

**Al Haider College
of Technology at
Ranchi, Jharkhand**

SYLLABUS OF
B. Tech in Electrical Engineering
Semester I-VIII

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SEMESTER –I

| Sr. No. | Name of the Subject | L-T-P | Credit | Contact Hours Per Week |
|----------------|-------------------------------------|---------------|---------------|-----------------------------------|
| 1 | Engineering Mathematics–I | 3-1-0 | 4 | 3 |
| 2 | Engineering Chemistry | 3-0-0 | 3 | 3 |
| | Programming for Problem Solving | 3-0-0 | 3 | 3 |
| 3 | Basic Electrical Engineering | 3-1-0 | 4 | 3 |
| | Engineering Physics | 3-1-0 | 4 | 3 |
| 4 | Engineering Mechanics | 3-0-0 | 3 | 3 |
| | English for Communication | 3-0-0 | 3 | 2 |
| 5 | Constitution of India | 0-0-0 | 0 | 2 |
| | Practical | | | 3 |
| 6 | Engineering Chemistry Lab | 0-0-1 | 1 | |
| | Engineering Physics Lab | 0-0-1 | 1 | 4 |
| 7 | Basic Electrical Engineering Lab | 0-0-1 | 1 | 4 |
| | Programming for Problem Solving Lab | 0-0-2 | 2 | 4 |
| 8 | Engineering Mechanics Lab | 0-0-1 | 1 | 2 |
| 9 | Engineering Graphics & Design | 0-0-2 | 2 | 4 |
| | Workshop Practices | 0-0-2 | 2 | 2 |
| | TOTAL | 12-2-5 | 19 | 45 |

SEMESTER –II

| Sr. No. | Name of the Subject | L-T-P | Credit | Contact Hours Per Week |
|----------------|-------------------------------------|---------------|---------------|-----------------------------------|
| 1 | Engineering Mathematics–II | 3-1-0 | 4 | 3 |
| 2 | Engineering Chemistry | 3-0-0 | 3 | 3 |
| | Programming for Problem Solving | 3-0-0 | 3 | 3 |
| 3 | Basic Electrical Engineering | 3-1-0 | 4 | 3 |
| | Engineering physics | 3-1-0 | 4 | 3 |
| 4 | Engineering Mechanics | 3-0-0 | 3 | 3 |
| | English for Communication | 3-0-0 | 3 | 2 |
| 5 | Constitution of India | 0-0-0 | 0 | 2 |
| | Practical | | | 3 |
| 6 | Engineering Chemistry Lab | 0-0-1 | 1 | |
| | Engineering Physics Lab | 0-0-1 | 1 | 4 |
| 7 | Basic Electrical Engineering Lab | 0-0-1 | 1 | 4 |
| | Programming for Problem Solving Lab | 0-0-2 | 2 | 4 |
| 8 | Engineering Mechanics Lab | 0-0-1 | 1 | 2 |
| | Engineering Graphics& Design | 0-0-2 | 2 | 4 |
| 9 | Workshop Practices | 0-0-2 | 2 | 2 |
| | TOTAL | 12-2-5 | 19 | 45 |

SEMESTER –III

| S. No: | Name of the Subject | Type of Paper | Credit | Contact Hours Per Week |
|---------------|---------------------------------|----------------------|---------------|-------------------------------|
| 1 | Electrical Circuit Analysis | PCC | 3 | 3 |
| 2 | Electromagnetic Fields | PCC | 4 | 4 |
| 3 | Analog Electronic | PCC | 3 | 3 |
| 4 | Engineering Mathematics – III | BSC | 4 | 4 |
| 5 | Electrical Machines- I | PCC | 4 | 4 |
| 6 | Environmental Sciences | MC | 0 | 2 |
| | PRACTICAL | | | |
| 7 | Electrical Circuit Analysis Lab | PCC | 1 | 2 |
| 8 | Electrical Machines- I Lab | PCC | 1 | 2 |
| 9 | Analog Electronics Lab | PCC | 1 | 2 |
| | TOTAL | | 21 | 26 |

