrinsic and extrinsic semiconductors, carrier concentration and conductivity in intrinsic semiconductors, formation of P-N junction diode and its V-I characteristics, Thermistor, Hall effect and its applications.

Unit-V: (8 Hrs)

Thin Films: Introduction to bulk, thin and nano – Thin films preparation Techniques-Thermal evaporation method, Electron beam evaporation method, Applications - Construction and working of solar cell.

Nanomaterials: Properties of Nano materials, Surface to Volume ratio, Quantum Confinement, Preparation of Nano materials by Top-down method (Ball milling method), Applications - Carbon Nano tubes.

Text Books:

T1. S.L. Gupta and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai publications, 2011Edition, Reprint 2012.(Unit 1-4)

T2. B. K. Pandey and S. Chaturvedi, Engineering physics, Cengage Publications, 2012, 1st Edition. (Unit 1-5)

T3. M.N. Avadhanulu, P.G. Kshirsagar and TVS Arun Murthy, A Text Book Engineering Physics, 11th Edition, S. Chand, 2018.(Unit 1-4).

References/ Suggested Reading

R1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition Paperback – 1 January 2019

R2. V. Raghavan, Materials Science and Engineering, Prentice Hall India Learning Private Limited; 6th Revised Edition, 2015.

R3. K.L. Chopra, Thin film Phenomena, New York, McGraw – Hill, 1969.

R4. https://ekumbh.aicte-india.org/allugcbook.php

Course Code	Course Title						Core/Elective
M24HS201HS	DATA STRUCTURES						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
-	45	15	0	30	40	60	3

Course Objectives:

The objective of this course is to make the student

1. To study the importance of structuring the data for easy access and storage.
2. To know the implementation of various data structures.
3. To acquire skills in using generic principles for data representation and manipulation with a view for efficiency, maintainability and code reuse.
4. Understand the concept of sorting and searching.
5. To understand the basic concepts of advanced data structures

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Explain** dynamic memory management, **classify** data types, **illustrate** algorithms, and **interpret** asymptotic notations.

CO2. **Describe** how arrays, records, linked structures, stacks, Queue, and Graphs are represented in memory

CO3. **Develop** applications using Linear and Non-linear data structures.

CO4. **Implement** sorting and searching techniques.

CO5. **Apply** the suitable data structure for a real world problem and think critically for improvement in solutions.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

PO/ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	-		2	-	-	-	-	-	-	2	3	2	-
CO3	2	-	-	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	-	-	-	-	-	-	-	-	-	3	2	-
CO5	-	-	3	3	2	-	-	-	-	-	2	2	3	-

UNIT- I

Introduction to Algorithms: Introduction, Algorithm Specifications, Recursive Algorithms, Performance Analysis of an algorithm- Time and Space Complexity, Asymptotic Notations, Amortized Analysis

UNIT- II

Linked Lists ADT: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue

Doubly linked list: Operations like traversing, searching, insertion, deletion, Circular Linked Lists: operations like traversing, searching, insertion, deletion.

UNIT- III

Stacks and Queues: ADT Stack, operations and its applications like Expression Conversion and evaluation, Queue ADT and its operations: Linear Queue, Circular Queue, Dequeue

UNIT- IV

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree and their operations, Heaps.

UNIT-V

Sorting and Searching: Objective and properties of different sorting algorithms: Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Linear and Binary Search algorithms, Hashing (linear probing, random probing, quadratic probing, rehashing, double hashing), Dictionaries

Graph: Basic Terminologies and Representations, Graph traversal techniques.

Text Books:

1. Horowitz, Sahani& Freed Fundamentals of data structure in C, , 2nd Edition, Computer Science Press.
2. Gilberg and Forouzan, 2nd Data Structure- A Pseudo code approach with C, Edition, Thomson publication
3. Tanenbaum, Data structure in C, 1st Edition, PHI publication / Pearson publication.

Reference Books:

1. Jean-Paul Tremblay, Paul G Sorenson, Introduction to Data Structures with Applications, 2nd Edition,
2. M.A.Weiss, Data structures and Algorithm Analysis in C, 2nd Edition, Pearson.
3. Pai, Data Structures & Algorithms; Concepts, Techniques & Algorithms, Tata McGraw Hill.
4. https://ekumbh.aicte-india.org/allugcbook.php

Course Code	Course Title						Core /Elective
M24ES202EE	Fundamentals of Electrical and Electronics Engineering						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
Basics of Physics & Mathematics	L	T	P/PW	TW/SL			
	45	15	-	30	40	60	3

Course Objectives: The objective of this course is to make student

1. Understand the concepts of electrical circuits and network theorems.
2. Familiar with the principles of Dc machines and transformers.
3. Understand the control importance of protection devices.
4. Understand the concepts of electronic elements and rectifiers.

