

## MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

## B.Tech. I and II Semester

Scheme of Instruction and Examination

[Common to CE, EEE, ECE, ME, MCT and MME]

(Choice Based Credit System)

For the batch to be admitted in the academic year 2021-22

## I Semester

S.No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
Induction Program									
1	MA101BS	Mathematics-I	3	1	0	30	70	3	4
2	PH101BS	Engineering Physics	3	1	0	30	70	3	4
3	CS101ES	Programming for problem solving	3	1	0	30	70	3	4
4	ME101ES	Engineering Graphics	1	0	4	30	70	3	3
5	MC101ESC	Environmental Science	3	0	0	30	70	3	0
	PH151BS	Engineering Physics Lab	0	0	3	30	70	3	1.5
7	CS151ES	Programming for problem solving Lab	0	0	3	30	70	3	1.5
<b>Total Hours/Marks/Credits</b>			<b>13</b>	<b>3</b>	<b>10</b>	<b>210</b>	<b>490</b>	<b>---</b>	<b>18</b>

## II-Semester

S. No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	EN201HS	English	2	0	0	30	70	3	2
2	MA202BS	Mathematics-II	3	1	0	30	70	3	4
3	CH201BS	Chemistry	3	1	0	30	70	3	4
4	ME202ES	Engineering Mechanics	3	1	0	30	70	3	4
5	EN251HS	English Language & Communication skills Lab	0	0	2	30	70	3	1
6	CH251BS	Engineering Chemistry Lab	0	0	3	30	70	3	1.5
7	ME251ES	Engineering Workshop	1	0	3	30	70	3	2.5
<b>Total Hours/Marks/Credits</b>			<b>12</b>	<b>3</b>	<b>8</b>	<b>210</b>	<b>490</b>		<b>19</b>

L: Lecture

T: Tutorial

D: Drawing

P: Practical

CIE: Continuous Internal Evaluation

SEE: Semester End Examination

L	T	P	C
3	1	0	4

**B.Tech. I Semester  
MA101BS: Mathematics-I  
(Common to all Branches)**

**Course Objectives**

<p>To learn</p> <ul style="list-style-type: none"> <li>• The concept of the rank of a matrix and applying it to know the consistency and solution of the system of linear equations.</li> <li>• The concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form.</li> <li>• Concept of Sequences and Series.</li> <li>• Geometrical approach to the mean value theorems and their application and evaluation of improper integrals using Beta and Gamma functions.</li> <li>• The concept of partial differentiation, total derivative and finding maxima and minima of function of two and three variables.</li> </ul>
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**Course Outcomes**

<p>After learning the contents of this paper, the student must be able to</p> <ul style="list-style-type: none"> <li>• Write the matrix representation of a set of linear equations and analyze the solution of the system of equations.</li> <li>• Find the eigen values and eigen vectors &amp; reduce the quadratic form to canonical form using orthogonal transformations.</li> <li>• Analyze the nature of sequences and series.</li> <li>• Evaluate the improper integrals using Beta and Gamma functions.</li> <li>• Find the extreme values of functions of two variables with/ without constraints.</li> </ul>
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**Unit-I: Matrices**

Types of Matrices - Real Matrix, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex matrix, Hermitian, Skew-Hermitian and Unitary Matrices; Elementary Transformations, Definition of rank of a Matrix, Computation of rank of a matrix by reducing it into Echelon form and Normal form; Inverse of a Matrix by Gauss-Jordan method; System of linear equations-Solution of Homogeneous Systems, Consistency and Solution of system of Non-Homogeneous linear equations by Rank Method; Direct Method-Gauss elimination method; Indirect Method-Gauss Jacobi Method, Gauss Seidel Iteration Method.

**Unit-II: Eigen values and Eigen vectors**

Definition of Vectors, Norm of a vector, Linearly dependent, Linearly independent and Orthogonal Vectors; Linear Transformation and Orthogonal Transformation, Eigen values and Eigenvectors and their properties; Diagonalization of a Matrix, Modal Matrix, Normalised Modal Matrix; Cayley-Hamilton Theorem (without proof), finding inverse and power of a Matrix by Cayley-Hamilton Theorem; Quadratic Forms, Index, Signature and Nature of the Quadratic Forms, reduction of Quadratic Form to Canonical Forms by Orthogonal Transformation.

**Unit-III: Sequences & Series**

Sequence: Definition of a Sequence, Limit, Convergent, Divergent and Oscillatory Sequences; Series: Convergent, Divergent and Oscillatory Series; Geometric Series Test; Series of positive terms- Comparison test, p-test, D-Alembert's ratio test, Raabe's test, Cauchy's Integral test, Cauchy's  $n^{\text{th}}$  root test, Logarithmic test; Alternating series; Leibnitz test, Absolute and Conditionally Convergence.

**Unit-IV: Calculus**

Basic concepts of limit, continuity and differentiability of function of single variables; Mean value theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation and applications, Cauchy's mean value Theorem. Taylor's series; Definition of Improper Integral: Beta, Gamma functions and their properties.

**Unit-V: Multivariable calculus**

Definitions of limit and continuity for functions of several variables; Partial Differentiation- Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence; Maxima and Minima of functions of two variables and three variables using method of Lagrange multipliers.

