



# SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

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

## **BOT 021: ENGINEERING MATHEMATICS-II**

### **Course Objectives: To learn**

- Methods of solving the differential equations of first and higher order.
- Evaluation of Partial Differential Equations
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

### **Course Outcomes:**

- After learning the contents of this paper the student must be able to
- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems
- Evaluate the Application in Solution of Wave and Heat Conduction Equations.
- Evaluate the line, surface and volume integrals and converting them from one to another

### **UNIT-I:- First Order ODE**

Exact, linear and Bernoulli's 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  $x$  and Clairaut's type.

### **UNIT-II:- Ordinary Differential Equations of Higher Order**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type  $\sin$ ,  $\cos$ , method of variation of parameters; Equations reducible to linear ODE with constant coefficients:

Legendre's equation, Cauchy-Euler equation.

### **UNIT-III:- Partial Differential Equations**

Partial Differential Equations of First Order, Partial Differential Equations with Constant Coefficients, Separation of Variable Method with Application in Solution of Wave and Heat Conduction Equations.

### **UNIT-IV:- Vector Differentiation**

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

### **UNIT-V:- Vector Integration**

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

**TEXT BOOKS:**

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, 9thEdition, Pearson, Reprint, 2002.

**REFERENCES:**

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.



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### **BOT 022: ENGINEERING CHEMISTRY**

#### **Course Objectives:**

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
- To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.
- To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

**Course Outcomes:** The basic concepts included in this course will help the student to gain:

- The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
- The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
- The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
- The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

#### **Unit - I:- Technology of Water:-**

Standards for drinking water, Methods of Treatment of water for domestic and industrial purposes: sedimentation, coagulation, filtration, sterilization, break point chlorination, Determination of alkalinity and hardness of water. Demineralization of water, softening of water: lime-soda process, ion-exchange process, zeolite process. Boiler Troubles: Carry Over, Priming, Foaming, Scale, Sludge, Corrosion, Caustic Embrittlement. Internal treatment of water: Carbonate conditioning, Phosphate conditioning, Colloidal conditioning, Calgon conditioning. Calculations on water softening by Lime-soda process, Zeolite process.

## **Unit - II:- Fuels, Combustion & Cement:-**

Classification, Calorific value, Types, Determination by Bomb calorimeter, Dulong's Formula, Analysis of Coal, Proximate and Ultimate analysis, Flue gas analysis, Significance, Numericals, Carbonization of Coal, Manufacture of metallurgical coke by Otto Hoffman's byproduct oven, Combustion calculations. Cement: Characteristics of the constitutional compounds of cement, setting and hardening of cement, Additives of the cement, Properties and general composition.

## **Unit - III:- Corrosion and Phase Rule:-**

Corrosion and its control: Electrochemical series, Galvanic series, Types of corrosion: dry and wet corrosion, galvanic, concentration cell, pitting, stress, inter-granular, waterline. Factors affecting corrosion: Nature of metal and nature of environment, Protective measure against corrosion. Phase Rule: Phase Rule, Explanation of terms, Advantages & Limitations of Phase rule, application of Phase rule to one component system; Water system.

## **Unit - IV:- Lubricants & Polymers:-**

Lubricants: Functions of lubricant, Mechanism of lubrication, Fluid or Hydrodynamic Lubrication, Thin film or Boundary lubrication & Extreme pressure lubrication, Tests of lubricants and their significance. Polymers: Types of Polymerization, thermoplastics & thermosetting polymers, preparation, properties and applications of Teflon, PVC, Nylon, Bakelite & Urea-Formaldehyde. Elastomers: Natural rubber, Vulcanization of rubber & Synthetic rubber.

## **Unit - V:- INSTRUMENTAL TECHNIQUES IN CHEMICAL ANALYSIS: -**

Lambert's and Beer's Law and its applications, Introduction, Principle, Instrumentation and applications of IR & UV spectroscopy, Gas Chromatography & its applications.

