GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR

SEMESTER SCHEME-2020-21

IV SEMESTER
(SESSION 2021-2022 & ONWARDS)

HYDRAULICS

Course Code	CE 4001 (Same as CC/CV 4001)
Course Title	Hydraulics
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:
- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn different types of pumps and their uses.

COURSE OUTCOMES

   After completing this course, student will be able to:
1. Measure pressure and determine total hydrostatic pressure for different conditions.
2. Understand various parameters associated with fluid flow
3. Determine head loss of fluid flow through pipes.
4. Find the fluid flow parameters in open channels.
5. Select relevant hydraulic pumps for different applications

COURSE CONTENT

1. **Pressure Measurement and Hydrostatic Pressure**
    1.1. Technical terms used in Hydraulics:
        1.1.1. Fluid, Fluid Mechanics
        1.1.2. Hydraulics, Hydrostatics and Hydrodynamics
        1.1.3. Ideal and Real Fluid
        1.1.4. Application of Hydraulics
    1.2. Physical Properties of Fluid:
        1.2.1. Density-Specific Volume
        1.2.2. Specific Gravity
        1.2.3. Vapour pressure, Surface Tension, Capillarity
        1.2.4. Viscosity - Newton's Law of Viscosity, Dynamic and Kinematic viscosity
    1.3. Various Types of Pressure:
        1.3.1. Atmospheric Pressure
        1.3.2. Gauge Pressure
        1.3.3. Absolute Pressure
        1.3.4. Vacuum Pressure
    1.4. Concept of Pressure Head and its unit
    1.5. Pascal's law of fluid pressure and its uses
    1.6. Measurement of Differential Pressure
        1.6.1. Manometers
            1.6.1.1 Piezometer - its limitation
            1.6.1.2 U-tube - simple, differential, inverted
            1.6.1.3 Micro-manometers
            1.6.1.4 Inclined tube micro-manometers
    1.1. Variation of Pressure with Depth:
        1.1.1. Pressure Diagram
        1.1.2. Hydrostatic Pressure
        1.1.3. Center of Pressure on immersed surfaces and on tank walls

2. FLUID FLOW PARAMETERS

    2.1 Types of flow
        2.1.1 Gravity and Pressure Flow
        2.1.2 Laminar, Turbulent
        2.1.3 Uniform, Non-uniform
        2.1.4 Steady, Unsteady flow
    2.2 Reynolds Number
    2.3 Discharge and its unit
    2.4 Continuity Equation of Flow
    2.5 Energy of flowing Liquid
        2.5.1 Potential
        2.5.2 Kinetic
        2.5.3 Pressure Energy
    2.6 Bernoulli's Theorem: Statement, Assumptions, Equation

3. FLOW THROUGH PIPES

    3.1 Major Head Loss in Pipe
        3.1.1 Frictional loss and its computation by Darcy's Weisbach Equation
    3.2 Minor Losses in Pipe
        3.2.1 Loss at Entrance, Exit
        3.2.2 Sudden Contraction, Sudden Enlargement
        3.2.3 Fittings
    3.3 Flow through Pipes
        3.3.1 Pipes in Series
        3.3.2 Pipes in Parallel
        3.3.3 Dupuit's equation for Equivalent Pipe
    3.4 Hydraulic Gradient Line and Total Energy Line
    3.5 Water Hammer in Pipes: Causes and Remedial measures
    3.6 Discharge measuring device for Pipe Flow: Venturimeter - construction and working
    3.7 Discharge measurement using Orifice, Hydraulic Coefficients of Orifice

4. FLOW THROUGH OPEN CHANNEL

    4.1 Geometrical properties of channel section
        4.1.1 Wetted Area
        4.1.2 Wetted Perimeter
        4.1.3 Hydraulic Radius for Rectangular and Trapezoidal Channel Section
    4.2 Determination of discharge by Chezy's equation and Manning's equation
    4.3 Conditions for Most Economical Rectangular and Trapezoidal Channel Section
    4.4 Discharge measuring devices:
        4.4.1 Triangular Notch
        4.4.2 Rectangular Notch
    4.5 Velocity measurement devices
        4.5.1 Current Meter
        4.5.2 Floats
        4.5.3 Pitot's Tube
    4.6 Froude Number

5. HYDRAULIC PUMPS

    5.1 Concept of Pump
    5.2 Types of Pump
        5.2.1 Centrifugal
        5.2.2 Reciprocating
        5.2.3 Submersible
    5.3 Suction Head, Delivery Head, Static Head, Manometric Head
        Selection and choice of pump

SUGGESTED LEARNING RESOURCES

1. Modi, P. N.and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
4. Khurmi R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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ADVANCED SURVEYING

Course Code	CE 4002(Same as CC 4002)
Course Title	Advanced Surveying
Number of Credits	2 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES:

Following are the objectives of this course:

- To know methods of Plane Surveying and Theodolite Surveying and their uses
- To learn Tacheometric Surveying and Curve Setting
- To understand the principles of Electronic Distance Measurement Equipment and Total Station and their use.
- To know the concept of Remote Sensing, GPS and GIS

COURSE OUTCOMES

After completing this course, student will be able to:

1. Prepare plans using Plane Table Surveys.
2. Prepare plans using Theodolite Surveys.
3. Find distances and elevations using Tachometer.
4. Prepare plans using Total Station instrument.
5. Locate coordinates of stations using GPS.

