Gujarat Technological University
Semester II

Maths II

Vectors in Rn, notion of linear independence and dependence, linear span of a set of vectors, vector subspaces of Rn, basis of a vector subspace.

- Systems of linear equations, matrices and Gauss elimination, row space, null space, and column space, rank of a matrix.
- Determinants and rank of a matrix in terms of determinants.
- Abstract vector spaces, linear transformations, matrix of a linear transformation, change of basis and similarity, rank-nullity theorem.
- Inner product spaces, Gram-Schmidt process, orthonormal bases, projections and least squares approximation.
- Eigenvalues and eigenvectors, characteristic polynomials, eigenvalues of special matrices (orthogonal, unitary, hermitian, symmetric, skew-symmetric, normal). algebraic and geometric multiplicity, diagonalization by similarity transformations, spectral theorem for real symmetric matrices, application to quadratic forms.

Texts/References

1. H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley (1995).
2. G. Strang, Linear algebra and its applications (4th Edition), Thomson(2006).
3. S. Kumaresan, Linear algebra - A Geometric approach, Prentice Hall of India (2000).
4. E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley (1999).

Elements Of Civil Engineering

I Scope of Civil Engineering

Introduction: Impact of Infrastructural Development on the Economy of a Country, Role of Civil Engineers, Importance of Planning, Scheduling and Construction Management.

II Surveying

Introduction: Surveying and levelling, Object and uses, Primary divisions, Fundamental principles, Classification of surveying, Plans and maps, Scales, Units of measure.

Linear measurements: Methods, Instruments used in chaining; Chain surveying, Ranging; Obstacles; Errors in chaining, Tape corrections, Conventional symbols

Compass surveying: Types and uses of compass, Bearings, Whole Circle Bearings, and Reduced Bearings, Computation of angles; Meridians; declinations and dip of needle; Local attraction; Chain and compass surveying field work.

Elevation measurements: Levelling, object and uses, terms used in levelling, levelling instruments, methods of levelling, recording and methods of reducing, errors in levelling, contours; characteristics and applications.

Areas and volumes; use of a Planimeter**.**

Modern Tools of Surveying and Mapping: Introduction to Theodolite, Electronic Distance Measurement Instruments, Total Station, Global Positioning System, Remote Sensing and Geographic Information System.

III Construction Materials

Requirement, types, uses, properties and importance of Civil Engineering materials like Stone, Bricks, Lime, Cement, Ferrous and Non Ferrous Metals, Ceramic Materials, Timber, Sand, Aggregate, Mortar and Concrete, Paints and Varnishes, Glass , Plastic, Conducting, Magnetic, and Miscellaneous Materials.

IV Elements of Building Construction

Planning: Elementary principles and basic requirements of a building planning, layout of residential & industrial buildings.

Construction: Classification of buildings based upon occupancy and structure, Design Loads, Common building components, their functions, and nominal dimensions. Elements of building drawing. Introduction to building byelaws.

V Water Resources Development

Elementary Hydrology, Sources of water, Watershed Development, water requirements and its conservation, Hydraulic Structures of Storage, Water Conveyance System: Canals; Water Conduits.

VI Transportation Engineering

Role of Transportation in National development, Transportation Ways, Surface Transportation and Aviation, Elements of Highway materials properties and highway construction, BOT Projects for Highways, Elements of Traffic Engineering and Traffic Control.

Reference Books:

1) Title :Surveying Vol .I & II
Author: Dr. B. C. Punamia
Publisher : Laxmi Publication Delhi

2) Title :Surveying Vol. I and II
Author : S. K. Duggal
Publisher : Tata Macgraw hill Publication New Delhi
3) Title: Civil Engg. Drawing
Author : S. C. Rangwala
Publisher: Charotar Pub. House Anand
4) Title : Building Construction
Author : Dr. B. C. Punamia
Publisher: Laxmi Pub. Delhi
5) Title : Engineering Material
Author : Dr. S.C. Rangwala
Publisher: Charotar Pub. House
6) Title : Building Materials
Author: Dr. S. .K. Duggal
Publisher : New Age International Pub.House Delhi
7) Title : Civil Engineering Material
Author : Jakson and Dhir
Publisher : ELBS Publishing London
8) Title : Civil Engineering Material
Author : Jakson and Dhir
Publisher : ELBS Publishing London
9) Title : Highway Engineering
Author: Khanna S. K. and Justo C. E.G.
Publisher : Nemchand and Brothers
10) Title : Irrigation Engineering and Hydraulic Structures
Author : Santoshkumar Garg
Publisher : Khanna Publishers Delhi

Elements of Electrical Engineering

I **D.C. Circuits:-** Effect Of Temperature Upon Resistance, Solutions Of series, parallel in brief, star-delta combination of Resistances, KVL & KCL.

II **Electrostatics & Capacitance:-** Definitions of Electrostatic, types of capacitors, series, parallel combinations & related circuit calculations in brief charging & discharging of capacitor. Energy stored in capacitor.

