## DIPLOMA (CIVIL)  
### 1ST SEMESTER

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<td>DCE-605C- OPEN CHANNEL FLOW</td>
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<td>DCE605D- REMOTE SENSING &amp; GIS</td>
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SEMESTER 1

DCE 101: BASIC MATHEMATICS

UNIT 1:

ALGEBRA
Laws of Indices - Formula of factorization and expansion ( (a2-b2), (a+b) 2 etc.) Laws of logarithm with definition of Natural and Common logarithm.

PARTIAL FRACTION
Definition of polynomial fraction proper & improper fractions and definition of partial fractions. To Resolve proper fraction into partial fraction with denominator containing non repeated linear factors, repeated linear factors and irreducible non repeated quadratic factors. To resolve improper fraction into partial fraction.

DETERMINANT AND MATRICES.
Determinant
Definition and expansion of determinants of order 2 and 3. Cramer’s rule to solve simultaneous equations in 2 and 3 unknowns.

Matrices
Definition of a matrix of order m X n and types of matrices. Algebra of matrices such as equality, addition, Subtraction, scalar multiplication and multiplication. Transpose of a matrix. Minor, cofactor of an element of a matrix, adjoint of matrix and inverse of matrix by adjoint method. Solution of simultaneous equations containing 2 and 3 unknowns by matrix inversion method.

BINOMIAL THEOREM
Definition of factorial notation, definition of permutation and combinations with formula. Binomial theorem for positive index. General term. Binomial theorem for negative index. Approximate value (only formula)

UNIT 2:

TRIGONOMETRY.
Measurement of an angle (degree and radian). Relation between degree and radian. Trig ratios of 00 , 300 , 450 etc. Fundamental identities.

TRIGONOMETRIC RATIOS OF ALLIED, COMPOUND, MULTIPLE & SUBMULTIPLE ANGLES
(Questions based on numerical computations, which can also be done by calculators, need not be asked particularly for allied angles ).
FACTORIZATION AND DEFACTORIZATION FORMULAE

INVERSE TRIGONOMETRIC RATIOS
Definition of inverse trigonometric, ratios, Principal values of inverse trigonometric ratios. Relation between inverse trigonometric ratios.

PROPERTIES OF TRIANGLE
Sine, Cosine, Projection and tangent rules (without proof) - Simple problems.

UNIT 3:

COORDINATE GEOMETRY
POINT AND DISTANCES
Distance formula, Section formula, midpoint, centroid of triangle. Area of triangle and condition of collinearity.

STRAIGHT LINE
Slope and intercept of straight line. Equation of straight line in slope point form, slope-intercept form, two-point form, two-intercept form, normal form. General equation of line. Angle between two straight lines condition of parallel and perpendicular lines. Intersection of two lines. Length of perpendicular from a point on the line and perpendicular distance between parallel lines.

CIRCLE
Equation of circle in standard form, centre – radius form, diameter form, two – intercept form.
General equation of circle, its centre and radius.

UNIT 4:

VECTORS
Definition of vector, position vector, Algebra of vectors (Equality, addition, subtraction and scalar multiplication) - Dot (Scalar) product with properties. Vector (Cross) product with properties.
Applications
Workdone and moment of force about a point & line

DCE102: COMMUNICATION SKILLS

UNIT 1:
Introduction to communication:
Definition, communication cycle/ process, The elements of communication : sender- message – channel- Receiver –Feedback & Context. Definition of communication process. Stages in the process : defining the context, knowing the audience, designing the message, encoding , selecting proper channels, transmitting, receiving, decoding and giving feedback.
UNIT 2:
Types of communication
Formal- Informal, Verbal- Nonverbal, Vertical- horizontal/ diagonal

UNIT 3:
Principals of effective communication :
Definition of effective communication - Communication barriers & how to overcome them.
Developing effective messages: Thinking about purpose, knowing the audience, structuring the
message, selecting
proper channels, minimizing barriers & facilitating feedback.

UNIT 4:
Non verbal- graphic communication:
Non-verbal codes: A- Kinesecs, B- Proxemics, C – Haptics D-Vocalics, E- Physical appearance. F
Chronemics, G –Artifacts - Aspects of body language Interpreting visuals & illustrating with visuals
like tables, charts & graphs.

UNIT 5:
Formal written skills :
Office Drafting: Circular, Notice, and Memo. Job Application with resume. Business correspondence:
Enquiry, Order letter, Complaint letter, and Adjustment letter. Report writing: Accident report, fall in
production, Progress / Investigative. Defining & describing objects & giving Instructions.

DCE 103: PHYSICS – I

UNIT 1:
UNITS AND DIMENSIONS
Fundamental and derived units in SI System, Dimensions of Physical Quantitites, Principle of
homogeneity - Dimensional equation, Applications of dimensional analysis: Checking the correctness
of physical equations, Derivation of simple physical relations, Limitation of Dimensional Analysis,
significant figures and Error Analysis.

FORCE AND MOTION
Scalars and Vectors, Velocity & acceleration, Equations of motion, Newton’s law of motion, Force & its
derivation from Newton’s laws of motion, Composition and resolution of forces, Parabolic Motion -
Horizontal projection and projection at an angle, time of flight, Horizontal range and maximum
horizontal range, Simple Problems, Centripetal acceleration, centripetal and centrifugal forces,
Concept of friction and its application. Application to banking of roads.
UNIT 2:

WORK, POWER AND ENERGY
Work and its Units, Work done on bodies moving on horizontal and inclined planes (consider frictional forces also). Concept of Power and its units, Calculations of power (simple cases). Concept of Kinetic energy and potential energy Expressions for P.E and K.E, Conservation of energy in the case of freely falling bodies, Principle of conservation of energy.

ROTATIONAL AND SIMPLE HARMONIC MOTIONS
Definition of moment of inertia, Moment of inertia of disc, ring & sphere, Torque and angular momentum and their inter relation, Principles of conservation (angular momentum and its applications). Kinetic energy of rolling body, S.H.M – derivation of displacement, velocity, acceleration, time period and frequency, Motion of cantilever, Free, forced and resonant vibrations (No derivation).

UNIT 3:

HEAT

TEMPERATURE AND ITS MEASUREMENT
Concept of heat and temperature on the basis of K.E. of molecules. Unit of heat Basic Principles of measurement of temperature, Thermocouple, Bimetallic and resistance, Pyrometers and Thermometers - Criteria for the selection of thermometers.

EXPANSION OF SOLIDS
Coefficient of linear, Surface and cubical expansions and relation amongst them, Thermal stresses (qualitative only) and their applications.

UNIT 4:

HEAT TRANSFER
Three modes of transfer of heat, Coefficient of thermal conductivity, its determination by Searle’s method and Lee’s disc method. Conduction through compound media (Series and parallel for two materials only), Heat radiation, Characteristics of heat radiations, Prevost’s theory of heat exchange, Black body radiations, Emissivity and absorbtivity - Kirchoff’s law and stefan’s law of radiation.

DCE 104: CHEMISTRY – I

UNIT 1:

STRUCTURE OF ATOM
ranking rule. Orbital concept types of bonds covalency, formation of ss, sp, pp, bonding with examples. Hybridization sp, sp2, sp3, (consider BeF2, BF3, CH4) molecules. Brief concept of modern periodic table of elements.

UNIT 2:

CHEMICAL EQUATION, OXIDATION & REDUCTION
Concept of Oxidation & Reduction.
Electronic concept of oxidation and reduction.
Redox reactions (direct and indirect).
Oxidation No. balancing of simple redox reactions by oxidation No.

UNIT 3:

IONIC EQUILIBRIUM
Ionization., degree of ionization, Focus effecting ionization
Ionization of water, ionization equilibrium in aqueous solutions, common ion effect

ACIDS AND BASES
Concept of acids and bases, their strength in ionization constant. PH value, acid base titration, choice of indicators. Hydrolysis - Buffer solution.

ELECTROLYSIS
Concept of electrolysis.
Faraday’s law of electrolysis.
Engineering applications (electrometallurgy, electroplating & electorefining)

UNIT 4:

WATER
Hard and soft water, removal of hardness by :
a. Soda lime process.
b. Permutit’s process.
c. Ion exchange method.
Disadvantages of hard water in industrial use, boiler scales, priming, foaming corrosion and caustic embrittlement.
Expressing the degree of hardness of water in (with simple problems)
a. Clark’s degree
b. O’Hener’s method
Determination of degree of hardness by (with simple problems) :
a. Soap titration method :
b. O’Hener’s method :
Water for drinking purposes .

SOLUTIONS & COLLOIDS
Solute, solvent, solution & colloids. Particle size and colloidal state - Tyndell effect, Brownian movement , coagulation.
DCE 105: ENGINEERING DRAWING – I

Drawing Instruments and their uses
1.1 Letters and numbers (single stroke vertical)
1.2 Convention of lines and their applications.
1.3 Scale (reduced, enlarged & full size) plain scale and diagonal scale.
1.4 Sheet layout.
1.5 Introduction to CAD (Basic draw and modify Command).
1.6 Geometrical constructions.

Engineering curves & Loci of Points.
1.2 To draw an ellipse by
2.1.1 Directrix and focus method
2.1.2 Arcs of circle method.
2.1.3 Concentric circles method.
2.2 To draw a parabola by:
2.2.1 Directrix and focus method
2.2.2 Rectangle method
2.3 To draw a hyperbola by:
2.3.1 Directrix and focus method
2.3.2 passing through given points with reference to asymptotes
2.3.3 Transverse Axis and focus method.
2.4 To draw involutes of circle & polygon (up to hexagon)
2.5 To draw a cycloid, 21 cycloids, hypocycloid
2.6 To draw Helix & spiral.
2.7 Loci of Points:
2.7.1 Loci of points with given conditions and examples related to simple mechanisms.