COURSE CONTENT

1. Plane Table Surveying
   1.1 Principles of Plane Table Survey
   1.2 Accessories of Plane Table and their use, Telescopic Alidade
   1.3 Setting of Plane Table
      1.3.1 Orientation of Plane Table
      1.3.2 Back Sighting and Magnetic Meridian Method
      1.3.3 True Meridian Method
   1.4 Methods of Plane Table Surveys
      1.4.1 Radiation
      1.4.2 Intersection
      1.4.3 Traversing
   1.5 Merits and Demerits of Plane Table Survey

2. Theodolite Surveying
   2.1 Types and uses of Theodolite
   2.2 Components of Transit Theodolite and their functions
   2.3 Reading the Vernier of Transit Theodolite
   2.4 Technical Terms
      2.4.1 Swinging
      2.4.2 Transiting
      2.4.3 Face left
      2.4.4 Face right
   2.5 Fundamental Axes of Transit Theodolite and their Relationship
   2.6 Temporary Adjustment of Transit Theodolite
   2.7 Measurement of Horizontal Angle by
      2.7.1 Direct
      2.7.2 Repetition Method
      2.7.3 Errors Eliminated by Method of Repetition
   2.8 Measurement of Magnetic Bearing of a line
      2.8.1 Prolonging and ranging a line,
      2.8.2 Deflection Angle.
      2.8.3 Measurement of Vertical Angle
   2.9 Theodolite traversing by
      2.9.1 Included Angle method

          2.9.2   Deflection Angle Method
2.10 Checks for open and closed traverse
2.11 Calculations of Bearing from Angles
2.12 Traverse Computation
          2.12.1 Latitude, Departure
          2.12.2 Consecutive Coordinates, Independent Coordinates
2.13 Balancing the Traverse by
          2.13.1 Bowditch's Rule
          2.13.2 Transit Rule
          2.13.3 Gale's Traverse Table Computation

3. **Tacheometric Surveying and Curve setting**
    3.1   Principles of Tacheometry
          3.1.1   Tacheometer and its component parts
          3.1.2   Anallatic lens
    3.2   Tacheometric formula for horizontal distance with telescope horizontal and staff vertical
    3.3   Field method for determining constants of Tacheometer
    3.4   Determining horizontal and vertical distances with Tacheometer by
          3.4.1   Fixed hair method and
          3.4.2   Staff held vertical
    3.5   Limitations of Tacheometry
    3.6   Types of curves used in roads and railway alignments
    3.7   Designation of curves
    3.8   Setting simple circular curve by
          3.8.1   Offsets from long chord
          3.8.2   Rankine's method of deflection angles

4. **Advanced Surveying Equipments**
    4.1   Principle of Electronic Distance Meter (EDM)
          4.1.1   Its component parts and their Functions
          4.1.2   Use of EDM
    4.2   Use of
          4.2.1   Micro Optic Theodolite
          4.2.2   Electronic Digital Theodolite
    4.3   Use of Total Station
          4.3.1   Use of function keys
          4.3.2   Measurements of Horizontal angles, Vertical Angles
          4.3.3   Distances and Coordinates using Total Station
          4.3.4   Traversing, Profile Survey and Contouring with Total Station

5. **Remote Sensing, GPS and GIS**
    5.1   Remote Sensing
          5.1.1   Overview
          5.1.2   Remote Sensing System
          5.1.3   Applications of Remote Sensing in Civil engineering
          5.1.4   Land use / Land cover
          5.1.5   Mapping, Disaster Management
    5.2   Use of Global Positioning System (G.P.S.) instruments
    5.3   Geographic Information System (GIS)
          5.3.1   Over view
          5.3.2   Components
          5.3.3   Applications
          5.3.4   Name of common Softwares for GIS
    5.4   Introduction to Drone Surveying

SUGGESTED LEARNING RESOURCES

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi GruhPrakashan, Pune.
2. Basak, N. N.,Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd.,Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.

4.   Saikia, M D.; Das. B.M.; Das. M.M., SurveyingPHI Learning Pvt. Ltd., New Delhi.
5.   Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6.   Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar,   Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
7.   Rao, P.VenugopalaAkella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
8.   Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9.   Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
10. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

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THEORY OF STRUCTURES

Course Code	CE 4003 (Same as CC 4003)
Course Title	Theory of Structures
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES:

Following are the objectives of this course:
- To learn concept of eccentric loading and stresses in vertical members like column, chimneys, dam
- To analyze beams using various methods like slope deflection, three moment, and moment distribution
- To understand different methods of finding axial forces in trusses.

Course Outcomes

After competing this course, student will be able to:
1. Analyze stresses induced in vertical member subjected to direct and bending loads.
2. Analyze slope and Deflection in fixed and continuous beams.
3. Analyze continuous beam under different loading conditions using the principles of   Three Moments.
4. Analyze continuous beam using Moment Distribution Method under different loading conditions.
5. Evaluate axial forces in the members of simple truss.

COURSE CONTENT

1. **Direct and Bending Stresses in vertical members**
    1.1 Introduction to axial and eccentric loads
    1.2 Eccentricity about one principal axis only
        1.2.1 Nature of Stresses
        1.2.2 Maximum and minimum stresses
        1.2.3 Resultant stresses and distribution diagram
        1.2.4 Condition for no tension or zero stress at extreme fiber
        1.2.5 Limit of Eccentricity
        1.2.6 Core of section for rectangular and circular cross sections
        1.2.7 Middle Third Rule
2. **SLOPE AND DEFLECTION**
    2.1 Concept of slope and deflection
    2.2 Stiffness of beams
    2.3 Relation among bending moment, slope, deflection and radius of curvature, (no derivation).
    2.4 Double integration method to find slope and deflection of cantilever and simply supported beams subjected to
        2.4.1 Concentrated load and
        2.4.2 Uniformly distributed load on entire span.
3. **FIXED AND CONTINUOUS BEAM**
    3.1 Concept of fixity, effect of fixity
    3.2 Advantages and disadvantages of fixed beam over simply supported beam
    3.3 Principle of Superposition
    3.4 Fixed End Moments from first principle for beam subjected to
        3.4.1 Point load
        3.4.2 UDL over entire span
    3.5 Application of standard formulae for a fixed beam in finding
        3.5.1 End moments
        3.5.2 End reactions
        3.5.3 Drawing S.F. and B.M. diagrams
    3.6 Definition, effect of continuity, nature of moments induced due to continuity, concept of deflected shape, practical examples.

