

**GOVERNMENT OF RAJASTHAN**  
**BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR**  
**SEMESTER SCHEME-2020-21**



**IV SEMESTER**  
(SESSION 2021-2022 & ONWARDS)

**HYDRAULICS**

|                   |                             |
|-------------------|-----------------------------|
| Course Code       | CV 4001(Same as CE/CC 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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(SEMESTER SCHEME-2020-21)

**Environment Pollution & Control**

|                   |                                 |
|-------------------|---------------------------------|
| Course Code       | CV 4002                         |
| Course Title      | Environment Pollution & Control |
| Number of Credits | 2 (L:2, T: 0, P: 0)             |
| Prerequisites     | NIL                             |
| Course Category   | PC                              |

**COURSE OBJECTIVES:**

Following are the objectives of this course:

- Impart knowledge on fundamental aspects of air pollution , noise pollution, Hazardous Waste, Soil Pollution.
- Differentiate the solid and hazardous waste based on characterization.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Identify the air pollutant control devices
- Monitor Air Pollution, Noise pollution, Hazardous Waste Pollution, Soil Pollution.

**COURSE CONTENT****1. Introduction**

- 1.1 Introduction to Environment Pollution
- 1.2 Types of Environment Pollution
- 1.3 Introduction to Water Pollution
- 1.4 Introduction to Waste Water Pollution

**2. Air Pollution**

- 2.1 Define Air pollution
- 2.2 Types and major sources of air pollutants
- 2.3 Air born diseases and their effects on health
- 2.4 Air pollution Control Methods
  - 2.4.1 Particulate control devices
  - 2.4.2 Methods of Controlling Gaseous Emissions
  - 2.4.3 Air quality standards

**3. Noise Pollution**

- 3.1 Define Noise Pollution
- 3.2 Major sources of noise pollution
- 3.3 Effects of noise pollution on health
- 3.4 Noise standards in industrial, commercial, residential and silence zones
- 3.5 Measurement and control methods
  - 3.5.1 Reducing residential and industrial noise
  - 3.5.2 ISO 14000

**4. Hazardous Waste**

- 4.1 Characterization
  - 4.1.1 Nuclear waste
  - 4.1.2 Biomedical wastes
  - 4.1.3 Electronic wastes
  - 4.1.4 Chemical wastes

- 4.2 Treatment and management of hazardous waste listed in 4.1.1 to 4.1.4
- 4.3 Disposal and Control methods

## 5. Soil Pollution

- 5.1 Types and major sources of soil pollutants
- 5.2 Effects of soil pollutants on physico-chemical and biological properties of soil
- 5.3 Landfills
  - 5.3.1 Types of Landfills
  - 5.3.2 Natural attenuation landfill
  - 5.3.3 Containment landfills
  - 5.3.4 Landfill construction, operation and performance monitoring
  - 5.3.5 Environmental monitoring around landfills
- 5.4 Control
  - 5.4.1 Detection, control and remediation of subsurface contamination
  - 5.4.2 Various types of barrier systems
  - 5.4.3 Reclamation of contaminated sites

## SUGGESTED LEARNING RESOURCES

- Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003.
- Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
- Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing
- Environmental Pollution and Control by J. Jeffrey Peirce, P Aarne Vesilind, Ruth Weiner Butterworth Heinemann.
- Hazardous Materials and Waste Management by Nicholas P. Cheremisinoff, Paul N. Cheremisinoff Elsevier Science
- Environmental Pollution Control Engineering by C. S. Rao New Age International.
- Soil Pollution From Monitoring to Remediation by Anabela Cachada, Armando C. Duarte, Teresa A.P. Rocha-Santos Elsevier Science
- Air Pollution Control by Sudarshan Prasad Mahajan Teri
- Air Quality Management by Suresh T. Nesaratnam, Shahram Taherzadeh John Wiley & Sons
- Noise Control by Shahram Taherzadeh Wiley
- Environment Pollution: Hazards And Control by R.D. Gupta Concept Publishing Company
- Elements of Environmental Pollution Control by OP Gupta KHANNA PUBLISHING HOUSE
- Environmental Pollution Monitoring and Control by S. M. Khopkar New Age International (P) Limited

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**SURVEYING**

|                   |                      |
|-------------------|----------------------|
| Course Code       | CV 4003              |
| Course Title      | Surveying            |
| Number of Credits | 1 (L: 1, T: 0, P: 0) |
| Prerequisites     | NIL                  |
| Course Category   | PC                   |

**COURSE OBJECTIVES:**

Following are the objectives of this course:

- Able to Perform types of surveying works required.
- To know the type of method and equipments to be used for different surveys
- To know the use and operational details of various surveying equipments.

