



SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Course: B. Tech Branch: CE,ME, EE, EC, Mining, Automobile, FT&S Semester: First
Academic Session: 2024 w.e.f. : 02-09-2024

BOT 011: ENGINEERING MATHEMATICS – I

Course Objectives: To learn:-

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
- Concept of Sequence.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

Course Outcomes: After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Analyze the nature of sequence and series.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.

UNIT-I: Matrices:-

Rank of matrix by Echelon form and Normal form. Eigen values and Eigen vectors, solution of simultaneous equation by elementary transformation and consistency of equation. Cayley Hamilton theorem and its application to find the inverse of Matrix. Diagonalisation of Matrix. Inverse of Non singular Matrices by Gauss-Jordan Method. Reduction of Quadratic form to Canonical form by Orthogonal Transformation.

UNIT-II: Ordinary Derivatives and Application:-

Expansion of Function by Maclaurin's and Taylor's Theorem (one variable), Partial Differentiation; Definition, Maxima and Minima of function of Two variables and Three variables using Method of Lagrange Multipliers.

UNIT-III: Partial Derivatives and Application:-

Euler's Theorem for Homogeneous function. Differentiation of Implicit Function, Total differential coefficient. Jacobian; Functional Dependence and Independence.

UNIT-IV: Integral Calculus:-

Definite Integral as a Limit of sum. Application in summation of Series. Beta and Gamma Function; Definition, Relation between Beta and Gamma Function, Duplication Formula, Application of Beta and Gamma Function.

UNIT-V: Application of Integral Calculus:-

Multiple Integral Double and Triple, Change of Order of Integration. Application of Multiple Integral in Area, Volume. Surface and Volume of solid of Revolution about X-Axis and Y Axis.

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

REFERENCES:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.



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BOT 012: ENGINEERING PHYSICS

Course Objectives:

- Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
- Students will be able to demonstrate competency and understanding of the concepts found in Quantum Mechanics, Fiber optics and lasers, Semiconductor physics and Electromagnetic theory and a broad base of knowledge in physics.
- The graduates will be able to solve non-traditional problems that potentially draw on knowledge in multiple areas of physics.
- To study applications in engineering like memory devices, transformer core and electromagnetic machinery.

Course Outcomes: Upon graduation:

- The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state.
- The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.
- Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
- The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.

UNIT-I: Quantum Mechanics

Introduction to quantum physics, Black body radiation, Planck's law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

UNIT-II: Semiconductor Physics

Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation.

UNIT-III: Optoelectronics

Radiative and non-radiative recombination mechanisms in semiconductors, LED and semiconductor lasers: Device structure, Materials, Characteristics and figures of merit, Semiconductor photo detectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

UNIT-IV: Lasers and Fibre Optics

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO₂) laser, He-Ne laser, Applications of laser.

Fiber Optics: Introduction, Optical fiber as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibers, Losses associated with optical fibers, Applications of optical fibres.

UNIT-V: Electromagnetism and Magnetic Properties of Materials

Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations, Polarisation, Permittivity and Dielectric constant, Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezoelectrics. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials.

TEXT BOOKS:

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learning.
2. Halliday and Resnick, Physics - Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand

REFERENCES:

1. Richard Robinett, Quantum Mechanics
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill inc. (1995).
3. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL



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BOT 012P: ENGINEERING PHYSICS

List of Experiments:

1. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.
2. Solar Cell: To study the V-I Characteristics of solar cell.
3. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.
4. Stewart – Gee’s experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect: To determine work function of a given material.
7. LASER: To study the characteristics of LASER sources.
8. Optical fibre: To determine the bending losses of Optical fibres.
9. LCR Circuit: To determine the Quality factor of LCR Circuit.
10. R-C Circuit: To determine the time constant of R-C circuit.

Note: All 10 Experiments are to be performed.



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BOT 013: BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Course Objectives:

- To introduce the concepts of electrical circuits and its components.
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits.
- To study and understand the different types of DC/AC machines and Transformers.
- To impart the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.

Course Outcomes:

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations

UNIT-I:- ELECTRICAL CIRCUITS:-

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law – Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only).