### **Suggested Text Books:**

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry by P.C.Jain&M.Jain; DhanpatRai Publishing Company (P) Ltd., New Delhi.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5<sup>th</sup> Edition.
5. University Chemistry, by B.M. Mahan, Pearson IV Edition.

Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan



- (iii) Proximate analysis of coal
    - a) Moisture content
    - b) Ash content
    - c) Volatile matter content
    - d) Carbon residue
  - (iv) Steam emulsification No & Anline point determination
  - (v) Cloud and Pour point determination of lubricating oil
3. Alloy Analysis
- (i) Determination of percentage of Fe in an iron alloy by redox titration using N-Phenyl anthranilic acid as internal indicator.
  - (ii) Determination of Cu and or Cr in alloys by Iodometric Titration.
  - (iii) Determination of % purity of Ferrous Ammonium Sulphate & Copper Sulphate.

### References

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5<sup>th</sup> edition

Text book on Experiments and calculations in Engineering chemistry – S.S. Dara



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## **BOT 023: BASIC COMPUTER ENGINEERING**

### **Course Objectives:**

- To learn the fundamentals of computer.
- To understand the various steps in programming development.
- To learn the syntax and semantics of C programming language.
- To learn structured programming approach and solving problems.
- To learn application development in C programming.

### **Course Outcomes:**

- To write algorithms and draw UML/Flowcharts for solving problems.
- Convert algorithms/flowcharts to C program.
- Coding and testing logic in C programming.
- Use of array, string, pointer and structures in C programming.
- Decompose a program into function and module.
- Use of Graphics in program and application.

### **UNIT-I:- Computer:-**

Definition, Classification, Organization i.e. CPU, register, Bus architecture, Instruction set, Memory & Storage Systems, I/O Devices, and System & Application Software.

### **UNIT-II:- Operating System:-**

Windows Operating System, overview of different versions of windows, characteristics and facilities of windows, components of desktop, working with files and folders, windows utilities and accessories- Notepad, Word pad , Paint brush, window explorer.

### **UNIT-III:- Introduction to MS Office:-**

Saving, closing, opening of documents, selecting Text, Editing text, finding and replacing text, printing document, MS Excel, Spreadsheet concept, working with Spreadsheet-creating, saving, editing and printing. MS PowerPoint,

### **UNIT-IV:- Computer Networking:-**

Basics of computer networks.

**Computer Security Basics:** Introduction to viruses, worms, malware, Trojans, Spyware and Anti- Spyware Software, Different types of attacks, Email spoofing.

### **UNIT-V:-**

Introduction to Algorithms, Complexities and Flowchart, Introduction to Programming, Categories of Programming Languages, Program Design, Programming Paradigms, Characteristics or Concepts of OOP, Procedure Oriented Programming VS object oriented

Programming.

Introduction to C++: Character Set, Tokens, Precedence and Associativity, Program Structure, Data Types, Variables, Operators, Expressions, Statements and control structures, I/O operations, Array, Functions,  
Introduction of modern tools (AI, ML, DS, IOT, Cyber security)

**Recommended Text Books:**

1. Fundamentals of Computers : E Balagurusamy, TMH
2. Basic Computer Engineering: Silakari and Shukla, Wiley India
3. Fundamentals of Computers : V Rajaraman, PHI

**Recommended Reference Books:**

1. Introduction of Computers : Peter Norton, TMH
2. Object Oriented Programming with C++ :E.Balagurusamy, TMH
3. Object Oriented Programming in C++: Rajesh K.Shukla, Wiley India
4. Concepts in Computing: Kenneth Hoganson, Jones & Bartlett.
5. Operating Systems – Silberschatz and Galvin - Wiley India
6. Computer Networks:Andrew Tananbaum, PHI



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## **BOT 023P: BASIC COMPUTER ENGINEERING**

### **Evaluation of Experiential:**

#### **List of Experiment**

1. Study of Computer Software and Hardware System.
2. Study and practice of Internal & External DOS commands.
3. Creation and editing of Text files using MS- word.
4. Creation and operating of spreadsheet using MS-Excel.
5. Creation and editing power-point slides using MS- power point
6. Study of types of Computer Network.
7. WAP to illustrate subtraction of two numbers.
8. WAP to illustrate addition of two numbers.
9. WAP to illustrate Arrays.
10. WAP to illustrate functions.