Orthographic projections
3.1 Introduction to Orthographic projections.
3.2 Conversion of pictorial view into Orthographic Views (First Angle Projection Method Only)

DCE 106: PHYSICS LAB – I

1. To determine the density of a cylinder using vernier calipers and balance.
2. To determine area of cross section of wire using screw gauge.
3. To determine the thickness of glass piece using spherometer.
4. Calculation and verification of period of vibration of a cantilever (use graph)
5. Verify Parallelogram law of forces.
6. Measurement of K.E. gained by a body dropped through height h.
7. To find the coefficient of linear expression of given rod.
DCE 107: CHEMISTRY LAB – I

1. Introduction of basic concepts of volumetric analysis & other related equipment.
2. Find the strength in grams per litre of the given solution or sodium hydroxide with the help of standard oxalic acid solution.
3. Find the strength of sulphuric acid in grams per litre using standard oxalic acid solution and an intermediate alkali solution indicator phenolphthalein.
4. Determine the strength of oxalic acid solution in grams per litre using standard sulphuric acid, indicator methyl orange.
5. Determine the total alkalinity in ppm in the given sample of water by soap solution method.
6. Estimate the total hardness of a sample of water by soap solution method.
7. Estimate the amount of chlorides present in water using silver nitrate solution. Indicator potassium chromate.
8. Determine percentage purity of commercial samples like blue vitrol and green vitrol volumetrically.
9. Qualitative analysis of some important acidic & basic radicals with direct testing with demonstration of group analysis.
SEMESTER 2

DCE 201: MATHEMATICS – I

UNIT I:
Function and Limit
Function
Definitions of variable, constant, intervals such as open, closed, semi-open etc.
Definition of Function, value of a function and types of functions,
Simple Examples.
Limits
Definition of neighborhood, concept and definition limit.
Limits of algebraic, trigonometric, exponential and logarithmic functions with simple examples.

UNIT 2:
Derivatives
Definition of Derivatives, notations.
Derivatives of Standard Functions
Rules of Differentiation. (Without proof). Such as Derivatives of Sum or difference, scalar multiplication, Product and quotient.
Derivatives of composite function (Chain rule)
Derivatives of inverse and inverse trigonometric functions.
Derivatives of Implicit Function
Logarithmic differentiation
Derivatives of parametric Functions.
Derivatives of one function w.r.t another function
Second order Differentiation.

UNIT 3:
Statistics And Probability
Statistics
Measures of Central tendency (mean, median, mode) for ungrouped and grouped frequency distribution.
Graphical representation (Histogram and Ogive Curves) to find mode and median
Measures of Dispersion such as range, mean deviation, Standard Deviation, Variance and coefficient of variation. Comparison of two sets of observations.
Probability
Definition of random experiment, sample space, event,
Occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely).
Definition of Probability, addition and multiplication theorems of Probability

UNIT 4:
Applications of Derivative
Geometrical meaning of Derivative, Equation of tangent and Normal
Rates and Motion
Maxima and minima
Radius of Curvature

**Complex number**
Definition of Complex number. Cartesian, polar, Exponential forms of Complex number.
Algebra of Complex number (Equality, addition, Subtraction, Multiplication and Division)
De-Moivre’s theorem (without proof) and simple problems.
Euler’s form of Circular functions, hyperbolic functions and relations between circular & hyperbolic functions

**UNIT 5:**
**Numerical Solution of Algebraic Equations**
Bisection method, Regula-Falsi method and Newton-Raphson method

**Numerical Solution of Simultaneous Equations**
Gauss elimination method
Iterative methods-Gauss Seidal and Jacobi’s method

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**DCE 202: APPLIED PHYSICS – II**

**UNIT 1:**
**Waves**
Sound and light as wavesfrequencies, wavelength and velocities and their relationship.

**UNIT 2:**
**Applications of Sound**
**Ultrasonics**
(a) Production of ultrasonic waves by using magnetostriction and piezo – electric methods.
(b) Applications to drilling cold welding, cleaning, flaw detection and exploration (Sonar).

**Acoustics**
(a) Reflection, refraction and absorption of sound waves by surfaces.
(b) Echo and reverbration.

**Applications of Light**
Refraction and refractive index.
Defects in image formation (Qualitative), Simple and compound microscope, astronomical and Galilean telescopes and their magnifying powers.

**Electrostatics**
Coloumb’s law, Unit charge - Electric field and Electric lines of force. Electric intensity due to charged straight conductor and plane sheet. Capacitance and its units, Parallel plate capacitor.
Grouping of capacitors in series and parallel (simple problems). Dielectric constant its functions.
UNIT 3:
D.C. Circuits

UNIT 4:
Electromagnetism

Modern Physics
Introduction to laser, its characteristics and important applications. Introduction to common modes of communication, viz Fax, Email, Internet etc.

DCE 203: CHEMISTRY – II

Module 1:
Water covering, Types of hardness- Units, Determination of hardness by EDTA method, Alkalinity of water and its significance, Numerical problems. Softening methods and Numerical problems based on these methods; Membrane-based processes; Problems with Boiler feed water and its treatments, Specifications for drinking water (BIS and WHO standards), Chlorination of Water; Sources and quality of drinking water, concept of water drainage systems; Concept of water harvesting, storage and recycling; Nature and uses of sludge obtained on treatment of municipal and industrial effluent water, role of a-forestation for water recycling; Toxicity of water; Sources of water pollutants, water pollution through analytical laboratories in schools, colleges and universities, measures for minimization and recycling of laboratory waste water.

Module 2:
Polymers & Composites covering, Basics of Polymer Chemistry, Molecular weight, Molecular shape, Crystallinity, Glass transition temperature and melting point, Visco-elasticity, Structure-property relationship; Methods of polymerization, Thermoplastics and Thermo-sets, Copolymerization, Elastomers-Structure, Applications, curing techniques; Advanced polymeric materials; Conducting polymers, Liquid crystal properties. Dendrimers and their difference from polymers, degradable polymer materials, solubility of polymeric & dendrimeric molecules, physicochemical properties of polymers; Fabrication of polymers-Compression/Injection/Extrusion moulding. Synthesis, Properties and Uses of PE, PVC, PMMA, Formaldehyde resins; Melamineformaldehyde-urea resins, adhesives and their adhesive mechanism; Composites- Basics of composites, Composition and Characteristic properties of composites; Types of Composites-Particle, Fibre, Reinforced, Structural, & their applications; Metallic and non-metallic fillers, molecular and oligomerization mechanism, nano-composites.
**Module 3:**
*Surfactants and Lubricants* covering, Surface active agents- Methods of preparation of soap, Cleaning mechanism, Types and advantages of detergents; Critical micelle concentration, hydrophilic and hydrophilic interactions. Fricoohesty of surfactant solutions, HLB values; Lubricants- Concept of tribology; Types of lubricants and Mechanism of lubrication, Physical and Chemical properties of lubricants, Additives of lubricants, Selection of lubricants, freezing points of lubricants.

**Module 4:**
*Biotechnology* covering, Significance and application of Biotechnology, Bio-reactors, Biotechnological processes; Fermentation, Production of Alcohol, Production of Vitamins; Industrial enzymes, Bio-fuels, Biosensors, Bio-fertilizers, Bio-surfactants; Applications of Biochips; Intra-molecular multiple force theory (IMMFT) of Bio-surfactants. *(6 Lectures)*

**Module 5:**
*Green Chemistry* covering, Introduction, Significance and latest research in this field; Various Industrial applications of green chemistry; Green technology- Latest green laboratory technology for saving experimental resources and infrastructural framework; R4M4 (Reduce, Reuse, Recycle, Redesign; Multipurpose, Multidimensional, Multitasking, Multi-tracking;) model with special reference of survisimeter, econoburette; Safer Technique for Sustainable Sodium Extract Preparation for Extra Elements Detection; Concept of molecular and atomic economy & its use in green chemistry; Life cycle analysis technique (cradle to grave approach) *(6 Lectures)*

**Module 6:**
*Instrumental Techniques* covering, Fundamentals of Spectroscopy; Principles and applications of UV-visible, IR & Atomic absorption Spectroscopy; Flame photometry; Principles and applications of chromatographic techniques including Gas, Column, HPLC. NMR & DSC working.

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**DCE 204: CONCEPTS IN INFORMATION TECHNOLOGY**

**Unit I**

**Unit II**

*Number System*: Various codes, decimal, binary, octal, hexadecimal conversion.

**Unit III**
*Internet and Web Technologies; Internet & World Wide Web*: Hypertext Marks Language, WWW, Gopher, FTP, Web Browsers, Search Engines, Email.
Unit IV

Unit V
Application of IT to Areas like E Commerce, Multimedia, and Entertainment.
Information Representation: Introduction to Information representation in Digital Media, Text, Image, graphics, Animation, Audio, Video etc, Introduction to JPEG & MPEG.

DCE 205: APPLIED MECHANICS

Unit – I
Concept of mechanics and applied mechanics - Explanation of Mechanics and applied - Mechanics, its importance and necessity, giving suitable examples on bodies at rest and in motion, - explanation of branches of this subject - Concept of rigid bodies.