**Suggested Readings:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.

**Reference Books:**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup> Reprint, 2010.

L	T	P	C
3	1	0	4

**B.Tech. I Semester**  
**PH101BS: Engineering Physics**  
**(Common to CE, ME, MCT & MME)**

**Course Objectives**

The objectives of the course is to make the student

- Acquire knowledge about motion of body in various coordinate systems
- To understand the harmonic motion in mechanical and electrical oscillatory systems
- Study of wave motion in one dimensional systems
- To understand the basics of interference and diffraction phenomena in optics.
- To understand the interaction of light with matter.

**Course Outcomes**

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

- Gain knowledge on motion of physical bodies in different coordinate systems, harmonic motion, motion of waves in one-dimension, Optical Phenomena like Interference, diffraction and the principles of lasers and Fiber Optics.
- Compare the various types of coordinates systems and apply them for various problems in their respective engineering fields
- Understand various harmonic systems and affects in decay of oscillations.
- Apply the concepts of propagation of waves in different media like transmission of optical and acoustic signals.
- Familiarize and apply the concepts of optics and radiation-matter interaction.

**Unit-I: Introduction to Mechanics**

Review of scalars and vectors, transformation of scalars and vectors under rotation transformation, forces in nature, Newton's laws and its completeness in describing particle motion, form invariance of Newton's second law.

Solving Newton's equations of motion in polar, cylindrical and spherical coordinates. motion with constraints and friction: Atwood's machine and motion of a body on an inclined plane.

**Unit-II: Harmonic Oscillations**

Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator: over damped, critical and under damped, logarithmic decrement – relaxation time.

Energy decay of damped harmonic oscillator, quality factor, damped electrical harmonic oscillators - LCR circuits, Mechanical and electrical impedance, forced harmonic oscillator and its power absorption.

**Unit-III: Waves in One Dimension**

Transverse wave on a string, the wave equation on a string, harmonics, reflection and transmission of waves at a boundary, impedance matching.

Standing waves and their Eigen frequencies, longitudinal waves in bar - velocity of longitudinal wave in a bar, acoustic waves and velocity of sound in gas.

**Unit-IV: Wave Optics**

Interference: Huygen's principle, superposition of waves and interference of light by wave front division and amplitude division, Young's double slit experiment, interference in thin films due to reflected light. Newton's rings, Michelson's interferometer.

Diffraction: Fresnel's and Fraunhofer's diffraction, Fraunhofer's diffraction due to single slit, double slit, diffraction grating - resolving power.

**Unit-V: Lasers and Fibre Optics**

Lasers: Absorption, spontaneous emission, stimulated emission, population inversion, Einstein coefficients, characteristics of lasers, principle, construction and working of laser: ruby laser, carbon dioxide (CO<sub>2</sub>) laser, He-Ne laser and semiconductor lasers, applications of lasers.

Fiber Optics: Introduction, optical fiber and its principle, acceptance angle, numerical aperture, step and graded index fibers, attenuation mechanism in optical fibers, applications of optical fibers.

**Suggested Readings:**

1. Manoj K. Harbola, Vijaya Krishna T. and Madhu Mohan T., Engineering Mechanics, Cengage Learning, 2018.
2. Pain H.J., “The physics of vibrations and waves”, Wiley, 2006.
3. Ajoy Ghatak , “Optics”, McGraw Hill Education, 2012.

**Reference Books:**

1. Harbola M.K., Engineering Mechanics, 2nd ed.- Cengage Learning
2. Main I.G., “Vibrations and waves in physics’, 3rd Ed<sup>n</sup>, Cambridge University Press, 2018.
3. Svelto O., “Principles of Lasers” Springer 5<sup>th</sup> Edition, 2010 .

L	T	P	C
3	1	0	4

**B.Tech. I Semester**  
**CS101ES: Programming for Problem Solving**  
**(Common to CE, EEE, ME, ECE, MCT & MME)**

**Course Objectives**

- |   |
|---|
| <ul style="list-style-type: none"> <li>• To learn the fundamentals of computers.</li> <li>• To understand the various steps in Program development.</li> <li>• To learn the syntax and semantics of C Programming Language.</li> <li>• To learn how to write modular and readable C Programs.</li> <li>• To learn structured programming approach in solving problems.</li> </ul> |
|---|

**Course Outcomes**

- |  |
|--|
| <ul style="list-style-type: none"> <li>• Formulate algorithms and design flowcharts for simple problems and to know the usage of various operators and control statements in program development.</li> <li>• Understand and analyze the concepts of arrays and pointers for real world problems.</li> <li>• Understand and analyze the concepts of strings and structures for real world problems.</li> <li>• Applying concept reusability and handling dynamic memory allocation</li> <li>• Apply various file handling techniques for better data management.</li> </ul> |
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**Unit – I**

**Introduction to Computing** - Components of a computer, Art of programming through Algorithms and Flowcharts, Number System-Decimal, Binary, Octal, Hexadecimal.

**Introduction to C Language** – History of C, Importance of C, Sample Programs, Basic structure of C programs, executing a C program. Character set, C tokens-keywords, identifiers, constants, variables, data types, managing input and output operations, operators-arithmetic, relational, logical, assignment, increment/decrement, conditional operator, bitwise, special operators, type conversions in expressions, operator precedence and associativity, decision making and branching-if, switch, goto, decision making and looping-while, do, for, jumps in loops-break, continue.