4. **ROLLING LOAD AND INFLUENCE LINE**
    4.1 Introduction to Influence line diagram for simply supported beams

4.1.1   Reaction
4.1.2   Shear force
4.1.3   Bending moment
4.2 Drawing of maximum B.M.D. and S.F.D. for simply supported beam for rolling loads of
4.2.1   Single concentrated load
4.2.2   Two point loads
4.2.3   Series of point loads

5.   SIMPLE TRUSSES

5.1 Types of Trusses
    5.1.1   Simple
    5.1.2   Fink
    5.1.3   Compound fink
    5.1.4   French Truss
    5.1.5   Pratt Truss
    5.1.6   Howe Truss
    5.1.7   North Light Truss
    5.1.8   King Post and Queen Post Truss
5.2 Calculate support reactions for trusses subjected to point loads at joints
5.3 Calculate forces in members of truss using
    5.3.1   Method of Joints

SUGGESTED LEARNING RESOURCES

1.   Ramamrutham.S, Theory of structures, Dhanpatrai& Sons.
2.   Khurmi, R. S. , Theory of Structures, S. Chand and Co., New Delhi.
3.   Bhavikatti, S S , Structural Analysis Vol-1, ,Vikas Publishing House Pvt Ltd.New Delhi.
4.   Junnarkar, S. B., Mechanics of structures, Volume-I and II Charotar Publishing House, Anand.
5.   Pandit, G.S. and Gupta, S.P., Theory of Structures, Tata McGraw Hill, New Delhi.
6.   Agor R, Structural Analysis, Khanna Publishing House, Delhi.

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BUILDING PLANNING AND DRAWING

Course Code	CE 4004 (Same as CC 4004)
Course Title	Building Planning and Drawing
Number of Credits	1 (L: 1, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:
- To learn basic principles of building planning and drawing.
- To know graphical representation of various components of buildings.
- To draw complete plan and elevation of a building.
- To learn basics of perspective drawings and Computer Aided Drawings.

COURSE OUTCOMES

After completing this course, student will be able to:
1. Interpret the symbols, signs and conventions from the given drawing.
2. Prepare line plans of residential and public buildings using principles of planning.
3. Prepare submission and working drawing for the given requirement of Load Bearing Structure.
4. Prepare submission and working drawing using CAD for the given requirement of Framed Structure.
5. Draw two-point perspective drawing for given small objects.

COURSE CONTENT

1.   Conventions and Symbols
    1.1. Conventions as per IS 962,
    1.2. Symbols for different materials such as
        1.2.1 Earthwork
        1.2.2 Brickwork
        1.2.3 Stonework
        1.2.4 Concrete
        1.2.5 Woodwork
        1.2.6 Glass.
    1.3. Graphical symbols for doors and windows
    1.4. Abbreviations, symbols for sanitary and electrical installations
    1.5. Types of lines
        1.5.1 Visible lines
        1.5.2 Centre line
        1.5.3 Hidden line
        1.5.4 Section line
        1.5.5 Dimension line
        1.5.6 Extension line
        1.5.7 Pointers
        1.5.8 Arrow head or Dots
    1.6. Appropriate size of lettering and numerals for titles, sub-titles, notes and dimensions.
    1.7. Types of Scale
        1.7.1 Monumental
        1.7.2 Intimate
        1.7.3 Criteria for Proper Selection of scale for various types of drawing.
    1.8. Sizes of various standard papers/sheets.

2.   Planning of Building
    2.1 Principles of Planning for Residential and Public Building
        2.1.1 Aspect
        2.1.2 Prospect
        2.1.3 Orientation
        2.1.4 Grouping

2.1.5 Privacy
2.1.6 Elegance
2.1.7 Flexibility
2.1.8 Circulation
2.1.9 Furniture Requirements
2.1.10 Sanitation
2.1.11 Economy

2.2 Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962
2.3 Rules and Bye-laws of sanctioning authorities for construction work.
2.4 Plot area, built up area, super built up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio).
2.5 Line Plans for Residential Building of minimum three rooms including water closet (WC), bath and staircase as per principles of planning.
2.6 Line Plans for Public Building
    2.6.1 School Building
    2.6.2 Primary Health Centre
    2.6.3 Restaurant
    2.6.4 Bank
    2.6.5 Post Office
    2.6.6 Hostel
    2.6.7 Function Hall
    2.6.8 Library

3. Drawing of Load Bearing Structure
3.1 Drawing of Single Storey Load Bearing Residential Building (2 BHK) with staircase
3.2 Data Drawing
    3.2.1 Plan
    3.2.2 Elevation
    3.2.3 Section
    3.2.4 Site plan
    3.2.5 Schedule of openings
    3.2.6 Construction notes with specifications
    3.2.7 Area statement
    3.2.8 Planning and Design of Staircase: Rise and Tread for Residential and Public Building
3.3 Working Drawing
    3.4.1 Developed Plan
    3.4.2 Elevation
    3.4.3 Section passing through Staircase or WC and Bath
3.5 Foundation Plan of Load Bearing Structure

4. Drawing of Framed Structure
4.1 Drawing of
    4.1.1 Two Storeyed Framed Structure (G+1)
    4.1.2 Residential building (2 BHK) with staircase.
4.2 Data Drawing
    4.2.1 Developed Plan
    4.2.2 Elevation
    4.2.3 Section
    4.2.4 Site plan
    4.2.5 Schedule of openings
    4.2.6 Construction notes with specifications
    4.2.7 Area statement
    4.2.8 Planning and Design of Staircase– Rise and Tread for residential and public building
4.3 Working Drawing of Framed Structure
    4.3.1 Developed Plan
    4.3.2 Elevation
    4.3.3 Section passing through staircase or WC and bath

    4.4 Foundation Plan of Framed Structure
    4.5 Details of
        4.5.1 RCC footing
        4.5.2 Column
        4.5.3 Beam
        4.5.4 Chajjas
        4.5.5 Lintel
        4.5.6 Staircase
        4.5.7 Slab
    4.6 Drawing with CAD
        4.6.1 Draw Commands
        4.6.2 Modify Commands
        4.6.3 Layer Commands