Unit – II
Laws of Forces - Force and its effects, units and measurement of force, characteristics of force vector representation - Bow’s notation, Types of forces, action and reaction, tension, thrust and shear force - Force systems: Coplanar and space force systems - Coplanar concurrent and non-concurrent forces. Free body diagrams, Resultant and components concept of equilibrium - Parallelogram law of forces - Equilibrium of two forces, superposition and transmissibility of forces - Newton’s third law, triangle of forces, different cases of concurrent coplanar, two force systems, extension of parallelogram law and triangle law to many forces acting at one point - polygon law of forces, method of resolution into orthogonal components for finding the resultant, graphical methods, special case of three concurrent coplanar forces - Lami’s theorem.

Unit - III
Concept of moment - Varignon’s theorem (statement only) - Principle of moments –application of moments to simple mechanism - parallel forces - calculation of their resultant - concept of couple properties and effect - moving a force parallel to its line of action - general cases of coplanar force system - general conditions of equilibrium of bodies under coplanar forces.
Concept of friction, laws of friction, limiting friction and coefficient of friction, sliding friction.

Unit - IV
Concept of gravity - gravitational force, centroid and center of gravity - centroid for regular lamina and center of gravity for regular solids - Position of center of gravity of compound bodies and centroid of composition area - CG of bodies with portions removed.

Unit - V
Laws of Motion - Concept of momentum - Newton’s laws of motion & their application - derivation of force equation from second law of motion - numerical problems on second law of
motion, piles, lifts and bodies tied with string - Newton’s third law of motion and numerical problems based on it - conservation of momentum - impulsive force (definition only).

Concept of machine - mechanical advantage, velocity ratio and efficiency of a machine their relationship - law of machine - simple machines (lever, wheel and axle, pulleys, jacks winch crabs only)

**DCE 206: ENGINEERING DRAWING – II**

*Sections* - Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventional in sectioning. Drawing of full section, half section, partial or broken out sections, offset sections, revolved sections and removed sections. Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square angle, channel, rolled sections. Exercises on sectional views of different objects.

*Isometric Views* - Fundamentals of isometric projections (Theoretical Projections) Isometric views from 2 to 3 given orthographic views. Preparation of simple working drawing of Furniture items like table, stool and any job prepared in the workshop.

*Development of Surfaces* - Parallel line and radial line methods of development. Development of simple and truncated surfaces (Cube, prism, cylinder, cone and pyramid).

**DCE 207: PHYSICS LAB – II**

1. To find the diameter of wire using a screw gauge.
2. To find volume of solid cylinder and hollow cylinder using a vernier caliper.
3. To determine the thickness of glass strip and radius of curvature of a concave surface using a spherometer.
4. To verify the parallelogram law of forces.
5. To determine the atmospheric pressure at a place using Fortin’s Barometer.
6. To determine the surface tension of a liquid by capillary rise method.

**DCE 208: CHEMISTRY LAB – II**

1. To determine the Chloride content in supplied water sample by using Mohr’s methods.
2. Determination of temporary hardness of water sample by O-Hener’s method.
3. To determine the total hardness of water sample in terms of CaCO3 by EDTA titration method using EBT indicator.
4. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.
DCE 209: INFORMATION TECHNOLOGY LAB

1. Create a document using functions: Save as, page number, Bullets and numbering.
2. Create a document using styles and Formatting options.
3. Create a document using different fonts.
4. Create a document, using the function page set up, & page preview, and then print that document.
5. Create a table & perform operation in it.
6. Create a table, chart in excel and implement all formula as addition, subtraction, multiplication and division.
7. How to use Mail Merge in MS Word.
8. Create a Power point presentation using slide designing.
9. Create, Save & print the power point presentation.
10. Create a power point presentation using clipart, Word art gallery & then add transition & Animation effects
SEMESTER 3

DCE 301: MATHEMATICS - II

Unit – I

DIFFERENTIAL CALCULUS: Concept of limits with standard limits. Differentiation by definition of $X^n$, $\sin x$, $\cos x$, $\tan x$, $e^x$, differentiation of sum, product and quotient of functions, differentiation of function as a function, differentiation of trigonometric inverse functions, logarithmic differentiation, successive differentiation (excluding $n^{th}$ order).

Applications: rate measure, errors, maxima and minima. Equation of tangent to a curve for the explicit functions and equation of normal. Newton’s method of solving equation using the formula $f(a)/ f'(a)$.

Unit - II

Integral calculus: Integration as inverse operation of differentiation. Simple integration by substitution by parts and by partial fraction (for linear factors) only. Evaluation of definite integral $\int_0^{\pi/2} \sin^n x \, dx$, $\int_0^{\pi/2} \cos^n x \, dx$, $\int_0^{\pi/2} \sin^n x \cos^n x$.

Using formula without proof.

Applications: Area bounded by a curve and axes, volume of solid formed by revolution of an area about axes, centre of gravity, moment of inertia, average value, root mean square of a function, gamma function.

Unit - III

Differential equation: Concept of formation of differential equation and solution of first order differential equation, Variable separation, homogeneous differential equation, linear differential equation, solution of linear differential equation.

Unit - IV

Matrix: Addition, subtraction, multiplication, rank of matrix.
INTRODUCTION:
FLUID- DEFINITION, TYPES, PHYSICAL PROPERTIES.

FLUID STATICS:
HYDROSTATIC LAW, PRESSURE, DENSITY, HEIGHT RELATIONSHIP, MANOMETER, PRESSURE ON PLANE, CURVED AND SUBMERGED SURFACES, CENTRE OF PRESSURE, BUOYANCY, EQUILIBRIUM OF FLOATING BODIES, METACENTRE.

FLUID KINEMATICS:
TYPES AND STATES OF MOTION- STEADY AND UNSTEADY, UNIFORM AND NONUNIFORM, LAMINAR AND TURBULENT FLOW, COMPRESSIBLE AND INCOMPRESSIBLE FLOWS, ONE, TWO & THREE DIMENSIONAL FLOWS, STREAMLINES, STREAK LINES AND PATH LINES, STREAM TUBE, STREAM FUNCTION AND VELOCITY POTENTIAL.

FLUID DYNAMICS:
CONTINUITY EQUATION, EULER’S EQUATION, BERNOULIS EQUATION- APPLICATION. TOTAL ENERGY. MOMENTUM EQUATION, ENERGY EQUATION.

FLOW THROUGH OPENINGS:
ORIFICES, MOUTHPIECES, CO-EFFICIENT OF CONTRACTION, VELOCITY AND DISCHARGE, NOZZLES.

NOTCHES AND WEIRS:
RECTANGULAR, TRIANGULAR AND TRAPEZOIDAL NOTCHES AND WEIRS, FRANCI’S FORMULA WITH END CONTRACTION, SUPPRESSED WEIR, CIPPOLETIC WEIR, SUBMERGED WEIR, BROAD CRESTED WEIR.

FLOW THROUGH PIPES:
LOSS OF HEAD DUE TO FRICTION, BEND AND ELBOWS, SUDDEN ENLARGEMENT, SUDDEN CONTRACTION, OBSOLETION AND AT ENTRANCE. DARCY WEISBACH FORMULA, COEFFICIENT OF FRICTION, FLOW THROUGH COMPOUND PIPES. SIPHON.

FLOW MEASUREMENT:
VENTURI METER, ORIFICE METER, NOZZLE METER, PITOT TUBE, CURRENT METER.

FLOW IN OPEN CHANNELS:
CHANNEL SECTION- WETTED PERIMETER, HYDRAULIC RADIUS, SLOPE; CHEZY’S AND MANNING’S FORMULA, ECONOMIC SECTION.
DCE 303:  MECHANICS OF SOLIDS

STRESS AND STRAIN: STRESS AT POINT, CAUCHY STRESS TENSOR, EQUILIBRUIUM EQUATION, ANALYSIS OF DEFORMATION AND STRAIN COMPONENTS. PRINCIPAL STRESSES AND STRAIN, STRESS AND STRAIN INVARIANTS.

CONSTITUTIVE RELATIONS: TRUE AND ENGINEERING STRESS STRAIN CURVE. MATERIAL PROPERTIES FOR ISOTROPIC MATERIALS AND THEIR RELATIONS. THEORIES OF FAILURES FOR ISOTROPIC MATERIALS. BENDING OF BEAMS, SHEAR FORCE AND BENDING MOMENT DIAGRAMS. STRESS AND DEFLECTIONS DUE TO TRANSVERSE SHEARS. AXIALLY LOADED MEMBERS.

ENERGY METHODS: STRAIN ENERGY DUE TO AXIAL, TORSION, BENDING AND TRANSVERSE SHEAR. CASTIGLIANO’S THEOREM, RECIPROCITY THEOREM.

COLUMN AND STRUT: BUCKLING LOAD FOR DIFFERENT END CONDITIONS, COLUMNS WITH INITIAL CURVATURES, ECCENTRICALLY LOADED COLUMN, BEAM COLUMN, STRESSES FOR COMBINED BENDING AND AXIAL LOAD

DCE 304:  BUILDING CONSTRUCTION AND MATERIALS

ROOFS: TYPES OF ROOF, SELECTION OF ROOFS.

DOORS, WINDOWS, VENTILATORS: TYPES, MATERIALS SPECIFICATION, MODULAR CONCEPT, CONSTRUCTION PRACTICES.