**Unit – II**

**Arrays:** Introduction, One-Dimensional Arrays-declaration of one-dimensional array, initializing of one-dimensional array, Two Dimensional Arrays- declaration of two-dimensional array, initializing of two-dimensional array, Multidimensional Arrays.

**Pointers:** Introduction-declaring a pointer variable, initialization of pointer variables, accessing a variable through its pointer, chain of pointers, pointer expressions, pointer increment and scale factor, pointer and arrays, pointer and character strings.

**Unit –III**

**Strings:** Introduction to strings, declaring and initializing string variables, reading strings from terminal and writing strings to screen, putting strings together, comparison of two strings, string handling functions.

**Structures:** Introduction-defining a structure, declaring a structure variable, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures. structures within structures, structures and functions, Unions, Enumerated data types.

**Unit –IV**

**User-Defined Functions:** Introduction, elements of user defined functions, categories of functions, nesting of functions, recursion, passing arrays to functions, passing strings to functions, scope, visibility and lifetime of variables, pointers as function arguments (call by reference).

**Dynamic Memory Allocation**-Introduction, malloc, calloc, free, realloc.

**Unit-V**

**Preprocessor:** Introduction, macro substitution, file inclusion, compiler control directives.

**Files:** Introduction, defining and opening a file, closing a file, input/output operations on files, random access to files, command line arguments.

**Suggested Readings:**

1. E. Balaguruswamy, Programming in ANSI C, Eighth Edition 2020, McGraw Hill Education.
2. B.W. Kernighan and Dennis M. Ritchie, The C Programming Language, Second Edition, Pearson education.

**Reference Books:**

1. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, Third Edition, Cengage Learning 2016.
2. Pradip Dey and Manas Ghosh, Programming in C , Oxford University Press, Second Edition, 2011.
3. B. Gottfried, Programming with C, 3rd edition, Schaum’s outlines, McGraw Hill Education (India) Pvt Ltd.

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1	0	4	3

**B.Tech. I Semester**  
**ME101ES: Engineering Graphics**  
**(Common to CE, EEE, ME, ECE, MCT & MME)**

**Course Objectives**

At the end of this course students are expected to

- Recognize the standards of Engineering Graphics, learn to generate Geometric Constructions, Conic Sections and construct Engineering Scales.
- Understand the procedure to develop orthographic projections of points, lines and planes.
- Learn the procedure to develop projection of solids and objects.
- Understand the procedure to generate the sections and developments of solids.
- Learn the procedure to develop Isometric projections, convert orthographic views to isometric views and vice versa using graphics instruments and AUTOCAD.

**Course Outcomes**

After successful completion of the course, students should be able to

- Apply the fundamental principles of Engineering Graphics to create engineering drawings of various geometric constructions, conic sections and engineering scales adhering to BIS Standards.
- Generate orthographic projections; front view, top view and side views of points and lines.
- Generate the orthographic projections of planes and solids
- Generate the sections of solids and developments of surfaces.
- Develop isometric projection convert orthographic views to isometric views and vice versa for practical engineering problems.

**Unit-I: Introduction to Engineering Graphics**

Principles of Engineering Graphics and their significance drawing instruments and their use conventions in Drawing, Lines, Lettering, Dimensioning and Geometrical construction. Conic sections including the Rectangular Hyperbola – General method only. Engineering curves: Cycloid, Epicycloid and Hypocycloid, Involute, Scales–Plain and Diagonal.

**Unit-II: Orthographic Projections**

Principles of Orthographic Projections–Conventions–Projections of points and lines –Inclined to one and both the planes.

**Unit-III: Projections of Planes and Regular Solids**

Projections of planes, regular geometric figures, Projections of regular solids - Simple position and inclined to one plane, Sections or Sectional views and true shapes of right regular Solids–Prism, Cylinder, Pyramid and Cone.

**Unit-IV: Development of Surfaces & Intersections of Solids**

Development of surfaces for right regular Solids–Prism, Cylinder, Pyramid and Cone. Intersection of Solids - Cylinder Vs Cylinder.

**Unit-V: Isometric Projections**

Principles of Isometric Projection – Isometric scale – Isometric views - Conventions – Isometric views of Lines, Plane figures, Simple compound solids - Isometric projection of Spherical parts. Conversion of Isometric views to Orthographic views and vice-versa – conventions

Introduction to AUTOCAD software package commands:

Introduction to CAD software package commands – free hand sketches of 2D – creation of 2D sketches of CAD package.