III **Electromagnetics:-** Magnetic Circuit , Comparison Between Electric And Magnetic Circuits , Series/Parallel Magnetic Circuit Calculations , Magnetic Hysteresis, Hysteresis And Eddy Current Loss, Magnetic Materials, Electromagnetic induction, Statically And Dynamically Induced E.M.F.S in brief, Fleming's Right hand rule-Left hand rule, Coefficients Of Self And Mutual Inductances , Coefficient Of Coupling, Series/Parallel Combinations Of Inductances, Rise And Decay Of Current In Inductive Circuits , Force Experienced By Current Carrying Conductor Placed In Magnetic Field.

IV **Single Phase A.C. Circuits:-** Generation Of Alternating Voltages & Currents, Their Equations, Definitions , R.M.S. And Average Values , Vector Representation Of Alternating Quantities , Addition And Subtraction Of Vectors , Complex Algebra., Phasor Relations Between Voltage And Current In Each Of Resistance, Inductance And Capacitance , A.C. Series And Parallel Circuits , Power And Power Factor , Methods Of Circuit Solution (Analytically & Vectorially), Resonance In Series And Parallel Circuits.

V **Polyphase Circuits:-** Generation Of Polyphase Voltages , 3,Phase System , Phase Sequence, Inter Connection Of 3 Phases , Voltage, Current And Power Relationships In Balanced Three Phase Circuits , Power Measurement In Single Phase And 3 Phase Circuits.

VI **Batteries, Cables:-** Battery, life of batteries, charging & discharging of battery. Cables, 2, 21/2, 3 and 4 core armored & unarmored cables.

VII **Electrical Wiring:-** Connectors & switches, system of wiring, domestic wiring installation, sub circuits in domestic wiring, simple control circuit in domestic installation, industrial electrification.

VIII **Illumination:-** Types of lamps, fixtures & reflectors, illumination schemes for domestic, industrial & commercial premises, Lumen requirements for different categories.

IX **Safety & protection:-** Safety, electric shock, first aid for electric shock other hazards of electrical laboratories & safety rules, use of multimeters, grounding, importance of grounding, equipment of grounding for safety. Circuit protection devices, fuses, MCB, ELCB & relays.

Reference Books:

I Electrical Technology Vol.1 By B.L.Theraja

II Basic Electrical Engineering By V.N.Mittal

III Electrical Estimating & costing by Surjitsingh (Dhanpat Rai & Co.)

Elements Of Mechanical Engineering

I **Introduction:** Prime movers, Sources of energy, Types of prime movers, Force and mass, Pressure, Work, Power, Energy, Heat, Temperature, Units of heat, Specific heat capacity, Interchange of heat, Change of state, Mechanical equivalent of heat, Internal energy, Enthalpy,Entropy,Efficiency, Statements of Zeroth Law, First law and Second Law of Thermodynamics.

II **Fuels and Combustion:** Introduction, Classification, Solid fuels, Liquid Fuels, Gaseous fuels, LPG,CNG and biofuels ,Calorific values.

III **Properties of gases :** Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, Internal energy, Relation between Cp and Cv, Enthalpy, Non flow process, Constant volume process, Constant pressure process, Isothermal process, Poly-tropic process, Adiabatic process.

IV **Properties of Steam :** Introduction, Steam formation, Types of Steam, Enthalpy, Specific volume of steam and dryness fraction of steam , Internal energy, Steam tables, Non-flow process. Measurement of dryness fraction, Throttling calorimeter, Separating calorimeter, Combined calorimeter.

V **Heat Engines :** Thermal prime movers, Elementary heat engines, Sources of heat, Working substances, Converting machines, Classification of heat engines, Heat engine cycles, Carnot cycle, , Rankine cycle, Ottocycle, Diesel cycle.

VI **Steam Boilers :** Introduction, Classification, Simple vertical boiler, Vertical multi-tubular boiler, Cochran type, Lancashire boiler, Locomotive boiler, Babcock and Wilcox boiler, High pressure boilers, Boiler details, Boiler performance. Functioning of different mountings and accessories.

VII **Internal Combustion Engines :** Introduction, Classification, Engine details, otto four-stroke cycle, Diesel-four-stroke cycle, Difference between otto cycle and Diesel cycle, Two-stroke cycle, Difference between two-stroke and four-stroke cycle, indicated power (ip), Brake Power (bp),Efficiencies.

VIII **Speed Control:** Introduction, Governors, I.C. Engine governing, Fly wheel.

IX **Pumps :** Introduction, Reciprocating pump, types and operation, Bucket pump, Air Chamber, Centrifugal pumps, Types and Priming, Rotary pumps.

X **Air Compressors:** Introduction, Uses of Compressed air, Reciprocating compressors, Operation of a compressor, Work for compression, Power required, Reciprocating compressor efficiency, Multistage reciprocating compressors, Rotary compressors.

XI **Refrigeration & Air Conditioning:** Introduction, Refrigerant, Types of refrigerators, Vapour compression refrigerating system, Window and split air conditioners.

