# Millia Institute of Technology
# Rambagh, Purnea

**Affiliated to BIhar Engineering University, Patna**

**NAAC Accredited & ISO 9001:2015**

# SYLLABUS

## Department of Mechanical Engineering

## 1st SEMESTER

**B. Tech (Mechanical Engineering)**
**SEMESTER –I**

| Sl No. | Course Code | Course Title | Hours Per Week | | | Total Credits |
|---|---|---|---|---|---|---|
| | | | Lecture | Tutorial | Practical | |
| 1. | 100101 | Engineering Chemistry | 3 | 0 | 0 | 3 |
| 2. | 100102 | Engineering Mathematics-I | 3 | 1 | 0 | 4 |
| 3. | 100103 | Communicative English | 3 | 0 | 0 | 3 |
| 4. | 100109P | Sports/Yoga/NCC/NSS | 0 | 0 | 2 | 1 |
| 5. | 100104 | Engineering Graphics and Design | 1 | 0 | 0 | 1 |
| 6. | 100106 | Basic Electrical Engineering | 3 | 0 | 0 | 3 |
| 7. | 100101P | Engineering Chemistry Lab | 0 | 0 | 2 | 1 |
| 8. | 100103P | Communicative English Lab | 0 | 0 | 2 | 1 |
| 9. | 100104P | Engineering Graphics and Design Lab | 0 | 0 | 4 | 2 |
| 10. | 100106P | Basic Electrical Engineering Lab | 0 | 0 | 2 | 1 |
| TOTAL | | | | | | 20 |

**Group A 1st & 2nd Sem (SESSION 2024-2025)**

## Course Code-100101 Engineering Chemistry 3 0 0 3

**UNIT 1.0- Atomic and Molecular Structure 8 hrs**

Electromagnetic radiations, Dual nature of electron and Heisenberg uncertainty Principle. Photoelectric effect, Planck's theory. Principles for the combination of atomic orbitals to form a molecular diagram of molecular orbitals. Bent's rule, VSEPR theory (typical example) co-ordination numbers and geometries. Isomerism in transition metal compounds. Metal Carbonyls; Synthesis and Structure.

**UNIT 2.0- Spectroscopy 6 hrs**

Principle of rotational and vibrational spectroscopy, selection rule for application in diatomic molecules, elementary idea of electronic spectroscopy, UV-VIS spectroscopy with related to rules and its applications. Basic Principle of nuclear Magnetic resonance spectroscopy with applications.

**UNIT 3.0 -Electrochemistry and Fuels 6 hrs**

Nernst equation, EMF and electrochemical cell, the introduction of corrosion, corrosion mechanism, types of corrosion, water line corrosion, stress corrosion, pitting corrosion, Lead acid storage cell, leclanche cell. Calorific value of fuels, proximate and ultimate analysis of coals, fuel cells, Bio fuels.

**UNIT 4.0- Water Chemistry 8 hrs**

Hardness of water, estimation of water hardness by EDTA and Alkalinity method. Removal of the hardness of water- soda lime process, zeolite process, Ion exchange process, Boiler problem, sludge, and scale formation, priming and foaming, Boiler corrosion, and Caustic embrittlement.

**UNIT 5.0 - Polymer and Plastics 8 hrs**

Polymerization techniques (free radical, ionic, and co-ordination mechanism)Preparation properties, and technical application of phenol-formaldehyde resins, elastomers, synthetic rubbers (Buna-S, Buna-N, neoprene). Inorganic polymers, Silicones, adhesives, epoxy resins. the structural difference between thermoplastic and thermosetting Plastics, the Importance of commercially important thermoplastics and thermosets; Poly ethylene, Polyvinyl chloride, Polystyrene.

**UNIT 6.0- Organic Reactions and Synthesis of A Drug Molecul 6 hrs**

Introduction to intermediate and reaction involving Substitution, addition, elimination, oxidation-reduction. Diels Elder cyclization and epoxide ring opening reactions, synthesis of commonly used drug molecules like aspirin.