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**Suggested Readings:**

1. N.D. Bhatt, Engineering Drawing, Charotar
2. Narayana, K.L. & P Kanniah, Text book on Engineering Drawing, Second edition, Scitech Publishers.
3. Basant Agrawal, Engineering Drawing/Mc Graw Hill

**Reference Books:**

1. K Venugopal and G. Sreekanjana, Engineering Drawing, second edition, New Age International.
2. N.S. Parthasarathy and Vela Murali, Engineering Drawing/Oxford
3. Shah, M.B. & Rana B.C., Engineering Drawing and Computer Graphics, Pearson
4. K Balaveera Reddy, etal, Computer Aided Engineering Drawing – CBS Publishers

L	T	P	C
3	0	0	0

**B.Tech. I Semester**  
**MC101ESC: Environmental Science**  
**(Common to CE, EEE, ME, ECE, MCT & MME)**

**Course Objectives**

- |   |
|---|
| <ul style="list-style-type: none"> <li>• To understand the natural resources and their conservation.</li> <li>• To understand the importance of ecosystem, biodiversity and ecological balance for sustainable development.</li> <li>• To gain knowledge about environmental pollution, effects and controlling measures.</li> <li>• To study about global environmental problems and global issues.</li> <li>• To understand the environmental policies, regulations and sustainable development.</li> </ul> |
|---|

**Course Outcomes**

- |  |
|--|
| <p>After completing the course, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Learn about different types of natural resources and take up the measures to protect the resources.</li> <li>• Get the information about ecosystem, biodiversity and their usage and conservation.</li> <li>• Get the information about the types of pollution, understand their effects and controlling measures.</li> <li>• Gain the knowledge about current global environmental issues and initiations to be taken to protect the environment.</li> <li>• Gain the knowledge about environmental acts, EIA, sustainable development and follow the rules and regulations.</li> </ul> |
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**Unit-I: Natural Resources**

- Classification** - Renewable and Non-renewable resources.  
**Forest Resources** - Uses, deforestation- causes, effects and preventive measures.  
**Water Resources** - Uses and over utilization of ground water, rain water harvesting, dams - benefits and problems. Causes, effects and management of floods and drought.  
**Mineral Resources** - Uses and Impacts of mining.  
**Energy Resources** - Growing energy needs, renewable and non-renewable energy resources, use of alternate energy resources.

**Unit-II: Ecosystem and Biodiversity**

- Ecosystem:** Concept of ecosystem - Structure and functions of ecosystem. Food chain, food web and ecological pyramids - significance. Primary and secondary production - Energy flow models: universal and single channel. Biogeochemical Cycles: Carbon cycle and Nitrogen cycle.  
**Biodiversity:** Definition, Levels of biodiversity, Values of biodiversity, Hotspots of biodiversity, Threats to biodiversity, Conservation of biodiversity: In-Situ and Ex-Situ conservation methods.

**Unit-III: Environmental Pollution**

- Pollution** - Definition and classification.  
**Air pollution:** Definition, sources, causes, effects and control measures. Ambient air quality parameters, Case Study.  
**Water pollution:** Definition, sources, causes, effects and control measures. Waste water treatment. Case study (Namami Ganga Project)  
**Soil pollution:** Sources, Land degradation - Soil erosion – effects and control measures. Impacts of modern agriculture on soil. Biomagnification and Bioaccumulation (Minamata disease).  
**Noise pollution:** Sources, effects and control measures.  
**Solid Waste:** E-Waste and Municipal solid waste management.

**Unit-IV: Global Environmental Issues and Global Efforts**

- Global warming: Greenhouse effect - definition, sources and effects of greenhouse gases. Ozone layer depletion -

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Importance of ozone layer, Ozone depleting substances - sources and effects. Acid rain - causes and effects. Climate change - National Action Plan on Climate Change (NAPCC) – Government of India Initiatives. International conventions/protocols: The Earth summit, Kyoto Protocol and Montreal Protocol. Carbon credits - Emission trading, Green Chemistry Principles. Biodiesel-concept - transesterification and advantages.

**Unit-V: Environmental Acts, EIA & Sustainable Development**

Environmental Protection Act - Legal aspects: Air (Prevention and control of pollution) Act 1981, Water (Prevention and control of pollution) Act -1974, Wildlife (Protection) Act - 1972, Biodiversity Act - 2002. Environmental Impact Assessment (EIA) - Concept, structure and flow chart of EIA. Concept of sustainable development - Environmental education, Concept of green building, Ecological foot print, Low carbon life style, Life cycle assessment (LCA) and Clean development mechanism.

**Project Work:** Related to current environmental issues.

**Suggested Readings:**

1. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses, University Grants Commission, Universities Press, 3<sup>rd</sup> Edition.
2. Kaushik A., Kaushik C.P., Text Book of Environmental Studies, New age International Publishers, 4<sup>th</sup> Edition.

**Reference Books:**

1. Anji Reddy M., Textbook of Environmental Sciences and Technology, BS Publication.
2. Rajagopalan R., Environmental Studies, Oxford University Press, 3<sup>rd</sup> Edition.
3. Raghavan Nambiar K., Text Book of Environmental Studies, Scitech Publications 2<sup>nd</sup> Edition.

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L	T	P	C
0	0	3	1.5

**B.Tech. I Semester**  
**PH151BS: Engineering Physics Lab**  
**(Common to CE, ME, MCT & MME)**

**Course Objectives**

The objectives of the course is to make the student to

- Demonstrate an ability to make physical measurements and understand the limits of precision in measurements
- Measure the properties of a variety of mechanical, electrical and optical systems.
- Gain the ability to construct a variety of electro mechanical systems.
- Apply the mathematical concepts/equations to obtain quantitative results

**Course Outcomes**

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

- Gain knowledge on motion of physical bodies, harmonic motion, motion of waves in one-dimension, optical phenomena like interference, diffraction and the principles of lasers and fiber optics.
- Apply the various procedures and techniques for the experiments.
- Use the different measuring devices to record the data with precision.
- Understand the basic principles of Physics through experiments.