**Course Outcomes**

After completing this course, student will be able to:

- Select the type of survey required for given situation..
- Prepare plans using Plane Table Surveys.

**COURSE CONTENT****1.Classification of Survey**

- 1.1 Survey – Principles, purpose and use
- 1.2 Types of surveying: Primary and Secondary
- 1.3 Classification of surveying
  - 1.3.1 Plane
  - 1.3.2 Geodetic
  - 1.3.3 Cadastral
  - 1.3.4 Hydrographic
  - 1.3.5 Photogrammetry
  - 1.3.6 Aerial
- 1.4 Scales
  - 1.4.1 Engineer's scale
  - 1.4.2 Representative Fraction (RF) and
  - 1.4.3 Diagonal scale

**2. Chain Surveying :**

- 2.1 Different types of chains
  - 2.1.1 Metric chain
  - 2.1.2 Engineer's chain
  - 2.1.3 Gunter's chain
  - 2.1.4 Revenue chain
- 2.2 Types of Tapes
  - 2.2.1 Linen tapes
  - 2.2.2 Metallic tapes
  - 2.2.3 Invar tapes
  - 2.2.4 Steel band
- 2.3 Ranging rods
- 2.4 Offset rods
- 2.5 Line ranger
- 2.6 Cross staff
- 2.7 Optical square
- 2.8 Arrows

- 2.9 Folding, unfolding, of chains
- 2.10 Testing and adjusting of chains
- 2.11 Ranging
  - 2.11.1 Direct ranging
  - 2.11.2 Indirect ranging
- 2.12 Chaining on plane ground,
- 2.13 Conventional signs in surveying
- 2.14 Recording in field book
- 2.15 Chaining on sloping ground
  - 2.15.1 Direct method
  - 2.15.2 Indirect method
- 2.16 Common errors and precautions
- 2.17 Traversing

### 3. Compass Surveying :

- 3.1 Prismatic compass
- 3.2 Surveyor's compass
- 3.3 Difference in the above two compasses
- 3.4 Definitions
  - 3.4.1 Meridian - magnetic, true, arbitrary
  - 3.4.2 Magnetic dip
  - 3.4.3 Magnetic declination
  - 3.4.4 Fore bearing
  - 3.4.5 Back bearing
- 3.5 Whole circle bearing system
- 3.6 Quadrilateral bearing system
- 3.7 Conversion from whole circle bearing to quadrilateral bearing and vice versa.
- 3.8 Reading the bearing of lines
- 3.9 Computation of internal and external angles
- 3.10 Distribution of instrumental error
- 3.11 Local attraction
- 3.12 Correction of bearings due to local attractions
- 3.13 Traversing with chain and compass
  - 3.13.1 Open traverse
  - 3.13.2 Closed traverse
- 3.14 Booking in field book
- 3.15 Adjustment of error

### 4. Levelling and Contouring

- 4.1 Basic terminologies:
  - 4.1.1 Level surfaces
  - 4.1.2 Horizontal and vertical surfaces
  - 4.1.3 Datum
  - 4.1.4 Bench Marks- GTS, Permanent, Arbitrary and Temporary
  - 4.1.5 Reduced Level
  - 4.1.6 Rise and Fall method
  - 4.1.7 Line of collimation
  - 4.1.8 Station
  - 4.1.9 Back sight, Fore sight, Intermediate sight
  - 4.1.10 Change point
  - 4.1.11 Height of instruments
- 4.2 Types of levels:
  - 4.2.1 Dumpy level
  - 4.2.2 Tilting level
  - 4.2.3 Auto level
  - 4.2.4 Digital level



## 4.3 Types of levelling:

- 4.3.1 Simple levelling
- 4.3.2 Differential levelling
- 4.3.3 Fly levelling
- 4.3.4 Profile levelling
- 4.3.5 Reciprocal Levelling

