

## SEMESTER-I / II "GROUP B"

### I B 1 ENGINEERING MATHEMATICS-II

#### Aim :

The course is aimed at developing the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology.

#### Objectives :

On completion of the course the students are expected:

- Solution of simultaneous equations by matrix method
- Fourier series
- to know the basics of vector calculus comprising of gradient, divergence & curl and line, surface
- to grasp the basics of complex integration and the concept of contour integration which is important for evaluation of certain integrals encountered in practice

#### SECTION-A

**Unit I:** Matrices : Inverse of matrix by adjoint method, Inverse of matrix by partitioning, Rank of a matrix, solution of simultaneous equations by matrix method, Eigen values and Eigen vectors,

Cayley-Hamilton theorem (without proof) (10)

**Unit II:** Fourier series: Periodic function, Fourier expansion of periodic function in  $(C, C+2L)$ , even and odd functions, half range Fourier series, Harmonic Analysis. (10)

**Unit III:** (a) Scalar Triple Product, vector triple product and their properties, multiple products.

(b) Rule of differentiation under integral sign.

(c) Tracing of curves in Cartesian, polar and parametric forms.

(10)

#### SECTION-B

**Unit IV:** Reduction formulae, Beta and Gamma function, Rectification.

(10)

**Unit V:** Double integration, change of order of integration, transformation to polar coordinates, Evaluation of area by double integration (10)

**Unit VI:** Triple integration, transformation to spherical polar coordinates, volume of solid by triple integration. Mean and RMS values.

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#### TEXT BOOK :-

(1) Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics, Vol.-I, & II, Pune V.G. Prakashan, Pune.

#### REFERENCE BOOKS :-

- 1) Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers.
- 2) Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
- 3) Ramana B.V. - Higher Engineering Mathematics, (TMH)
- 4) Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH)

### I B 2 ENGINEERING CHEMISTRY

#### Aim :

To impart a sound knowledge on the principles of Chemistry involving the different application oriented topics required for all engineering branches.

#### Objectives :

The student should be conversant with:

- Chemistry involved in the different segments of environment and technological developments in water
- The principles involved in corrosion control, nuclear fuels, power generation and nanotechnology
- Utilization of Polymer and engineering materials towards different applications
- Importance of fuels and lubricants
- Concept of analytical techniques

#### SECTION-A

##### Unit I: Water Technology :

Hardness of water :- Temporary and permanent hardness, units and their inter-conversions, Experimental determination by

EDTA method, softening of water by Lime-Soda, Ion exchange and Zeolite process. Numerical problems based on Lime Soda & Zeolite process. (9)

##### Unit II: Corrosion, Corrosion Control and Nano-Chemistry :

Corrosion & its control - : Dry & Wet corrosion and their mechanism, Types of corrosion-Pitting corrosion, waterline

#### REFERENCE BOOKS :

- 1) "Engineering Chemistry"-Jain & Jain. (Dhanpat Rai & Sons).
- 2) "A Text book on Experiments & Calculations in Engineering Chemistry- S. S. Dara. (S.Chand).
- 3) "Text book of Engineering & Technology" vol I & II-Rajaram & Kuriacose.
- 4) "A Text Book of Polymer Science & Tech"-V Gowarikar.

5) Nanotechnology Fundamentals and Applications : Manasi Karkare, I K International Pub.

### **I B 3 COMPUTER PROGRAMMING**

#### **Aim:**

To impart knowledge to analyze, solve, design and code real-life problems using C language.

#### **Objectives:**

To learn the basic concepts of computing. To know the methodology of problem solving. To develop skills in programming using C language.

#### **Guidelines for Tutorial Classes:**

Course instructors have to plan for programming exercises to be solved independently by students during tutorial classes.