**List of Experiments:**

1. Torsional pendulum: To determine the rigidity modulus of the material of the given wire using torsional pendulum.
2. Coupled Oscillator: To determine the spring constant by single coupled oscillator.
3. LCR Circuit: To determine quality factor of LCR circuits.
4. Melde's experiment: To determine the frequency of a electrical tuning fork using Melde's apparatus.
5. Newton's rings: To determine the wavelength of light source by forming Newton's rings.
6. Diffraction grating: To determine the number of lines per centimeter of the grating.
7. Dispersive power: To determine the dispersive power of prism by using spectrometer.
8. LASER: To study the V-I and P-I characteristics of LASER Diode.
9. Optical fibre: To determine the bending losses of optical fibre.
10. Optical fibre: To determine the Numerical aperture of a given fibre.

**Note: Any 8 experiments are to be performed**

**Suggested Reading:**

1. Madhusudhana Rao C.V., Vasanth Kumar V., Engineering Physics Lab manual, 4<sup>th</sup> Edition, Scitech Publications (India), Pvt. Ltd.

L	T	P	C
0	0	3	1.5

**B.Tech. I Semester  
CS151ES: Programming for Problem Solving Lab  
(Common to CE, EEE, ME, ECE, MCT & MME)**

**Course Objectives**

- To work with an IDE to create, edit, compile, run and debug programs.
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files.

**Course Outcomes**

- To be able to formulate problems and write programs to implement usage of various operators and control statements in program development.
- Applying the concepts of arrays and pointers to solve the problems.
- Applying the concepts of strings and structures to solve the problems.
- Applying concept reusability and handling dynamic memory allocation.
- Apply various file handling techniques for better data management.

**Expression Evaluation & Control Structures:**

- a. Write the program for the simple, compound interest.
- b. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula  $s = ut + (1/2)at^2$  where u and a are the initial velocity in m/sec (= 0) and acceleration in  $m/sec^2$  (= 9.8  $m/s^2$ )).
- c. Write a program for find the max and min from the three numbers.
- d. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >=70% = Distinction. Read percentage from standard input.
- e. Write a C program, which takes two integer operands and one operator from the user, performs the operation, and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)
- f. Write a C program to find the roots of a Quadratic equation.
- g. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:  

$$\begin{matrix} 5 \times 1 = 5 \\ 5 \times 2 = 10 \\ 5 \times 3 = 15 \end{matrix}$$
- h. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
- i. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- j. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
- k. Write a C program to construct a pyramid of numbers as follows:

```

1           *           1           1
1 2        * *        2 3         2 2
1 2 3      * * *      4 5 6       3 3 3
    
```

**Arrays and its Applications:**

- a. Write a C program to find the minimum, maximum and average in an array of integers.

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- b. Write a C program that uses functions to perform the following:
  - i. Addition of Two Matrices
  - ii. Multiplication of Two Matrices

**Pointers:**

- a. Write a C program for reading elements using pointer into array and display the values using array.
- b. Write a C program for display values reverse order from array using pointer.
- c. Write a C program through pointer variable to sum of n elements from array.

**Strings:**

- a. Write a C program using functions to insert a sub-string into a given main string from a given position.
- b. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
- c. Write a C program to count the lines, words and characters in a given text.

**Structures:**

- a. Write a C program to add two complex numbers by Passing Structure to Function.
- b. Write a C program to Store Information of a Student Using Structure.
- c. Write a C program to demonstrate e-num

**Functions and Dynamic Memory allocation functions:**

- a. Write a C programs that use both recursive and non-recursive functions.
  - i. To find the factorial of a given integer.
  - ii. To find the GCD (greatest common divisor) of two given integers.
- b. Write a C program to implement dynamic memory allocation for an array using malloc (), calloc (), realloc() and free().

**Files:**

- a. Write a C program to display the contents of a file to standard output device.
- b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
- c. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

**Reference Books:**

1. E Balagurusamy, Programming in ANSI C , Mc Graw Hill, Eighth Edition, 2019.
2. B.A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, Third Edition, Cengage Learning 2016.
3. B.W. Kernighan and Dennis M. Ritchie, The C Programming Language, Second Edition, Pearson education, 1988.
4. B. Gottfried, Programming with C, Fourth edition, Schaum's outlines, McGraw Hill Education (India) Pvt Ltd, 2018.

**Group – II: MR-21 B.Tech.**

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L	T	P	C
2	0	0	2

**B.Tech. II Semester**  
**EN201HS: English**  
**(Common to CE, EEE, ME, ECE, MCT & MME)**

**Introduction**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.

**Unit-I**

‘Toasted English’ a short essay by R.K. Narayan

Vocabulary: The Concept of Word Formation –The Use of Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences - Importance of Punctuation-

Techniques for writing precisely – Paragraph writing – Types, Structures and Features of a Paragraph –

Creating Coherence-Organizing Principles of Paragraphs in Documents.

**Unit-II**

‘Ancient Architecture in India’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.