SEMESTER –IV

| S.No | Name of the Subject | Type of Paper | Credit | Contact Hours Per Week |
|-------------|---------------------------------------|----------------------|---------------|-------------------------------|
| 1 | Electrical Machines-II | PCC | 4 | 4 |
| 2 | Digital Electronics | PCC | 3 | 3 |
| 3 | Power Electronics | PCC | 4 | 4 |
| 4 | Signals and Systems | PCC | 3 | 3 |
| 5 | Biology for Engineers | BSC | 3 | 3 |
| 6 | Essence of Indian Knowledge Tradition | MC | 0 | 2 |
| | PRACTICAL | | | |
| 7 | Electrical Machines II Lab | PCC | 1 | 2 |
| 8 | Digital Electronics Lab | PCC | 1 | 2 |
| 9 | Power Electronics Lab | PCC | 1 | 2 |
| | TOTAL | | 20 | 25 |

SEMESTER –V

| S.No | Name of the Subject | Type of Paper | Credit | Contact Hours Per Week |
|------|---|---------------|-----------|------------------------|
| 1 | Power Systems–I | PCC | 3 | 3 |
| 2 | Control Systems | PCC | 3 | 3 |
| 3 | Microprocessors | PCC | 3 | 3 |
| 4 | Program Elective – I | PEC | 3 | 3 |
| | Electrical Energy Conservation and Auditing | | | |
| | Electrical Machine Design | | | |
| | Industrial Electrical Systems | | | |
| 5 | Open elective-I | OEC | 3 | 3 |
| | Electronic Devices | | | |
| | Strength of Materials | | | |
| | Data Structures and Algorithms | | | |
| 6 | Professional practice law & ethics | HSMC | 3 | 3 |
| | PRACTICAL | | | |
| 7 | Power Systems I Lab | PCC | 1 | 2 |
| 8 | Control Systems Lab | PCC | 1 | 2 |
| 9 | Microprocessors Lab | PCC | 1 | 2 |
| 10 | Summer Internship-1(3-4 Weeks) | PROJ | 2 | 0 |
| | TOTAL | | 23 | 24 |

SEMESTER –VI

| S.No | Name of the Subject | Type of Paper | Credit | Contact Hours Per Week |
|------|---------------------------------------|---------------|-----------|------------------------|
| 1 | Power Systems – II | PCC | 3 | 3 |
| 2 | Measurements and Instrumentation | PCC | 3 | 3 |
| 3 | Program Elective – II | PEC | 3 | 3 |
| | Digital Signal Processing | | | |
| | Control Systems Design | | | |
| 4 | Program Elective – III | PEC | 3 | 3 |
| | Line Commutated and Active Rectifiers | | | |
| | High Voltage Engineering | | | |
| | Electromagnetic Waves | | | |
| 5 | Open Elective –II | OEC | 3 | 3 |
| | Wavelet Transforms | | | |
| | Internet of Things | | | |
| | Thermal and Fluid Engineering | | | |
| 6 | IPR | HSMC | 3 | 3 |
| | Practical | | | |
| 7 | Power Systems II Lab | PCC | 1 | 2 |
| 8 | Measurements and Instrumentation Lab | PCC | 1 | 2 |
| | TOTAL | | 20 | 22 |

SEMESTER –VII

| Sl. No. | Name of the Subject | Type of Paper | Credit | Contact Hours Per Week |
|---------|--|---------------|-----------|------------------------|
| 1 | Professional Elective -IV | PEC | 3 | 3 |
| | Power System Protection | | | |
| | Electrical and Hybrid Vehicles | | | |
| | Computational Electromagnetic | | | |
| 2 | Professional Elective - V | PEC | 3 | 3 |
| | Power System Dynamics and Control | | | |
| | Power Quality and FACTS | | | |
| | Electrical Drives | | | |
| 3 | Open Elective - III | OEC | 3 | 3 |
| | Analog and Digital Communication | | | |
| | Embedded Systems | | | |
| | Fluid Machinery | | | |
| 4 | Open Elective - IV | OEC | 3 | 3 |
| | Power Plant Engineering | | | |
| | Image Processing | | | |
| | Automobile Engineering | | | |
| 5 | Project Management | HSMC | 3 | 3 |
| | PRACTICAL | | | |
| 9 | Summer Internship-II(4-6 Weeks) | PROJ | 3 | 0 |
| 10 | Minor Project(Project to be carried over to next semester) | PROJ | 3 | 6 |
| | TOTAL | | 21 | 21 |