Course Outcomes: After completion of the course, the student will be able to

1. **Explain** concepts of Electrical Circuits, DC Machines, Transformers, Autotransformers, Diodes, Transistors and protective switches.
2. **Analyze** electrical circuits by applying the concept of network reduction techniques and theorem.
3. **Apply** basic laws to derive EMF equation of DC generator, Transformers and Torque equation of DC Motor.
4. **Compare** different types of DC Machines and different types of Transformers.
5. **Compare** Half & Full wave Rectifiers and Configurations of Transistors in CB, CE, CC modes.

CO-PO/PSO Mapping Table: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	2	2	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	-	-	-	-	-	2	2	-	-	-	-	-
AVG	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**

Unit-I: Introduction to Electrical Circuits:

Circuit Concepts, R-L-C Parameters, Voltage– Current relationship for Passive Elements, Voltage and Current Sources, Ohm's Law, Kirchhoff's Laws, Source Transformation, Series, Parallel, Series Parallel Combinations, Nodal and Mesh Analysis.

Unit-II: Network Theorems:

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Milliman's theorem, Tellegan's theorem (DC excitation only).

Unit-III: DC Machines:

Introduction to DC Generator and DC Motor, Basic construction of DC Machine, Principle of operation of Generator and Motor, EMF equation of DC generator, Torque equation of DC motor, separately excited machines, Self-excited machines-Series and Shunt machines, Open circuit characteristics of DC separately excited generator, characteristics of DC shunt motor, applications of DC machines (Qualitative analysis only).

Unit-IV: Transformers and Protection Devices:

Introduction to AC fundamentals, Introduction to transformers, Principle of operation, basic construction of transformer, EMF equation of Transformer, Autotransformer- Principle of operation, applications.

Switch, Fuse, Switch-Fuse Unit, MCB, MCCB, types of wires and cables, earthing.

Unit-V: Electronic Devices:

Review of P-N junction diode, Rectifiers- Half-wave rectifier and Full-wave rectifier-Mid-point type and bridge type rectifiers, Zener diode- forward and reverse biased conditions and its characteristics, Transistors- construction and working of BJT, configurations of BJT (CB, CE, CC,) and its characteristics, Transistor as an amplifier.

TEXT BOOKS:

1. N.K. De, "Basic Electrical Engineering", Universities Press, 2015.
2. J.B. Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K. Kataria & Sons Publications, 2002.
3. Electronic Devices and Circuits, S. Salivahanan, N. Suresh kumar, McGraw Hill.

REFERENCE BOOKS:

1. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "Basic Electrical Engineering" Tata McGraw Hill, Publications,2009
2. Electronic Devices and Circuits Theory, Boylsted, Prentice Hall Publications
3. https://ekumbh.aicte-india.org/allugcbook.php

Course Code	Course Title						Core /Elective
M24MC203CE	ENVIRONMENTAL SCIENCE						Mandatory
Prerequisites	Notional Hours				CIE	SEE	Credits
-	L	T	P/PW	TW/SL			
	30	-	-	-	40	60	NIL

Course Objectives:

The objective of the course is to make the students to:

1. Describe various types of natural resources available on the earth surface.
2. Explain the concepts of an ecosystem and the biotic and abiotic components of various aquatic ecosystems.
3. Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity.
4. Explain the causes, effects and control measures of various types of environmental pollutions.
5. Describe the methods for water conservation, the causes, effects of global warming, climate change, acid rain, ozone layer depletion, population explosion.

Course Outcomes:

After completion of the course, student will be able to:

CO 1. **Describe** the various types of natural resources.

CO 2. **Differentiate** between various biotic and abiotic components of ecosystem.

CO 3. **Examine** the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India.

CO 4. **Illustrate** causes, effects, and control measures of various types of environmental pollutions.

CO 5. **Explain** the methods of water conservation, causes, and effects of climate change, global warming, acid rain and ozone layer depletion, population explosion.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	3	3	-	-	-	-	3	2	-
CO2	3	2	-	-	-	3	2	-	-	-	-	3	-	-
CO3	2	-	--	--	--	3	3	--	--	--	--	3	3	--
CO4	2	2	-	-	-	3	3	-	-	-	-	3	2	-
CO5	2	2	--	--	--	3	3	--	--	--	--	3	3	--

Unit-I:

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, need for public awareness.