## 4.4 Contour, contour intervals, horizontal equivalent

## 4.5 Use of contour maps

## 4.6 Characteristics of contours

## 4.7 Methods of Contouring: Direct and indirect

**5. Plane Table Surveying**

## 5.1 Principles of Plane Table Survey

## 5.2 Accessories of Plane Table and their use, Telescopic Alidade

## 5.3 Setting of Plane Table

- 5.3.1 Orientation of Plane Table
- 5.3.2 Back Sighting and Magnetic Meridian Method
- 5.3.3 True Meridian Method

## 5.4 Methods of Plane Table Surveys

- 5.4.1 Radiation
- 5.4.2 Intersection
- 5.4.3 Traversing

## 5.5 Merits and Demerits of Plane Table Survey

**SUGGESTED LEARNING RESOURCES**

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune VidyarthiGruhPrakashan, 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., Surveying PHI 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.Venugopala Akella, 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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**WASTE WATER TREATMENT**

|                   |                       |
|-------------------|-----------------------|
| Course Code       | CV 4004               |
| Course Title      | Waste Water Treatment |
| 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 provide a coherent development to the students for the courses in sector of engineering like Waste Water treatment , house drainage etc.
- To analyze the Waste water sources and waste water characteristics.
- To Know about various waste water treatment process.
- To give an experience in the implementation of engineering concepts which are applied in field of waste Water treatment process.
- To present the foundations of many basic Engineering tools and concepts related Environmental Engineering.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Know the concept of Waste Water treatment , house drainage and building rain age etc.
- Know the sources and characteristics of Waste water.
- Know about the Laying & Maintenance of Sewers.
- Draw labeled layout for Waste water treatment plant.
- Know the procedure of Waste water treatment.

**COURSE CONTENT****1. Sanitation System**

1.1 Necessity of systematic collection and disposal of waste

1.2 Type of Waste:

1.2.1 Dry waste

1.2.2 Semi-liquid waste

1.2.3 Liquid waste

1.3 Terminology related to sanitary engineering

1.3.1 Sewer

1.3.2 Sewerage

1.3.3 Sewage

1.3.4 Sullage

1.3.5 Sludge

1.4 Quantity of Sewage

1.4.1 Domestic sewage

1.4.2 Industrial waste

1.4.3 Storm water

1.4.4 Volume of domestic sewage dry weather flow (D.W.F.) and equivalent DWF

1.4.5 Variation of flow

1.4.6 Limiting velocities

1.4.6.1 Non-silting velocity

1.4.6.2 Non-scouring velocity

1.4.6.3 Self cleansing velocity

1.4.6.4 Transporting velocity

1.5 Depth of flow

**2. Characteristics and Collection of Sewage:****2.1 Characteristics of sewage**

- 2.1.1 B.O.D and its significance
- 2.1.2 C.O.D and its significance
- 2.1.3 Central Pollution Control Board Norms for discharge of treated sewage
- 2.1.4 Objects of sewage treatment

**2.2 Testing of Sewage**

- 2.2.1 Physical test
- 2.2.2 Biological test
- 2.2.3 Chemical test

**2.3 Collection of Sewage:**

- 2.3.1 Separate, combined and partially separate System
- 2.3.2 Stone ware sewers
- 2.3.3 Cast iron sewers
- 2.3.4 Concrete sewers
- 2.3.5 Sewer Joints
- 2.3.6 Different shapes of sewers
  - 2.3.6.1 Components of sewerage systems
  - 2.3.6.2 Systems of layout

**3. Building Drainage & Appurtenances:**

- 3.1 Aims and requirements
- 3.2 Fittings and arrangements in single and multi storied buildings
- 3.3 Different sanitary fitting and their installation
- 3.4 Traps, seal in traps
- 3.5 Gully trap
- 3.6 Intercepting trap
- 3.7 Grease trap
- 3.8 Causes of breaking seal in the traps and precautions
- 3.9 Testing of house drainage system
- 3.10 Septic tank
- 3.11 Soak pit
- 3.12 Manholes
- 3.13 Drop manhole
- 3.14 Inlets
- 3.15 Catch basin
- 3.16 Inverted syphon
- 3.17 Flushing tanks
- 3.18 Ventilating shaft
- 3.19 Lamp holes