**Test/ Reference:-**


1. University Chemistry, B.H. Mahan,Pearson
2. Chemistry, principles and application, M.J. Sienko and R.A. Plane, McGraw Hill International
3. Fundamentals of molecular Spectroscopy, C.N. Banwell , McGraw Hill International
4. Engineering Chemistry (NPTEL Web- Book), B.L. Tembe, Kamaluddin and M.S. Krishnan, NPTEL
5. Physical Chemistry, P.W. Atkins, Oxford University Press
6. A text book of engineering chemistry, S. Chawala, Dhanpat Rai Publication
7. General Chemistry Part 1, R. Sarkar, New Central Book agency

**Group A 1st & 2nd Sem (SESSION 2024-2025)**

## Course Code-100101P Engineering Chemistry Lab 0 0 2 1

**Perform any 10 Experiments**

1. To estimate hardness of water by alkalinity method
2. To estimate hardness of water by EDTA method
3. To remove hardness of water by ion exchange method
4. Determination of pH of a given acid solution using a standard sodium hydroxide solution
5. Determination of surface tension and viscosity
6. Chemical analysis of salt (Acid radical and basic radical)
7. Adsorption of acetic acid by charcoal
8. Test of adulteration of fat butter, sugar, turmeric powder, chilli powder and pepper
9. Saponification/ acid value of an oil
10. Identification of organic substances and their functional groups
11. Potentiometric determination of redox potentials and emf
12. Synthesis of drug/ polymer like ASPRIN/ Urea- formaldehyde resin
13. Thin layer chromatography
14. Analysis of flue gas by orsatapparatus

**Group A 1st & 2nd Sem (SESSION 2024-2025)**

## Course Code-100102 Engineering Mathematics–I 3 1 0 4

**Unit- 1.0: Linear Algebra-I** **7 hrs**

Elementary Row operations, Gauss -Jordan Method for finding the inverse of Matrix, Complex Matrix : Hermitian , Skew Hermitian and Unitary Matrix, Vector space, Sub Spaces, Linear dependence and Independences of Vectors, Linear Span, Basis, Dimension, Extension of basis of subspace, The rank of a matrix, Row and column space, Solvability of system of linear equations.

**Unit- 2.0: Linear Algebra-II** **7 hrs**

Linear Transformations, Kernel and Range of linear transformation, Matrix Representation of a linear transformation, Rank-Nullity Theorem, Eigen Value and Eigen Vectors, Properties of Eigen vectors, Eigen Bases, Orthogonal Transformation, Similarity Transformation, Matrix Diagonalization, Cayley- Hamilton Theorem.

**Unit- 3.0: Calculus for single variable** **7 hrs**

Inderminate form, L'Hospital Rule, Rolle's Theorem, Mean Value Theorem, Expansion of function (single variable), Taylor and Maclaurin Series, Riemann Integration, Riemann Sum, Improper Integrals, Beta and Gamma function and their properties.

**Unit- 4.0 : Multivariable Calculus (Differentiation)** **7 hrs**

Function with two or more variable, Limit, continuity and Partial differentiation, Total Differentiation

Taylor's series and Maclaurin's series for function with two variable, Jacobian, Maxima and Minima, Method of Lagrange's multiplier.

**Unit-5.0: Multivariable Calculus (Integration)** **7 hrs**

Double Integral, change of order of integration, Triple integral, Change of Variable in a Double and Triple Integrals, Change to polar coordinate, Change to cylindrical coordinate, Change to spherical polar coordinate, Application to area and volume using double and triple integral

**Unit- 6.0: Vector Calculus** **7 hrs**

Scalar and vector fields, Gradient, Directional derivative, Divergence, Curl and their properties, Line integral, Green's theorem in plane (without proof), Surface integral, Stoke's theorem (without proof), Volume Integral, Gauss-Divergence' theorem (without proof).

**Test/ Reference:-**


1. AICTE's Prescribed Textbook: Mathematics-I (Calculus & Linear Algebra), Reena Garg, Khanna Book Publishing Co. ISBN-10 9391505171
2. Advanced Engineering Mathematics, Chandrika Prasad & Reena Garg, Khanna Book Publishing Co., 2021. ISBN 10: 9386173522 / ISBN 13: 9789386173522.
3. Higher Engineering Mathematics, B.V. Ramana, Tata McGraw Hill New Delhi, 11th Reprint, 2010,ISBN-10 007063419X ISBN-13978- 0070634190.
4. Advanced Engineering Mathematics, SrkIyengar Rk Jain,Narosa,5thEdition,ISBN-10 8184875606I
   SBN-13978-8184875607
5. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.

**Group A 1st & 2nd Sem (SESSION 2024-2025)**

## Course Code-100103 Communicative English 3 0 0 3

**Unit-1.0: Vocabulary Building** **7 hrs**

Nature of Word Formation; Root Word and Morpheme; Prefix and Suffix; Foreign Expressions in English; Synonym and Antonym; Homophone and Homograph; Abbreviation and Acronym.