Natural Resources: Water Resources-Use and over utilization of surface and ground water, flood, drought, conflicts over water, Dams: Benefits and Problems. Food Resources-World Food Problems, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, Forest Resources-Use and over exploitation, deforestation & its effect on tribal people. Land Resources -Land Degradation, environmental effect of mining, man induced landslides, soil erosion and desertification**.** Energy Resources-Growing energy needs Renewable and Non-renewable energy resources.

Unit-II: Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in ecosystem, food chains, ecological pyramids, ecological succession, types of ecosystems (marine, pond, river, forest, grassland, desert)

Unit-III: Biodiversity: Levels of Biodiversity, Bio-geographical classification of India, Value of biodiversity, Threats to biodiversity, endangered and endemic species of India, Conservation of biodiversity, global and national efforts.

Unit-IV: Environmental Pollution: Definition, Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, solid waste management.

Environment Protection Act: Air, water, forest and wildlife Acts, issues in the enforcement of environmental legislation

Unit-V: Social Issues and the Environment: Watershed management and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle and disaster management in India.

Text Books:

1. Deswal S. and Deswal A., A Basic Course on Environmental studies, Dhanpat Rai & Co Pvt. Ltd. 2013.
2. Perspectives in Environmental Studies, Anubha Kaushik & C.P Kaushik, New Age International Publishers, 6th Edition 2018).

References/ Suggested Reading

1. Benny Joseph, Environmental Studies", Tata McGraw Hill (3rd Edition 2017).
2. Suresh K. Dhameja, Environmental Studies, S.K. Kataria & Sons, 2010.
3. Rajagopalan R., Environmental Studies, Second Edition, Oxford University Press, 2013.
4. V.K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE, 1999
5. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.
6. https://ekumbh.aicte-india.org/allugcbook.php

Course Code	Course Title	Notional Hours					Core /Elective	
M24BS252HS	ENGINEERING PHYSICS LAB						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
Higher secondary level Physics		-	-	45	-	1.5	40	60

Course Objectives: The objective of this course is to make the student

- To learn the proper use of various kinds of physics laboratory equipment using the theoretical knowledge
- To learn how data can be collected, presented and interpreted in a clear and concise manner
- To learn problem solving skills related to physics principles and interpretation of experimental data
- Understand the behaviour of semiconductors and opto-electronic devices.
- To determine error in experimental measurements and techniques used to minimize such error make the student as an active participant in each part of all lab exercises.

Course Outcomes: After completion of the course, the student will be able to

CO1. **Perform** analytical and experimental tasks by applying prerequisite hands-on skills in engineering laboratory setups.

CO2. **Perform** and calibrate precise measurement techniques while executing experiments to ensure accuracy and reliability of results

CO3. **Perform** experimental setups to measure and record the electrical properties of semiconductor materials, determine the energy gap, threshold voltage, and solar cell efficiency, and compile conclusions from the data.

CO4. **Handle,** calibrate, and test contemporary scientific instruments such as lasers and fiber optics to obtain accurate experimental data.

CO5. **Demonstrate** teamwork by presenting, explaining, and reviewing laboratory results collaboratively with peers.

CO/PO Mapping: (Scale:1-Slight, 2-Moderate, 3-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	–		–	–	–	3	–	–
CO2	2	2	3	–		–	–	–	3	–	–
CO3	3	3	2	–		–	–	–	3	–	–
CO4	2	–	–	–		–	–	–	3	–	–
CO5	3	–	–	–		–	–	–	3	–	–

LIST OF EXPERIMENTS

1. Determination of wavelength of laser using diffraction grating.
2. Determination of Numerical Aperture (NA) and Acceptance angle of an optical fiber
3. To find the dielectric constant of a given material
4. To draw the V-I characteristics of solar cell and to calculate fill factor.
5. To draw the V-I characteristics of P-N junction diode and to evaluate series resistance in forward and reverse bias conditions.
6. Thermistor characteristics, determine the constants A and B.
7. To find the value of energy gap of a given semiconductor.
8. Determination of carrier concentration, mobility and Hall co-efficient in a semiconductor using Hall Effect experiment.
9. To draw the curve between the magnetic field and Intensity of magnetization for a given specimen and to find out Coercivity and Retentivity of the specimen.
10. Synthesis of new materials using sol-gel.
11. To determine the rigidity modulus of the material of the given wire using Torsional Pendulum.
12. Photoelectric effect – Determination of Planck's constant.

Note: A minimum of eight experiments to be done.