SEMESTER –VIII

| Sl. No. | Name of the Subject | Type of Paper | Credit | Contact Hours Per Week |
|----------------|--|----------------------|---------------|-------------------------------|
| 1 | Professional Elective - VI | PEC | 3 | 3 |
| | HVDC Transmission Systems | | | |
| | Wind and Solar Energy Systems | | | |
| | Advanced Electric Drives | | | |
| 2 | Open Elective- V | OEC | 3 | 3 |
| | VLSI circuits | | | |
| | Modern Manufacturing Processes | | | |
| | Computer Networks | | | |
| 3 | Open Elective - VI | OEC | 3 | 3 |
| | Electrical Materials | | | |
| | Big Data Analysis | | | |
| | PRACTICAL | | | |
| 4 | Major Project | PROJ | 8 | 16 |
| 5 | Extra-Curricular/ Co-Curricular Activity | PROJ | 0 | 0 |
| | TOTAL | | 17 | 25 |

AAHCT, Ranchi, Jharkhand
Al Haider College of Technology Department of Engineering
Faculty – Bachelor of Technology in Electrical Engineering
PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

After completing this undergraduate program, a learner:

[PO.1]. Engineering knowledge: An ability to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to get the solution of engineering problems.

[PO.2]. Problem analysis: Ability to identify, formulate, review research literature, and analyse complex engineering problems.

[PO.3]. Design/Development of Solutions: Ability to design solutions for complex Engineering Problems by considering social, Economic and Environmental aspects.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge to design, conduct analyze experiments to get valid conclusions.

[PO.5]. Modern tool usage: ability to create, select, and apply appropriate techniques, and to model complex engineering activities with an understanding of the limitations.

[PO.6]. The engineer and society: Ability to apply knowledge by considering social health, safety, legal and cultural issues.

[PO.7]. Environment and sustainability: Understanding of the impact of the adopted engineering solutions in social and environmental contexts.

[PO.8]. Ethics: Understanding of the ethical issues of civil engineering and applying ethical principles in engineering practices.

[PO.9]. Individual and teamwork: Ability to work effectively as an individual or in the team, as a member or as a leader.

[PO.10]. Communication: An ability to communicate clearly and effectively through different modes of communication.

[PO.11]. Project management and finance: Ability to handle project and to manage finance related issue.

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning.

AAHCT, Ranchi, Jharkhand

Al Haider College of Technology Department of Engineering

Faculty – Bachelor of Technology in Electrical Engineering

PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES

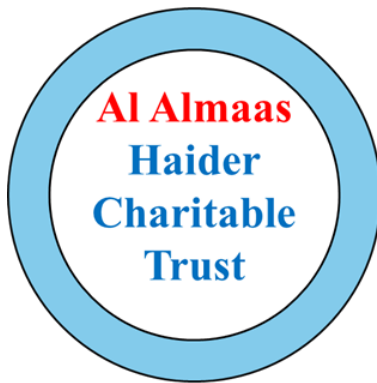
PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Professional skills – The ability to analyze and design civil engineering structures as per the guidelines in Indian standards and other relevant codes like buildings, bridges, tunnels, railways, airports, water and sewage treatment plants, etc.

[PSO.2]. Problem-solving skills – The ability to manage large infrastructural projects by making use of latest techniques of project management for optimum utilization of resources via man, material and money.

[PSO.3]. Successful Career and Entrepreneurship – Strong desire to acquire modern scientific knowledge by pursuing higher studies, which will lead them to identify problems in the civil engineering domains and thereby become an entrepreneur to propose solutions.