PREFABRICATION: STANDARDIZATION, MECHANIZATION INDUSTRIALIZATION MODULAR CO-ORIZATION, JOINS, COMPARISON WITH INSITU CONSTRUCTION

TEMPORARY SUPPORTING STRUCTURES: SHUTTERING AND SCAFFOLDING, FOR FOOTING, COLUMN, BEAM, SLAB ETC

CEMENT CONCRETE WORKS: PLAIN CEMENT CONCRETE, REINFORCED CEMENT CONCRETE STEEL WORK IN R.C.C.

FLOORING: REQUIREMENTS, TYPES OF FLOORING METHOD OF LYING SKID RESISTANCE FLOOR, INDUSTRIAL FLOOR, NEO CONSTRUCTION PRACTICES.

STAIRCASES: TYPES OF STAIRS, MATERIAL, ORIENTATION SIMPLE GEOMETRIC CALCULATIONS, RAMS, ELEVATORS, ESCALATORS, LIFT

PLANNING: SURVEY-LAYOUT-INVESTIGATION FOR DIFFERENT TYPES OF BUILDING ORIENTATION OF BUILDING SURFACE WATER DRAINAGE SYSTEM, WATER SUPPLY, ELECTRIFICATION, SEWAGE DISPOSAL- ROAD ALIGNMENT, PREPARATION OF SCHEMES ETC.
FUNCTIONAL REQUIREMENT OF A BUILDING: BASIC REQUIREMENTS – STRENGTH AND STABILITY, COMFORT AND CONVENIENCE RESISTANCE TO MOISTURE PENETRATION, FIRE SAFETY (NSC CLASSIFICATION) THERMAL INSULATION, DAY LIGHTING AND VENTILATION, SOUND INSULATION, SECURITY AGAINST BURGLARY, PROTECTION AGAINST VERMINS OR TERMITES.

BUILDING COMPONENTS: THEIR BASIC REQUIREMENTS, FOUNDATION, PLINTH, FLOOR, SUPER STRUCTURE, WALLS, APIERS, BEAMS, COLUMNS, LINTELS, DOORS, WINDOWS, VENTILATIONS, SHEDES, SHADES, CELLING, ROOFS, STEPS, STAIRS, FINISHES AND UTILITY FIXTURES.

FOUNDATION: CLASSIFICATION-TYPES, PLACES OF USE, ISOLATED, WALL FOOTING, COMBINED FOOTING, GRILLAGE FOUNDATION, RAFT FOUNDATION, PILE FOUNDATION, TYPE AND APPLICATION, BASEMENTS BUOYANCY RAFT, CAISSONS, CYLINDERS, SHAFTS. CONSTRUCTION- SETTING OUT EXCAVATION, TIMBERING, SHORRING AND BRACING, DEWATERING.

MASONARY WORKS: BRICK MASONARY AND STONE MASONARY CONSTRUCTION, CAVITY WALLS PARTITION WALLS TYPES OF BONDS, REINFORCED BRICK MASONARY.

INTRODUCTION TO BUILDING MATERIALS
CEMENT AND AGGREGATE- CHEMICAL COMPOSITION, MANUFACTURING, PHYSICAL CHARACTERISTICS, HYDRATION, PROPERTIES OF CEMENT COMPOUNDS, DIFFERENT TYPES OF CEMENTS, TESTS ON CEMENT. COARSE AND FINE AGGREGATES, INFLUENCE OF AGGREGATES ON THE PROPERTIES OF CONCRETE, AGGREGATE SELECTION.

PREPARATION OF CONCRETE- FRESH CONCRETE- W.C RATIO, CURING ETC.

BUILDING DRAWING PRACTICAL:

INTRODUCTION: - PURPOSE OF DRAWING, REQUIREMENTS, DIFFERENT TYPES, SYMBOLS FOR MATERIALS, INSTALLATION & FIXTURES.
BUILDING COMPONENTS: - FOUNDATION, MASONARY, TRUSSES, STAIRS.
BUILDING DRAWING: - PLAN, ELEVATION AND SECTION OF- SINGLE STOREYED, MULTI STOREYED (FLAT ROOF & SLOPED ROOF) BUILDINGS

DCE 305: APPLIED MECHANICS

Unit – I
Concept of mechanics and applied mechanics – Explanation of Mechanics and applied - Mechanics, its importance and necessity, giving suitable examples on bodies at rest and in motion, - explanation of branches of this subject - Concept of rigid bodies.
Unit – II

Laws of Forces - Force and its effects, units and measurement of force, characteristics of force vector representation - Bow’s notation, Types of forces, action and reaction, tension, thrust and shear force - Force systems: Coplanar and space force systems - Coplanar concurrent and non-concurrent forces. Free body diagrams, Resultant and components concept of equilibrium - Parallelogram law of forces - Equilibrium of two forces, superposition and transmissibility of forces - Newton’s third law, triangle of forces, different cases of concurrent coplanar, two force systems, extension of parallelogram law and triangle law to many forces acting at one point - polygon law of forces, method of resolution into orthogonal components for finding the resultant, graphical methods, special case of three concurrent coplanar forces - Lami’s theorem.

Unit - III

Concept of moment - Varignon’s theorem (statement only) - Principle of moments –application of moments to simple mechanism - parallel forces - calculation of their resultant - concept of couple properties and effect - moving a force parallel to its line of action - general cases of coplanar force system - general conditions of equilibrium of bodies under coplanar forces.

Concept of friction, laws of friction, limiting friction and coefficient of friction, sliding friction.

Unit - IV

Concept of gravity - gravitational force, centroid and center of gravity - centroid for regular lamina and center of gravity for regular solids - Position of center of gravity of compound bodies and centroid of composition area - CG of bodies with portions removed.

Unit - V

Laws of Motion - Concept of momentum - Newton’s laws of motion & their application - derivation of force equation from second law of motion - numerical problems on second law of motion, piles, lifts and bodies tied with string - Newton’s third law of motion and numerical problems based on it - conservation of momentum - impulsive force (definition only).

Concept of machine - mechanical advantage, velocity ratio and efficiency of a machine their relationship - law of machine - simple machines (lever, wheel and axle, pulleys, jacks winch crabs only)

DCE 306: ENGINEERING GRAPHICS

Unit - I

Scales – their need and importance – (Theoretical instructions). Drawing of plain and diagonal scales. Handling Use and Care of Drawing instruments and Materials. Drawing Instruments – Materials - Layout of Drawing sheets - Free Hand Sketching and Lettering - Different types of lines in engineering drawing as per ISI specifications - Practice of free hand sketching of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles and circles.

Lettering Technique and Practice - Instrumental single stroke lettering of 35 mm and 70 mm height in the ratio of 7:4 Free hand Lettering (Alphabet and numerals)lower case and upper case, single stroke and block letters, vertical and inclined at 75 degree in different standards, series of 3:5 8 and 12 mm heights in the ratio of 7:4
Unit – II

**Dimensioning Technique** - Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions). Dimensioning of Overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sink holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches.

Unit - III

**Projection** - Theory of projections (Elaborate theoretical instructions) - Drawing 3 views of given objects (Non symmetrical objects may be selected for this exercise) - Drawing 6 views of given objects (Non symmetrical objects may be selected for this exercise). Identification of surfaces on drawn views and objects drawn. Exercises on missing surfaces and views. Orthographic drawing or interpretation of views. Introduction to third angle projections.

Unit - IV

**Sections** - Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventional in sectioning. Drawing of full section, half section, partial or broken out sections, offset sections, revolved sections and removed sections. Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square angle, channel, rolled sections. Exercises on sectional views of different objects.

Unit - V

**Isometric Views** - Fundamentals of isometric projections (Theoretical Projections) Isometric views from 2 to 3 given orthographic views. Preparation of simple working drawing of Furniture items like table, stool and any job prepared in the workshop.
SEMESTER 4

DCE 401: SURVEYING

INTRODUCTION TO CHAIN AND COMPASS SURVEYING: INTRODUCTION, DEFINITION OF SURVEYING, PRIMARY DIVISIONS OF SURVEYING, PRINCIPLES OF SURVEYING, APPROXIMATE METHODS OF CHAIN AND TAPE SURVEYING, INSTRUMENTS FOR CHAINING AND TAPING, MEASUREMENT BY CHAIN AND TAPE, ERRORS AND CORRECTIONS, TESTING AND ADJUSTMENT OF A CHAIN, CHAINING ON FLAT AND SLOPING GROUND, OBSTACLES IN CHAINING, DIRECT AND INDIRECT METHOD OF RANGING, METHOD OF TRAVERSING, PRINCIPLE BASIC DEFINITIONS

LEVELING: CLASSIFICATION- PROFILE & CROSS-SECTION, FLY LEVELING, RECIPROCAL LEVELING, TRIGONOMETRIC LEVELING, ERRORS IN LEVELING AND ACCURACY.

PLANE TABLE SURVEYING: EQUIPMENTS & ACCESSORIES, METHODS OF LOCATING DETAILS-RADIATION, INTERSECTION AND RESECTION. ADVANTAGES & DISADVANTAGES.

THEODOLITE: MEASUREMENT OF HORIZONTAL ANGLE- METHOD OF REPETITION AND REITERATION, VARIOUS TYPES OF THEODOLITES-20 VERNIER, MICRO-OPTIC AND ELECTRONIC. INTRODUCTION TO TOTAL STATION.

TRAVERSING BY THEODOLITE- CLOSED TRAVERSE, COMPUTATION OF INDEPENDENT COORDINATES- GALE’S TRAVERSE TABLE

TACHEOMETRY: BASIC SYSTEMS OF TACHEOMETRIC MEASUREMENT, PRINCIPLES OF STADIA AND TANGENTIAL METHOD WITH STAFF VERTICAL, DERIVATION OF FORMULAE AND NUMERICAL PROBLEMS.

