

DIPLOMA SEM V CE

Diploma Vth Sem												
S.No	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit	Hours
			L	T	P	Assign ment	TA	Total	ESE			
1	5AD.302	Civil Estimation & Costing	3	0	0	20	10	30	70	100	3	3
2	5AD.303	Theory of Structure	3	0	0	20	10	30	70	100	3	3
3	5AD.304	Transportation II	3	0	0	20	10	30	70	100	3	3
4	5AD.305	Design of Steel Structure	3	0	0	20	10	30	70	100	3	3
5	40D.401	**Seminar in Executive Communication	2	0	0	20	10	30	*20	50	0	2
6	ELECTIVE I (Choose any one from the followings)											
	5AD.325	Irrigation Engineering	3	0	0	20	10	30	70	100	3	3
	5AD.321	Quantity surveying	3	0	0	20	10	30	70	100	3	3
	5AD.322	River Engineering and Flood Control	3	0	0	20	10	30	70	100	3	3
	5AD.323	Water Supply & Sanitary Engineering	3	0	0	20	10	30	70	100	3	3
	5AD.324	Waste Management	3	0	0	20	10	30	70	100	3	3
PRACTICAL/DESIGN/DRAWING/SESSIONAL												
1	5ADP.304	Design of Steel Structure Lab	0	0	2		30	30	20	50	1	2
2	5ADP.302	Civil Estimating & Costing Lab	0	0	2		30	30	20	50	1	2
3	5ADP.303	Theory of Structure Lab	0	0	2		30	30	20	50	1	2
										700	18	23
*Note: Only Viva voce is conducted												
**Note: Non Credit Course												

Program: Diploma

Semester: Five

Course: Irrigation Engineering

Course Code: 5AD.325

L	T	P	C
3	0	0	3

Course Objective:

- To assess the irrigation needs of crops
- Design weirs on pervious foundation
- Design gravity dam and earthen dam
- Design the canal systems

Unit-I

Introduction: Definition–Irrigation and irrigation engineering, advantages of irrigation, ill effects of over irrigation, and types of irrigation project- purpose wise and administrative wise, Methods of irrigation (Surface and Lift Irrigation)

Hydrology-Definition of hydrology, hydrological cycle and its components, definition of rainfall, factors affecting rain fall, rain gauge and rain gauge station, types of rain gauges (names only)averageannualrainfallanditscalculation,definitionofrunof,factor affecting runoff ,calculation of runoff by run of coefficient, inglis’ formula, Stranges and Binnie’s tables and curves.Maximumfooddischargeandmethodsofcalculation,yieldanddependableyieldandmethodscalculation

Unit-II

Water Requirement of Crops- Cropping seasons and crop in Jharkhand, Definition – Crop period, base period, Duty, Delta , Types of Duty, factors affecting Duty , relation between Duty Delta and base period Definition – CCA , GCA, IA, intensity of irrigation, time factor, capacity factor. Problems on water requirement and capacity of canal

Investigation and Reservoir Planning-Survey for irrigation project, data collected for irrigation project. Area capacity curve, silting of reservoir, rate of silting, factors affecting silting, methods to control. Control levels and respective storage in reservoir. Fixing control levels (Numerical).

Unit-III

Dams and Spillways-Types of dams – Earthen dams and Gravity dams (masonry and concrete) Comparison of earthen and gravity dams with respect to foundation, seepage, construction and maintenance Earthen Dams – Components and their function , typical cross section seepage through embankment and foundation seepage control though embankment and foundation . Methods of constructions, types of failure of earthen dams and remedial measures, Gravity Dams Theoretical and practical profile, typical cross section, drainage gallery, joint in gravity dam, high dam and low dam.

Spillways-Definition, function, location and components, Emergency and services, ogee spillway and bar type spillway, discharge over spillway. Spillway with and without gates

Well

Unit-IV

Diversion Head Works-Weirs – components, parts function and types, layout of diversion head works with its components and their function, canal head regular, silt excluders and slit ejectors.

Barrages – components and their function. Difference between weir and barrage irrigation department standard design and specifications

Canals – classification of canals according to alignment and position in the canal network, Cross sections of canals in cutting, embankment, partial cutting and embankment. Design of most economical canal section with numerical.

