Chemical Engineering

Scheme and Syllabus (With effect from 2020-21 admitted batch)

B.Tech I Year - I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits C
			L	T	P				
CH-1101	BS	Mathematics – I	3	0	0	30	70	100	3
CH-1102	BS	Chemistry	3	0	0	30	70	100	3
CH-1103	HSS	English	3	0	0	30	70	100	3
CH-1104	ES	CPNM	3	0	3	30	70	100	3
CH-1105	ES	Basic Electrical Engineering	3	0	0	30	70	100	3
CH-1106	HSS	English Language Lab	0	0	2	50	50	100	1.5
CH-1107	BS	Chemistry Lab	0	0	3	50	50	100	1.5
CH-1108	ES	CPNM Lab	0	0	3	50	50	100	1.5
Total Credits									**19.5**

B.Tech I Year - II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits C
			L	T	P				
CH-1201	BS	Mathematics – II	3	0	0	30	70	100	3
CH-1202	BS	Physics	3	0	0	30	70	100	3
CH-1203	ES	Engineering Graphics	1	0	4	30	70	100	3
CH-1204	ES	Material Science & Engineering	3	0	0	30	70	100	3
CH-1205	ES	Mechanical Engineering	3	0	0	30	70	100	3
CH-1206	ES	Workshop Lab	0	0	3	50	50	100	1.5
CH-1207	BS	Physics Lab	0	0	3	50	50	100	1.5
CH-1208	ES	General Engineering Lab. (Mechanical Engineering/ Electrical Engineering)	0	0	3	50	50	100	1.5
Total Credits									**19.5**

CH-1101

MATHEMATICS-I

Course Objectives:

- To transmit the knowledge of Partial differentiation.
- To know of getting maxima and minima of function of two variables and finding errors and approximations.
- To evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.

Course Outcomes:

- Find the partial derivatives of functions of two or more variables.
- Evaluate maxima and minima, errors and approximations.
- Evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.
- Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

Syllabus

(Partial Differentiation)

Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs)

(Applications of Partial Differentiation)

Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima

of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

(Multiple Integrals)

Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

(Multiple Integrals-Applications)

Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Center of gravity - Moment of inertia - product of inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

(Fourier Series)

Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis.

TEXT BOOK:

Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

REFERENCE BOOKS:

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

*****

CH-1102

CHEMISTRY

Course Objectives:

- To apply the basic knowledge of Chemistry to the Engineering Discipline.
- To develop knowledge about water and its treatment for industrial and potable purposes.
- To develop understanding in the areas of Polymers, Mechanism of Corrosion of Metals and Corrosion Control Methods, Fuels, Lubricants and Nanomaterials for of conducting polymers, bio-degradable polymers and fiber reinforced plastics and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Course outcome:

- This course applies the basic concepts and principles studied in Chemistry to Engineering.
- It provides an application of chemistry to different branches of engineering
- The students will be able acquire knowledge in the areas of Water Chemistry,Polymers, Corrosion, Fuels and Lubricants and nanomaterials and suggest innovative solutions for existing challenges in these areas.

Syllabus

Water Chemistry

Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Polymers and Plastics

Polymers: Definition – Types of Polymerization (Addition & Condensation) – Mechanisms of Addition Polymerization – Radical and Ionic – Thermodynamics of Polymerization Process. **Plastics:** Thermosetting and Thermoplastics – Effect of Polymer Structure on Properties of Cellulose Derivatives – Vinyl Resins – Nylon (6,6), Reinforced Plastics – Conducting Polymers.

Corrosion

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion.

Corrosion Controlling Methods: Protective Coatings: Metallic Coatings, Electroplating and Electroless Plating – Chemical conversion Coatings – Phosphate, Chromate, Anodized, Organic Coatings – Paints and Special Paints.

Fuels and Lubricants

Solid Fuels: Wood and Coal, Ranking of Coal – Analysis (Proximate and Ultimate) Coke Manufacture – Otto Hoffmann's Process – Applications; **Liquid Fuels:** Petroleum Refining – Motor Fuels – Petrol and Diesel Oil – Knocking – Octane number – Cetane Number; **Gaseous Fuels:** Biogas, LPG and CNG – Characteristics – Applications; **Rocket Fuels:** Propellants – Classification – Characteristics

Lubricants: Classification – Mechanism – Properties of Lubricating Oils – Selection of Lubricants for Engineering Applications.