[PSO.4]. Communication: Communicate effectively on complex engineering activities with the engineering community & with society at large, such as being able to comprehend & write effective reports & design documentation, make effective presentations & give & receive clear instructions.



**Al Haider College
of Technology at
Ranchi, Jharkhand**

SYLLABUS OF
B. Tech in Electrical Engineering
Semester- I

AAHCT, Ranchi, Jharkhand

Al Haider College of Technology Department of Engineering

Faculty – Bachelor of Technology in Electrical Engineering

SEMESTER –I

| Sr. No. | Name of the Subject | L-T-P | Credit | Contact Hours Per Week |
|----------------|-------------------------------------|---------------|---------------|-----------------------------------|
| 1 | Engineering Mathematics–I | 3-1-0 | 4 | 3 |
| 2 | Engineering Chemistry | 3-0-0 | 3 | 3 |
| | Programming for Problem Solving | 3-0-0 | 3 | 3 |
| 3 | Basic Electrical Engineering | 3-1-0 | 4 | 3 |
| | Engineering physics | 3-1-0 | 4 | 3 |
| 4 | Engineering Mechanics | 3-0-0 | 3 | 3 |
| | English for Communication | 3-0-0 | 3 | 2 |
| 5 | Constitution of India | 0-0-0 | 0 | 2 |
| | Practical | | | 3 |
| 6 | Engineering Chemistry Lab | 0-0-1 | 1 | |
| | Engineering Physics Lab | 0-0-1 | 1 | 4 |
| 7 | Basic Electrical Engineering Lab | 0-0-1 | 1 | 4 |
| | Programming for Problem Solving Lab | 0-0-2 | 2 | 4 |
| 8 | Engineering Mechanics Lab | 0-0-1 | 1 | 2 |
| 9 | Engineering Graphics & Design | 0-0-2 | 2 | 4 |
| | Workshop Practices | 0-0-2 | 2 | 2 |
| | TOTAL | 12-2-5 | 19 | 45 |

Subject: Engineering Chemistry

Code: BTE22011

3 Credits | Semester 1

Total Lecture: 45

Total Tutorial: 9

A. Introduction:

- The following are the objectives of this course:
- To understand the Concepts of chemical bonding.
- To know the importance of the Periodic Table of the Elements, how it came to be, and its role in organizing chemical information.
- To learn about the basic concepts of Spectroscopy.

B. Course Outcomes: At the end of the course, students will be able to

| | |
|-------|--|
| [CO1] | Understand the skills required to succeed in graduate school, the chemical industry or professional school. |
| [CO2] | Acquire a foundation of chemistry of sufficient breadth and depth to enable them to understand and critically interpret the primary chemical literature. |
| [CO3] | Recognize the exigency and importance of engineering chemistry in the use of industrial and domestic determination. |
| [CO4] | Design economic and new methods of synthesis of new materials and apply their knowledge for the protection of the environment and application in their field. |
| [CO5] | Understand an insight into the latest (R&D oriented) topics, to enable the engineering student to upgrade the existing technologies and pursue further research. |

C. SYLLABUS

ATOMIC AND MOLECULAR STRUCTURE: Molecular orbital of diatomic molecules and plots of the multi-centre orbital. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbital of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Numerical based on Crystal field stabilization energy. Band structure of solids

SPECTROSCOPIC TECHNIQUES AND APPLICATIONS: Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibration and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering

USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA: Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Cell potentials, the Nernst equation and applications, Relation of free energy with EMF. Acid base, oxidation reduction and solubility equilibrium. Corrosion, Types of corrosion, galvanic series, Cathodic and anodic reactions, corrosion prevention methods.

PERIODIC PROPERTIES: Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electro negativity, polarizability, oxidation states, coordination numbers and geometries. Hard soft acids and bases (Classification, pearsons HSAB principle, its application and limitation), molecular geometries (VSEPR theory to NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2 and H_2O)

INDUSTRIAL CHEMISTRY: Polymers: types of polymers, polymerization, applications, and important synthetic polymers. Ceramics material: Classification and Applications, Water treatment, Air pollution and Control techniques.