**Unit-2.0: Basic Writing Skills** **7 hrs**

Parts of Speech: Types of Words; Structures of Sentence; Kind of Sentence; Phrase and Clause; Punctuation Marks; Capitalization; Tenses: Present, Past and Future; Voices: Active and Passive; Formation of Questions using Primary Auxiliaries, Modals and Wh-Words.

**Unit-3.0: Common Errors in English** **7 hrs**

Articles; Prepositions; Modifiers; Subject-Verb Agreement; Noun-Pronoun agreement; Redundancies; Cliches; Spelling Error.

**Unit-4.0: Principles of Appropriate Writi** **7 hrs**

Defining: Describing, Classifying and Exemplifying; Introduction, Body, and Conclusion; References, Quotations and Illustrations; Organizing the Paragraphs in a Document; 7Cs of the Professional Writing: Clear, Concise, Concrete, Correct, Coherent, Complete and Courteous.

**Unit-5.0: Practices of Formal Writing** **7 hrs**

Formal Letter: Cover-Letter and Application; Resume Writing; Report Writing; Minutes of Meeting; Memorandum; Notice; Essay Writing: Personal and Impersonal; Email Writing Etiquettes; Article Writing; Writing for Current Social Media.

**Unit-6.0: Comprehension of Written English** **7 hrs**

*Of Studies* (Essay) by Sir Francis Bacon; *The Sun Rising* (Poem) by John Donne; *The Last Leaf* (Story) by O Henry; Unseen/Untaught Passage.

**Test/ Reference:-**


1. English language and communication skills for engineers, Sanjay Kumar,Pushp lata, Oxford university Press
2. Communicative English for Technical student, Dr. Bijay Bhadur Singh and Dr. Kalpana Sinha, Foundation publishing House (FPM)
3. Communication Skill (As per VRV syllabus 2018),Sanjay Kumar and Pushp lata, Oxford University Press
4. A course in Listening & Speaking, V. Sasi Kumar ,P. Kiranmai Dutt and Geetha Rajeevan, Foundation Books

**Group A 1st & 2nd Sem (SESSION 2024-2025)**

## Course Code-100103P Communicative English Lab 0 0 2 1

**Perform any 10 Experiments**

**Language Lab of English** includes Listening Comprehension, Reading Comprehension, Speaking Skills: Phonetics, International Phonetic Alphabet Symbols (IPAS), Sounds: Vowels and Consonants, Pronunciation, Intonation, Stress and Rhythm, Just A Minute Technique (JAM), Communication: Verbal and Non-Verbal; Ethical Usage of Artificial Intelligence, Self-Introduction: Social, Academic and Professional; Interview: Online and Offline; Oral Presentation, Debate, Group Discussion, Group-Activities, and Brainstorming Vocabulary Activities.

1. Listening Comprehension and Speed (Software)
2. Reading Comprehension and Speed (Software)
3. Pronunciation: Learning and Test (Software)
4. Self-Introduction: Social, Academic and Professional
5. English Typing: Microsoft Word Document (MS Word), and Microsoft Power Point Presentation (PPT)
6. Oral Presentation
7. Interview: Online and Offline
8. Just A Minute Technique (JAM) and Extempore
9. Debate
10. Group Discussion
11. Activities: Role Play, Peer Activities, and Group Activities
12. Anchoring and Addressing: an Assembly, a Meeting, a Seminar, a Party

**Group A 1st & 2nd Sem (SESSION 2024-2025)**

## Course Code-100101P Sports/Yoga/NCC/NSS 0 0 2 1

Course Objectives:

(a) Encouraging creativity and innovation: The course could aim to foster a culture of creativity and innovation among engineering students. It could provide opportunities for students to generate and develop new ideas, think critically, and come up with innovative solutions to real-worldproblems. This objective could be achieved through brainstorming sessions, design thinking exercises, and hands-on projects.

(b) Enhancing problem-solving skills: The course could focus on enhancing the problem-solving skills of engineering students. It could provide training on various problem-solving techniques, such as root cause analysis, critical thinking, and decision-making. Students may learn how to identify and analyse complex problems, develop feasible solutions, and implement them effectively.

(c) Developing project management skills: The course could aim to develop project management skills among engineering students. It could cover topics such as project planning, scheduling, budgeting, and risk management. Students may learn how to manage resources, communicate effectively, and work collaboratively in a project-based environment.

(d) Promoting interdisciplinary collaboration: The course could encourage interdisciplinary collaboration among engineering students. It could provide opportunities for students from different engineering disciplines to work together on innovative projects. This could foster cross-disciplinary learning, encourage diverse perspectives, and promote teamwork and collaboration skills.