HORIZONTAL AND Vertical CURVES: CHARACTERISTICS OF DIFFERENT TYPES- ELEMENTS OF CIRCULAR AND TRANSITION CURVES, METHODS OF SETTING OUT OF SIMPLE CIRCULAR AND COMBINED CURVES.

CONTOURING: CHARACTERISTICS OF CONTOURS, VARIOUS METHOD.

DCE 402: ANALYSIS OF STRUCTURE

INTRODUCTION TO STRUCTURAL ANALYSIS: FORMS OF STRUCTURES, LOADS AND FORCES, FREE BODY DIAGRAM, CONDITION OF EQUILIBRIUM OF FORCES, SUPPORT CONDITIONS, DETERMINE AND INDETERMINATE STRUCTURES.

STATICALLY DETERMINE BEAMS: AXIAL THRUST, BENDING MOMENT AND SHEAR FORCE DIAGRAM WITH CONCENTRATED AND DISTRIBUTED LOADS.
DEFLECTION IN BEAMS: COMPUTATION OF SLOPE AND DEFLECTION BY DOUBLE INTEGRATION, MOMENT AREA METHOD, CONJUGATE BEAM METHOD, APPLICATION TO SIMPLY SUPPORTED, OVERHANG AND CANTILEVER BEAMS.

STRAIN ENERGY AND VIRTUAL WORK: STRAIN ENERGY FOR AXIAL FORCE, BENDING, SHEAR AND TORSION.

ANALYSIS OF PIN JOINTED STRUCTURES: METHOD OF JOINTS AND SECTIONS, DEFLECTION OF JOINTS, MAXWELL’S RECIPROCAL THEOREM. ANALYSIS OF TWO HINGED AND THREE HINGED ARCHES

DCE 403: GEOTECHNICAL ENGINEERING

SOIL DEPOSITS BASED ON ORIGIN, SOIL MAP OF INDIA, INDEX PROPERTIES, PHASE –RELATIONSHIPS, PARTICLE SIZE DISTRIBUTION, CONSISTENCY AND PLASTICITY, FABRIC AND STRUCTURE, SENSITIVITY & THIXOTROPY, CLAY MINERALS – MONTMORILLONITE, ELITE & KAOLINITE, IDENTIFICATION AND CLASSIFICATION OF SOILS, CLASSIFICATION OF ROCKS, ROD, RMR SYSTEM.

EFFECTIVE STRESSES PRINCIPLE, CAPILLARITY IN SOILS.

PERMEABILITY OF SOIL – DARCY’S LAW, PERMEABILITY – LABORATORY AND FIELD DETERMINATION, QUICK CONDITION, PERMEABILITY OF STRATIFIED DEPOSITS, FACTORS AFFECTING PERMEABILITY.

SEEPAGE THROUGH SOILS, LAPLACE EQUATION, FLOWNET –ITS CONSTRUCTION AND USES, SEEPAGE THROUGH HOMOGENEOUS EARTH DAM WITH AND WITHOUT FILTERS.

COMPACTION OF SOILS, COMPACTION TEST, OPTIMUM MOISTURE CONTENT AND ZERO AIR VOID LINE FIELD METHODS OF CONTROL OF COMPACTION, METHODS OF COMPACTION OF VARIOUS TYPES OF DEPOSITS IN FIELD.

COMPRESSIBILITY AND CONSOLIDATION OF SOILS – INTRODUCTION TO THE PROCESS OF CONSOLIDATION (SPRING ANALOGY), E-P CURVES, METHODS OF ESTIMATING PRECONSOLIDATION PRESSURE, OVER CONSOLIDATION RATIO, TERZAGHI’S THEORY OF ONE DIMENSIONAL CONSOLIDATION, CONSOLIDATION TEST AND DETERMINATION OF C_u, M_v AND C_C, PRIMARY AND SECONDARY CONSOLIDATION, COMPRESSION CHARACTERISTICS OF CLAYS AND SETTLEMENT ANALYSIS.

SHEAR STRENGTH OF SOILS- STRESS AT A POINT, MOHR’S STRESS CIRCLE, MOHR- COULOMB FAILURE CRITERIA, DEFINITION OF STRESS PATH, SHEAR TESTING OF SOIL, DIRECT SHEAR, TRIAXIAL, UNCONFINED COMPRESSION VANE SHEAR, UNDRAINED AND DRAINED STRENGTHS, SHEAR CHARACTERISTIC OF SAND NORMALLY LOADED AND OVER CONSOLIDATED CLAYS, SKEMPTON’S PORE PRESSURE PARAMETERS, CHOICE OF TEST CONDITIONS AND SHEAR PARAMETERS
STABILITY OF SLOPES:
FINITE AND INFINITE SLOPES, CONCEPT OF FACTOR OF SAFETY, SWEDISH METHOD, FRICTION CIRCLE METHOD, TAYLOR’S STABILITY NUMBER & CHART, EFFECT OF SUBMERGENCE, STEADY SEEPAGE AND SUDDEN DRAWDOWN CONDITIONS

DCE 404: TRANSPORATION ENGINEERING


PAVEMENT MATERIALS AND DESIGN:- DESIRABLE PROPERTIES AND TESTING OF HIGHWAY MATERIALS; ROAD AGGREGATES, BITUMINOUS MATERIALS AND SUBGRADE SOIL- FACTORS INFLUENCING THE DESIGN OF PAVEMENTS, DESIGN OF FLEXIBLE AND RIGID PAVEMENTS.

PAVEMENT CONSTRUCTION AND MAINTENANCE- HISTORICAL DEVELOPMENT OF ROAD CONSTRUCTION- CONSTRUCTION OF EARTH ROADS, WBM ROADS, STABILIZED ROADS, BITUMINOUS PAVEMENTS, CEMENT CONCRETE ROADS AND JOINTS IN CEMENT CONCRETE ROADS-TYPES AND CAUSES OF FAILURES IN FLEXIBLE AND RIGID PAVEMENTS.

DCE 405: HYDRAULICS AND HYDRAULIC MACHINES

VISCOSOUS FLOW:
VISCOSITY- DYNAMIC AND KINEMATIC; EQUATION OF MOTION- NAVIER- STOKES EQUATION; LAMINAR FLOW IN CIRCULAR PIPES- HAGEN POISEUILLE EQUATION, FLOW BETWEEN PARALLEL PLATES- COUETTE FLOW, PLANE POISOUILLE FLOW.
TURBULENT FLOW:
EDDY VISCOSITY, PANDTLE MIXING LENGTH THEORY, VELOCITY DISTRIBUTION OVER SMOOTH AND ROUGH SURFACES.

BOUNDARY LAYER THEORY:
BOUNDARY LAYER THICKNESS- DISPLACEMENT, MOMENTUM AND ENERGY THICKNESS, LAMINAR AND TURBULENT BOUNDARY LAYER ALONG A FLAT PLATE- MOMENTUM INTEGRAL EQUATION; LAMINAR SUB-LAYER.

FLOW AROUND SUBMERGED BODIES:
DRAG AND LIFT, PRESSURE AND FRICTION DRAG ON SPHERE, CYLINDER AND DISC. SEPARATION OF FLOW -KERMAN VORTEX STREET, LIFT-CYLINDER WITH CIRCULATION, MAGNUS EFFECT, DRAG AND LIFT COEFFICIENTS.

OPEN CHANNEL FLOW:
NORMAL DEPTH, SPECIFIC ENERGY, CRITICAL DEPTH AND CRITICAL VELOCITY, PRISMATIC AND NON-PRISMATIC CHANNEL SECTION, TYPES OF BED SLOPE. GRADUALLY VARIED FLOW-SURFACE PROFILE, EQUATION OF GRADUALLY VARIED FLOW-DIRECT STEP METHOD, BACKWATER CURVE, RAPIDLY VARIED FLOW-HYDRAULIC JUMP IN HORIZONTAL RECTANGULAR CHANNEL, DEPTH AND LENGTH OF JUMP, LOSS OF ENERGY.

IMPACT OF JET:
IMPULSE MOMENTUM PRINCIPAL, MOMENTUM OF MOMENTUM, FORCE OF JET ON FIXED, HINGED AND MOVING PLATE, INCLUDING CURVED PLATE, WATER WHEEL AND RADICALLY ROTATING CURVED VANES.

TURBINES:
CLASSIFICATION, IMPULSE AND REACTION TURBINES, WORK DONE, POWER AND EFFICIENCIES, PELTON WHEEL, FRANCIS TURBINE, KALPAN AND PROPELLER TURBINE, DRAFT TUBE, UNIT QUANTITIES, SPECIFIC SPEED.

PUMPS:
CENTRIFUGAL PUMP- VELOCITY TRIANGLE, WORK DONE, MANOMETRIC HEAD, EFFICIENCY, MINIMUM STARTING SPEED, MULTI STAGE PUMP. RECIPROCATING PUMP-DISCHARGE, INDICATOR DIAGRAM, EFFECTS OF ACCELERATION AND FRICTION, AIR VESSELS.