D. TEXTBOOKS

1. A textbook of Engg. Chemistry-ShashiChawla T2. Engineering Chemistry by Wiley
2. Physical Chemistry by Atkins
3. Engineering chemistry by P.C. Jain (Dhanpat Rai Publishing company)
4. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
5. Fundamentals of Molecular Spectroscopy, by C. N. Banwell

E. REFERENCE BOOKS

1. Environmental Engg. - Keiley
2. Selected topics in inorganic chemistry-MMT
3. I. A Levine, Physical chemistry, McGraw Hill
4. Organic chemistry by Clayden.
5. Essentials of Physical Chemistry, Bahl& Tuli, S. Chand Publishing.
6. Inorganic Chemistry by J D Lee.

Subject: Engineering Mathematics–I

Code: BTE21001

Credit - 4 | Semester 1

Total Lecture: 60

Total Tutorial: 12

A. Introduction:

- To familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level
- Serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

B. Course Outcomes: At the end of the course, students will be able to

| | |
|-------|---|
| [CO1] | Remember the differential and integral calculus to notions of curvature, and to improper integrals. Apart from some other applications, they will have a basic understanding of Beta and Gamma functions. |
| [CO2] | Understand the fallouts of Rolle's Theorem that is fundamental to the application of analysis to Engineering problems. |
| [CO3] | Demonstrate the tool of power series and Fourier series for learning advanced Engineering Mathematics. |
| [CO4] | Analyze functions of several variables that is essential in most branches of engineering |
| [CO5] | Evaluate the essential tool of matrices and linear algebra in a comprehensive manner. |

C. SYLLABUS

| |
|--|
| CALCULUS: Evolutes and involutes, Evaluation of definite and improper integrals, Beta and Gamma functions and their properties Application of definite integral, Curve tracing, area, evaluate surface areas and volumes of revolutions |
| CALCULUS: Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders, Indeterminate forms and Hospitals rule, Maxima and minima |

SEQUENCE AND SERIES: Convergence of sequence and series, tests for convergence, Power series, Taylors series, series for exponential, trigonometric and logarithm functions, 2 Fourier series: Half range sine and cosine series, Parseval's theorem

MULTIVARIABLE CALCULUS (DIFFERENTIATION): Limit, continuity and partial derivatives, directional derivatives, total derivative, Tangent plane and normal line; Maxima, minima and saddle points, Method of Lagrange multipliers; Gradient, curl and divergence

MATRICES: Symmetric, skew-symmetric and orthogonal matrices, complex matrix, hermitian, skew hermitian matrix, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations, Eigen values and Eigen vectors; Diagonalization of matrices, Cayley-Hamilton Theorem, and Orthogonal transformation

D. TEXTBOOKS

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006

E. REFERENCE BOOKS

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008
B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

Subject: Basic Electrical Engineering

Code: BTE21003

Credits- 4 | Semester 1

Total Lecture: 60

Total Tutorial: 12

A. Introduction:

- To Enhance understanding the basic concepts of Core Electrical Engineering subjects. The topics covered under this subject will help
- To enhance the basic understanding of Electrical machines and power systems and basic electronics through the topic covered under this Subject

B. Course Outcomes: At the end of the course, students will be able to

| | |
|-------|--|
| [CO1] | Understand the basic knowledge of electrical quantities such as current, voltage, power, energy and frequency |
| [CO2] | Predict the behavior of any electrical and magnetic circuits. |
| [CO3] | Formulate and solve complex AC, DC circuits. |
| [CO4] | Identify the type of electrical machine used for that particular application. |
| [CO5] | Realize the requirement of transformers in transmission and distribution of electric power and other applications. |

C. SYLLABUS

D. C. CIRCUITS: Electrical circuit elements (R, L and C), voltage and current sources, dependent and independent sources, Units and dimensions, Source Conversion, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin's theorem and their application for analysis of series and parallel resistive circuits excited by independent voltage sources, Power & Energy in such circuits. Mesh & nodal analysis, Star Delta transformation & circuits and Norton theorems. Time- domain analysis of first-order RL and RC circuits.