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### **BOT 024: BASIC MECHANICAL ENGINEERING**

#### **Course Objectives:**

- To Study of different Materials, tools, equipments and processes those are common in the engineering field.
- To gain a good basic working knowledge required for the production of various engineering products.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To have practical exposure to various welding and joining processes.
- Study and practice on machine tools and their operations

#### **Unit I:- Materials**

**Materials:** Classification of engineering material, Iron-Carbon diagram. Mechanical properties like strength, hardness, toughness, ductility, brittleness, malleability etc. of materials, Tensile test- Stress-strain diagram of ductile and brittle materials, Hooks law and modulus of elasticity, Hardness and Impact testing of materials, BHN etc.

#### **Unit II- Measurement and Production process**

**Measurement:** Concept of measurements, errors in measurement, Temperature, Pressure, Velocity, Flow strain, Force and torque measurement, Vernier caliper, Micrometer, Dial gauge, Slip gauge, Sine-bar and Combination set.

#### **Production**

Elementary theoretical aspects of production processes like casting, carpentry, welding, Arc welding, gas welding, TIG and MIG etc. Introduction to Lathe, Drilling machines, milling machine and shaper their various operations.

#### **Unit III:-**

**Fluids:** Fluid properties pressure, density and viscosity etc. Types of fluids, Newton's law of viscosity, Pascal's law, Bernoulli's equation for incompressible fluids, Only working principle of Hydraulic machines, pumps, turbines, Reciprocating pumps.

#### **Unit IV:-Thermodynamics;-**

**Thermodynamics:** Thermodynamic system, properties, state, process, Zeroth, First and second law of thermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy.

#### **Unit V: Reciprocating Machines**

Working principle of steam Engine, Carnot, Otto, Diesel and Dual cycles P-V & T-S diagrams and its efficiency, working of Two stroke & Four stroke Petrol & Diesel engines. Working principle of compressor.

#### **Reference Books:**

1. Basic Mechanical Engineering by M. M . Rathore, V. D. Shrivastava, S. K. Somani; Dhanpat Rai Publishing Company
2. Basic Mechanical Engineering by R. K. Rajput; Laxmi Publication
3. Basic Mechanical Engineering by Gourav Agrawal, Akshay Goel; Satya Publication



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## **BOT 024P: BASIC MECHANICAL ENGINEERING**

### **List of Experiments**

1. Study of Universal Testing machines.
2. Linear and Angular measurement using, Micrometer, Slip Gauges, Dial Gauge and Sine-bar.
3. Study of Lathe Machine.
4. Study of Drilling Machines.
5. Verification of Bernoulli's Theorem.
6. Study of various types of Boilers.
7. Study of different IC Engines.
8. Study of different types of Boilers Mountings and accessories.



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## **BOT 025: BASIC CIVIL ENGINEERING & ENGINEERING MECHANICS**

### **Course Objectives:**

- To understand the basic knowledge of engineering construction materials
- To identify the elements of building construction.
- Apply the basic principles of surveying
- To understand the various systems of forces applied on the body, laws of forces and equilibrium.
- Apply the laws of mechanics on beam and trusses.

### **Unit I: Civil Engineering Materials**

Stone, bricks, cement, lime, timber – types, properties, test and uses. Mortar – cement, lime and mud mortar mixing, curing, properties, test and uses., RCC, RBC, PFC, FRC concrete, ferro-cement – properties and uses. Steel, aluminum, copper, glass. Plastics, bitumen, paints, distemper, varnishes, solid and hollow concrete blocks, precast stone masonry blocks, roofing and flooring tiles.