Canal lining – Definition, purpose, types of canal lining advantages of canal lining properties of good canal lining material, C.D. Works- different C.D, Works, canal falls, escapes, cross regulators and canal outlets.

Suggested Readings:

1. *Irrigationandhydraulicstructure*, S.K.Garg, Khannapublisher, NewDelhi
2. *IrrigationEngineering*, B.C.Punmia, LaxmiPublication, Delhi
3. *IrrigationEngineering*, N.N.BASAK, Tata McGraw-Hill Education

Program: Diploma

Semester: Five

Course: Civil Estimation and Costing

Course Code: 5AD.302

L	T	P	C
3	0	0	3

Course Objective:

- Apply different types of estimates in different situations
- Carry out analysis of rates and bill preparation at different locations
- Demonstrate the concepts of specification writing Carry out valuation of assets

Unit-I

Buildings-Introduction to estimating: Types of estimates, drawings to attached with these estimates, preparation of rough cost estimates, Units of measurement and units of payment of different items of work, Different methods of taking out quantities Centre line into in/out methods, Preparation of a detailed estimate, complete with detailed reports, specifications, abstract of cost and material statement for a small residential; Building with a flat roof, Preparation of a detailed estimate, complete with detailed reports, specifications, abstract of cost and material statement for pitched roof with steel truss only

Unit-II

Analysis of Rates:

Steps in the analysis of rates for any item of work requirement of material, labour, sundries and contractors profit

Calculation of quantities of materials for:

- a) Plain cement concrete of different proportions
- b) Brick masonry in cement and lime mortar
- c) Plastering and pointing with cement mortar in different proportions
- d) White washing

Analysis of rates of the following items of work when the data regarding labour, rates of Material and rates of labor is given:-

- a) Earth work in excavation and filling with a concept of lead and lift
- b) Cement concrete in foundation
- c) Damp proof course.
- d) RCC and RB in roof slabs
- e) First class burnt brick masonry in cement mortar
- f) Cement plaster
- g) Cement pointing flush, deep pointing

Unit-III

Irrigation-Calculation of earth work for inclined channels with the help of drawings for different Cross-sections, Preparation of detailed estimate for a brick lined distributary from a given Section

Public Health-Preparation of detailed estimate for laying a water supply line (CI pipe)

Preparation of detailed estimate for sanitary and water supply fittings in a domestic

Containing one set of toilets and septic tank, Preparation of detailed estimate for laying a brick sewer

Unit-IV

Roads:-Methods for calculating earth work using:

- i) Average depth
 - ii) Average cross sectional area
 - iii) Graphical method
- Calculations of quantities of materials for roads in plains for given drawings
Preparation of detailed estimate using the above quantities
Detailed estimate of a single span slab culvert with return wing walls
Calculation of quantities of different items of work for a masonry retaining wall from Given drawings

Suggested Readings:

1. *Estimating&costinginCivilEngineering, B.N.Datta, UBSPublishersDistributors*
2. *Estimating&costing, SpecificationandValuationinCivilEngineering, M.Chakraborti,*
3. *Estimating&costing, S.C.Rangwala, CharotarPublicationAnand*
4. *Estimating&costing, G. S.Birdie, DhanpatRaiandSonsDelhi*

Program: Diploma

Semester: Five

Course: Estimation and Costing Lab

Course Code: 5ADP.302

L	T	P	C
0	0	2	1

Assignment work:

- (1) Prepare Check list of items of following type of Civil Engineering works.
 - (a) Load bearing type Building (b) Framed structure type building (c) W.B.M.Road
 - (d)Septic tank (e) Community well
- (2) Writing the rules of deduction's for below mentioned items of work as per IS 1200.
 - (a) Brickwork b) Plastering / Pointing work c) Painting work
- (3) Taking out quantities of various items of work for load bearing building.
 - i) Excavation for foundation
 - ii) Plain Cement Concrete of foundation
 - iii) U.C.R. /B B Masonry work in foundation and plinth.
 - iv) D.P.C.
 - v) Plinth Filling
 - vi) Brick masonry work
 - vii) Flooring, skirting, dados
 - viii) Plastering. (Internal & External)
 - ix) Wood work in doors.
- 4) Taking out quantities of following items for a small R.C.C. Hall
 - a) Concrete work for footing Column, Beam, slab
 - b) Schedule of Reinforcement for Structural members and computation of quantity of reinforcement
 - c) Calculation of Form works for all above items.
- 5) Preparing detailed estimate of a RCC single storied residential building for all items of work. (The quantity of reinforcement shall be calculated by percentage.)
- 6) Preparing Rate analysis of following items: Building work – Brick work, P.C.C., R.C.C., Plastering and Flooring.
- 7) Taking out quantities of earth work for a Road profile prepared in surveying subject. Prepare the lead statement (Quarry Chart).
- 8) Taking out quantities for a Community well.
- 9) Taking out quantities for Septic Tank.

Program: Diploma

Semester: Five

Course: Theory of Structure

Course Code: 5AD.303

L	T	P	C
3	0	0	3

Course Objective:

- Ability to determine deflections of beams and frames using classical methods
- Ability to solve statically indeterminate structures using classical methods
- Ability to solve statically indeterminate structures using matrix (stiffness) method
- Ability to use modern structural analysis software

Unit-I

Analysis of Trusses-Definition of frames, classification of frames, perfect, imperfect, redundant and deficient frame, relation between members and joints, assumptions in analysis, Method of joint, method of section and graphical method to find nature of forces

Unit-II

Slope And Deflection-Concept of slope and deflection, Relation among bending moment, slope, deflection and radius of curvature, differential equation (no derivation), double integration method to find slope and deflection of simply supported and cantilever beam, Macaulay's method for slope and deflection,, application to simply supported and cantilever beam subjected to concentrated and uniformly distributed load, locating point of maximum deflection and its magnitude.

Unit-III

Fixed Beam- Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam

Principle of superposition, fixed end moments from first principle for beam subjected to UDL over entire span, central point load, Point load other than mid span, Application of standard formulae in finding moments and drawing S.F. and B.M. diagrams for a fixed beam

Continuous Beam

Definition, effect of continuity practical example, nature of moments induced due to

Continuity, concept of deflected shape, Clapeyron's theorem of three moments, Application of

Theorem maximum up to three spans and two unknown support moment only, Support at same level, Spans having same and different moment of inertia subjected to concentrated loads and uniformly, distributed loads over entire span, Drawing SF and BM diagrams for continuous beams.

Unit-IV

Columns

Definition, classification of column, buckling of axially loaded compression member, Types of

End conditions for column, effective length, radius of gyration, slenderness ratio,

Assumptions in the theory of long column Euler's theory buckling load and Rankine's theory,

Crippling load, factor of safety, safe load, Application of Rankine's and Euler theory, designing

Solid circular or hollow circular sections, Limitations of Euler's formula

Suggested Readings:

1. *Theory of structures, S. Ramamrutham, Dhanpat Rai & Sons, Delhi*
2. *Theory of structures, Dr. B.C.Punmia, SBH, New Delhi*
3. *Theory of structures, R. S. Khurmi, S. Chand Publications, Delhi*

Program: Diploma

Semester: Five

Course: Theory of Structure Lab

Course Code: 5ADP.303

L	T	P	C
0	0	2	1

List of Experiments:-

1. Analysis of a Redundant joint
2. Deflection of a Truss
3. Elastic displacement of curved members
4. Elastic properties of Beams
5. Three hinge Arch
6. Two hinge Arch
7. Behavior of Struts
8. Experimental and Analytical study of 3 bar pin jointed truss.