A.C. CIRCUITS : Representation and Generation of sinusoidal AC voltage, definition of average value, R.M.S. value, form factor and peak factor of AC quantity , Concept of phasor, Concept of Power factor, Concept of impedance and admittance, Active, reactive and apparent power, Analysis of single-phase ac circuits consisting of R, L, C R-L, R-C, R-L-C series & parallel circuit Resonance Necessity and advantages of three phase systems, Meaning of Phase sequence, balanced and unbalanced supply and loads. Relationship between line and phase values for

| |
|--|
| balanced star and delta connections. Power in balanced & unbalanced three- phase system and their measurements |
| TRANSFORMERS: Types of Magnetic Material, BH characteristics (magnetization characteristics) of Ferro magnetic materials, self - inductance and mutual inductance, energy in linear magnetic systems, AC excitation in magnetic circuits, magnetic field produced by current carrying conductor, Force on a current carrying conductor. Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency Auto-transformer and three-phase transformer connections |
| ELECTRICAL MACHINES: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators |
| POWER CONVERTERS & ELECTRICAL INSTALLATIONS: DC-DC buck and boost converters, duty ratio control Single-phase and three-phase voltage source inverters; sinusoidal modulation Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup |

D. TEXTBOOKS

1. B.L. Theraja & A.K Theraja, Electrical Technology Volume-I, S. Chand & Co
2. V.N. Mittle, Basic Electrical Engineering, Tata McGraw Hill
3. S.N. Singh Basic Electrical Engineering, P.H.I
4. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall
5. C.L. Wadhwa Basic Electrical Engineering, New Age International
6. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cambridge University Press.
7. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

E. REFERENCE BOOKS

1. L.S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press
2. E. Hughes, Electrical and Electronics Technology, Pearson

Subject: Engineering Mechanics

Code: BTE22009

Credits- 3 | Semester I

Total Lecture: 45

Total Tutorial: 9

A. Introduction:

- To obtain resultant of various forces
- To obtain resultant of various forces
- To understand role of friction in equilibrium problems
- To know fundamental laws of machines and their applications to various engineering problems

B. Course Outcomes: At the end of the course, students will be able

| | |
|-------|---|
| [CO1] | Identify the force systems for given conditions by applying the basics of mechanics. |
| [CO2] | Determine unknown force(s) of different engineering systems. |
| [CO3] | Apply the principles of friction in various conditions for useful purposes. |
| [CO4] | Find the centroid and center of gravity of various components in engineering systems. |
| [CO5] | Select the relevant simple lifting machine(s) for given purposes. |

C. SYLLABUS

BASICS OF MECHANICS AND FORCE SYSTEM: Basic concepts, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units. Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification. Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem. Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.

EQUILIBRIUM: Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analyzing equilibrium, Lami's Theorem – statement and explanation, Application for various engineering problems. Types of beams, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple), Beam reaction for cantilever, simply supported beam with or without overhang –subjected

to combination of Point load and uniformly distributed load, Beam reaction graphically for simply supported beam subjected to vertical point loads only

FRICTION & VIRTUAL WORK: Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction. Introduction, laws of coulomb friction, simple contact friction problems, belt friction, the square crew thread rolling resistance, Equilibrium of bodies on level surface subjected to force parallel and inclined to plane. Equilibrium of bodies on inclined plane subjected to force parallel to the plane only. Work of a force, Principle of Virtual work and its application.

CENTROID AND CENTRE OF GRAVITY& TRUSS: Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle), Centroid of composite figures composed of not more than three geometrical figures, Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere) Centre of Gravity of composite solids composed of not more than two simple solids. The structural model, simple trusses, analysis of simple trusses: method of joints, Method of sections, graphical method.

SIMPLE LIFTING MACHINE: Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio, efficiency of machines, law of machine. Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility, Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block.