Nanomaterials

Nanomaterials, Properties and application of fullerenes, fullerols, Carbon nanotubes and nanowires. Synthesis - Top-down and Bottom-up approaches - Nanocomposites - Nanoelectronics- Applications of nanomaterials in catalysis, telecommunication and medicine.

Text Books:

1. Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, New Delhi.
2. A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi.

Reference Books:

1. Engineering Chemistry – B. K. Sharma – Krishna Prakashan – Meerut.
2. Introduction to Nanoscience - S. M. Lindsay - Oxford University Press
3. Engineering Chemistry - B. L. Tembe, Kamaluddin and M. S. Krishnan, (NPTEL).

CH-1103

ENGLISH

Course Objectives:

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts;
- To apply relevant writing formats to draft essays, letters, emails and presentations; and
- To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problem solving.

Course Outcomes:

- Students will be able to analyse a given text and discover the various aspects related to language and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication; and
- Learn to apply the topics in real-life situations for creative and critical use.

Syllabus

On the conduct of life: William Hazlitt

Life skills: Values and Ethics

If: Rudyard Kipling

The Brook: Alfred Tennyson

Life skills: Self-Improvement

How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki

Life skills: Time Management

On saving Time: Seneca

Chindu Yellama

Life skills: Innovation

Muhammad Yunus

Politics and the English Language: George Orwell

Life skills: Motivation

Dancer with a White Parasol: Ranjana Dave

Grammar:

Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers – Clichés, Redundancies.

Vocabulary:

Introduction to Word Formation – Root Words from other Languages – Prefixes and Suffixes – Synonyms, Antonyms – Common Abbreviations

Writing:

Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary

Writing: Essay Writing

Life skills: Innovation

Muhammad Yunus

Textbook: *Language and Life: A Skills Approach* Board of Editors, Orient Blackswan Publishers, India. 2018.

References :

1. *Practical English Usage*, Michael Swan. OUP. 1995.
2. *Remedial English Grammar*, F.T. Wood. Macmillan.2007
3. *On Writing Well*, William Zinsser. Harper Resource Book. 2001
4. *Study Writing*, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

5. *Communication Skills*, Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. *Exercises in Spoken English*, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

CH-1104

CPNM

Course Objectives:

- The course is designed to provide complete knowledge of C language.
- To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To provide knowledge to the Students to develop logics which will help them to create programs, applications in C.
- This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
- This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes:

- **Identify** basic elements of C programming structures like data types, expressions, control statements, various simple functions and **Apply** them in problem solving.
- **Apply** various operations on derived data types like arrays and strings in problem **solving**.
- **Design** and Implement of modular Programming and memory management using Functions, pointers.
- **Apply** Structure, Unions and File handling techniques to **Design** and **Solve** different engineering programs with minimal complexity.
- **Apply** Numerical methods to **Solve** the complex Engineering problems.

Syllabus

1. Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output.

2. Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else..if ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

3. Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

4. Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications

5. Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

6. File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments-Program Applications

7. Numerical Methods: Solutions of Algebraic and Transcendental Equations, Bisection Method, Newton Raphson Method. Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rules. Solutions of Ordinary First Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Text Book:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.
2. Introduction to Numerical Methods, SS Sastry, Prentice Hall

Reference Books:

1. Let Us C ,YashwantKanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.
4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M. Barone (Author), Enzo Marinari (Author), Giovanni Organtini, World Scientific.

CH-1105

BASIC ELECTRICAL ENGINEERING

Course Objectives:

- An understanding of basic EE abstractions depends on analysis and design of electric and magnetic circuits and its elements.
- To provide the students with knowledge of fundamental laws in electrical engineering
- To develop the ability of the students to analyze electrical and magnetic circuits using the basic laws of electrical engineering
- To expose the students to the concepts of various types of electrical machines and application of electrical machines.
- To inculcate the understanding about the AC fundamentals
- To prepare the students to have a basic knowledge of transformers
- To acknowledge about three phase induction motor and its operating principle
- To know about the fundamentals of synchronous motors and its working principle

Course Outcomes:

After the completion of the course, the student should be able

- To predict the behavior of any electrical and magnetic circuits.
- student will be able to state and explain the basic laws of electromagnetic induction.
- To impart knowledge on Constructional details, principle of operation, types of Electrical Machines performance Characteristics ,speed control methods and its applications
- Ability to conduct experiments on Ac Machines to find its characteristics.
- Abel to calculate performance characteristics of transformer like regulation and efficiency
- The ability to formulate and then analyze the working of synchronous motors
- Able to solve simple problems on synchronous motors