5.   Perspective Drawing
    5.1 Definition
    5.2 Types of Perspective
    5.3 Terms used in Perspective Drawing
    5.4 Principles used in Perspective Drawing
    5.5 Two Point Perspective of small objects only such as
        5.5.1 Steps
        5.5.2 Monuments
        5.5.3 Pedestals

SUGGESTED LEARNING RESOURCES

1.   Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.
2.   Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd New Asian Publishers, New Delhi.
3.   M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.
4.   Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publication, Anand.
5.   Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., New Delhi.
6.   Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.
7.   Singh, Ajit, Working with Auto CAD 2000, Mcgraw Hill Publishing company Ltd. New Delhi.
8.   Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

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WATER RESOURCES ENGINEERING

Course Code	CE 4005 Same as CV 4005
Course Title	Water Resources Engineering
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES
Following are the objectives of this course:
- To learn estimation of hydrological parameters.
- To understand water demand of crops and provisions to meet the same.
- To know planning of reservoirs and dams.
- To design irrigation projects, canals and other diversion works.

Course Outcomes:
  After completing this course, student will be able to:
  1. Estimate hydrological parameters.
  2. Estimate crop water requirements of a command area and capacity of canals.
  3. Execute Minor and Micro Irrigation Schemes.
  4. Select the relevant Cross Drainage works for the specific site conditions.
  5. Design, construct and maintain simple irrigation regulatory structures.

COURSE CONTENT
1. **Introduction to Hydrology**
   1.1 Hydrology: Definition and Hydrological Cycle
   1.2 Rain Gauge
       1.2.1 Symons Rain Gauge
       1.2.2 Automatic Rain Gauge
   1.3 Methods of Calculating Average Rainfall
       1.3.1 Arithmetic Mean
       1.3.2 Isohyetal
   1.4 Runoff
       1.4.1 Factors affecting Run off
       1.4.2 Computation of Run off
2. **Crop Water Requirement and Reservoir Planning**
   2.1 Irrigation and its Classification
   2.2 Crop Water Requirement
       2.2.1 Cropping Seasons
       2.2.2 Crop Period
       2.2.3 Base Period
       2.2.4 Duty
       2.2.5 Delta
       2.2.6 CCA
       2.2.7 GCA
       2.2.8 Intensity of Irrigation
       2.2.9 Factors Affecting Duty
       2.2.10 Problems on Water Requirement and Capacity of Canal
   2.3 Methods of Application of Irrigation Water and its Assessment
   2.4 Surveys for Irrigation Project, Data Collection for Irrigation Project
   2.5 Silting of Reservoir
       2.5.1 Rate of Silting
       2.5.2 Factors affecting Silting and Control Measures
3. **Dams and Spillways**
   3.1 Dams and its Classification
       3.1.1 Earthen Dams
       3.1.2 Gravity Dams (masonry and concrete)

3.2 Earthen Dams
3.3 Spillways
    3.3.1 Definition
    3.3.2 Energy Dissipaters

4. Minor and Micro Irrigation
  4.1 Percolation Tanks – Need, Selection of site
  4.2 Lift Irrigation Scheme
    4.2.1 Components and their Functions
    4.2.2 Lay Out
  4.3 Drip and Sprinkler Irrigation
    4.3.1 Need
    4.3.2 Components and Layout
  4.4 Well Irrigation
    4.4.1 Types and Yield of Wells
    4.4.2 Advantages and Disadvantages of Well Irrigation

5. Diversion Head Works & Canals
  5.1 Weirs
    5.1.1 Components
    5.1.2 Parts
    5.1.3 Types
    5.1.4 K.T. Weir: Components and Construction
  5.2 Diversion Head Works
    5.2.1 Layout
    5.2.2 Components and their functions
  5.3 Barrages
    5.3.1 Components and their functions
    5.3.2 Difference between Weir and Barrage
  5.4 Canals
    5.4.1 Classification according to Alignment and Position in the Canal Network
    5.4.2 Cross section of Canal in Embankment and Cutting
    5.4.3 Partial Embankment and Cutting
    5.4.4 Balancing Depth
  5.5 Canal lining
    5.5.1 Purpose
    5.5.2 Material used and its properties
    5.5.3 Advantages
  5.6 Cross Drainage Works
    5.6.1 Aqueduct
    5.6.2 Siphon Aqueduct
    5.6.3 Super Passage
    5.6.4 Level Crossing
  5.7 Canal Regulators
    5.7.1 Head Regulator
    5.7.2 Cross Regulator
    5.7.3 Escape
    5.7.4 Falls and Outlets

SUGGESTED LEARNING RESOURCES

1. Punmia, B.C., Pande, B, Lal, Irrigation and Water Power Engineering, Laxmi Publications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education
6. Asawa, G.L., Irrigation and water resource Engineering, New Age
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic Structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

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TRANSPORTATION ENGINEERING

Course Code	CE 4006 (Same as CC 4006)
Course Title	Transportation Engineering
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES
Following are the objectives of this course:
- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.
- To perform different tests on road materials.
- To identify the components of railway tracks.

COURSE OUTCOMES
After completing this course, student will be able to:
1. Identify the types of roads as per IRC recommendations.
2. Implement the geometrical design features of different highways.
3. Perform different tests on road materials.
4. Identify the components of railway tracks.
5. Identify the defects in railway tracks.

COURSE CONTENT
1. **Overview of Highway Engineering**
   1.1 Role of Transportation in the Development of Nation, Scope and Importance of Roads in India and its' Characteristics
   1.2 Different Modes of Transportation
       1.2.1 Land way
       1.2.2 Waterway
       1.2.3 Airway
       1.2.4 Merits and Demerits of Roadway and Railway
   1.3 General Classification of Roads
   1.4 Selection and factors affecting Road Alignment

2. **Geometric Design of Highway**
   2.1 Camber
       2.1.1 Definition
       2.1.2 Purpose
       2.1.3 Types as per IRC recommendations
   2.2 Kerbs
       2.2.1 Road Margin
       2.2.2 Road Formation
       2.2.3 Right of Way
   2.3 Design Speed and various factors affecting design speed as per IRCrecommendations.
   2.4 Gradient
       2.4.1 Definition
       2.4.2 Types as per IRC recommendations
   2.5 Sight Distance (SSD)
       2.5.1 Definition
       2.5.2 Types as per IRC recommendations

   2.6 Curves
       2.6.1 Necessity
       2.6.2 Types: Horizontal, Vertical Curves, Transition Curves

    2.7 Extra widening of Roads,
    2.8 Super Elevation
        2.8.1 Definition
        2.8.2 Method of providing Super Elevation.