D. TEXTBOOKS

1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
3. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.

E. REFERENCE BOOKS

1. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune VidhyarthiGruh.
2. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, CambridgeUniversity Press.
3. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

Subject: Engineering Chemistry Lab

Code: BTE22015

Credits- 1 | Semester I

Total Lecture: 30

A. Introduction:

- To expose the students to a breadth of experimental techniques using modern instrumentation.
- The student will learn the laboratory skills needed to design, safely conduct and interpret chemical research.

B. Course Outcomes: At the end of the course, students will be able

| | |
|-------|---|
| [CO1] | Understand the principles of chemistry relevant to the study of science and engineering |
| [CO2] | Estimate rate constants of reactions from concentration of reactants/products as a function of time |
| [CO3] | Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc. |
| [CO4] | Differentiate hard and soft water, solve the related numerical problems on water purification and its significance in industry and daily life. |

C. SYLLABUS

| S.No. | Name of Experiments |
|-------|--|
| 1 | To determine the viscosity and relative viscosity of given sample by using Ostwald's Viscometer. |
| 2 | To prepare buffer solution and standardization of pH meter. |
| 3 | Determination of chloride content of water. |
| 4 | Determination of cell constant and conductance of solutions. |
| 5 | Determination of the amount of iron in an iron ore solution by KMnO_4 |
| 6 | To determine adsorption isotherm of acetic acid by activated charcoal |

| | |
|---|--|
| 7 | To determine alkalinity of a given water sample. |
| 8 | To synthesis a polymer/drug. |

D. TEXT BOOKS

1. Practical Chemistry by S.S. Dara
2. Practical Chemistry by D N Bajpai – S. Chand Publishing

E. REFERENCE BOOKS

1. Advanced Practical Chemistry Book by pragati prakashan

Subject: Basic Electrical Engineering Lab

Code: BTE21005

Credits- 1 | Semester I

Total Lecture: 30

A. Introduction:

- To impart a basic knowledge of electrical instruments voltmeter, ammeter, multi-meter, and oscilloscope. Real-life resistors, capacitors and inductors.
- Measurement such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
- Emphasize the effects of electric shock and precautionary measures.
- Improve the ability to function on a multi-disciplinary team.

B. Course Outcomes: At the end of the course, students will be able to;

| | |
|-------|--|
| [CO1] | Understand different meters and instruments for the measurement of electrical quantities |
| [CO2] | Understand the linear and nonlinear characteristics of different types of loads experimentally |
| [CO3] | Design and experiment with potential divider circuits |
| [CO4] | Experimentally verify the basic circuit theorems |
| [CO5] | Measure power and power factor in ac circuits |

C. SYLLABUS

| S.No. | Name of Experiments |
|-------|--|
| 1 | Demonstrate the verification of Ohm's law. |
| 2 | Demonstrate the verification of Resistance in series and parallel apparatus. |
| 3 | Demonstrate the verification of Kirchhoff's current law (KCL). |
| 4 | Demonstrate the verification of Kirchhoff's voltage law (KVL). |
| 5 | Demonstrate the characteristics of a wave rectifier. |
| 6 | Demonstrate the characteristics of full wave rectifier. |

| | |
|---|---|
| 7 | Demonstrate the verification of Thevenin's theorem. |
| 8 | Demonstrate the verification of Norton's theorem. |

D. TEXTBOOKS

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, latest edition.
2. S.N. Singh, Basic Electrical Engineering, P.H.I.,2013
3. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall,2014
4. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University press, 2012

E. REFERENCE BOOKS

1. C.L. Wadhwa, Basic Electrical Engineering. New Age International.
2. B.L. Theraja & A.K Theraja Textbook of Electrical Technology - Vol. 1, S. Chand Publication
3. E. Hughes & I.M. Smith Hughes Electrical Technology Pearson
4. Vincent Del Toro Electrical Engineering Fundamentals