#### **SECTION-A**

##### **UNIT I: Problem Solving:**

Organization of PC, Basic concepts of problem solving on computer, Input-Process-Output cycle. Algorithms, Flowcharts and algorithm development. Examples of algorithms for sorting a list with insertion sort and bubble sort. Examples of algorithms for searching: Linear search and binary search. (10)

##### **UNIT II: C Fundamentals:**

Introduction to C language, First C program, Program execution, Keywords, Character set, Built in Data Types, Variables, Expressions, Operators & their precedence. Assignment statement. I/O using scanf( ) and printf( ) functions, Format specifiers for scanf( ) and printf( ) functions. (10)

##### **UNIT III: C Control constructs:**

Decision-making using if, if-else and switch-case statements, Loops using for, while, do-while statements, break and continue statements. Functions: declaration, definition and parameter passing mechanism. (10) corrosion, inter-granular corrosion, galvanic and stress corrosion.

Role of design and material selection in corrosion control, Anodic and Cathodic protection, hot dipping (Galvanizing and tinning) Introduction of Nano-Chemistry, types of Nano materials, General methods of preparation of Nano materials, Applications

of Nano materials. (7)

#### **Unit III: Portland cement & Nuclear Fuels & Power generation :**

A) Portland cement: Raw materials & manufacture of cement by wet process, setting and hardening, heat of hydration, soundness of cement. B) Nuclear Fuels & Power generation: Nuclear binding energy, nuclear fission and fusion, critical mass, Components of nuclear power reactor and breeder reactors. (9)

#### **SECTION-B**

##### **Unit IV: Fuels and Lubricants:**

A) Fuels :- Definition of chemical fuel, classification, calorific value-gross and net, analysis of coal, Proximate and ultimate analysis and their significance, cracking of petroleum fractions, Use of gasoline and diesel in internal combustion engines, Knocking, Chemical constitution and knocking properties, octane number, cetane number. B) Lubricants: - Classification of lubricants, mechanism of lubrication, testing of lubricants for viscosity and viscosity index, flash and fire point. (7)

##### **Unit V: Polymers, Resins/ Plastics, Rubbers:**

Classification of polymers on the basis of their structure, methods of polymerization, Cationic & Anionic polymerization, Thermosetting and Thermoplastic Resin, Preparation, properties and uses of PVC, Teflon, Bakelite, Natural rubber : vulcanization, properties and uses of Synthetic rubbers - styrene rubber, nitrile rubber & butyl rubber. (7)

##### **Unit VI: Environmental Chemistry :**

Segments of environment: lithosphere, hydrosphere, bio-sphere & atmosphere. Green House Effect, Acid rain, Ozone depletion. Methods and equipments for controlling of Particulate emissions: wet scrubber, fabric filters, cyclone separators and electrostatic precipitators. (7)

#### **TEXT BOOK :**

(1) "A Text Book of Engineering Chemistry"-S. S. Dara. (S.Chand).

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## **SECTION-B**

### **UNIT IV:** Scope Rules and Arrays

Storage classes: automatic, static, extern, register type.

Introduction to arrays: single dimensional and multi-dimensional.

Strings, Arrays of strings and string related functions. Programs for Searching and sorting the arrays of strings. (10)

### **UNIT V:** Pointers:

Definition and uses of pointers. Address of operator, pointer arithmetic, Pointers and functions. Parameter passing mechanism using pointers. Pointers and Arrays, Arrays of pointers. Pointers and Strings. (10)

### **UNIT VI:** Structures and Files:

Declaring and using the Structures. Operation on structures.

Arrays of structures, Pointers to structures.

Unions and their comparison with Structures. Introduction to Files. File types.

File handling functions. Command line arguments. (10)

## **TEXT BOOK:**

K R Venugopal & S R Prasad. "Mastering C" Tata-McGraw Hill-2207.

## **REFERENCE BOOKS:**

1. Pradeep Dey & Manas Ghosh " Computer Fundamentals & Programming in C" Oxford University Press 2006.
2. Herbert Schildt - C Complete Reference (Tata-McGraw Hill)
3. Gottfried – Problem Solving in C (Schaum Outline Series- McGraw Hill)
4. Noel Kalicharan - C by Example (Cambridge University Press)

## **I B 4 ELECTRICAL ENGINEERING**

### **Aim :**

To impart basic knowledge of electric circuits, magnetic circuits, D.C. machines and transformers, A.C. machines and control systems.