3.   Construction of Road Pavements
    3.1 Types of Road Materials and their Tests
        3.1.1 Test on Aggregates
            3.1.1.1   Flakiness and Elongation Index Tests
            3.1.1.2   Angularity Number Test
        3.1.2 Test on Bitumen
            3.1.2.1   Penetration
            3.1.2.2   Ductility
            3.1.2.3   Flash and Fire Point Test
            3.1.2.4   Softening Point Test
    3.2 Pavement
        3.2.1 Definition
        3.2.2 Types
        3.2.3 Structural Components of Pavement and their functions
    3.3 Construction of WBM Road.
    3.4 Merits and demerits of WBM & WMM Road
    3.5 Construction of Flexible Pavement / Bituminous Road
    3.6 Types of Bitumen and its properties, Emulsion, Cutback, Tar.
    3.7 Terms used in Bituminous Roads
        3.7.1 Prime Coat
        3.7.2 Tack Coat
        3.7.3 Seal Coat
    3.8 Merits and Demerits of Bituminous Roads
    3.9 Cement Concrete Road
        3.9.1 Methods of Construction
        3.9.2 Alternate and Continuous Bay Method
        3.9.3 Construction Joints
        3.9.4 Filler and Sealers
        3.9.5 Merits and Demerits of Concrete Roads
        3.9.6 Types of Joints

4.   Basics of Railway Engineering
    4.1 Permanent Way
        4.1.1 Ideal Requirement
        4.1.2 Components
        4.1.3 Rail Gauge, types, factors affecting selection of a gauge.
    4.2 Rail, Rail Joints–Requirements, Types.
    4.3 Creep of Rail: Causes and Prevention.
    4.4 Sleepers
        4.4.1 Functions and Requirement
        4.4.2 Types, Concrete Sleepers and their density
    4.5 Ballast
        4.5.1 Function and Types
        4.5.2 Suitability
    4.6 Rail Fixtures and Fastenings
        4.6.1 Fish Plate
        4.6.2 Spikes
        4.6.3 Bolts, Keys
        4.6.4 Bearing Plates
        4.6.5 Chairs: Types of Anchors and Anti-creepers.

5.   Track geometrics, Construction and Maintenance
    5.1 Alignment - Factors governing Rail Alignment.

5.2 Track Cross Sections
    5.2.1 Standard cross section of single and double line in cutting and embankment.
    5.2.2 Important Terms
        5.2.2.1 Permanent Land
        5.2.2.2 Formation Width
        5.2.2.3 Side Drains
5.3 Railway Track Geometrics
    5.3.1 Gradient
    5.3.2 Curves- Types and factors affecting
    5.3.3 Grade Compensation
    5.3.4 Super Elevation
    5.3.5 Limits of Super Elevation on Curves
    5.3.6 Cant Deficiency
    5.3.7 Negative Cant
    5.3.8 Coning of Wheel
    5.3.9 Tilting of Rail
5.4 Branching of Tracks, Points and Crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle.
5.5 Station

SUGGESTED LEARNING RESOURCES

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi (ISBN: 978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg ,Standard Book House, New Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S. Chand Publication, New Delhi.
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering,New Age International (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

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CONSTRUCTION MANAGEMENT

Course Code	CE 40071 (Same as CC/CV 40071)
Course Title	Construction Management
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

COURSE OBJECTIVES

Following are the objectives of this course:
- To understand the contract management and associated labour laws.
- To prepare and understand the principles involved in site layout.
- To know the procedure for scheduling of various activities in construction project.
- To understand the labour laws, procedure for arbitration, settlements.
- To know different safety measures in construction projects.

COURSE OUTCOMES

After completing this course, student will be able to:
1. Understand the contract management and associated labour laws.
2. Prepare and understand the nuances of executing the site layout.
3. Prepare networks and bar charts for the given construction project.
4. Understand the intricacies of disputes, related arbitration and settlement laws.

Apply safety measures at construction projects

COURSE CONTENT

1. Construction Industry and Management
   1.1 Organization
       1.1.1 Objectives
       1.1.2 Principles of Organization
       1.1.3 Types of Organization
               1.1.3.1 Government/Public
               1.1.3.2 Private Construction Industry
       1.1.4 Role of Various Personnel in Construction Organization
   1.2 Agencies associated with Construction Work
       1.2.1 Owner,
       1.2.2 Promoter
       1.2.3 Builder
       1.2.4 Designer
       1.2.5 Architects
   1.3 Role of Consultant for Various Activities
       1.3.1 Preparation of Detailed Project Report (DPR)
       1.3.2 Monitoring of Progress and Quality
       1.3.3 Settlement of Disputes

2. Site Layout
   2.1 Principles governing Site Layout
   2.2 Factors affecting Site Layout
   2.3 Preparation of Site Layout
   2.4 Land acquisition procedures and providing compensation

3. Planning and Scheduling
   3.1 Identifying broad activities in construction work & allotting time to it
       3.1.1 Methods of Scheduling
       3.1.2 Development of Bar Charts
       3.1.3 Merits&Limitations of Bar Charts
   3.2 Elements of Network
       3.2.1 Event
       3.2.2 activity