Vocabulary: Synonyms and Antonyms.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

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Reading: Improving Comprehension Skills – Techniques for Good Comprehension

Writing: Nature and Style of Sensible Writing- Defining- Describing Objects, Places and Events – Classifying- Providing Examples or Evidence

**Unit-III**

‘Blue Jeans’ from the prescribed textbook ‘English for Engineers’

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives- Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Information Transfer, Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Job Application with Resume.

**Unit-IV**

‘The Road Not Taken’ by Robert Frost

Vocabulary: Standard Abbreviations and Acronyms in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension- Intensive Reading and Extensive Reading

Writing: Writing Practices–Writing Introduction and Conclusion – Essay Writing-Précis Writing.

**Unit-V**

‘What should you be Eating’ from the prescribed textbook ‘English for Engineers’

Vocabulary: Technical Vocabulary and its usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports – Writing a Report.

**Suggested Readings:**

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.
2. Toasted English by R.K. Narayan
3. The Road Not Taken by Robert Frost

**Reference Books:**

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Murali, K and Mishra, S. (2011) Communication Skills for Engineers Pearson Publishers
3. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
4. Wood, F.T. (2007) Remedial English Grammar. Macmillan.
5. Zinsser, William. (2001) On Writing Well. Harper Resource Book.
6. Hamp-Lyons, L. (2006) Study Writing. Cambridge University Press.



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3	1	0	4

**B.Tech. II Semester  
MA202BS: Mathematics-II  
(Common to all Branches)**

**Unit-I: First Order Ordinary Differential Equations**

Overview of first order and first degree differential equations; Exact differential equations, Differential equations reducible to Exact, Linear and Bernoulli's differential equations; Applications: Newton's law of cooling, Law of natural growth and decay.

Equations not of first degree: equations solvable for p, equations solvable for x, equations solvable for y and Clairaut's type.

**Unit-II: Ordinary Differential Equations of Higher Order**

Higher order linear differential equations with constant coefficients: Solutions of Homogeneous differential equations and Solutions of Non-Homogeneous equations with terms of the type  $\sin ax$ ,  $\cos ax$ ,  $x^m$ ,  $e^{ax}$ ,  $xv(x)$  and  $v(x)e^{ax}$ ; Method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

**Unit-III: Multivariable Calculus (Integration)**

Introduction to curve tracing (regular curves); Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Applications: Evaluation of Area (by double integrals) and volume (by double integrals and triple integrals).

**Unit-IV: Vector Differentiation**

Vector point functions and scalar point functions. Gradient, Divergence, Curl, Scalar potential functions, Solenoidal and Irrotational vectors. Directional derivatives, Tangent plane and Normal plane and Laplacian Operator. Vector Identities.

**Unit-V: Vector Integration**

Line, Surface and Volume Integrals. Green's Theorem, Gauss divergence Theorem and Stoke's Theorem (without proofs) and their applications.

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**Suggested Readings:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.

**Reference Books:**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
2. Paras Ram, Engineering Mathematics, 2<sup>nd</sup> Edition, CBS Publishes.
3. S. L. Ross, Differential Equations, 3<sup>rd</sup> Ed., Wiley India, 1984.

# Metallurgical and Materials Engineering

B.Tech. I/II semester

CH101BS/ CH201BS

**Engineering Chemistry**

(Common to all branches)

L	T	P	C
3	1	0	4

## Course Objectives:

To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer:

- To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion its control to protect the structures.
- To imbibe the basic concepts of petroleum and its products.
- To acquire required knowledge about engineering materials like smart materials, Refractories, Lubricants and Nanomaterials

## Course Outcomes:

After completing the course, the student will be able to acquire:

- Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
- The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
- They can learn the fundamentals and general properties of polymers and other engineering materials.
- They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

### UNIT - I: Water and its treatment: [8]

Introduction to hardness of water – Expression of hardness, Units and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and breakpoint chlorination.

Boiler troubles: Sludge, Scale, Boiler corrosion and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion-exchange processes. Desalination of water – Reverse osmosis.

### UNIT – II Battery Chemistry & Corrosion [8]

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol

Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

**Corrosion:** Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anodic method, Metallic coating-Electroplating.

### **UNIT - III: Polymeric materials: [8]**

Definition – Classification of polymers with examples – Types of polymerization – addition and condensation polymerization with examples.

**Plastics:** Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon

**Fibers:** Preparation, Properties and engineering applications of Nylon 6:6, and Terylene

**Elastomers:** Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokolrubber.

**Conducting polymers:** Characteristics and Classification with examples-mechanism of conduction intrans-polyacetylene and applications of conducting polymers.

**Biodegradable polymers:** Concept and advantages - Polylacticacid and polyvinyl alcohol and their applications.

### **UNIT - IV: Energy Sources: [8]**

Introduction, Calorific value of fuel – HCV, LCV- Dulong’s formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch’s process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

### **UNIT - V: Engineering Materials: [8]**

**Smart materials and their engineering applications:** Shape memory materials- Poly L-Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinylamides.