### **Objectives :**

To expose the students to the analysis of electric and magnetic circuits, performance characteristics of D.C. machines, A.C. machines and transformers and to give awareness of the basics of Control System Engineering.

## **SECTION-A**

### **Unit I: Fundamentals**

a) Basic concept of Voltage , Current, Power, Energy and relationship between them

b) Resistance Resistivity, Conductivity, Temperature effect on resistance and temperature coefficient of resistance.

c) Series and parallel circuits , Star-Delta transformation,

d) Kirchoff's laws, Superposition theorem, Thevenin's theorem, Maximum Power Transfer Theorem (8)

### **Unit II: Magnetic Circuit & Electromagnetism**

a) Basic concept of Magnetic flux, Flux density, MMF, Reluctance, Magnetic field intensity and their relationship

b) Leakage and fringing of flux

c) Series and Parallel Magnetic circuits

d) Principles of Electromagnetic induction self and mutual induction coefficient of coupling and Energy stored in magnetic circuit

e) Magnetization curves (8)

### **Unit III : A.C. Fundamentals**

a) RMS , Average values form factor ,peak factor for Sinusoidal Wave form only

b) Single phase A.C. Series circuit with Resistance Inductance, Capacitance and phasor Diagrams Series resonance.

c) Single phase A.C. Parallel circuit with Resistance Inductance, Capacitance and phasor Diagrams Parallel resonance.

d) Impedance Triangle Active and Reactive power (7)

## **SECTION-B**

### **Unit IV: Polyphase Circuits**

a) Balanced Three phase circuits: Production of three phase supply, Star and Delta balanced load. Relationship of phase and line values of voltage and current for Star and Delta connections. (7)

### **Unit V : Electrical machines**

A) Single Phase Transformer

a) Principle of operation Construction and Classification EMF Equation

b) EMF Equation ,Losses ,Efficiency, Regulation

B) Electromechanical Energy Conversion

a) Working principle , Construction and various parts of D.C. Machines

b) Classification , characteristics and applications of D.C. Machines (8)

### **Unit VI Electrical Apparatus and safety**

a) Measurement of Current, Voltage, Power, Energy

b) Range extension of Ammeter, Voltmeter, Wattmeter and Energy meter

Electrode coating. Welding positions. Type of welding joint. Common welding defects such as cracks, undercutting, slag inclusions, porosity.

**One job on welding:** Job involving, edge preparation for Arc welding for different jobs like Lap welding of two plates, butt welding of two plates and welding to join plates at right angles.

**III) CARPENTRY :** Brief study of various hand tools like chisel, saw, planer. Timber, definition, engineering applications, seasoning and preservation, plywood and plyboards. Introduction, use of marking tools & hand tools such as marking gauge, try squares, steel rules, saws, jackplane, etc. Use of power tools, safety precautions.

**One job on carpentry:** Job involving a joint, wood sizing exercise in planning, marking, sawing, chiseling and grooving to make. Use and setting of hand tools like hack saw, jack plane, chisels and gauges for construction of various joints like T – Lap joint, Bridle joint , Corner mortise joint, Dovetail / butt joint such as a tray, frame etc.

### **B) DEMONSTRATION:**

Minimum two physical demonstrations provided from following. In addition to physical demonstrations **Video / LCD** presentations for rest of demonstrations may be provided.

**1) CARPENTRY:** Demonstration for wood turning with various forms on cylindrical wood piece.

**2) GAS CUTTING:** Demonstration on Gas cutting. Introduction, principle, equipment & its operation, safety precautions and demonstration of Oxy-Acetylene Gas cutting process.

**3) ELECTRONICS:** Introduction to Active & Passive Electronic components. Demonstration and use of electrical and electronics

hand and power tools. Measurement of resistor and capacitor, measurement of voltage and frequency using oscilloscope.

Demonstration and performance measurement of any two

electronic components / devices – Diodes, Transistor & Logic gates. Working of Remote Controller.

**4) PRINTED CIRCUIT BOARDS :** Layout drawing, +ve and -ve film making, PCB etching and drilling, tinning and soldering techniques. Assembly of Electronic components on the printed circuit board (PCB).