UNIT-II:- ELECTRICAL MACHINES:-

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT-III: - ANALOG ELECTRONICS: -

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon & Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters.

Unit IV:- DIGITAL ELECTRONICS:-

Review of number systems, binary codes, error detection and correction codes, Combinational logic – representation of logic functions-SOP and POS forms, K-map representations – minimization using K maps (Simple Problems only).

Unit V:- DIGITAL COMMUNICATION:-

Introduction to Communication Systems – Modulation – Types – Need for Modulation. Theory of Amplitude Modulation – Evolution and Description of SSB Techniques – Theory of Frequency and Phase Modulation – Comparison of Analog Communication Systems. Generation and detection of AM and FM

Suggested Text-Books/Reference-Books:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L.S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
5. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.
6. Basic Electrical Engineering – B. L. Thereja, 20th edition 2007, S. Chand Publication
7. Basic Electrical & Electronics Engineering – J. B. Gupta, Galgotia Publication



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BOT 013P: BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

List of Experiments

1. To Verify Ohm's Law.
2. To Verify KVL & KCL.
3. To Verify Super Position Theorem.
4. Analysis of Series and Parallel Connection of Batteries.
5. To Verify Nortons Theorem.
6. Practice in soldering- Measurement of Resistant and Measurement of specific Resistant.
7. Demonstration and identification of types of cables. Demonstration & practice on using standard wire gauge.
8. Examination and checking of cables and conductors and verification of materials according to the span.
9. To verify P-N Junction Diode.
10. To verify LED.
11. To study of robotics parts.
12. Create a line follower robots.
13. Create a ultrasonic robot.



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BOT014: COMMUNICATION SKILLS

Unit-I:- Introduction:-

Identifying Common errors in writing: Subject-Verb Agreement, Reported speech: Direct and Indirect, Articles, Prepositions. Active and Passive Voice, Sentence Structure.

Unit-II:- Vocabulary building and usage:-

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Homophones and homonyms, one word substitution.

Unit-III:- Communication Process and Its needs:-

Introduction, Meaning and Significance, Barriers to Communication and Ways to overcome them, process of Communication, Oral and Written Communication, nonverbal communication, Importance of communication for Technical students,.

Unit-IV:- Developing Writing Skills:-

Planning, Drafting and Editing, Precise writing, Precis, Technical definition and Technical description, Report writing: Features of writing a good Report, Structure of a Formal Report, Report to Trouble, Laboratory Report, Progress Report.

Writing skills on social media platforms like Facebook, Instagram, X, thread etc.

Unit-V:- Business Correspondence:-

Importance of Business Letters, Parts and Layout; Application, Contents of good Resume, guidelines for writing Resume, Complaint, E-mail and Tender, Calling/Sending Quotation, Order.

Books Recommended:

1. Communication Skill, Sanjay Kumar and Pushlata, OUP2011.
2. Technical Communication : Principles and practice”, Meenakshi Raman and Sangeeta Sharma (Oxford)
3. Practical English Usage Michael Swan OUP, 1995.
4. Effective Business Communication”, Krizan and merrier (Cengage learning)
5. Exercises in spoken English Parts I-III CIEFL, Hyderabad, Oxford University Press

6. Communication Skills for Technical Students Book- I, Book -II- M/S Somaiya Publication, Bombay
7. Practical English Grammar- Thomson & Martinet
8. English Conversation Practice- Grant Taylor
9. Effective Business Communication-M.V. Rodrigues, Concept Pub. Co. New Delhi.
10. English Grammar, Usage, and Composition - Tickoo& Subramanian, S. Chand & Co. Standard Allen Longman.



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BOT014P: COMMUNICATION SKILLS Lab

Course objective: The language laboratory focuses on the practice of English through audio-visual aids and Computer software. It intends to enable the students to speak English correctly with confidence and intends to help them to overcome their inhibitions and self-consciousness while speaking in English.

Topics to be covered in the Language laboratory sessions:

1. Listening Comprehension.
2. Pronunciation, Intonation, Rhythm
3. Practicing everyday dialogues in English
4. Interviews.
5. Formal Presentation

Final Assessment should be based on assignment, assessment, presentation and interview of each candidate.