**Lubricants:** Classification of lubricants with examples-characteristics of a good lubricants - properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

**Refractories:** Definition, Classification, Characteristics of a good refractory. Applications of refractories.

### **TEXT BOOKS:**

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

### **REFERENCE BOOKS:**

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

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**B.Tech. II semester**  
**ME202ES: Engineering Mechanics**  
**(Common to CE, ME, MCT & MME)**

**Course Objectives**

The objectives of the course are to make the student

- Explain the resolution of forces, compute the resultant of system of forces and solve problems using equations of equilibrium.
- Perform analysis of forces acting on bodies lying on rough surfaces.
- Locate the centroid and compute the area moment of inertia of a section and mass moment of inertia of standard and composite sections
- Locate centre of gravity and compute the mass moment of inertia of standard and composite bodies.
- Explain kinematics and kinetics of particles, curvilinear motion of rigid bodies.

**Course outcomes**

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

- Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate area moment of inertia of a given section.
- Find the centre of gravity and calculate the mass moment of inertia of given body.
- Solve problems using kinematic equations and also solve problems using principles of kinetics such as work-energy principle, Impulse-momentum principle.

**Unit-I**

**Introduction to Engineering Mechanics** - Basic concepts, System of Forces, Moment of Forces and its Application; Resultant of Force System, Free body diagrams, Equilibrium of System of Forces, Equations of Equilibrium of Coplanar Concurrent Force System; Spatial Systems - Components in Space, Resultant; Static Indeterminacy.

**Unit-II**

**Friction:** Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, Wedge Friction, Screw jack;

**Unit-III**

**Centroid** of Lines and Areas from first principles; Centroid of composite sections;  
**Centre of Gravity** of simple bodies and composite bodies; Theorems of Pappus.

**Unit-IV**

**Moment of Inertia** – Definition; Theorems of moment of inertia; Area Moment of inertia of plane sections from first principles, Area Moment of inertia of composite sections;  
**Mass Moment of Inertia** - Transfer Formula, Mass moment of inertia of simple bodies and composite bodies.

**Unit-V**

**Kinematics** - Rectilinear motion; Plane curvilinear motion;

**Kinetics** - D'Alembert's principle - its applications in translation and motion of connected bodies; Work Energy principle - its application in motion of connected bodies; Impulse-momentum principle.

**Suggestion Readings:**

1. K. Vijay Kumar Reddy and J. Suresh Kumar, Singer's Engineering Mechanics – Statics and Dynamics, BS Publications, 2011.
2. Irving H. Shames and G. Krishna Mohan Rao, Engineering Mechanics, Pearson Education, 2005.

**Reference Books:**

1. Timoshenko S.P and Young D.H., Engineering Mechanics, McGraw Hill International Edition, 1983.
2. Beer F.P & Johnston E.R Jr. Vector, Mechanics for Engineers, Tata McGraw Hill, 2004.
3. Hibbeler R.C & Ashok Gupta, Engineering Mechanics, Pearson Education, 2010.
4. Tayal A.K., Engineering Mechanics – Statics & Dynamics, Umesh Publications, 2011.
5. Basudeb Bhattacharyya, Engineering Mechanics, Oxford University Press, 2008.
6. Nelson A, Engineering Mechanics - Statics and Dynamics, McGraw Hill Education, 2017.

Group – II: MR-21 B.Tech.

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**B.Tech. II Semester**  
**EN251HS: The English Language and Communication Skills Lab**  
**(Common to CE, EEE, ME, ECE, MCT & MME)**

**The English Language and Communication Skills Lab (ELCS) shall have two parts:**

- a. Computer Assisted Language Learning (CALL)Lab**
- b. Interactive Communication Skills (ICS)Lab**

**Listening Skills**

Objectives

1. To enable students develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation.
2. To facilitate students to practice listening for general content, listening for specific information and for intensive listening.
3. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to understand and practise word accent, recognize and use the right intonation in sentences.*

**Speaking Skills**

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
  - Oral practice: Just A Minute (JAM)Sessions/Introduction to structured talk
  - Describing objects/situations/people
  - Role play – Individual/Group activities
  - Interview skills



**Exercise – I**

**CALL Lab:**

*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers to Listening.

*Practice:* Introduction to Phonetics – Speech Sounds - Vowels – Monophthongs and Diphthongs –Consonants – Voiced and Voiceless- Past tense markers (-ed & -es) and Plural Markers.

**ICS Lab:**

*Understand:* Communication at Work Place- Spoken vs. Written language.

*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

**Exercise – II**

**CALL Lab:**

*Understand:* Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

**ICS Lab:**

*Understand:* Features of Good Conversation – Starting a Conversation – Joining a Conversation – Ending a Conversation - Non-verbal Communication – Eye contact and Facial gestures.

*Practice:* Situational Dialogues – Role-Play-Individual & Group - Expressions in Various Situations –Making Requests and Seeking Permissions – Telephone Etiquette – Dos and Don'ts of Mobile phone Etiquette.

**Exercise - III**

**CALL Lab:**

*Understand:* Intonation-Errors in Pronunciation-the Interference of Mother Tongue (MTI).

*Practice:* Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

**ICS Lab:**

*Understand:* How to make Formal Presentations.

*Practice:* Formal Presentations.

**Exercise – IV**

**CALL Lab:**

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests.

**ICS Lab:**

*Understand:* Public Speaking – Exposure to Structured Talks – Power Point Presentations – Poster Presentations.

*Practice:* Making a Short Speech – Extempore and Prepared – Aspects of Presentation.

**Exercise – V**

**CALL Lab:**

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests.