References:

R1. S. L. Gupta and Dr. V. Kumar, "Practical physics with viva voice", Pragati Prakashan Publishers, Revised Edition, 2009

R2. M. N. Avadhanulu, A. A. Dani and Pokely P.M, "Experiments in Engineering Physics", S. Chand & Co, 2008

Course Code	Course Title						Core / Elective
M24ES251CS	DATA STRUCTURES LAB						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Programming and Problem Solving	0	0	30	0	40	60	1

Course Objectives:

The objective of this course is to make the student

1. Design and construct simple programs by using the concepts of structures as abstract data type.
2. To have a broad idea about how to use pointers to implement data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time application
5. Understand basics of sorting, searching, trees

Course Outcomes:

After the completion of course the students will be able to:

CO1. **Implemen**t linear data structures such as single Linked list, double linked list, stacks, queues using array

CO2. **Demonstrate** the conversion between infix, postfix, and prefix notations.

CO3. **Explain** the properties of non-linear data structures and **implement** trees and graphs.

CO4. **Apply** and **analyze** hashing techniques for efficient data storage and retrieval.

CO5. **Implement** various kinds of searching, sorting and traversal techniques and know when to choose which technique

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2		3			1	1			2	3	3
CO2	2	3	2	1	2			1	2			1	2	2
CO3	3	3	3	2	3			2	2	1		2	3	3
CO4	2	3	2	2	3			1	1			1	2	3
CO5	3	3	2	2	3			1						

LIST OF EXPERIMENTS

1. Implementation of Stacks, Queues ADT using arrays
2. Implementation of Stacks, Queues ADT using linked lists.
3. Implementation of Singly Linked List, Doubly Linked List and Circular List ADT.
4. Implementation of stack and use it to convert infix to postfix expression and postfix evaluation
5. Implementation of Binary search tree and its operations (creation, traversal, min & max, search)
6. Implementation of operations on AVL trees ADT
7. Implementation of Linear search and Binary Search
8. Implementation of Hashing collision resolution techniques.
9. Implementation of Insertion Sort, Selection Sort
10. Implementation of Merge Sort, Quick Sort
11. Implementation of Heap Sort.
12. Implementation of DFS and BFS

LIST OF ADDITIONAL EXPERIMENTS:

1. **Write a C program to implement Minimum Spanning Tree (MST) using Kruskal's and Prim's Algorithms.**
2. **Write a C program to implement Dijkstra's Algorithm to find the shortest path in a graph.**

Text Books:

1. Horowitz, Sahani& Freed Fundamentals of data structure in C, , 2nd Edition, Computer Science Press.
2. Gilberg and Forouzan, 2nd Data Structure- A Pseudo code approach with C, Edition, Thomson publication
3. Tanenbaum, Data structure in C, 1st Edition, PHI publication / Pearson publication.

Reference Books:

1. Jean-Paul Tremblay, Paul G Sorenson, Introduction to Data Structures with Applications, 2nd Edition,
2. M.A.Weiss, Data structures and Algorithm Analysis in C, 2nd Edition, Pearson.
3. Pai, Data Structures & Algorithms; Concepts, Techniques & Algorithms, Tata McGraw Hill.

Course Code	Course Title						Core /Elective
M24ES251EE	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/PW	TW/SL			
Basics of Physics & Mathematics, FEEE	-	-	30	-	40	60	1

Course Objectives: The objective of this course is to make student

1. Understand the concepts of electrical circuits and network theorems.
2. Familiar with the principles of Dc machines and transformers.
3. Understand the control importance of protection devices.
4. Understand the concepts of electronic elements and rectifiers.

Course Outcomes: After completion of the course, the student will be able to

1. **Measure** electrical parameters such as R, L, C using **electrical instruments** such as LCR meter, and multimeter with accuracy.
2. **Master** fundamental laws and theorems (KVL, KCL, Superposition, Thevenin's, Norton's theorems) using appropriate tools and techniques.
3. **Master network theorems** to simplify circuits for maximum power transfer and to validate theoretical principles (Tellegen's and Millman's theorem) through experimentation.
4. **Perform testing of electrical machines** such as DC generators, shunt motors, and transformers under various loading conditions to determine their characteristic behaviour.
5. **Assemble electronic components** like diodes, Zener diodes, and BJTs to **perform** experiment and plot V-I characteristics to distinguish their operational behaviour and applications.