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BOT 015: ENGINEERING GRAPHICS

Course objectives:

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

Course Outcomes: At the end of the course, the student will be able to:

- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

UNIT – I:- Introduction to Engineering Drawing:-

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola. Cycloid, Epicycloid and Hypocycloid, Involute, helix and Archimedean spiral

Scales – Plain, & Diagonal & Scale of Chords.

UNIT- II:- Orthographic Projections:-

Principles of Orthographic Projections–Conventions–Projections of Points and Lines, Projections of Plane regular geometric figures.— Auxiliary Planes.

UNIT – III:- Projections of Regular Solids:-

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

UNIT – IV:- Development of Surfaces:-

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone and composite.

Intersection of Solids: Intersection of – Prism v/s Prism- Cylinder v/s Cylinder

UNIT – V:- Isometric Projections:-

Principles of Isometric Projection–Isometric Scale–Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

Introduction to CAD: (For Internal Evaluation Weightage only):

Introduction to CAD Software Package Commands.- Free Hand Sketches of 2D-Creation of 2D Sketches by CAD Package.

2D Drawing of element on AutoCAD. (At least 2 drawing)

TEXTBOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

REFERENCE BOOKS:

1. Engineering Drawing - Basant Agrawal and C. M. Agrawal/ McGraw Hill
2. Engineering Drawing - M. B. Shah, B.C. Rane / Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy *et al.* – CBS Publishers
4. Engineering Drawing – Dhananjay A. Jolhe/ Tata McGraw Hill



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BOT 015P: ENGINEERING GRAPHICS PRACTICAL

- Practice assignment must be conducted on drawing sheets based on each topic.
- 2D drafting on AutoCAD software



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BOT 016P: BASICS OF INDIAN CONSTITUTION

Course Objectives: This paper will orient students on

- Constitutional rights and duties, perspective and remedies.
- To realize the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution

Course Outcomes: After learning the contents of this paper the student must be able to

- Understand and explain the significance of Indian Constitution as the fundamental law of the land.
- Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.

UNIT-I:- Fundamental Rights – I

Definition of State" for Enforcement of Fundamental Rights: Justifiability of Fundamental Rights, Doctrine of Eclipse, Severability, Waiver.

Right to Equality (Articles 14-18): Doctrine of Reasonable Classification and the Principle of Absence of Arbitrariness, Legitimate Expectations, Principle of Compensatory Discrimination.

Fundamental Freedom (Article 19): Freedom of Speech and Expression, Freedom of Press and Media; Expansion by Judicial Interpretation of Article 19; Reasonable Restrictions (Article 19 clause (2) to (5)).

UNIT-II:- Fundamental Rights – II

Right to Life and Personal Liberty (Articles 20-22): Scope and Content (Expansive Interpretation- Right to Privacy, Gays" Rights, Live-in Relationships, etc.).

Right to Education (Article 21A): RTE Act, 2009.

Right against Exploitation (Articles 23-24): Forced Labour, Child Employment and Human Trafficking.

Freedom of Religion and Cultural and Educational Rights of Minorities (Articles 25-30).

Unit-III: Right to Constitutional Remedies

Writs: Habeas Corpus, Mandamus, Certiorari, Prohibition and Quo-warranto

Art. 32 and Art. 226

Judicial Review

Writ Jurisdiction and Private Sector

Unit-IV: Directive Principles and Fundamental Duties

Nature and Justiciability of the Directive Principles

Detailed Analysis of Directive Principles (Articles 37-51)

Fundamental Duties d. Inter-Relationship between Fundamental Rights and (51 A) Directive Principles

Text Books :

1. V.N. Shukla, Constitution of India, Eastern Book Agency, 2014
2. M.P. Jain, Indian Constitutional Law, Lexis Nexis, 2013

References:

1. D.D. Basu, Introduction to the Indian Constitution of India, Prentice Hall of India Private Ltd., New Delhi, 1994
2. H. M. Seervai, Constitutional Law of India, Universal Law Publishing Co., Reprint, 2013
3. Glanville Austin, Indian Constitution-Cornerstone of the Nations, Oxford University Press, 1999
4. P.M. Bakshi, The Constitution of India, Universal Law Publishing Co., 2014