(e) Facilitating practical application of engineering concepts: The course could focus on the practical application of engineering concepts and principles. It could provide students with opportunities to apply their theoretical knowledge to real-world projects, prototypes, or simulations. Students may learn how to translate engineering theories into practical solutions and develop hands-on experience in implementing innovative projects.

**Pre-requisite: Nil**

**Course Outcome**:

1. Developed innovative projects: Students may have successfully developed innovative projects that demonstrate their creativity, problem-solving skills, and technical competence. These projects could be prototypes, models, simulations, or practical solutions to real-world problems, showcasing their ability to apply engineering concepts in a creative and innovative manner.

2. Improved critical thinking and problem-solving skills: Students may have honed their critical thinking and problem-solving skills through various course activities, such as brainstorming, design thinking, and project development. They may have learned to analyse complex problems, identify viable solutions, and make informed decisions based on technical, economic, and social considerations.

3. Enhanced project management and teamwork skills: Students may have gained practical experience in managing projects, including planning, scheduling, budgeting, and risk management. They may have learned how to work effectively in a team, collaborate with diverse team members, and communicate project progress and results professionally.

4. Increased interdisciplinary knowledge and collaboration: Students may have gained exposure to interdisciplinary concepts and collaborated with peers from different engineering disciplines. They may have learned to appreciate diverse perspectives, leverage interdisciplinary knowledge, and work collaboratively to develop innovative solutions that integrate multiple domains of engineering.

5. Cultivated a mindset of innovation and entrepreneurship: Students may have developed a mindset of innovation and entrepreneurship, recognizing the importance of creativity,

adaptability, and continuous improvement in engineering practice. They may have learned to identify opportunities, think critically, and take risks to develop and implement innovative projects with commercial or societal potential.

List of Reports:

Any topics related to innovative project.

**Group A 1st & 2nd Sem (SESSION 2024-2025)**

## Course Code-100104 Engineering Graphics and Design 1 0 0 1

**Unit- 1.0: Introduction to Engineering Drawing** **7hrs**

Principles of Engineering Graphics and Their Significance, Usage of Drawing Instruments, Lettering, Conic Sections including the Rectangular Hyperbola (General Method Only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales Plain, Diagonal and Vernier Scales

**Unit- 2.0 Orthographic Projections** **7hrs**

Principles of Orthographic Projections - Conventions -Projections of Points and Lines Inclined to Both Planes; Projections of Planes Inclined Planes Auxiliary Planes.

**Unit- 3.0 Projections of Regular Solids** **7hrs**

Types of Solids, Projects of Solids (Prism, pyramids, cone, and cylinder): Inclined to Both the Planes- Auxiliary Views; Draw Simple Annotation, Dimensioning and Scale.

**Unit- 4.0 Sections and Sectional Views of Right Angular Solids** **7hrs**

Section of Solids (Prism, Cylinder, Pyramid, Cone), Auxiliary Views; Development of Surfaces Of Right Regular Solids- Prism, Pyramid, Cylinder And Cone; Draw The Sectional Orthographic Views of Geometrical Solids, Objects From Industry And Dwellings (Foundation To Slab Only).

**Unit- 5.0 Isometric Projections** **7hrs**

Isometric Views, Compound Solids; Principles of Isometric Projection Isometric Scale, Conventions; Isometric Views of Lines, Planes, Simple and Conversion of Isometric Views toOrthographic Views And Vice-Versa, Conventions.

**Unit- 6.0 Overview of Computer Graphics** **7hrs**

Listing the Computer Technologies that Impact on Graphical Communication, Demonstrating Knowledge of the Theory of CAD Software [Such As: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify And Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog Boxes And Windows, Shortcut Menus (Button Bars), The Command Line (Where Applicable), The Status Bar, Different Methods of Zoom as Used in CAD, Select and Erase Objects.; Isometric Views of Lines, Planes, Simple And Compound Solids.