Program: Diploma

Semester: Five

Course: Transportation-II

Course Code: 5AD.304

L	T	P	C
3	0	0	3

Course Objective:

- Perform geometric design for the three modes
- Carry out the surveys for railways, airports and harbours
- Plan the layout of different types of terminals

Unit-I

Introduction and Rails: Development and classification in Indian Railways, Permanent way, Gauge, coning of wheels Rails – Function, Composition and requirement of rail section, Comparison of sections, Length, Welding, Expansion and length of welded rails, corrugated rails, Hogged rails, buckling of rails, Creep of rails, wear on rails, Rail joints

Sleepers and Rail Fittings: Sleepers: Functions and requirements of sleepers, Classification of sleepers; Timber, Metal, Concrete – R.C.C. and prestressed concrete sleepers, Spacing of sleepers and sleeper density

Rail Fixtures and Fastenings: Purpose and types, Fish plates, Spikes, Bolts, Chairs, Blocks, Keys, Bearing plates, Elastic Fastenings, Check rails and Guard rails

Formations and Sub grade: Ballast: Functions and requirements of ballast, Types of ballast, Size and section of ballast Formation and sub grade

Unit-II

Geometric Design of Rail Tracks: Cross-section, Gradients, Speed, Curves and Super elevation, Cant deficiency, Cant excess, Negative super elevation, Transition curve, Safe speed on curves, Length of Vertical curve

Points and Crossing: Turnouts, Points or switches, Crossing number and angle of crossing, types of track junctions, Design calculations of a turnout

Signaling & Interlocking: Object and Principles of signaling, classification of signals Necessity and functions of interlocking

Station yard Layout & Tractate Resistances: Railway Station – Types; Sidings, Marshalling and Loco Yards Traction and Tractive resistance

Unit-III

Airports: Introduction, ICAO, Aircraft characteristics, Airport Planning, Regional planning, development of new airports, airport site selection, Airport obstructions, Zoning, classification of obstructions, imaginary surfaces, approach zone and turning zones, Runway design, airport capacity, loading apron, service hanger, taxiway design, introduction to airport pavement design.

Unit-IV

Harbours: Types of Harbours, size and accessibility, Tides, wind and wave, Dynamic effect of wave of wave action, Breakwaters and their classification, mound construction.

Docks: Types of Docks, Shape and size, caissons for dock entrances, floating docks and their design considerations.

Suggested Readings:

1. *Highway Engineering, Khanna &Justo, Khanna Publication*
2. *Road, Railway, Bridges, Biridi&Ahuja, S.B.H. New Delhi*
3. *Transportation Engineering, N.L. Arora, S.P. Luthara, I.P.H. New Delhi*

Program: Diploma

Semester: Five

Course: Design of Steel Structure

Course Code: 5AD.305

L	T	P	C
3	0	0	3

Course Objective:

- Ability to analyze and design of tension members
- Ability to analyze and design of columns
- Ability to analyze and design of beams
- Ability to analyze and design of beam-columns
- Ability to analyze and design of simple bolted and welded connections

Unit-I

Introduction-Types of sections used, Grades of steel and strength, characteristics; advantages and disadvantages of steel as construction material; Use of steel table and relevant I.S. code; Types of loads on steel structure and its I.S. Code specification
Connections

Unit-II

Riveted connections-Types of rivets and their use, Types of riveted joint and its failure, Strength of riveted joint and efficiency of a riveted joint. Assumptions in theory of riveted joint Design of riveted joint for axially loaded member, Welded connection Introduction, Permissible stress in weld, strength of weld, advantages and disadvantages of welded joint. Types of weld and their symbols, Types of welds and their symbols, Design of fillet weld and butt weld subjected to axial load.

Unit-III

Design of Tension Member-Types of sections used, permissible stresses in axial tension and gross and net cross-sectional area of tension member, Analysis and Design of tension member with welded and riveted connection, Introduction to Lug Angle and Tension splice

Unit-IV

Design of Compression Member-Angle struts, Types of sections used, effective length, radius of gyration, slenderness ratio and its limit, permissible compressive stresses, Analysis and design of axially loaded angle struts with welded and riveted connection, Stanchion and columns, types of sections used; simple and built up sections, effective length, Analysis and design of axially loaded column, Introduction to lacing and battening
Column Bases-Types of column bases, Design of slab base and concrete block, Introduction to gusseted base.