**4. Laying & Maintenance of Sewers:**

- 4.1 Setting out alignment
- 4.2 Excavation
- 4.3 Checking the gradient using boning rod
- 4.4 Preparation of bed
- 4.5 Lowering, laying and jointing
- 4.6 Testing
- 4.7 Back filling
- 4.8 Construction of masonry sewers

4.9 Construction of surface drains

4.10 Maintenance of Sewer

- 4.10.1 Inspection of mains
- 4.10.2 Cleaning of sewers
- 4.10.3 Precautions during cleaning operations
- 4.10.4 Maintenance of traps
- 4.10.5 Cleaning of house drainage line
- 4.10.6 Ventilation of sewers
- 4.10.7 Tools and equipment needed for maintenance

**5. Treatment and Disposal**

5.1 Primary treatment

5.2 Secondary treatment

5.3 Function and construction of

- 5.3.1 Screening chambers
- 5.3.2 Grit chambers
- 5.3.3 Clarifier chambers
- 5.3.4 Trickling filters
- 5.3.5 Aeration tank
- 5.3.6 Activated sludge process

5.4 Sludge treatment

5.5 Sludge digestion

5.6 Sludge disposal

**SUGGESTED LEARNING RESOURCES**

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers
3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. II, Laxmi Publishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

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**WATER RESOURCES ENGINEERING**

|                   |                             |
|-------------------|-----------------------------|
| Course Code       | CV 4005 (Same as CE 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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(SEMESTER SCHEME-2020-21)

**SOLID WASTE MANAGEMENT**

|                   |                        |
|-------------------|------------------------|
| Course Code       | CV 4006                |
| Course Title      | SOLID WASTE MANAGEMENT |
| 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 get a broader understanding on various aspects of solid waste management (starting from its generation to processing with options for reuse and recycle, transport, and disposal) practiced in different municipalities.
- This course will also cover many other aspects including recovery of conversion products from solid waste to compost and biogas, incineration and energy recovery, and integrated waste management.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Identify the different sources of solid waste
- Execute the relevant method of collection and transportation of solid wastes
- Execute the action plan for disposal of solid wastes
- Acquire knowledge on energy productions from waste in the perspectives of sustainable development

**COURSE CONTENT****1. INTRODUCTION**

- 1.1 Generation of solid waste
- 1.2 Classification of solid waste
- 1.3 Characteristics of solid waste
- 1.4 Analysis and processing of solid waste

**2. SOLID WASTE SYSTEM**

- 2.1 collection
- 2.2 storage,
- 2.3 transportation
- 2.4 disposal system

**3. WASTE PROCESSING TECHNIQUES**

- 3.1 Biological reprocessing
- 3.2 Sanitary landfill
- 3.3 Waste to energy
- 3.4 Incineration
- 3.5 Composting

**4. RECOVERY OF RESOURCES**

- 4.1 Conversion products
- 4.2 Energy generation



**5. IMPACT OF SOLID WASTE ON ENVIRONMEMT**

- 5.1 Air
- 5.2 Water
- 5.3 Land

**SUGGESTED LEARNING RESOURCES**

1. Manual on Municipal solid waste management, CPHEEO, Ministry of Urban Development GOI.
2. WHO manual on solid waste management.

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(SEMESTER SCHEME-2020-21)

**CONSTRUCTION MANAGEMENT**

|                   |                                |
|-------------------|--------------------------------|
| Course Code       | CV 40071 (Same as CE/CC 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](http://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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**THEORY OF STRUCTURES**

|                   |                      |
|-------------------|----------------------|
| Course Code       | CV 40072             |
| Course Title      | Theory of Structures |
| 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 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 completing 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 PvtLtd.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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**HYDRAULICS LAB**

|                   |                             |
|-------------------|-----------------------------|
| Course Code       | CV 4008(Same as CE/CC 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 Chandramouli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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**ENVIRONMENT POLLUTION & CONTROL LAB**

|                   |                                    |
|-------------------|------------------------------------|
| Course Code       | CV 4009                            |
| Course Title      | Environment Pollution& Control 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 Gain knowledge of air pollution measurement.
- To Gain knowledge of Noise pollution measurement
- To Gain knowledge municipal solid waste management
- To Gain knowledge Water Treatment Plant
- To Gain knowledge Waste Water Treatment Plant