Syllabus:

Magnetic circuits: Definitions of magnetic circuit, reluctance, magneto motive force (mmf), magnetic flux, simple problems on magnetic circuits, hysterisis loss (chapter 8, page nos. 155-175),

Electromagnetic induction: Faraday's laws of electromagnetic induction, induced E.M.F., dynamically induced E.M.F, statistically induced EMF, self inductance, mutual inductance (Chapter 9, page nos. 176-190),

D.C. generators: D.C generator principle, construction of D.C generator, E.M.F equation of D.C generator, types of D.C generators, armature reaction, losses in D.C generator, efficiency, characteristics of D.C generators, applications of D.C generators (chapter 10, 11, pages 208-238),

D.C. motors: D.C motor principle, working of D.C motors, significance of back, E.M.F, torque equation of D.C motors, types of D.C motors, characteristics of D.C motors, speed control methods of D.C motors, applications of D.C motor, testing of D.C machines, losses and efficiency, direct load test and Swinburne's test (Chapter 12, 13, page Nos. 239-269),

A.C. circuits: Introduction to steady state analysis of A.C circuits, single and balanced 3 phase circuits (chapter 16, page nos. 323-348),

Transformers: Transformer principle, EMF-equation of transformer, transformer on load, equivalent circuit of transformer, voltage regulation of transformer, losses in a transformer, calculation of efficiency and regulation by open circuit and short circuit tests (Chapter 20, page Nos. 423-455),

Three phase inductance motor: Induction motor working principle, construction of 3-phase induction motor, principle of operation, types of 3-phase induction motor, torque equation of induction motor, slip-torque characteristics, starting torque, torque under running condition,

maximum torque equation, power stages of induction motor, efficiency calculation of induction motor by direct loading (Chapter 21, page nos. 463-489),

Altemator: Altenator working principle, EMF equation of altenator, voltage regulation by Synchronised impedance method (Chapter 23, page nos. 505-515),

Synchonous motor: Synchronous motor principle of operation, construction, methods of starting of synchronous motor, (Chapter- 24, page nos. 516-526),

Text book:

1. 'Elements of Electrical Engineering & Electronics' by V.K. Mehta, S.Chand & Co.

Reference book:

'A first course in Electrical Engineering' by Kothari.

CH-1106

ENGLISH LANGUAGE LAB

Course Objectives:

- To make students recognize the sounds of English through Audio-Visual aids;
- To help students build their confidence and help them to overcome their inhibitions and self- consciousness while speaking in English;
- To familiarize the students with stress and intonation and enable them to speak English effectively; and
- To give learners exposure to and practice in speaking in both formal and informal contexts.

Course Outcomes:

- Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
- A study of the communicative items in the laboratory will help students become successful in the competitive world;
- Students will be able to participate in group activities like roleplays, group discussions and debates; and
- Students will be able to express themselves fluently and accurately in social as well professional context.

Syllabus

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation.

Reference Books:

1. Ashraf Rizvi. *Effective Technical Communication*. Tata McGraw Hill Education Private Limited, New Delhi.
2. *Speak Well*. Orient Blackswan Publishers, Hyderabad.
3. Allan Pease. *Body Language*. Manjul Publishing House, New Delhi.

CH-1107

CHEMISTRY LAB

Course Objectives:

- To develop the fine skills of quantitative determination of various chemical components through titrimetric analysis
- To prepare and use ion exchange / zeolite columns for the removal of hardness of water
- To develop the skill of organic synthesis through the preparation of a polymer/ drug

Course Outcomes:

- The course provides quantitative determine the amount of various chemical species in solutions by titrations and conduct the quantitative determinations with accuracy
- The course provides to develop novel materials to be used as zeolite and prepare columns for removal of hardness of water
- The course provides to synthesis a polymer or a drug

Syllabus

1. Determination of Sodium Hydroxide with HCl (Na_2CO_3 Primary Standard)
2. Determination of Alkalinity (Carbonate and Hydroxide) of water sample
3. Determination of Fe(II)/Mohr's Salt by Permanganometry
4. Determination of Oxalic Acid by Permanganometry
5. Determination of Chromium (VI) by Mohr's Salt Solution
6. Determination of Zinc by EDTA method
7. Determination of Hardness of Water sample by EDTA method
8. Determination of Chlorine in water by Iodometric Titration
9. Ionexchange/ Zeolite column for removal of hardness of water