**ICS Lab:**

*Understand:* Interview Skills – Resume Preparation – Salient features of Interview Skills – Before the Interview – During the Interview – After the Interview.

*Practice:* Mock Interviews.

**Suggested Readings:**

1. Exercises in Spoken English. Parts 1, 2 & 3. CIEFL, Hyderabad: OUP
2. ELCS Lab Manual, A Workbook for CALL and ICS Lab Activities, published by Orient Blackswan Private Limited, Hyderabad.

**Reference Books:**

1. Cambridge English, Business Benchmark, South Asian Edition, Student's Book, Norman Whitby – B2 Level.
2. Communication Skills for Engineers Pearson Publishers.
3. Skills Annexe, Functional English for Success, published by Orient BlackSwan, Hyderabad.

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4. Technical Communication, published by Oxford University Press, New Delhi.
5. English for Engineering Course Workbook published by Hitech Publishing Company Pvt. Ltd., Hyderabad.
6. Selected TED Talks

MR22 B.Tech. Syllabus

MGIT(A)- Hyderabad

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY(Autonomous)  
Chaitanya Bharathi (P.O), Gandipet, Hyderabad-500 075

B.Tech. I/II Semester Syllabus  
CH151BS/ CH251BS

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Engineering Chemistry Lab  
(Common to all branches)

**Course Objectives:**

The course consists of experiments related to the principles of chemistry required for an Engineering student and the student will learn the following:

- Estimation of hardness of water to check its suitability for industrial and drinking purpose and estimation procedures through volumetric analysis.
- Estimation procedures using conductometry and potentiometry.
- Preparation of polymers such as Bakelite and Polystyrene in the laboratory.
- Understand the lubricant properties such as saponification value and viscosity of oils.
- Understand the corrosion of metals in a corrosive medium.

**Course Outcomes:**

After completing the course, the student will gain practical knowledge on:

- Determination of parameters like hardness of water and estimations through volumetric analysis.
- Performance of experiments of conductometry and potentiometry and estimation procedures using them.
- Preparation of polymers like Bakelite and Polystyrene.
- Performing experiments related to estimation of saponification value and viscosity of lubricating oils.
- Performing experiments to know rate of corrosion of mild steel in various conditions.

**List of Experiments:**

- I. **Volumetric Analysis:** Estimation of hardness of water by EDTA - Complexometry method.
- II. **Volumetric Analysis:** Estimation of  $\text{Fe}^{+2}$  by Dichrometry.
- III. **Conductometry:** Estimation of the concentration of an acid by Conductometry.
- IV. **Potentiometry:** Estimation of the amount of  $\text{Fe}^{+2}$  by Potentiometry.
- V. **Potentiometry:** Determination of an acid concentration using Potentiometer.
- VI. **Preparations:**
  1. Preparation of Bakelite.
  2. Preparation Polystyrene

**VII. Lubricants:**

1. Estimation of acid value of given lubricating oil.
2. Estimation of viscosity of lubricating oil using Ostwald's Viscometer.

**VIII. Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor

**IX. Virtual lab experiments**

- a. Construction of Fuel cell and its working.
- b. Smart materials for Biomedical applications
- c. Batteries for Electrical vehicles.
- d. Functioning of Solar cell and its applications.

**REFERENCE BOOKS:**

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna - S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry - 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel - ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia - Narosa Publications Ltd., New Delhi (2007).

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**B.Tech. II Semester**  
**ME251ES: Engineering Workshop**  
**(Common to CE, EEE, ME, ECE, MCT & MME)**

**Course Objectives**

At the end of this course students are expected to

- Study of different hand operated power tools, uses and their demonstration.
- Gain a good basic working knowledge required for the production of various engineering products.
- Provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field.
- Study commonly used Engineering trades like Carpentry, Fitting, Tin smithy, Foundry, House wiring, Plumbing & Black smithy and practical exposure to these trades.
- Study of various machining operations.

**Course Outcomes**

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

- Practice on various workshop trades including plumbing, Fitting, Carpentry, Foundry, House wiring, Tin smithy, Black smithy and Welding by using different tools.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring and chiseling.
- Apply basic electrical engineering knowledge for House wiring practice.
- Implement the knowledge of basic workshop processes under safety norms.
- Understand different metal joining techniques using arc welding process.

**1. Trades for Exercises** (At least two exercises from each trade)

- I. Carpentry –Bridle Joint, Half - Lap Joint, Mortise & Tenon Joint
- II. Fitting – L- fit, V-Fit & Dovetail Fit
- III. Tin-Smithy – Square Tin, Rectangular scoop & Rectangular tray
- IV. Foundry – Preparation of Green Sand Mould using Single Piece and Split Pattern
- V. Welding Practice – Arc Welding- Lap Joint, Butt Joint & T Joint
- VI. House-wiring – Parallel & Series, Two-way Switch and Tube Light
- VII. Black Smithy – Oval shape, S – Hook & Fan Hook

**2. Trades for Demonstration & Exposure**

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools used in construction and Wood working operations.

**Suggested Readings:**

1. B. L. Juneja, Workshop Practice / Cengage
2. K. Venugopal, Workshop Manual / Anuradha.

**Reference Books:**

1. P. Kannaiah/ K. L. Narayana, Work shop Manual - SciTech
2. Venkat Reddy, Workshop Manual / BSP