**Test/ Reference:-**


1. Engineering Drawing, N.D. Bhatt, Charotar Publishing House, 53rd Edition, ISBN: 978-9380358277
2. A Textbook of Engineering Drawing, R.K. Dhawan, S. Chand Publishing, Revised Edition, ISBN: 978-8121929571
3. Engineering Drawing and Graphics, K. Venugopal, V. Prabhu Raja, New Age International Publishers, 3rd Edition, ISBN: 978-8122430120
4. Engineering Graphics with AutoCAD, D.M. Kulkarni, A.P. Rastogi, A.K. Sarkar, PHI Learning Pvt. Ltd., 1st Edition, ISBN: 978-8120337834

**Group A 1st & 2nd Sem (SESSION 2024-2025)**

## Course Code-100104P Engineering Graphics and Design Lab 0 0 4 2

**Perform any 10 Experiments**

1. (Which includes dimensioning methods, different types of line, construction of different polygon, divide the line and angle in parts, use of stencil)
2. Construction of Plane, Diagonal & Vernier Scales.
3. Construction of Ellipses, Parabolas, and Hyperbolas using the general method.
4. Construction of cycloid, epicycloid, hypocycloid, and involute of a circle.
5. Projection of Points and Lines inclined to both planes.
6. Projections of Planes (e.g., rectangular, triangular) in inclined positions.
7. Projection of Solids (prisms,pyramids, cones, and cylinders)
8. Drawing of Sections of Prisms, Cylinders, Pyramids, and Cones.
9. Development of Surfaces for prisms, pyramids, cylinders, and cones.
10. Construction of Isometric views of lines, planes, and simple solids.
11. Introduction to CAD Software.
12. Use of CAD software to draw basic geometric shapes, apply dimensions, and modify objects.

**Group A 1st & 2nd Sem (SESSION 2024-2025)**

## Course Code-100106 Basic Electrical Engineering 3 0 0 3

**Unit- 1.0** **8 hrs**

DC Circuit Analysis and Network Theorems: Concepts of Network, Active and Passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements. R L and C as linear elements. Source Transformation. Kirchhoff's Law, loop and nodal methods of analysis; star – delta transformation; Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem. (Simple Numerical Problems)

**Unit- 2.0** **5 hrs**

Magnetic Circuit: Magnetic circuit concepts, analogy between Electric & Magnetic circuits, Magnetic circuits with DC and AC excitation, Magnetic leakage. B-H curve, Hysteresis and Eddy Current losses, Magnetic circuit calculations.

**Unit- 3.0** **8 hrs**

Steady State Analysis of Single-Phase AC Circuits: Sinusoidal, Square and Triangular waveforms–average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel, and series – parallel RLC Circuits: Apparent, Active & Reactive Powers, Power factor, causes and problems of low power factor, power factor improvement. Resonance in Series and Parallel Circuits. (Simple Numerical Problems)

**Unit- 4.0** **5 hrs**

Three Phase AC Circuits: Three Phase System – its necessity and advantages, meaning of phase sequence and star and delta connections, balanced supply and balanced load, line and phase voltage/ current relations, three phase power and its measurement. (Simple Numerical Problems)

**Unit- 5.0** **10 hrs**

Introduction to DC Machines:Principal, Operation, Construction, and types of DC machines, e.m.f. equation of generator and torque equation of motor.

Single Phase Transformer: Principle of Operation, Construction, e.m.f. equation, losses in transformer, efficiency.

Three Phase Induction Motor:Principal, Operation, and Construction (Simple Numerical Problems)

**Unit- 6.0** **6 hrs**

Soldering- Soldering and desoldering techniques, breadboard wiring, general-purpose PCB soldering/wiring.

Wiring-Types of residential and commercial wiring systems, general rules and guidelines for installation, loadcalculation and sizing of wire, rating of main switch, distribution board.

**Test/ Reference:-**


1. Basic Electrical Engineering, D.P. Kothari et al,McGraw-Hill Education 4th Edition,2019
2. Electrical and Electronic Technology Edward Hughes, 12th edition, 2016
3. Principles Electrical Engineering and Electronics, V.K Mehata, Rohit Mehta, S Chand and Company 2nd edition, 2015
4. Basic Electrical Engineering, J. B. Gupta, Katson Publication
5. A textbook of Electrical Technology B. L. Thereja, A. K. Thereja Vol. 1, 2, and 3 S Chand Publication

**Group A 1st & 2nd Sem (SESSION 2024-2025)**

## Course Code-100106P Basic Electrical Engineering Lab 0 0 2 1

**Perform all 10 Experiments**

1. Verification of Kirchhoff's laws.
2. Verification of Superposition Theorem.
3. Verification of Thevenin's Theorem.
4. Verification of Norton's Theorem.
5. Verification of Maximum Power Transfer Theorem.
6. Measurement of power in 3 – Ø circuit by Two Watt meter method and determination of its power factor.
7. Star to Delta and Delta to Star conversion of the three circuit.
8. Determination of Efficiency by load test of a 1 – Ø Transformer.
9. To study the typical BHK house wiring
10. Study of safety precautions while working on electrical installations and necessity of earthing