10. Synthesis of Polymer/ drug

Reference Books:

1. Vogel's Quantitative Chemical Analysis – V – Edition – Longman.
2. Experiments in Applied Chemistry (For Engineering Students) – Sinita Rattan – S. K. Kataria & Sons, New Delhi

CH-1108

CPNM LAB

Course Objectives:

- To impart writing skill of C programming to the students and solving problems.
- To write and execute programs in C to solve problems such as Modularize the problems into small modules and then convert them into programs.,
- To write and execute programs in C to solve problems such as arrays, files, strings, structures and different numerical methods.
- This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes:

- Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
- Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.
- Apply and practice logical ability to solve the real world problems.
- Apply Numerical methods to Solve the complex Engineering problems.

Syllabus

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line?

2. Write a program, which generates 100 random integers in the range of 1 to 100. Store them in an array and then print the arrays. Write 3 versions of the program using different loop constructs. (e.g. for, while, and do while).
3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, Copying one string to another, Reversing a string, adding one string to another.
4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float, and double. What happens when you add 1 to the largest possible integer number that can be stored?
5. Write a program, which generates 100 random real numbers in the range of 10.0 to 20.0, and sort them in descending order.
6. Write a function for transposing a square matrix in place (in place means that you are not allowed to have full temporary matrix).
7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.
8. Given two points on the surface of the sphere, write a program to determine the smallest arc length between them.
9. Implement bisection method to find the square root of a given number to a given accuracy.
10. Implement Newton Raphson method to det. a root of polynomial equation.
11. Given table of x and corresponding f(x) values, Write a program which will determine f(x) value at an intermediate x value by using Lagrange's interpolation/
12. Write a function which will invert a matrix.
13. Implement Simpson's rule for numerical integration.
14. Write a program to solve a set of linear algebraic equations.

CH-1201

MATHEMATICS – II

Course Objectives:

- The way of obtaining rank, eigen values and eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form from a given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes:

- Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

Syllabus

(Linear Algebra)

Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

(Eigen Values and Eigen Vectors)

Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

(Ordinary Differential Equations of First Order and its Applications)

Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

(Differential Equations of Higher Order)

Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

(Laplace Transforms)

Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by t^n - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace

Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

TEXT BOOK:

Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43r^{d} edition, Khanna publishers.

REFERENCE BOOKS:

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

CH-1202

PHYSICS

Course Objectives:

- To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.
- To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.
- To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
- To Learn basics of lasers and optical fibers and their use in some applications.
- To Understand concepts and principles in quantum mechanics and Nanopahse Materials. Relate them to some applications.

Course Outcomes:

- Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.
- Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications .
- Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a single slit
- Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fiber. Realize their role in optical fiber communication.

- Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

Syllabus

THERMODYNAMICS

Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

ELECTROMAGNETISM

Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonics : Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonics.

OPTICS

Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit **(**Qualitative and quantitative treatment**)**.

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

LASERS and FIBRE OPTICS

Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers

Introduction to optical fibers, principle of propagation of light in optical fibers, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibers, Fibre optics in communications, Application of optical fibers.

MODERN PHYSICS

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi conductors and insulators.

Nanophase Materials

Introduction, properties, Top-down and bottom up approaches, Synthesis - Ball milling, Chemical vapour deposition method , sol-gel methods, Applications of nano materials.

TEXT BOOKS :

1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand
3. Engineering Physics by R.K. Gaur and S.L. Gupta –Dhanpat Rai

Reference Books:

1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

CH-1203

ENGINEERING GRAPHICS

Course Objectives:

- Understand the basics of Engineering Graphics and BIS conventions.
- Develop the graphical skills for communication of concepts, ideas and design of engineering products through technical drawings
- Demonstrate and practice the various profiles/curves used in engineering practice through standard procedures.
- Demonstrate and practice the orthographic projections of points, lines, planes, solids and section of solids
- Demonstrate and practice the development of surfaces of simple solids
- Familiarize the basic concept of isometric views clearly.