DCE 406: MECHANICS OF SOLIDS LAB

1. To determine the hardness of a given specimen using Rockwell hardness tester.
2. To determine the hardness of a given specimen using Brinell hardness tester.
3. To find out the impact energy of a specimen by impact testing machine.
4. To find out the ultimate tensile strength of mild steel rod using universal testing machine.
5. To find out the ultimate tensile strength of aluminum rod using universal testing machine.
6. To find out the ultimate compressive strength of brick using universal testing machine.
7. To find out the ultimate compressive strength of cast iron using universal testing machine.
DCE 407: SURVEYING LAB

1. TO RANGE A LINE MORE THAN ONE CHAIN LENGTH AND RECORDING THE DETAILS IN A FIELD BOOK.

2. CHAIN SURVEYING AND TAPPING.

3. PROFILE AND CROSS-SECTIONAL LEVELING WITH THE HELP OF DUMMY LEVEL.

4. LEVELLING AND CONTOURING- DIRECT CONTOURING- FOR OBLONG AND SMALL AREAS

5. PLANE TABLE SURVEYING AND TRAVERSING

6. COMPASS TRAVERSING USING PLANE TABLE.

7. THEODOLITE SURVEYING- MEASUREMENT OF HORIZONTAL AND VERTICAL ANGLES., TRAVERSING WITH THEODOLITE
SEMESTER 5
DCE 501: IRRIGATION ENGINEERING

INTRODUCTION:
DEFINITION, AIM, NECESSITY, BENEFITS AND ILL EFFECTS OF IRRIGATION; IRRIGATION DEVELOPMENT IN INDIA – ITS STATUS IN NORTH EAST, TYPES OF IRRIGATION – ADVANTAGES AND DISADVANTAGES.

SOIL – WATER PLANT RELATIONSHIP:
SOIL WATER CLASSIFICATIONS, FIELD CAPACITY, WILTING POINT, AVAILABLE MOISTURE; SOIL FERTILITY MANURE AND FERTILIZER; CROP ROTATION, FUNCTIONS OF SOIL WATER.

WATER REQUIREMENT OF CROPS:
CROP SEASONS, CONSUMPTIVE USE – EVAPOTRANSPIRATION, MEASUREMENTS, COMMAND AREA, DELTA, DUTY, BASE PERIOD KOR DEPTH, KOR PERIOD, IRRIGATION REQUIREMENTS, DEPTH AND FREQUENCY OF IRRIGATION, FACTORS EFFECTING WATER REQUIREMENTS, PRINCIPAL CROPS OF INDIA.

WATER APPLICATION METHODS:
SURFACE IRRIGATION – VARIOUS METHODS, SUB SURFACE IRRIGATION – DRIP IRRIGATION, SPRINKLER IRRIGATION, ADVANTAGES AND DISADVANTAGES OF DIFFERENT METHODS.

FLOW IRRIGATION:
SOURCES AND SYSTEMS OF FLOW IRRIGATION, IRRIGATION CANALS – CLASSIFICATION, ALIGNMENT, NETWORKS. INUNDATION CANAL, CANAL LOSSES, CANAL LINING – FUNCTIONS, ADVANTAGES, TYPES, LINING MATERIALS, MAINTENANCE OF IRRIGATION CANAL.

LIFT IRRIGATION:
TYPES, SOURCES, ADVANTAGES AND DISADVANTAGES, WELL IRRIGATION – COMPARISON WITH CANAL IRRIGATION, TYPES AND CONSTRUCTION OF WELLS; LIFT CANAL IRRIGATION.

CANAL DESIGN:
CANAL SECTION AND BED SLOPE, DESIGN OF LINED AND RIGID BOUNDARY CANAL – MANNING’S EQUATION; DESIGN OF ALLUVIAL CANALS – KENNEDY’S AND LACEY’S SILT THEORIES, THEIR LIMITATIONS AND DRAW BACKS
CANAL HEADWORKS:

LAYOUT AND COMPONENTS OF STORAGE AND DIVERSION HEAD WORKS, DESCRIPTIVE STUDIES OF DAMS, WEIRS, BARRAGE, SPILLWAYS AND HEAD REGULATOR, SILL EXCLUDER.

REGULATION WORKS:

CANAL FALLS – NECESSITY, LOCATION, VARIOUS TYPES; REGULATORS, SILT CONTROL DEVICES, CANAL OUTLET AND ESCAPES.

CROSS DRAINAGE WORKS:

NECESSITY, TYPES – AQUEDUCTS, SUPERPASSAGES, LEVEL CROSSING, SELECTION OF SUITABLE TYPES.

WATER LOGGING AND LAND RECLAMATION:

WATER LOGGING – CAUSES, ILL EFFECTS AND PREVENTIVE MEASURES.

DCE 502: DESIGN OF STRUCTURES – I

PROPERTIES OF CONCRETE AND REINFORCING STEEL, STRESS-STRAIN CHARACTERISTICS, SHRINKAGE AND CREEP PHENOMENON. I.S. SPECIFICATION.

METHODS OF DESIGN: ELASTIC THEORY AND LIMIT STATE THEORY.

ANALYSIS AND DESIGN OF SECTIONS IN FLEXURE BY ELASTIC AND LIMIT STATE METHODS: SINGLY AND DOUBLY R.C. SECTION, T AND L SECTIONS.

ANALYSIS & DESIGN SECTIONS FOR SHEAR AND BOND. ANCHORAGE AND SPlicing OF REINFORCEMENT, DETAILING OF REINFORCEMENT.

DESIGN OF SIMPLE AND CONTINUOUS BEAMS.

DESIGN OF AXIALLY AND ECCENTRICALLY LOADED SHORT AND LONG COLUMN.

DESIGN OF ONE-WAY AND TWO-WAY SLAB, CONTINUOUS SLAB.

DESIGN OF FOOTING: ISOLATED AND COMBINED FOOTING; STRIP FOOTING.

RETAINING WALL: CANTILEVER AND COUNTERFORT TYPES WITH AND WITHOUT SURCHARGE
1. CONCRETE AS A BUILDING AND ITS INGREDIENTS:

CEMENT: MANUFACTURE OF PORTLAND CEMENT, ITS COMPOSITION, HYDRATION OF CEMENT, PHYSICAL AND CHEMICAL PROPERTIES, CONCEPT OF STRENGTH DEVELOPMENT. GEL SPACE RATIO, POWERS LAW, GEL STRUCTURE.

TESTING OF CEMENT FROM PHYSICAL AND CHEMICAL PROPERTIES AS PER BIS SPECIFICATIONS. DIFFERENT TYPES OF CEMENT SUCH AS SLAG CEMENT, PORTLAND POZZOLONA CEMENT AND HIGH ALUMINA CEMENT, THEIR CHARACTERISTICS, COMPOSITION, USE AND PROPERTIES.

AGGREGATES AND TESTING OF AGGREGATES:
CLASSIFICATION, SOURCE, PHYSICAL AND MECHANICAL PROPERTIES. TESTING OF AGGREGATES FOR PHYSICAL AND MECHANICAL PROPERTIES. WATER.

2. PRODUCTION OF FRESH CONCRETE:
PROPORTIONING OF CONCRETE, OPERATIONS INVOLVED IN CONCRETE PRODUCTION, WORKABILITY, FACTORS AFFECTING WORKABILITY, MEASUREMENT OF WORKABILITY. PROBLEM OF SEGREGATION AND BLEADING AND LAITTANCE.

PROPERTIES OF HARDENED CONCRETE:
STRENGTH AND DURABILITY, FACTORS AFFECTING STRENGTH AND DURABILITY OF CONCRETE.

3. CONCRETE MIX DESIGN: PRINCIPLE AND METHODS, STATISTICAL QUALITY CONTROL. CONCRETE RHEOLOGY, METURITY CONCEPT, IS METHOD FOR CONCRETE MIX DESIGN.

4. INTRODUCTION TO SPECIAL CONCRETES:
ADMIXTURES IN CONCRETE.
SPECIAL CONCRETE AS LIGHTWEIGHT CONCRETE. HIGH DENSITY CONCRETE, SULPHUR IMPREGMENTED CONCRETE, POLYMER CONCRETE, LIME CONCRETE CONSTITUENTS AND USES.
HIGH STRENGTH CONCRETE.
FIBRE REINFORCED CONCRETE.

5. MATERIAL TESTING AND INSTRUMENTATION:
CONVENTIONAL VS. NON-DESTRUCTIVE TESTING. METHODS & PRINCIPLES OF NDT.
DCE 504: COMPUTER AIDED DESIGN

INTRODUCTION TO USE SOFTWARES:

(AUTO-CAD, 2D, 3D-MAX, 3D-HOME ARCHITECT) IN BUILDING DRAWING.

BUILDING DRAWING USING STAD-PRO.

DCE 505: CIVIL ENGINEERING DRAWING

INTRODUCTION TO THE CODE FOR PRACTICE OF BUILDING DRAWING, PLAN, ELEVATION AND SECTION OF DIFFERENT RESIDENTIAL AND PUBLIC BUILDINGS.

INTRODUCTION TO FUNCTIONAL PLANNING OF RESIDENTIAL AND COMMERCIAL BUILDINGS.

PRACTICES: DRAWING OF PLAN, ELEVATION, SECTIONAL VIEW OF DIFFERENT BUILDINGS AND OTHER CIVIL ENGINEERING STRUCTURES.

STAIRS AND STAIRCASES:
INTRODUCTION, STAIRS, LOCATIONS, STAIR, TYPES OF STAIR, PRINCIPLES TO BE OBSERVED WHILE PLANNING AND DESIGN A STAIR.
DESIGN OF STAIR, SPIRAL STAIRS, STAIRS FOR A MULTILAYERED BUILDING.