      3.2.3   dummy activities
      3.2.4   Precautions in drawing Network
      3.2.5   Numbering the events
   3.3   CPM networks
      3.3.1   Activity Time Estimate
      3.3.2   Event Times by Forward &Backward Pass Calculation
      3.3.3   Start and Finish Time of Activity
      3.3.4   Project Duration
      3.3.5   Floats, Types of Floats
          3.3.5.1   Free
          3.3.5.2   Independent
          3.3.5.3   Total Floats
      3.3.6   Critical Activities and Critical Path
   3.4   Purpose of Crashing a Network
      3.4.1   Normal Time and Cost
      3.4.2   Crash Time and Cost
      3.4.3   Cost Slope
      3.4.4   Optimization of Cost and Duration
   3.5   Material Management
      3.5.1   Ordering Cost
      3.5.2   Inventory Carrying Cost
      3.5.3   Economic Order Quantity
   3.6   Store Management
      3.6.1   Various Records related to Store Management
      3.6.2   Inventory Control by ABC Technique
      3.6.3   Introduction to Material Procurement through Portals (e.g. www.inampro.nic.in)

4   Construction Contracts and Specifications

   4.1   Types of Construction Contracts
   4.2   Contract documents
      4.2.1   Specifications
      4.2.2   General Special Conditions
   4.3   Contract Management
   4.4   Procedures involved in Arbitration and Settlement (Introduction only)

5   Safety in Construction

   3.1   Safety in Construction Industry
      3.1.1   Causes of Accidents
      3.1.2   Remedial and Preventive Measures
   3.2   Labour Laws and Acts pertaining to Civil construction activities (Introduction only)

SUGGESTED LEARNING RESOURCES

1.   Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
2.   Gahlot,P.S. and Dhir, B.M Construction planning and management   New   Age   International   (P)   Ltd. Publishers, New Delhi.
3.   Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt Ltd. New Delhi
4.   Mantri, S., The A To Z of Practical Building Construction and its Management, Satya Prakashan New Delhi
5.   Khanna, O.P. , Industrial Engineering and management, Dhanpat Rai New Delhi
6.   Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM, Laxmi Publications (P)Ltd.
7.   Sengupta, B., Guha H., Construction Management and Planning, Tata-McGraw Hill.
8.   Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
9.   Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

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RURAL CONSTRUCTION TECHNOLOGY

Course Code	CE 40072 (Same as CC 40072)
Course Title	Rural Construction Technology
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

Course Objectives:

Following are the objectives of this course:
- To learn development and planning of low cost housing infrastructure.
- To know about different government schemes for Rural Development.
- To understand techniques for rural road construction as per IRC stipulations.
- To learn rural irrigation techniques and watershed management.

COURSE OUTCOMES

After compelting this course, student will be able to:
1. Plan low cost housing using rural materials.
2. Make use of relevant government schemes for construction of roads and housing.
3. Use guidelines for rural road construction.
4. Implement different irrigation systems for rural areas.
5. Identify the need of watershed management in rural areas.

COURSE CONTENTS

1. Rural Development and Planning
1.1 Scope
1.2 Development Plans
1.3 Various approaches to Rural DevelopmentPlanning
1.4 Significance of Rural Development
1.5 Rural development programme/projects

2. Rural Housing
2.1 Low cost construction material for housing
2.2 Composite material
    2.2.1 Ferro-cement &Fly Ash
    2.2.2 Autoclaved Calcium Silicate Bricks
    2.2.3 Soil-Stabilized un-burnt Brick
2.3 Plinth Protection of Mud Walls
2.4 Water-Proof and Fire-retardant Roof Treatment for Thatch Roofs
2.5 Pre-cast Stone Masonry
2.6 Rat-trap Bond for Walls
2.7 Panels for Roof
2.8 Ferro-Cement Flooring/Roofing units
2.9 Biomass - Types of fuels such as
    2.9.1 Firewood
    2.9.2 Agricultural Residues
    2.9.3 Dung Cakes
2.10 Renewable Energy and Integrated Rural Energy Program
    2.10.1 Objectives
    2.10.2 Key elements
    2.10.3 Implementation
    2.10.4 Financial Provisions
    2.10.5 Sources of Renewable Energy
2.11 Working of Gobar Gas and Bio Gas Plants.

3. Water Supply and Sanitation for Rural Areas
3.1 Sources of Water: BIS & WHO Water Standards.
3.2 Quality, Storage and Distribution for Rural Water Supply Works

    3.3 Hand Pumps
        3.3.1 Types
        3.3.2 Installation
        3.3.3 Operation
        3.3.4 Maintenance of Hand Pumps
    3.4 Conservation of water
        3.4.1 Rainwater Harvesting
        3.4.2 Drainage in Rural Areas
    3.5 Construction of Low Cost Latrines
        3.5.1 Two Pit Pour Flush Water Seal
        3.5.2 Septic Tank etc.
    3.6 Low Cost Community and Individual Garbage Disposal Systems
    3.7 Ferro-Cement Storage Tanks

4. Low Cost Rural Roads

    4.1 Broad categories of Pavement Layers
    4.2 Types of Granular Sub-Bases and Bases
    4.3 Guidelines for Surfacing of Rural Road as per relevant IRC codes
    4.4 Pradhan Mantri Gram SadakYojna (PMGSY) - Highlights of Scheme

5. Low Cost Irrigation

    5.1 Design consideration and construction of
        5.1.1 Tube-Well
        5.1.2 Drip Irrigation System
        5.1.3 Sprinkler Irrigation System
    5.2 Watershed and Catchment Area Development – Problems and Features of Watershed Management
    5.3 Watershed Management Structures
        5.3.1 K. T. Weir
        5.3.2 Gabion Structure
        5.3.3 Cement Plug
        5.3.4 Contour Bunding
        5.3.5 Farm Pond
        5.3.6 Bandhara System

SUGGESTED LEARNING RESOURCES
    1. Madhov Rao A G, and Ramachandra Murthy, D S, Appropriate Technologies for low cost Housing Oxford and IBH Publishing Co. Pvt. Ltd.
    2. CBRI, Roorkee, Advances in Building Materials and Constriction.
    3. Desai,Vasant , Rural Development in India: Past, Present and Future : a Challenge in the Crisis, Himalaya Publishing House, Delhi.
    4. Rastogi, A.K.Rural Development Strategy, Wide Vision, Jaipur.
    5. Singh, Katar, Rural Development Principles, Policies and Management, Sage Publications India Pvt Ltd.
    6. Gaur, Keshav Dev, Dynamics of Rural Development, Mittal Publications, Delhi.
    7. Document Published by Ministry of Rural development, Govt. of India, Ministry of Rural development.