Course Outcomes:

- Develop simple engineering drawings by considering BIS standards.
- Able to draw different engineering curves with standard Procedures
- Comprehend the basics of orthographic projections and deduce orthographic projections of points, lines, planes and solids at different orientations in real life environment.
- Visualize clearly the sections of solids.
- Apply the concepts of development of surfaces while designing/analyzing any product.
- Recognize the significance of isometric drawing to relate 2D environment with 3D environment.

Syllabus

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions, and Scales.

Curves: Conic sections: General construction of ellipse, parabola and hyperbola. Construction of involutes of circle and polygons only. Normal and tangent to curves.

Projections of Points: Principal or Reference Planes, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane.

Projections of Straight Line Inclined to Both the Reference Planes: Projections of Planes: Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other reference plane and perpendicular to one reference plane and inclined to other reference plane. Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids (Prism, Pyramid, Cylinder and Cone) in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Isometric Views: Isometric projection, Isometric scale and Isometric view. Isometric view of Prisms, Pyramids, cylinder, cone, and their combinations.

Text Book:

Elementary Engineering Drawing by N.D.Bhatt, Charotar Publishing House.

Reference:

Engineering Graphics by K.L. Narayana and P. Kannaiah, Tata Mc-Graw Hill

CH-1204

MATERIALS SCIENCE & ENGINEERING

Course Objectives:

Materials science and engineering is an important subject to every engineer to understand about the materials' behavior in different environments. Main objectives of the study are as follows:

1. To understand the structure of atoms
2. To learn something about the crystalline nature of the materials
3. To know about the influence of atoms controlling the properties of materials
4. To know the equivalency of the materials for replacement
5. To learn to prepare alloys, composites for conventional materials
6. To find the relation between arrangement an thermodynamic properties of materials

Course Outcomes:

1. To know about the appropriate utility of materials based on their nature.
2. To know the behavior of the materials w.r.t their directions.
3. To know the behaviour of materials exposed to different conditions in different phases.
4. To calculate the stability materials and knew the importance of crystalllinity.
5. Selectivity of the materials for suitable design to manufacture the machines
6. To improve the properties choosing alternative materials suchas alloys, composites instead of conventional materials (to minimize fractures, wear and tear).
7. Leads to prepare some knew semiconductors for important purposes.

An introduction to materials, classification of engineering materials, brief review of atomic structure, calculation of energy of electron of Bohr's atomic model, Bonds in materials – classification, properties of ionic, covalent and metallic solids, variation in bonding character and properties. Crystal Geometry and crystal structure – solids- crystalline solids and amorphous solids (non-crystalline), differences between crystalline and non-crystalline materials. Ideal

crystal, space Lattice, unit cell, primitive cell, non-primitive cell, lattice co-ordinates, Bravis lattices for crystal systems, crystal systems and their properties, symmetry and elements of symmetry, Atomic packing faction and packing efficiency (SC, BCC, FCC, Diamond cubic and HCP structures), c/a ratio for HCP structure. Miller indices for directions and linear density calculation, planes in crystals and their representation, planar density calculation, coordination number. Determination of crystal Structure by X-ray diffraction method – Debye method, numerical problems for different cubic structures (SC, BCC and FCC).

Fundamentals of thermodynamics – stability and meta-stability of materials, internal energy (E), enthalpy (H), Gibb's free Energy (G), and thermal entropy and configurational entropy (S). solid solutions-types, crystal imperfections – classification, point defects- classification and estimation of point defects in the crystals; Imperfections (dislocations) – classification (edge and screw); Berger circuits and Burgers Vector, planar defects, volume defects, dislocation reactions, role of dislocations in determining crystal properties; surface defects - types

Mechanical Properties: Stress –types of stresses; Strain-types of strain; true stress and true strain, engineering stress and engineering strain of the materials, relation between engineering strain and true strain, relation between engineering stress and true stress; Hooke's Law; Poisson's Ratio, stress-strain diagram and its uses; different moduli of elasticity – Young's modulus, shear modulus, and bulk modulus; relation between different moduli of elasticity, strain vs stress relationship diagrams for different materials (metals, non-metals, rubbers and plastics and polymers); elastic deformation and plastic deformation and their differences. Critical Resolved shear stress (CRSS). Fracture – types, ductile fracture and its mechanism, brittle fracture and its mechanism (Griffith's criteria), fatigue factors affecting the fatigue, creep and creep failure mechanisms, creep resistance materials. Composite materials – classification, advantages of composite materials over conventional materials, Limitations of composite materials, factors affecting the performance of fibrous composites, factors affecting the performance of matrix in composites,

Phase- time scale for phase changes, Phase diagrams- phase rule, single component systems, Binary phase changes, the lever rule and numerical problems, advantages of phase diagrams,

advantages of alloying of metals on the properties of steels, Iron-iron carbide (Fe-Fe_3C) phase diagram, limitations of plain carbon steels, types of steels used in chemical industries,

Corrosion and prevention: Principles and mechanism of corrosion, types of corrosion cells: composition cell, concentration cell, stress cells, Different forms of corrosion, prevention and control of corrosion: proper selection of materials, proper design and fabrication procedure, application of protective coatings.