FOUNDATION PLINTH, DAMP-PROOF AND BASEMENT:

FOUNDATION, PLINTH, DAMP PROOF COURSE – DAMP PROOF, METHOD OF PREVENTING DAMPNESS, BASEMENT, CAVITY WALLS, CONSTRUCTION DETAILS, WALL TIES

DEC 506: ESTIMATING AND COSTING

1ST HALF-ESTIMATION

INTRODUCTION: - PRINCIPLES OF ESTIMATING, PURPOSE AND TYPES OF ESTIMATES, STANDARD METHODS OF MEASUREMENT.

SPECIFICATIONS OF WORK: - AIMS OF SPECIFICATION, TYPES, METHOD OF PREPARATION, DETAIL SPECIFICATION OF SOME IMPORTANT ITEMS.
RATE ANALYSIS: - PURPOSE IMPORTANCE, FACTORS AFFECTING RATE ANALYSIS, LABOUR & MATERIAL REQUIREMENT FOR IMPORTANT ITEMS OF WORK.

SCHEDULE OF RATES: - LOCAL SCHEDULE OF RATES, CPWD SCHEDULE, IMPORTANCE OF SCHEDULE. SCHEDULE OF RATES FOR IMPORTANT ITEM-SUCH AS-EARTH WORK, CARRIAGE, CONCRETE, BRICK WORK, WOOD WORK, STEEL WORK ETC.

BUILDING ESTIMATE: -

ESTIMATE OF SINGLE STORIED BUILDING (SLOPED ROOF & R.C.C.), TRUSSES.

ROAD ESTIMATE: - EARTHWORK CALCULATION, ESTIMATE FOR A NEW ROAD, CULVERT.

2ND HALF-COSTING

BASIC KNOWLEDGE OF VALUE: -

MARKET VALUE, RENT, GROUND RENT SECURED, UNSECURED, INTEREST, PRESENT VALUE, REVERSIONARY VALUE.

RENTAL METHOD OF VALUATION: -

CROSS RENT, NET RENT, RACK RENT, SECURITY, YEAR’S PURCHASE, ANNUAL SINKING FUND, SALARY OR PREMIUM.

LAND AND BUILDING METHODS OF VALUATIONS: -

FACTORS AFFECTING VALUE OF LANDS.

BUSTER LAND, LAND LOCKED LAND: -

VARIOUS METHODS OF VALUATION OF BUILDINGS, DEPRECIATION, COMPARISON OF LAND VALUE BY BELTING, VALUE OF LEASEHOLD INTEREST.
SEMESTER 6
DCE 601: PROJECT

UNDER THIS COURSE, STUDENTS OF THE CLASS WILL BE DIVIDED INTO GROUPS OF 2/3/4 STUDENTS. EACH GROUP WILL BE ASSIGNED A TOPIC RELATED TO CIVIL ENGINEERING FIELD. THE TOPIC MAY BE EITHER EXPERIMENTAL OR THEORETICAL RELATING TO RESEARCH/DESIGN/ DEVELOPMENT/ IMPLEMENTATION WORK. THE GROUP WILL WORK UNDER ONE OR MORE SUPERVISOR(S) FROM THE DEPARTMENT AND SUBMIT A REPORT ON THE WORK. EACH STUDENT WILL GIVE A PRESENTATION ON THE PROJECT WORK BEFORE A PANEL OF EXAMINERS.

DCE 602: MANAGEMENT

HUMAN RESOURCE POLICIES AND PRACTICES: SELECTION PRACTICES, TRAINING AND DEVELOPMENT PROGRAMMES; PERFORMANCE EVALUATION; UNION — MANAGEMENT INTERFACE; MANAGING DIVERSITY IN ORGANISATIONS.

INVESTMENT ANALYSIS: TIME VALUE OF MONEY. CASH FLOWS AND MEASURES OF INVESTMENT WORTH; INVESTMENT ANALYSIS

MANAGEMENT: CONCEPTS, STATUS AND FUNCTIONS. ROLE OF MANAGEMENT. MANAGEMENT SKILLS. EFFECTIVE VERSUS SUCCESSFUL MANAGERIAL ACTIVITIES. MOTIVATION - EARLY AND CONTEMPORARY THEORIES ON MOTIVATION- IMPLICATION FOR MANAGERS AND APPLICATIONS. GROUP BEHAVIOUR AND GROUP DYNAMICS: FOUNDATIONS OF GROUP BEHAVIOUR. DEFINING AND CLASSIFYING GROUPS; STAGES OF GROUP DEVELOPMENT; GROUP INTERACTION; EXTERNAL CONDITIONS; GROUP MEMBER RESOURCES; GROUP STRUCTURE; GROUP PROCESSES; TASKS AND DECISION MAKING.

LEADERSHIP- LEADERSHIP THEORIES. RECENT APPROACH TO LEADERSHIP AND CONTEMPORARY ISSUES IN LEADERSHIP.

ORGANISATIONAL DYNAMICS: ORGANISATIONAL CHANGE AND STRESS MANAGEMENT. HUMAN FACTORS IN INDUSTRY- FATIGUE AND SYMPTOMS. FATIGUE CONTROL

PROJECTS AND PROJECT EVALUATION: ECONOMIC AND FINANCIAL EVALUATION OF PROJECTS. ECONOMIC AND SOCIAL COST BENEFIT ANALYSIS.
DCE 603: DESIGN OF STRUCTURES-II

GENERAL PRINCIPLES OF DESIGN:
TYPES OF LOADS, STRUCTURAL ARRANGEMENT, STRUCTURAL METALS AND THEIR PROPERTIES, I.S. SPECIFICATION.

RIVETED JOINTS:
DIMENSION, PITCH, EDGE DISTANCE, TYPES OF FAILURE, STRENGTH AND EFFICIENCY OF LAP AND BUTT JOINTS, SPLICES FOR ANGLES, FLANGES AND WEB PLATES.

RIVETED CONNECTIONS IN FRAMES:
CENTRALLY AND ECCENTRICALLY LOADED CONNECTION, RIVETED CONNECTION, RIVET IN COMBINED SHEAR AND TENSION.

WELDED JOINTS:
TYPES OF WELDED JOINTS, VARIOUS TYPES OF BUTT AND FILLET JOINTS, STRENGTH AND EFFICIENCY OF WELDED JOINTS.

WELDED CONNECTION IN FRAMES:
WELDED BRACKETS, MOMENT RESISTANT WELDED CONNECTIONS. DESIGN OF TENSION MEMBERS, SPlicing OF TENSION MEMBERS.

DESIGN OF COMPRESSION NUMBERS:
SIMPLE STRUTS, CONCENTRICALLY AND ECCENTRICALLY LOADED SIMPLE AND BUILT UP COLUMNS, COLUMN SPLICE, SECONDARY DESIGN CONSIDERATION, COLUMN SPlicing.

DESIGN OF BEAMS:
SIMPLE AND BUILT UP BEAMS, LATERALLY RESTRAINED AND UN-RESTRAINED BEAMS.

COLUMN BASES:
CENTRALLY AND ECCENTRICALLY LOADED, BASE PLATE DESIGN AND GRILLAGE FOUNDATION.

DESIGN OF ROOF TRUSS:
TYPES OF TRUSS FOR DIFFERENT SPANS, DEAD, LIVE AND WIND LOADS, RISE, CAMBER AND SPACING, END SUPPORTS AND BEARINGS, JOINTS AND CONNECTIONS, DESIGN OF PURLIN. INDUSTRIAL BUILDINGS-TRUSS, COLUMNS, BRACINGS.

DCE 604: ENVIRONMENTAL ENGINEERING

INTRODUCTION: WATER SUPPLY SYSTEM, ITS OBJECTIVES AND COMPONENTS
WATER QUANTITY: VARIOUS DEMANDS OF WATER, DESIGN PERIOD, POPULATION FORECASTING, PERCAPITA CONSUMPTION – RECOMMENDED RATES, FACTORS AFFECTING CONSUMPTION, VARIATION OF DEMAND AND ITS IMPACT AN DESIGN OF WATER SUPPLY SYSTEM, FIRE DEMAND.
WATER QUALITY: IMPURITIES OF WATER AND WATER BORN DISEASES, WATER ANALYSIS PHYSICAL, CHEMICAL AND BACTERIOLOGICAL, SAMPLING METHOD, WATER QUALITY STANDARDS.

SOURCES OF WATER: SURFACE AND SUBSURFACE SOURCES AND THEIR CHARACTERISTICS, RAIN WATER HARVESTING, IMPOUNDING RESERVOIR STORAGE REQUIREMENTS, WELLS –DIFFERENT TYPES, WELL COMPONENTS, CONSTRUCTION, DEVELOPMENT AND SANITARY PROTECTION OF WELLS, GROUND WATER RECHARGE.

INTAKE WORKS AND CONVEYANCE OF WATER: RIVER, RESERVOIR AND CHANNEL INTAKES, SELECTION OF INTAKE, RISING MAIN – TYPE OF CONDUITS AND ITS JOINTS, PUMPS – TYPES AND SELECTION OF PUMPS.

TREATMENT OF WATER: METHOD, PURPOSES, SEQUENCE OF TREATMENTS, AERATION, SEDIMENTATION – PLAIN AND WITH COAGULATION, COAGULANTS AND THEIR DOSAGE, FEEDING UNITS, MIXING BASINS AND FLOCCULATION UNITS, SEDIMENTATION TANKS AND THEIR DESIGN, FILTRATION –PRINCIPLE, TYPE OF FILTERS, SLOW AND RAPID SAND FILTERS, PRESSURE, DIATOMITE AND MULTIMEDIA FILTERS.