**5) GLASS BLOWING:** Definition of glass, Basic concepts of glass structure, Batch materials and minor ingredients and their functions, Elementary concept of glass manufacturing process, Different types of glasses. Application of glasses. Types of 17 18

c) Necessity of earthing, limiting values for various installations

d) Types of earthing ( Pipe earthing and Plate earthing) (7)

### **TEXT BOOKS :-**

1. Basic Electrical Engineering , First Ed., Kulshreshtha D.C., TMH - 2008

2. Principle of Electrical Engineering , 4th Edition, Del Toro V., PHI 2005

### **REGERENCE BOOKS :-**

1. Basic Electrical Engineering, Fifth Edition, Fitzgerald A.E., TMH -2006.

2. Basic Electrical Engineering, First ed., R.Anand Natarajan, P.Ramesh Babu, SCITECH Publications, 2009

3. Basic Electrical Engineering –First ed., T.K.Nagsarkar , OXFORD University Press, 2005

### **I B 5 WORK SHOP – II**

### **COURSE OBJECTIVES:**

- To give students 'hands on experience' of craftsmanship.
- To make students familiar with different work trades.
- To develop quality & safety consciousness amongst the students.
- To develop awareness of fire safety amongst the students.
- To develop respect towards labour work amongst the students.
- To develop skill sets for creating entities from primitive engineering materials.

- To develop skill sets for establish in connections through wires and cables.
- This exercise also aims at inculcating respect for physical work and hard labour in addition to some value addition by getting exposed to interdisciplinary engineering domains.

#### **A) PERFORMANCE:**

**I) SHEET METAL:** Introduction to sheet metal tools, their use, different sheet metal joints, soldering, surface development. Specifications of metal sheets, Surface coatings; Operations like cutting, bending, folding, punching, riveting ; Joining by brazing and soldering.

**One job on sheet metal:** Job involving soldering operation, making, cutting, bending, joining operations of small parts using sheet metal like Tray, Funnel, Dust Bin, etc.

**II) WELDING :** Classification & brief introduction to welding processes - Arc, Gas and Resistance. Definition of welding, brazing and soldering processes, and their applications. Oxy-Acetylene Gas welding process, Equipment and Techniques, Type of flames and their applications. Manual metal arc welding technique and equipment, AC and DC welding Electrodes, constituents and functions of Glasses, Manufacturing & properties of Glasses. Demonstration of glass blowing.

**6) PLUMBING :** Use of plumbing tools, spanners, wrenches, threading dies, demonstration of preparation of a domestic plumbing line involving fixing of a water tap and use of coupling, elbow, tee and union etc.

**7) MASONRY:** Use of mason's tools like trowel, hammers, spirit level, square, plumb, line and pins etc. Demonstration of mortar making, single and one and half brick masonry, English and Flemish bonds, block masonry, pointing and plastering

#### **REFERENCES:**

11. B. S. Raghuvanshi, A Course in Workshop Technology, Vol – I, Dhanapat Rai and Sons.
12. Hajara Choudhari, Elements of Workshop Technology, Vol – I, Media Promoters.

13. Gupta and Kaushik, Workshop Technology, Vol – I, New Heights.
14. Chapman, Workshop Technology, Vol – I, The English Language Book Society.

15. H.S.Bawa, Workshop Technology, Vol.-I, TMH Publications, New Delhi.

16. S.K.Hajra Choudhary, Elements Of Workshop Technology, Media Promoters & Publishers Pvt.Ltd.

17. Workshop Technology, Vol I, II and III, Chandola S.P., Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi.

8. Hwaiyu Geng, Manufacturing Engineering Handbook, McGraw Hill Publishing Co.Ltd.

9. Lawrence E.Doyle, Manufacturing Processes and Materials for Engineers, Prentice Hall Inc.

10. Mark Minasi, The complete PC upgrade and maintenance guide — BPB. Publications

11. Elements of Ceramics - F.H Norton

12 Fundamentals of Ceramics - Barsoum

**NOTE:** Journal should be prepared and submitted based on information of tools and equipments used, jobs prepared by using various

tools, equipments, machines in the above three trades of performance sections. It also consist of details of demonstration (minimum two) demonstrated to students with brief description.