Text books:

1. `Materials Science & Engineering' by V.Raghavan, Prentice Hall of India Ltd, New Delhi
2. `Elements of Materials Science & Engineering', 5th Edition, Lawrence H.VanVlack, Addision-Weley Publishing Company

Reference books:

1. `Science of Engineering Materials', Vols.1-3, by Manas Chanda, McMillan Company of India, Delhi
2. `Principles of Materials Science & Engineering', William F.Smith, McGraw-Hill Publishing Co.
3. `Essentials of Materials Science' by A.G. Guy.
4. A textbook of Engineering physics, by Dr.M.N.Avadhanulu and Dr.P.G.Kshirsagar; S.Chand and company pvt Ltd. Chapters 26 and 27.
5.. An introduction to corrosion science and engineering By Herbert Uhilig and R. Winston Revie, Published by John Wiley and sons, New York.
6. Corrosion Engineering by Mars.G.Fontana, McGraw-Hill, publication

CH-1205

MECHANICAL ENGINEERING

Course Objectives:

- To be aware of the basics in Thermodynamics
- To get knowledge on applications of steam tables
- To understand the principles and applications of IC engines, compressors and turbines
- To comprehend the principles of belts, chain drives and gears

Course Outcomes:

- To Know the thermodynamic laws and various processes
- To make out the applications of steam in boilers and turbines
- To derive the various performance parameters related to IC engines and of air compressors
- To arrive basic needs of working of belts, chain drives and gears

Syllabus:

Thermodynamics: Definitions, systems, classification of thermodynamic systems, cycles and zeroth law of thermodynamics, first law of thermodynamics, closed system, flow processes, open systems with steady flow process, applications of steady flow energy equation to engineering systems.

Second law of thermodynamics: Carnot cycle, inequality of Classius-reversible Carnot cycle, entropy, relation between heat and entropy, general expression for entropy change, entropy change of a perfect gas during various thermodynamic processes, air standard cycles, Otto, diesel, dual combustion cycles,

Properties of steam and use of steam tables: Boilers, classification steam boilers, simple vertical, Cochran, locomotive boiler, Babcock and Wilcox boiler, steam generation, Rankine cycle.

Impulse and reaction turbine: Classification of steam turbines, velocity diagram and power produced in impulse turbine, performance of steam turbines, reduction of rotor speed,

I C engines: Classification-main composition of IC engines, carburettor, fuel pump injector, cooling systems for IC engines, working of 2-stroke and 4-stroke petrol and diesel engines, power and efficiency of IC engines.

Reciprocating air-compressors: Single stage, work done during cycle, effect of clearance, two stage compressors, condition for minimum work, effect of inter-cooling, efficiency.

Drives: Belts, expression for the ratios of tension on the slack and tight side, power transmitted – V-belts, chain drives, gears – spur, helical, bevel gear, trains simple and compound.

Text books:

1. A Text Book of Thermal Engineering by R. S. Khurmi and J. K. Gupta
2. 'Theory of Machines' by R. S. Khurmi

Reference books:

1. 'Engineering Thermodynamics' by P.K.Nag
2. 'Engineering Thermodynamics' by J.B.Jones and R.E.Dugar
3. 'Engineering Thermodynamics' by R.K.Rajput
4. 'Theory of Machines' by Balani

CH-1206

WORKSHOP LAB

Course Objectives:

- Get hands on experience with the working skills in Carpentry trade.
- Know how to work with Sheet Metal tools.
- Get familiar with the working skills of Metal Fitting operations.
- Get hands on experience with house hold electrical wiring.

Course Outcomes:

- Can be able to work with Wood Materials in real time applications.
- Can be able to build various parts with Sheet Metal in day-to-day life.
- Can be able to apply Metal Fitting skills in various applications.
- Can be able to apply this knowledge to basic house electrical wiring and repairs.