**Course Outcomes**

After completing this course, student will be able to:

- Measurement of TSP by High Volume Sampler
- Measurement of PM10 and PM2.5
- Measurement of Noise levels at different surroundings
- Know municipal solid waste management
- Know the presence of phosphate, sulphate and chloride in the soil

**LIST OF PRACTICALS TO BE PERFORMED**

|    |   |
|----|---|
| 1. | Measurement of TSP by High Volume Sampler.  |
| 2. | Measurement of PM10 and PM2.5   |
| 3. | Measurement of Noise levels at different surroundings                                 |
| 4. | Study visits to municipal solid waste management stations and prepare a report on it. |
| 5. | Visit Water Treatment Plant and prepare a report on it.                               |
| 6. | Visit Waste Water Treatment Plant and prepare a report on it.                         |
| 7. | Experiment to test the presence of phosphate, sulphate and chloride in the soil       |

**SUGGESTED LEARNING RESOURCES**

- Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003.
- Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
- Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing
- Environmental Pollution and Control by J. Jeffrey Peirce, P Aarne Vesilind, Ruth Weiner Butterworth Heinemann.
- Hazardous Materials and Waste Management by Nicholas P. Cheremisinoff, Paul N. Cheremisinoff Elsevier Science
- Environmental Pollution Control Engineering by C. S. Rao New Age International.
- Soil Pollution From Monitoring to Remediation by Anabela Cachada, Armando C. Duarte, Teresa A.P. Rocha-Santos Elsevier Science
- Air Pollution Control by Sudarshan Prasad Mahajan Teri
- Air Quality Management by Suresh T. Nesaratnam, Shahram Taherzadeh John Wiley & Sons
- Noise Control by Shahram Taherzadeh Wiley
- Environment Pollution: Hazards And Control by R.D. Gupta Concept Publishing Company
- Elements of Environmental Pollution Control by OP Gupta KHANNA PUBLISHING HOUSE
- Environmental Pollution Monitoring and Control by S. M. Khopkar New Age International (P) Limited

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**BUILDING PLANNING AND DRAWING LAB**

|                   |                                   |
|-------------------|-----------------------------------|
| Course Code       | CV 4010 (Same as CE/CC 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**

| <b>A. Sketch Book</b>                   |  |
|---|--|
| 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).<br>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)<br>a) Residential Bungalows( Minimum three plans)<br>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.<br>a) Developed plan, Elevation<br>b) Section for above developed plan.<br>c) Site plan for above drawings including area statement, schedule of opening and construction notes  |
| <b>B. Full Imperial Size Sheet (A1)</b> |  |
| 1.                                      | Draw submission drawing to the scale 1:100 of a single storey load bearing residential building (2BHK) with flat Roof and staircase showing<br>a) Developed plan and elevation<br>b) Section passing through Stair or W.C. and Bath<br>c) Foundation plan and schedule of openings<br>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:<br>a) Developed plan<br>b) Elevation<br>c) Section passing through Staircase, WC and Bath<br>d) Site plan (1:200) and area statement<br>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.<br>a) Developed plan<br>b) Elevation.<br>c) Section passing through Staircase, WC and Bath<br>d) Foundation plan<br>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<br>b) Detailed enlarged section of RCC column and footing with plinth filling<br>c) Detailed enlarged section of RCC Beam, Lintel and Chajjas<br>d) Detailed enlarged section of RCC staircase and slab |
| 5. | Draw two point perspective drawing of small simple objects ,scale 1:50<br>a) Draw plan, elevation, eye level, picture plane and vanishing points.<br>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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**SURVEYING LAB**

|                   |                      |
|-------------------|----------------------|
| Course Code       | CV 4011              |
| Course Title      | 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 understand types of surveying works required
- To know the type of method and equipments to be used for different surveys
- To know the use and operational details of various surveying equipments

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Select the type of survey required for given situation.
- Prepare plans using Plane Table Surveys.