XII **Couplings, Clutches and Brakes:** Introduction, Couplings, Clutches, Brakes, Types of brakes. Difference between a brake and a clutch.

XIII **Transmission of Motion and Power:** Introduction, Methods of drive, Power transmission elements, shaft and axle, Belt-drive, Pulleys, Power transmitted by a belt, Chain drive, Friction drive, Gear drive

XIV **Important Engineering Materials:** Properties of materials, Ferrous & Nonferrous materials and other important engineering materials such as Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic, polymer and composite material

Reference Books:

I Elements of Mechanical Engineeringby K.P.Roy and Prof.S.K . Hajra Chaudhary , Media Promoters and Publishers Pvt.Ltd.Bombat

II Introduction to Engineering Materials by B.K. Agrawal Tata McgraHill Publication New Delhi

III Thermal Science and Engineering by Dr. D.S. Kumar, S.K. Kataria & sons Publication New Delhi

IV Fundamental of Mechanical Engineering by G.S. Sawhney, Prentice Hall of India Publication New Delhi

V Thermal Engineering by R.K. Rajput ,S.Chand Publication New Delhi

Basics of Environmental Studies

1. Introduction to Environment, Ecology and Ecosystem

Definition and Inter-relationships amongst and between them
Components of Environment, Relationship between different components
Man-Environment relationship
Impact of Technology on the environment
Environmental Degradation:

2 Ecology & Ecosystems

Introduction: Ecology- Objectives and Classification
Concepts of an ecosystem- structure & function of ecosystem
Components of ecosystem- Producers, Consumers, Decomposers
Bio-Geo- Chemical Cycles- Hydrological Cycle, carbon cycle, Oxygen Cycle, Nitrogen Cycle, Sulfur Cycle
Energy Flow in Ecosystem
Food Chains: Grazing, Detritus, & Food webs
Ecological Pyramids
Major Ecosystems: Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem, Aquatic Ecosystem, Estuarine Ecosystem

3 Population & Natural Resources

Development of Habitation patterns and Environmental factors governing human settlement Population & Pollution , Reasons for overpopulation ,Population Growth, Demographic Projections and Population Structures ,Production of food
Renewable & Nonrenewable Resources: Renewable Resources, Nonrenewable Resources, Destruction versus Conservation
Water Resources: Water Resources-Indian Scenario, Water Sources- Surface & Ground Water Sources, Uses & overuses of water resources, problems due to Overexploitation of Water Resources
Forest Resources : Forest Resources - Indian Scenario , Importance of forests- Ecologically & Economically, Uses of forest products, Forest Types, Deforestations-Causes and effects, Forest Degradation in India

Energy Resources : Energy Resources - Indian Scenario , Conventional Energy Sources & its problems, non-conventional energy sources-Advantages & its limitations , Problems due to Overexploitation of Energy Resources

4 Environmental Pollution

Types of Environmental Pollution
Water Pollution : Introduction – Water Quality Standards , Sources of Water Pollution, Classification of water pollutants, Effects of water pollutants , Eutrophication

Air Pollution : Composition of air , Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like SPM, SO_2, NO_X – Natural & Anthropogenic Sources, Effects of common air pollutants

Land & Noise Pollution : Introduction- Lithosphere, Land Uses, Causes of land Degradation, Sources of Noise Pollution, Effects of noise pollution

Current Environmental Global Issues : Global Warming & Green Houses Effects, Acid Rain , Depletion of Ozone Layer

REFERENCE BOOKS :

1 Environmental Studies: R. Rajagopalan,Oxford University Press

2 Environmental Pollution: Causes, Effects & Control by K.C Agrawal

3 Environmental Science by Richard T Wright & Bernard J Nebel

4 Environmental Science by Daniel B Botkin & Edward A Keller

5 Environmental Engineering & Management by Suresh K Dameja

6 Environmental Management by Dr. Swapan C Deb

7 Environment & Ecology by Dr Gourkrishna Dasmohapatra

8 Introduction To Environmental Engineering and Science by Master Gilbert M.

Workshop

Objectives: Exposure to Industrial environment, work culture, hand tools and general purpose machine.

Developing Creativity, Craft man skill, approach to work and Planning capability

Syllabus:

Demonstration of Hand tools, Power tools, Machine tools, Processes, Materials, Marking, and Measurement in following shops:Carpentry, Pattern making, Foundry, Fitting, Smithy, Welding, Tin smithy,Plumbing, Machine shop and Electroplating.

Making Jobs in Fitting, Carpentry, Smithy, Tin smithy and Welding shops

Journal is to be prepared covering the topics of demonstration and Report about Process / Methodology / Inspection for making jobs.

Text Books & Reference Books:

Choudhary, Hajara " Elements of Workshop Technology", Media Promotors & Publishers, 1997

Raghuvanshi B.S. "Workshop Technology" Vol. I & II, Dhanpat Rai & Sons 1998

Chapman W.A. J and Arnold E. "Workshop Technology" Viva low priced Student edition, 1998