### **Unit II: Building construction**

Elements of building construction, planning with respect to orientation. Utility of space, energy efficiency etc. foundation, convention spread footing, raft, RCC fitting grillage and arch foundation, pile foundation etc. super structure – stone and bricks masonry wall, partition wall, plastering and pointing, Roof floor, window, door, lintel. Stair cases – types and their suitability, dampness.

### **Unit III: Surveying**

Introduction to surveying, instrument – leveling, theodolites, plane table and related devices, electronic surveying instruments etc. measurement of distance – conventional and EDM methods, measurements of directions by different methods, measurements of elevation by different methods, reciprocal leveling.

### **Unit IV:-Forces and Force System; Equilibrium:**

Force and Force Systems: Introduction, Force and Force Systems , Moment & Couple, Varignon's Theorem, Resultant and Resolution Forces, Parallel Forces, Free Body Diagram, Equilibrium Conditions, Support and Support Reaction, Application to Various Engineering Problems.

**Unit V:- Centre of gravity and moment of inertia:** Centroid of plane figures and centre of gravity of masses and forces, moment of inertia of area and mass, radius of Gyration, principle axes of sections and principle of inertia.

**Beams; Trusses and Frames:** Beams: Introduction, Types of Beams, Support Reactions, Shear Force and Bending Moment Diagram for Simply Supported, Overhanging and Cantilever Beam, Point of Contra-flexure.

**Trusses and Frames:** Introduction, Types of Trusses and Frames, Analysis of Forces in Trusses and Frames by different Methods.

### **Reference Books:**

1. S. Ramamurtam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
2. Prasad I.B., Applied Mechanics, Khanna Publication.
3. Punmia, B.C., Surveying, Standard book depot.
4. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI
5. S.P, Timoshenko, Mechanics of structure, East West press Pvt.Ltd.
6. Surveying by Duggal – Tata McGraw Hill New Delhi.
7. Building Construction by S.C. Rangwala- Charotar publications House, Anand.
8. Building Construction by Grucharan Singh- Standard Book House, New Delhi
9. Global Positioning System Principles and application- Gopi, TMH
10. R.C. Hibbler – Engineering Mechanics: Statics & Dynamics.
11. A. Boresi & Schmidt- Engineering Mechines- statics dynamics, Thomson' Books
12. R.K. Rajput, Engineering Mechanics S.Chand & Co.



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## **BOT 025P: BASIC CIVIL ENGINEERING & ENGINEERING MECHANICS**

### **List of Experiment:**

**Students can perform any 10 experiments from the following list.**

1. To perform traverse surveying with prismatic compass, check for local attraction and determine corrected bearings and to balance the traverse by Bowditch's rule.
2. To perform leveling exercise by height of instrument of Rise and fall method.
3. To measure horizontal and vertical angles in the field by using Theodolite.
4. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.
5. To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.
6. To determine the Compressive Strength of brick.
7. To determine particle size distribution and fineness modulus of coarse and fine Aggregate.
8. To verify the law of Triangle of forces and Lami's theorem.
9. To verify the law of parallelogram of forces.
10. To verify law of polygon of forces
11. To find the support reactions of a given truss and verify analytically.
12. To determine support reaction and shear force at a given section of a simply Supported beam and verify in analytically using parallel beam apparatus.
13. To determine the moment of inertia of fly wheel by falling weight method.
14. To verify bending moment at a given section of a simply supported beam.



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## **BOT 026P: ENGINEERING WORKSHOP**

**Pre-requisites: Practical skill**

**Course Objectives:**

- To Study of different hand and power operated tools, uses and their demonstration in various shops.
- To gain a good basic working knowledge required for the production of various engineering products and practices on simple jobs.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- Study and practice on machine tools and their operations

### **1. TRADES FOR EXERCISES:**

**At least two exercises from each trade:**

- 1. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)**
- 2. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)**
- 3. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)**
- 4. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)**
- 5. Welding Practice – ( Arc Welding & Gas Welding)**
- 6. Black Smithy – ( Round to Square, Fan Hook and S-Hook)**

### **2. TRADES FOR DEMONSTRATION & EXPOSURE:**

**Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working**

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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