Subject: Engineering Mechanics Lab

Code: BTE22013

Credits- 1 | Semester I

Total Lecture: 30

A. Introduction:

- To obtain resultant of various forces.
- To calculate support reactions through conditions of equilibrium for various structures
- To understand role of friction in equilibrium problems
- To know fundamental laws of machines and their applications to various engineering problems

B. Course Outcomes: At the end of the course, students will be able

| | |
|-------|---|
| [CO1] | Identify the force systems for given conditions by applying the basics of mechanics. |
| [CO2] | Determine unknown force(s) of different engineering systems. |
| [CO3] | Apply the principles of friction in various conditions for useful purposes. |
| [CO4] | Find the centroid and center of gravity of various components in engineering systems. |
| [CO5] | Select the relevant simple lifting machine(s) for given purposes. |

C. SYLLABUS

| S.No. | Name of Experiments |
|-------|--|
| 1 | To verify the law of the moment by using a bell crank lever |
| 2 | To verify the support reactions of a simply supported beam |
| 3 | To calculate the Mechanical advantage, Velocity Ratio and efficiency of Single Winch Crab. |
| 4 | To calculate the Mechanical Advantage, Velocity Ratio and efficiency of double Winch Crab. |
| 5 | To calculate the Mechanical Advantage, Velocity Ratio, and efficiency of Single start Worm & Worm Wheel |
| 6 | To calculate the Mechanical Advantage, Velocity Ratio, and efficiency of Double start Worm & Worm Wheel. |

| | |
|---|---|
| 7 | To calculate the Mechanical Advantage, Velocity Ratio, and efficiency of Triple start Worm & Worm Wheel |
| 8 | To verify triangle and parallelogram law of forces with the help of Gravesend's apparatus. |

D. TEXT BOOKS

1. Bedi D.S., Engineering Mechanics, Khanna Publishing House
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co., New Delhi.
3. Bansal R K, A textbook of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S., S Chand & Co., New Delhi.

E. REFERENCE BOOKS

1. Dhade, Jamadar & Wala Welkar, Fundamentals of Applied Mechanics, Pune Vidhyarthi Gruh.
2. Ram, H. D.; Chauhan, A. K. Foundations and Applications of Applied Mechanics, Cambridge University Press.
3. Meriam, J. L., Kraige, L. G. Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

Subject: Engineering Graphics & Design

Code: BTE21004

Credits- 2 | Semester I

Total Lecture: 60

A. Introduction:

- Increase ability to communicate with people
- Learn to sketch and take field dimensions.
- Learn to take data and transform it into graphic drawings.
- Learn basic Auto Cad skills.
- Learn basic engineering drawing formats
- Prepare the student for future Engineering positions

B. Course Outcomes: At the end of the course, students will be able to;

| | |
|--------------|---|
| [CO1] | Perform basic sketching techniques |
| [CO2] | Understand of architectural and engineering scales will increase. |
| [CO3] | Draw orthographic projections and sections. |
| [CO4] | Draft the engineering drawings in practical application |
| [CO5] | Become familiar with office practice and standards |

C. SYLLABUS

| S.No. | Name of Experiments |
|--------------|---|
| 1 | Introduction to Engineering Drawing |
| 2 | Projection of Points and Straight Lines |
| 3 | Projection Straight Lines |
| 4 | Projection of Planes |
| 5 | Isometric Axes, Lines, Planes, Solids. |
| 6 | Orthographic Projection |
| 7 | Development of Surface |
| 8 | Introduction to AUTO CAD |

D. TEXTBOOKS

1. Engineering Graphics, N.D Bhatt, Charotar Publishing House Pvt. Limited
2. Principle of Engineering Graphics and Drawing, R.K Dhawan, S. Chand Publishing

3. Engineering Graphics and Drafting, P.S GILL, S. K. Kataria& Sons

E. REFERENCE BOOKS

1. Engineering Drawing and Computer Graphics, Shah, M.B. & Rana B.C. Pearson Education
2. Engineering Graphics, Agrawal B. & Agrawal C. M TMH Publication
3. Textbook on Engineering Drawing, Narayana, K.L. & P. Kannaiah, Scitech Publishers