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HYDRAULICS LAB

Course Code	CE 4008(Same as CC/CV 4008)
Course Title	Hydraulics Lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:
- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn different types of pumps and their uses.

Course Outcomes

After completing this course, student will be able to:
1. Measure pressure and determine total hydrostatic pressure for different conditions.
2. Understand various parameters associated with fluid flow.
3. Determine head loss of fluid flow through pipes.
4. Find the fluid flow parameters in open channels.
5. Select relevant hydraulic pumps for different applications.

LIST OF PRACTICALS TO BE PERFORMED

1.	Use Piezometer to measure Pressure at a given point.
2.	Use U tube Differential Manometer to measure Pressure Difference between two given points.
3.	Use Reynold's Apparatus to determine type of flow.
4.	Use Bernoulli's Apparatus to apply Bernoulli's Theorem to get Total Energy Line for a flow in a closed conduit of varying cross sections.
5.	Use Friction Factor Apparatus to determine Friction Factor for a given pipe.
6.	Determine Minor Losses in pipe fittings due to Sudden Contraction and Sudden Enlargement.
7.	Determine Minor Losses in pipe fitting due to Bend and Elbow.
8.	Calibrate Venturimeter to find out the discharge in a pipe.
9.	Calibrate the Orifice to find out the discharge through a tank.
10.	Use Current meter to measure the velocity of flow of water in Open Channel.
11.	Use Pitot Tube to measure the velocity of flow of water in Open Channel.
12.	Use Triangular Notch to measure the discharge through Open Channel.
13.	Use Rectangular Notch to measure the discharge through Open Channel.

SUGGESTED LEARNING RESOURCES

1. Modi,P.N.and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics and Hydraulic Machines, Khanna Publishing House, Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
4. Khurmi,R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S Chand Publishers, New Delhi.
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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ADVANCED SURVEYING LAB

Course Code	CE 4009 (Same as CC 4009)
Course Title	Advanced Surveying Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:
- To know methods of plane surveying, Theodolite surveying and their uses.
- To learn tacheometric surveying and curve setting.
- To understand the principles of Electronic Distance Measurement and Total station and their uses.
- To know the concept of Remote Sensing, GPS and GIS.

Course Outcomes

After completing this course, student will be able to:
1. Prepare plans using Plane Table Surveys.
2. Prepare plans using Theodolite surveys.
3. Find distances and elevations using Tachometer.
4. Make measurements using Total Station.

LIST OF PRACTICALS TO BE PERFORMED

1.	Use Plane Table Survey to prepare plans of a plot of seven sided closed traverse by Radiation Method.
2.	Use Plane Table Survey to prepare plans, locate details by Intersection Method.
3.	Use Plane Table Survey to prepare plans, locate details by Traversing Method.
4.	Use Plane Table Survey to carry out Survey Project for closed traverse for minimum five sides around a building.
5.	Use Transit Theodolite to measure Horizontal and Vertical angle by Direct Method.
6.	Running a closed traverse using theodolite, computation, balancing and plotting by Gale's traverse table
7.	Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Theodolite Survey Project.
8.	Use Thedolite as a Tacheometer to compute reduced levels and horizontal distances.
9.	Set out a circular curve by Rankine's Method of Deflection Angles.
10.	Use micro optic Theodolite to Measure Horizontal angle by Direct Method.
11.	Use EDM to measure horizontal distance.
12.	Use Total station instrument to measure horizontal distances
13.	Use Total station instrument to measure vertical angle.
14.	Use Total station instrument to carry out Survey Project for closed traverse for minimum five sides.
15.	Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Total Station Survey Project.
16.	Use GPS to locate the coordinates of a station.

SUGGESTED LEARNING RESOURCES

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi GruhPrakashan, Pune.
2. Basak, N. N.,Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd.,Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, M D.; Das. B.M.; Das. M.M., SurveyingPHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar,   Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
7. Rao, P.VenugopalaAkella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
8. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
10. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

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BUILDING PLANNING AND DRAWING LAB

Course Code	CE 4010 (Same as CC/CV 4010)
Course Title	Building Planning and Drawing Lab
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:
- To learn the basic principles of building planning and drawing.
- To make graphical representation of various components of buildings.
- To draw complete plan and elevation of a building.
- To learn basics of perspective drawings and Computer Aided Drawings.

LIST OF PRACTICALS / DRAWINGS TO BE COMPLETED

A. Sketch Book	
1.	Draw various types of lines, graphical symbols for materials, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962
2.	Write summary of observations of all technical details from the given drawing (One/Two BHK) obtained from the professional architect or civil engineer (Group activity in four students).
3.	a) Measure the units of existing building (Load Bearing / Frame structure). b) Draw Line Plan of measured existing building at serial no 3a to the suitable scale.
4.	Draw Line Plan to suitable scale (Minimum 1BHK, Staircase, WC and Bathroom) a) Residential Bunglows(Minimum three plans) b) Apartment (Minimum two plans).
5.	Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library)
6.	Draw the following plans for a Framed Structure (One/Two BHK) from given line plan. a) Developed plan, Elevation b) Section for above developed plan. c) Site plan for above drawings including area statement, schedule of opening and construction notes
B. Full Imperial Size Sheet (A1)	
1.	Draw submission drawing to the scale 1:100 of a single storey load bearing residential building (2BHK) with flat Roof and staircase showing a)Developed plan and elevation b) Section passing through Stair or W.C. and Bath c) Foundation plan and schedule of openings d) Site plan (1:200), area statement, construction notes
2.	Draw submission drawing, to the scale of 1:100, of (G+1) Framed Structure Residential Building (2BHK) with Flat Roof and staircase showing: a) Developed plan b) Elevation c) Section passing through Staircase,WC and Bath d) Site plan (1:200) and area statement e) Schedule of openings and Construction Notes.
3.	Draw the above mentioned drawing at serial number (B-2) using CAD software and enclose the print out. a) Developed plan b) Elevation. c) Section passing through Staircase,WC and Bath d) Foundation plan e) Site plan (1:200), area statement, Schedule of openings and construction notes.
4.	Draw working drawing for above mentioned drawing at serial number (B-2) showing

	a) Foundation plan to the scale 1:50
	b) Detailed enlarged section of RCC column and footing with plinth filling
	c) Detailed enlarged section of RCC Beam, Lintel and Chajjas
	d) Detailed enlarged section of RCC staircase and slab
5.	Draw two point perspective drawing of small simple objects ,scale 1:50
	a) Draw plan, elevation, eye level, picture plane and vanishing points.
	b) Draw perspective view