Syllabus

Carpentry: Any three jobs from – Half lap joint, Mortise and Tenon joint, Half – lap Dovetail joint, Corner Dovetail joint, Central Bridle joint.
Sheet Metal: Any three jobs from – Square tray, Taper tray(sides), Funnel, Elbow pipe joint.
Fitting: Any three jobs from – Square, Hexagon, Rectangular fit, Circular fit and Triangular fit.
House wiring: Any three jobs from – Tube light wiring, Ceiling fan wiring, Stair-case wiring, Corridor wiring.

References:

1. Elements of workshop technology, Vol.1 by S. K. and H. K. Choudary.
2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas.

CH-1207

PHYSICS LAB

Course Objectives:

- To enable the students to acquire skill, technique and utilization of the Instruments
- Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.
- To impart the practical knowledge in basic concepts of Wave optics, Lasers and Fiber optics.
- To familiarize the handling of basic physical apparatus like Vernier callipers, screw gauge, spectrometers, travelling microscope, laser device, optical fibre, etc.

Course Outcomes:

- Ability to design and conduct experiments as well as to analyze and interpret
- Ability to apply experimental skills to determine the physical quantities related to Heat, Electromagnetism and Optics
- The student will learn to draw the relevance between theoretical knowledge and the means to imply it in a practical manner by performing various relative experiments.

Syllabus

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current Carrying Circular Coil.
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer.
5. Determination of Refractive Index of Ordinary ray μ_o and Extraordinary μ_e ray.

6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth's Magnetic Field.
10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.
11. Carey Foster's Bridge – Verification of laws of Resistance and Determination Of Specific Resistance.
12. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.
13. Photoelectric cell-Characteristics.
14. Planks Constants.
15. Laser- Diffraction.

CH-1208

GENERAL ENGINEERING LABORATORY

MECHANICAL ENGINEERING LABORATORY

Course Objectives:

- To be aware of the viscosity, flash point of oil samples and calorific value of a gas
- To get knowledge on calibration of pressure gauge, flywheel and torsional pendulum
- To understand the principles and applications of Air compressors and IC engines

Course Outcomes:

- To determine the viscosity, flash point and calorific value of fluids
- To make out the applications of pressure gauge, flywheel and torsional pendulum
- To derive performance parameters related to IC engines and efficiencies of air compressor

Experiments

1. Find the viscosity of the given sample of oil using Redwood viscometer-1
2. Find the viscosity of the given sample of oil using Redwood viscometer-II
3. Find the flash point of the given sample of oil using Abel's flash point tester
4. To calibrate pressure gauge using standard pressure and standard weights
5. Draw the valve timing diagram of a 4-stroke diesel engine and port timing diagram of a 2-stroke petrol engine
6. Perform load test at full load, half load, ¼ th load on a 4-stroke Ruston engine and draw the performance curves
7. Find the volumetric efficiency, isothermal efficiency of the given compressor

8. To determine the moment of inertia of a fly-wheel and shaft experimentally and compare the values with the calculated values
9. To determine experimentally the calorific value of a gaseous fuel by using Junkers gas calorimeter
10. To determine the modulus of rigidity of the material of the wire by torsional oscillators

ELECTRICAL ENGINEERING LABORATORY

Course Objectives

This course provides

- Insight of fundamental laws in electrical engineering.
- Deals with the constructional and operational details of DC and AC machines.
- Analyze electrical and magnetic circuits using basic laws of electrical engineering

Course Outcomes

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

- Understand the basic laws of electrical and magnetic circuits.
- Analyze the characteristics of DC generator and motors.
- Design of equivalent circuit of transformer.
- Apply the basic knowledge to solve problems on synchronous machines.

Experiments

1. Study and calibration of ammeter
2. Study and calibration of voltmeter
3. Study and calibration of wattmeter
4. Study and calibration of energy meter
5. Measurement of low resistance (armature)
6. Measurement of medium resistance (field)
7. Measurement of insulation resistance
8. Measurement of filament resistance

9. Verification of KCL and KVC
10. Superposition theorem.
11. Parameters of a choke coil
12. OC and SC tests on transformer
13. Load test D.C. shunt machine
14. OC test on DC,. separately excited machine
15. Swinburne's test
16. 3-phase induction motor (No load and rotor block tests)
17. Alternator regulation by Syn. impedance method