The term work shall be assessed based on a) the record of attendance, b) Term work done, c) the written/practical / oral tests on the term work to decide the depth of understanding.

The term work is to be assessed weekly.

#### **PRACTICAL EXAMINATION:**

Practical examination will consists of actual preparation of one job from any of the above performance sections. Duration of examination will be 3 hrs. Total marks are 25, out of which 15 marks are for job preparation and 10 marks for viva voce which should be conducted when the students are on job.

#### **I B 6 ENGINEERING CHEMISTRY**

##### **LIST OF EXPERIMENTS**

1. Determination of alkalinity of water sample in given alkali mixture.  
(i) NaOH and Na<sub>2</sub>CO<sub>3</sub> (ii) Na<sub>2</sub>CO<sub>3</sub> and NaHCO<sub>3</sub>
2. Determination of hardness of water by EDTA method.

3. Determination of chloride ions in water sample. (Mohr's Method)
4. Determination of chlorine in water sample. (Iodometry)
5. Determination of % CaO in given cement sample.
6. Preparation of phenol formaldehyde & Urea formaldehyde resin.
7. Determination of viscosity of lubricating oil by Redwood viscometer  
No. 1
8. Determination of viscosity of lubricating oil by Redwood viscometer  
No. 2
9. Determination of flash point of lubricating oil by Pensky Marten's Apparatus.
10. Determination of flash point of lubricating oil by Abel's apparatus.
11. To carry out proximate analysis of coal.
12. Determination of acid value of lubricating oil.
13. Determination of Fe<sub>2+</sub> and Fe<sub>3+</sub> in given solution.
14. Determination of Dissolved Oxygen in Water Sample.
15. Determination of conductivity of unknown sample by conductivity meter.
16. Determination of P<sub>H</sub> of unknown sample by P<sub>H</sub> meter.  
(Note : Minimum 08 experiments shall be conducted.)

### **I B 7 COMPUTER PROGRAMMING COMPUTER PROGRAMMING LABORATORY :**

The objective of this lab is not only to provide a Hands-on Experience to C programming, but also to expose the students to the latest tools of the trade. This lab is based on modern operating systems like Linux/Windows.

The students should be exposed to word processor, spreadsheet software, presentation software and web browser. Use of open source software like Star Office, Open Office with open source OS like Linux/ Ubuntu/BOSS should be encouraged.

It is expected that the candidate demonstrates adequate to high skills with these tools and programming with C.  
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The sample list of programs is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Basic interface of a GUI based OS.
2. File handling using Text Editor/Word Processor.
3. Presentation using Presentation software.
4. Spreadsheet software usage.
4. Introduction to Internet and Web Browsing.
5. Programming in C: Minimum ten programs based on the above syllabus. The programs should cover Functions, Control constructs, Decision constructs, Arrays, Pointers, Structures Files and Commandline arguments.

### **I B 8 ELECTRICAL ENGINEERING PRACTICALS :**

- 1] To verify Kirchoff's laws.
- 2] To verify Thevenin's theorem
- 3] To verify Superposition theorem
- 4] To verify Maximum Power Transfer theorem
- 5] To plot B-H curve for given magnetic material
- 6] To verify vector relationship of Current & Voltage in RLC series circuit.
- 7] To verify vector relationship of Current & Voltage in RLC parallel circuit
- 8] To plot resonance curve in RLC series circuit.
- 9] To verify line & phase relationship of current & voltage in balanced three phase STAR Connection
- 10] To verify line & phase relationship of current & voltage in balanced three phase DELTA Connection
- 11] To determine Voltage ratio & current ratio for given single phase transformer.
- 12] To determine efficiency & regulation of given single phase transformer by direct loading.
- 13] Starting & reversing of DC shunt motor.
- 14] Measurement of power & energy in given single phase circuit using Wattmeter & Energy meter.  
(Note : Minimum 08 experiments shall be conducted.)