SUGGESTED LEARNING RESOURCES

1. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing
2. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd
3. M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill
4. Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publication, Anand.
5. Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.
6. Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.
7. Singh, Ajit, Working with Auto CAD 2000, Mcgraw Hill Publishing company Ltd.
8. Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

COURSE OUTCOMES

After completing this course, student will be able to:
1. Interpret the symbols, signs and conventions from the given drawing.
2. Prepare line plans of residential and public buildings using principles of planning.
3. Prepare working drawing for the given requirement of Load Bearing Structure.
4. Prepare working drawing using CAD for the given requirement of Framed Structure.
5. Draw two-point perspective drawing for given small objects.

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WATER RESOURCES ENGINEERING LAB

Course Code	CE 4011
Course Title	Water Resources Engineering Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:
- To learn estimation of hydrological parameters.
- To understand water demand of crops and provisions to meet the same.
- To know planning of reservoirs and dams.
- To design irrigation projects, canals and other diversion works.

LIST OF PRACTICALS TO BE PERFORMED

1.	Calculate average rainfall for the given area using arithmetic mean method.
2.	Calculate average rainfall for the given area using Isohyetal,Theissen polygon method.
3.	Compute the yield of the Catchment area demarcated in **Sr.No.2**.
4.	Estimate crop water requirement for the given data.
5.	Estimate capacity of the canal for the given data.
6.	Calculate reservoir capacity from the given data.
7.	Calculate control levels for the given data for a given reservoir.
8.	Draw a labeled sketch of the given masonry/earthen dam section.
9.	Prepare a model of any irrigation structure using suitable material.
10.	Draw a labeled sketch of the given diversion head works and Cross Drainage works.
11.	Design a canal section for the given conditions with estimation of the quantity of material required for lining.

SUGGESTED LEARNING RESOURCES

1. Punmia, B.C., Pande, B, Lal, Irrigation and water power engineering, Laxmi Publications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand and Company
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education India Pvt. Ltd.
6. Asawa, G.L., Irrigation and water resource Engineering, New Age International(P)
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

COURSE OUTCOMES

After completing this course, student will be able to:
1. Estimate hydrological parameters.
2. Estimate crop water requirements of a command area and capacity of canals.
3. Execute Minor and Micro Irrigation Schemes.
4. Select relevant Cross Drainage works for the specific site conditions.
5. Design, construct and maintain simple irrigation regulatory structures.

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TRANSPORTATION ENGINEERING LAB

Course Code	CE 4012 (Same as CC 4012)
Course Title	Transportation Engineering Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:
- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.
- To perform different tests on road materials.
- To identify the components of railway tracks.

COURSE OUTCOMES

After completing this course, student will be able to:
1. Identify the types of roads as per IRC recommendations.
2. Implement the geometrical design features of different highways.
3. Perform different Tests on road materials.
4. Identify the components of railway tracks.
5. Identify the defects in railway tracks.

LIST OF PRACTICALS TO BE PERFORMED:

1.	Draw the sketches showing standard cross sections of Expressways, Freeways, NH/SH, MDR/ODR.
2.	Flakiness and Elongation Index of Aggregates.
3.	CBR Test.
4.	Aggregate Impact Test.
5.	Los Angeles Abrasion Test.
6.	Aggregate Crushing Test.
7.	Softening Point Test of Bitumen.
8.	Penetration Test of Bitumen.
9.	Flash and Fire Point Test of Bitumen.
10.	Ductility Test of Bitumen.
11.	Visit the constructed road for visual inspection to identify defects and suggest remedial measures.
12.	Visit the road of any one type (flexible or rigid) to know the Drainage Condition.
13.	Visit to Railway Track for visual inspection of fixtures, fasteners and yards.

SUGGESTED LEARNING RESOURCES

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg ,Standard Book House, Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S. Chand
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering,New Age International (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

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ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

Course Code	CE 4222 (Same in All Branches of Engg.)
Course Title	Essence of Indian Knowledge and Tradition
Number of Credits	0 (L-2, T-0, P-0)
Prerequisites	None
Course Category	AU

COURSE CONTENTS:

Basic Structure of Indian Knowledge System:

(i)वेद,

(ii)उपवेद (आयुवेद,धनुवेद,गन्धवेद,स्थानत्यआदद)

(iii)वेदथाथांग (शिक्षा, कलन, ननरुत, व्याकरण, ज्योनतषछथांद),

(iv)उनथाइग (धर्मशथास्त्र, र्तीथांथांसथा, नुरथाण, तकशरथास्त्र)

- •Modern Science and Indian Knowledge System
- •Yoga and Holistic Health care
- •Case Studies.

REFERENCES /SUGGESTED LEARNING RESOURCES:

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2. Swami Jitatmanand, " Modern Physics and Vedant", Bhartiya Vidya Bhavan.
3. Fritz of Capra, " The wave of Life".
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5. V N Jha, " Tarka sangraha of Annam Bhatta, International" Cinmay Foundation, Velliarnad, Amakuam.
6. R N Jha, " Science of Consciousness Psychotheraphy and Yoga Practices" Vidya nidhi Prakasham, Delhi, 2016.

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