CO-PO/PSO Mapping Table: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	3	3	-	-	-	-	-
CO2	3	3	-	2	-	-	-	3	3	-	-	-	-	-
CO3	3	3	-	-	-	-	-	3	3	-	-	-	-	-
CO4	3	3	-	2	-	-	-	3	3	-	-	-	-	-
CO5	3	3	-	2	-	-	-	3	3	-	-	-	-	-
AVG	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**-**

LIST OF EXPERIMENTS

1. CRO- applications, measurements of R, L, C using LCR meter, colour coding method.
2. Verification of KVL and KCL.
3. Verification of Superposition theorem.
4. Verification of Thevenin's theorem.
5. Verification of Norton's theorem.
6. Verification of Milliman's theorem.
7. Verification of Maximum power transfer theorem.
8. Verification of Tellegan's theorem.
9. OCC characteristics of DC Generator.
10. Load test on DC Shunt Motor.
11. Loading of transformer- measurement of primary and secondary voltages and currents.
12. V-I Characteristics of silicon and Germanium type P-N Junction diodes.
13. V-I Characteristics of silicon and Germanium type of Zener diodes.
14. V-I Characteristics of BJT in CB configuration.

Note: A minimum of ten experiments to be done from the above list of experiments.

REFERENCE BOOKS:

1. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "Basic Electrical Engineering" Tata McGraw Hill, Publications,2009
2. Electronic Devices and Circuits Theory, Boylsted, Prentice Hall Publications

Course Code	Course Title						Core/Elective
M24ES253CE	ENGINEERING GRAPHICS						Core
Prerequisites	Notional Hours				CIE	SEE	Credits
	L	T	P/Drg	TW/SL			
-	15	-	60	15	40	60	3

Course Objectives:

The objective of the course is to make the students to:

1. Inculcate a good understanding of engineering drawing conventions & their significance.
2. Impart skills to make technical drawings.
3. Impart capability to identify and draw engineering curves to scale.
4. Develop skills of drafting projections of standard geometric entities (points, lines, planes, solids with section).
5. Develop 3d visualization skills to understand 2d drawings in 3d space & vice versa.

Course Outcomes:

After completion of the course, student will be able to:

CO1. **Demonstrate** the use of drawing instruments and AutoCAD basic commands to reproduce engineering graphics with accuracy.

CO2. **Construct** and execute engineering curves such as conic sections, cycloids, and involutes using AutoCAD with precision.

CO3. **Develop** orthographic projections of points, lines, planes, and solids in various orientations by applying AutoCAD drafting skills.

CO4. **Illustrate** sectional views and surface developments of prisms, pyramids, cylinders, and cones using AutoCAD tools.

CO5. **Create** and generate isometric and orthographic projections of simple and compound solids using AutoCAD for effective visualization of 3D objects.

CO-PO Mapping Table: (Scale: 1-Slight, 2-Moderate, 3-High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	-	-	-	1	2	-	3	3	2
CO2	3	2	2	1	3	-	-	-	1	2	-	3	3	2
CO3	3	3	2	2	3	-	-	-	1	2	-	3	3	2
CO4	3	3	2	2	3	-	-	-	1	2	-	3	3	2
CO5	3	3	3	2	3	-	-	-	1	2	-	3	3	2

List of experiments:

1. Principles of Engineering Graphics and their significance, Usage of drawing instruments.
2. Introduction to AutoCAD-Basic commands and simple drawings
3. Conic Sections – I Construction of ellipse, parabola and hyperbola given focus and eccentricity.
4. Conic Sections – II Construction of ellipse (given major and minor axis), parabola (given base and height).
5. Cycloids (cycloid & epicycloid) and Involutes (involute of triangle, square)
6. Scales (plain & diagonal scales)
7. Orthographic Projections - Projections of points placed in different quadrants.
8. Projections of straight lines. Lines parallel to both the planes, line perpendicular to or inclined to one reference plane
9. Projections of planes – I: Orthographic projection of planes in different positions
10. Projections of solids – I: Regular Prism/Pyramids, cylinders & cones, Projections of solids in simple position
11. Projection of solids – II: Projections of solids when the axes inclined to one or both the reference planes
12. Section of solids – I: When the sectional plane is parallel or perpendicular to one reference plane
13. Section of solids – II: When the sectional plane is inclined to one reference plane
14. Development of surfaces-I Prism and Cylinders
15. Development of Surfaces-II Pyramids and Cones
16. Isometric projection - I: Conversion of 3D Isometric/oblique views of compound solids to 2D Orthographic views.

Text Books:

1. Engineering Drawing, ND Bhatt, Charotar Publication, 53rd Edition, 2014 (All sheets)
2. Engineering Drawing, KL Narayana & P Kannaiha, Scitech publications, 3rd Edition, 2013 (All sheets).

References:

1. Engineering Drawing and Graphics Technology, T.E French et al, Mc Graw Hill International.
2. Engineering Drawing Graphics & Auto cad, K Venugopal, New Age International.
3. Engineering Drawing with a primer on Auto cad, AN Siddique et al, Prentice Hall of India Ltd.
4. Engineering Drawing, Basant Agrawal & C M Agrawal, McGraw Hill Publications, Third edition 2019