**LIST OF PRACTICALS TO BE PERFORMED**

- Study of
  - Different types of chains and tapes
  - Cross staff
  - Optical square
  - Line ranger
- Use of Chains :
  - Folding and unfolding
  - Ranging and chaining on plane and sloping surface
  - Setting right angles.
  - Setting parallel lines.
  - Taking offsets.
- Chain surveying of small areas
- Study of prismatic compass
- Study of surveyor compass
- Measurements of bearing of lines
- Transverse by compass and adjustment of error
- Study of the component parts and handling of
  - Dumpy level
  - Tilting level
  - Staves
- Temporary adjustments of a dumpy level and a tilting level
- Use of dumpy level and tilting level in differential levelling and levelling for cross section and longitudinal section. Recording in level book and plotting.
- Study of Automatic level.
- Study and use of plane table and its accessories e.g. stand, table, clamping arrangement, sight vane, through compass, plumbing fork, plumb bob, spirit level etc.
- Methods of plane tabling
  - Radiation
  - Intersection
  - Traversing
  - Resection
- Two and three point problems
- Preparation of a plan on area by plane table survey.
- Plotting spot levels of a given area by the grid method and interpolation of contours.
- Preparations of a contoured plan of an uneven area with the help a level and a plane table.

**SUGGESTED LEARNING RESOURCES**

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune VidyarthiGruhPrakashan, 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., Surveying PHI 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.Venugopala Akella, 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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(SEMESTER SCHEME-2020-21)

**WASTE WATER TREATMENT LAB**

|                   |                           |
|-------------------|---------------------------|
| Course Code       | CV 4012                   |
| Course Title      | Waste Water Treatment 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 analyze the characteristics of Waste water.

- To Know about various waste water treatment process.
- To give an experience in the implementation of engineering concepts which are applied in field of waste Water treatment process.
- To present the foundations of many basic Engineering tools and concepts related Environmental Engineering.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Perform various tests to assess quality of Waste water.
- Estimate solids in sewage as per BIS codes.
- Draw line diagram of sewer pipeline system for a locality.

**LIST OF PRACTICALS TO BE PERFORMED:**

|    |   |
|----|---|
| 1  | Determine the pH of the given sample of sewage.   |
| 2  | Determine Total Solids of the given sewage sample.  |
| 3  | Determine the Total Dissolved Solids of the given sewage sample.                                  |
| 4  | Determine Total Settle-able Solids of the given sewage sample.                                    |
| 5  | Determine Total Suspended Solids of the given sewage sample.                                      |
| 6  | Determination of chlorides of sewage sample.  |
| 7  | Determination of Sulphates of sewage sample.  |
| 8  | Determine the Quantity of Dissolved Oxygen present in the given water sample by Winkler's Method. |
| 9  | Determine Biochemical Oxygen Demand exerted by the given wastewater sample.                       |
| 10 | Determine Chemical Oxygen Demand of the waste water sample.                                       |
| 11 | To study various Sanitary Fittings  |

**SUGGESTED LEARNING RESOURCES**

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. II, *Khanna Publishers*
3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. II, Laxmi Publishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

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**ESSENCE OF INDIAN KNOWLEDGE AND TRADITION**

|                   |   |
|-------------------|---|
| Course Code       | CV 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) उन्नवेद (आयुर्वेद, धनुर्वेद, गन्धर्ववेद, स्थानतत्त्वआदयः)
- (iii) वेदशाखाः (शिक्षा, कलत्र, ननरुत, व्याकरण, ज्योतिषशास्त्रादयः),
- (iv) उन्नथाङ्ग (धर्मशास्त्र, रीतिशास्त्रादयः, नृशास्त्र, तत्त्वशास्त्रादयः)
  - Modern Science and Indian Knowledge System
  - Yoga and Holistic Health care
  - Case Studies.

**REFERENCES /SUGGESTED LEARNING RESOURCES:**

1. V. Sivarama Krishna, " Cultural Heritage of India- Course Material", Bhartiya Vidya Bhavan, Mumbai, fifth Edition, 2014.
2. Swami Jitatanand, " Modern Physics and Vedant", Bhartiya Vidya Bhavan.
3. Fritz of Capra, " The wave of Life".
4. Fritz of Capra, " Tao of Physics".
5. V N Jha, " Tarkasangraha of Annam Bhatta, International" Cinmay Foundation, Velliarnad, Amakum.
6. R N Jha, " Science of Consciousness Psychotherapy and Yoga Practices" VidyanidhiPrakasham, Delhi, 2016.

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