OTHER TREATMENTS OF WATER: DISINFECTION, NECESSITY OF CHLORINATING- CLORINE DOSE, BREAK POINT CHLORINATION, FEEDING UNITS, OZENISATION, HARDNESS AND SOFTENING OF WATER, LIME PROCESS, LIME AND SODA ASH PROCESS, BASE EXCHANGE PROCESS, REMOVAL OF TASTE AND ODOUR, IRON AND MANGANESE

DISTRIBUTION SYSTEM: SERVICE RESERVOIR NECESSITY, TYPES AND ESTIMATION OF CAPACITY, SYSTEM OF SUPPLY, CONTINUOUS AND INTERMITTENT, DISTRIBUTION SYSTEM, LAYOUT AND DESIGN OF DISTRIBUTION SYSTEM, EQUIVALENT PIPE METHOD, HERDY –CROSS METHOD, METHOD OF SECTIONS, CIRCLE METHOD, MAINTENANCE OF DISTRIBUTION SYSTEM, DETECTION OF LEAKAGE AND WASTAGE AND THEIR PREVENTION, GATES AND VALVES IN DISTRIBUTION SYSTEM.

PLUMBING OF BUILDINGS FOR WATER SUPPLY: SERVICES CONNECTION, SYSTEM OF WATER SUPPLY IN BUILDINGS. FIXTURE UNITS, PLUMBING SYSTEM, DETECTION AND REMEDIES OF DEFECTS IN PLUMBING SYSTEM.

WATER POLLUTION: CAUSES, EFFECTS AND PREVENTIVE MEASURES.
**DCE 605A-DCE605D: ELECTIVE SUBJECTS:**

(ANY ONE OF THE FOLLOWING)

**DCE-605A  BRIDGE ENGINEERING**

INVESTIGATION AND SITE SELECTION, HYDRAULIC FACTORS, ALIGNMENT, TRAFFIC ASPECTS, TYPES OF BRIDGES; LOADING STANDARD, IRC SPECIFICATION, IMPACT FACTOR, GENERAL DESIGN CONSIDERATION, STRUCTURAL DESIGN OF HIGHWAY AND RAILWAY BRIDGES IN MASONRY, REINFORCED, PRESTRESSED CONCRETE AND STEEL; SUPERSTRUCTURES: SLAB BRIDGE, BEAM AND SLAB BRIDGE, PLATE GIRDER AND COMPOSITE BRIDGES, BEARINGS AND EXPANSION JOINTS, BRIDGE FOUNDATION: TYPES OF FOUNDATION, DESIGN OF WELL AND PILE FOUNDATION, BRIDGE VIBRATION: TRAFFIC LOADING, SEISMIC AND WIND EFFECT, CONSTRUCTION TECHNIQUES AND MAINTENANCE.

**DCE-605B  APPLIED GEOTECHNICAL ENGINEERING**

INTRODUCTION TO SITE DIFFICULTIES, CONSTRUCTION DEWATERING AND GROUND FREEZING.

LIQUEFACTION OF SOILS, CAUSES, EVALUATION OF LIQUEFACTION POTENTIAL, LIQUEFACTION MITIGATION MEASURES.

UPWARD FLOW, QUICKSAND CONDITION, CRITICAL HYDRAULIC GRADIENT, METHODS TO PREVENT PIPING AND SAND BOILING, DESIGN EXAMPLES.

SELECTION OF PILES AS PER SITE CONDITIONS, NEGATIVE SKIN FRICTION ON PILES, IT'S REMEDIES.

SETTLEMENT ANALYSIS OF FOUNDATIONS, DIFFERENTIAL SETTLEMENTS, TOLERABLE LIMITS, MEASURES TO MINIMIZE DIFFERENTIAL SETTLEMENTS.

**DCE605C-OPEN CHANNEL FLOW**

**BASIC PRINCIPLES:**

OPEN CHANNEL, TYPES AND SECTION ELEMENTS. CLASSIFICATION OF FLOW, BASIC EQUATIONS, VELOCITY CO – EFFICIENT, PRESSURE DISTRIBUTION, SPECIFIC FORCE.

**UNIFORM FLOW IN RIGID – BOUNDARY CHANNELS:**

BOUNDARY SHEAR, FLOW OVER SCATTERED ROUGHNESS ELEMENTS, CHEZY'S EQUATION, MANNIG'S EQUATION, OTHER RESISTANCE FORMULAE, EQUIVALENT ROUGHNESS, CHANNEL CONVEYANCE, SECTION FACTOR – CURVES FOR RECTANGULAR AND TRAPEZOIDA CHANNELS, FLOW IN A CIRCULAR CHANNEL, RELATION BETWEEN CONVEYANCE AND DEPTH.

**DESIGN OF CHANNELS:**

RIGID – BOUNDARY CHANNELS, NON SCOURING ERODIBLE BOUNDARY CHANNELS, ALLUVIAL CHANNELS, FREE BOARD IN CHANNELS.
ENERGY DEPTH RELATIONSHIP:
SPECIFIC ENERGY, CRITICAL DEPTH, SPECIFIC ENERGY CURVE, CRITICAL DEPTH COMPUTATION, CONTROL SECTION, APPLICATION OF SPECIFIC ENERGY AND CRITICAL DEPTH CONCEPTS. CHANNEL TRANSITIONS.

CHANNEL CONTROL AND TRANSITIONS:
FREE OVERFALL, SHARP CRESTED WEIRS, FLOW OVER SPILLWAYS, BROAD – CRESTED WEIRS, SIDE WEIRS, SLUICE GATE, STANDING WAVE FLUME, SUBCRITICAL FLOW TRANSITIONS, SUPERCritical FLOW TRANSITIONS, FLOW IN BENDS.

UNSTEADY FLOW:
WAVES AND THEIR CLASSIFICATION, CELERITY OF A WAVE, SURGES, EQUATIONS OF MOTION, INTRODUCTION TO DAM BREAK FLOOD, METHOD OF CHARACTERISTICS AND FINITE DIFFERENCE

GRADUALLY VARIED FLOW:
GOVERNING EQUATION AND ITS LIMITATIONS, WATER SURFACE PROFILES – CLASSIFICATION AND CHARACTERISTICS; FLOW PROFILES ON MILD, STEEP, CRITICAL, HORIZONTAL AND ADVERSE SLOPES, COMPUTATION OF G.V.F. IN PRISMATIC AND NON PRISMATIC CHANNELS, BY DIRECT STEP METHOD AND BY NUMERICAL METHOD, DELIVERY OF CHANNELS.

RAPIDLY VARIED FLOW HYDRAULIC JUMP:
TYPES OF JUMP, HYDRAULIC JUMP IN HORIZONTAL AND SLOPING RECTANGULAR CHANNELS, LOCATION AND LENGTH OF JUMP ON HORIZONTAL FLOOR, FORCED HYDRAULIC JUMP, JUMP IN EXPANDING RECTANGULAR CHANNELS. ENERGY LOSS AND APPLICATION OF HYDRAULIC JUMP

CHANNEL CONTROL AND TRANSITIONS:
FREE OVERFALL, SHARP CRESTED WEIRS, FLOW OVER SPILLWAYS, BROAD – CRESTED WEIRS, SIDE WEIRS, SLUICE GATE, STANDING WAVE FLUME, SUBCRITICAL FLOW TRANSITIONS, SUPERCritical FLOW TRANSITIONS, FLOW IN BENDS.

UNSTEADY FLOW:
WAVES AND THEIR CLASSIFICATION, CELERITY OF A WAVE, SURGES, EQUATIONS OF MOTION, INTRODUCTION TO DAM BREAK FLOOD, METHOD OF CHARACTERISTICS AND FINITE DIFFERENCE.
INTRODUCTION TO REMOTE SENSING: PRINCIPLES, ELECTROMAGNETIC RADIATION. INTERACTION MECHANISMS. IDEAL AND PRACTICAL REMOTE SENSING SYSTEM. ADVANTAGE AND DISADVANTAGE OF REMOTE SENSING OVER CONVENTIONAL METHODS. REFERENCE DATA SPECTRAL SIGNATURE.

PLATFORM AND SENSORS FOR REMOTE SENSING. TERRESTRIAL AND AERIAL PLATFORMS, SPACE PLATFORMS – LANDSAT, SPOT. IRS. CHARACTERISTICS OF VARIOUS SENSOR PHOTO THEODOLITE, AERIAL CAMERA, MSS, RBV, TM, HRV AND LISS SYSTEM RADIOMETERS.

CHARACTERISTICS AND USE OF VARIOUS DATA PRODUCT – B& W, COLOURED AND INFRARED PHOTOGRAPHS, PHOTOMOSAIC, ORTHOPHOTOGRAPH, B&W SATELLITE IMAGERIES, F.C.C., HIGH-DENSITY TAPES, CCT


APPLICATION OF REMOTE SENSING TO WATER RESOURCE DEVELOPMENT: FUNDAMENTAL ANALYSIS OF LANDFORMS, GEOMORPHOLOGY, DRAINAGE CHARACTERISTICS, SOIL TYPE EROSIONAL FEATURES, LAND USE, VEGETAL COVER, POLLUTION STUDIES, GROUND WATER STUDIES, FLOOD PLAIN MAPPING, APPLICATION TO HIGHWAY PLANNING AND ENGINEERING

GIS- INTRODUCTION TO GIS, CREATION OF DIGITAL GEOGRAPHIC DATA, CHARACTERISTICS OF GIS, UTILIZATION OF GIS FOR WATER RESOURCES, APPLICATION OF HYDROLOGICAL MODELING.