Suggested Readings

1. *Design of steel structures*, L. S. Negi, TMH
2. *Design of steel structures*, S. K. Duggal, TMH
3. *Design of steel structures*, P. Dayaratnam, TMH

Program: Diploma

Semester: Five

Course: Design of Steel Structure Lab

Course Code: 5ADP.305

L	T	P	C
0	0	2	1

List of Experiments:-

1. Draw the layout of different types of Riveted Connections.
2. Draw the neat sketch of staggered joints and show pitch, gauge and edge distance.
3. Draw the plan and elevation of Grillage foundation
4. Draw the plan and elevation of Slab Base.
5. Draw the plan and elevation of Gusseted base.
6. Draw the neat sketch of column made by channel section with necessary arrangements of lacing and battening.
7. Draw the neat sketch of column made by angle section with necessary arrangements of lacing and battening.

Program: Diploma

Semester: Five

Course: Seminar in Executive Communication

Course Code: 40D.401

L	T	P	C
2	0	0	0

Course Objective: To impart more advanced basic skills through intensive practice, in this unit again the students get opportunities to apply their general awareness and classroom learning to practical situation to achieve the targeted career goal in this increasingly competitive world Some of the career oriented units are Discussion Skills, Interview Skills, Job Search Strategies, Job Correspondence etc. , they need to undergo ,

- An average student acquires basic skills required for a cherished job.
- Their appreciative personality development becomes a value added attribute in their professional sphere.
- The course enhances communication, leadership and teamwork skills; and personal development skills using practical approach and exposure of students to the realities of the world
- To put greater emphasis on development of non-technical skills, such as flexibility, leadership and good communication.

Activity Based

WORKSHOPS

- Debate
- Extempore
- Group Discussion
- Panel Discussion
- Presentation-Paper & Oral
- Reports: Survey Report, Project Report, Case Study

Suggested Books & Readings:

- Monippally, Matthukutty. M. 2001. *Business Communication Strategies*. 11th Reprint. Tata McGraw-Hill. New Delhi
- Swets, Paul. W. 1983. *The Art of Talking So That People Will Listen: Getting Through to Family, Friends and Business Associates*. Prentice Hall Press. New York
- Lewis, Norman. 1991. *Word Power Made Easy*. Pocket Books
- Sen , Leena .*Communication Skills ; Eastern Economy Edition*
- Ghanekar , Dr. Anjali . *Essentials of Business Communication Skills ; Everest Publishing House*
- David Green . *Contemporary English Grammar, Structure & Composition ; MacMillan*
- *Dictionary; Oxford*
- *Dictionary ; Longman*

Websites

- www.tatamcgrawhill.com/digital_solutions/monippally
- www.dictionary.cambridge.org
- www.wordsmith.org
- www.edufind.com
- www.english_the_easy_eay.com
- www.englishclub.com
- www.english_grammar_lessons.com
- www.wikipedia.org/wiki/english_grammar

Semester: Five

Course: River Engineering and Flood Control (Elective I)

Course Code: 5AD.322

L	T	P	C
3	0	0	3

Course Objective:

- Various Stream flow measurements technique
- Basic components of river Training works.
- Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design.
- Various components of hydrologic cycle that affect the movement of water in the earth

Unit I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes

Unit –II

Behavior of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control.

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration.

Unit-IV

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampers and other river/ flood protection works.

Suggested Books :

1. *River Behaviour Management and Training (Vol. I & II)*, CBI&P, New Delhi.
2. *Irrigation & Water Power Engineering-* B. C. Punmia and Pande B. B. Lal.
3. *River Engineering* by Margeret Peterso
4. *Principles of River Engineering by (the non tidel alluvial) PH Jameen*

Program: Diploma

L	T	P	C
---	---	---	---

Semester: Fifth
Course: Quantity Survey
Course Code: 5AD.321

3	0	0	3
---	---	---	---

Course Objective:

- Prepare quantity estimates for buildings, roads, rails and canal works
- Evaluate contracts and tenders in construction practices
- Design sewerage system
- Design components of water supply systems

Unit I

Introduction to the subject: Definition of quantity surveying/estimation –need for estimation –duties of Quantity Surveyor Measurement of Materials and works various items of Civil Engineering work as per I.S: 1200 and their units of measurement. Rules for measurement. General specifications for different items of work Types of estimates Detailed Estimate – Abstract Estimate - Definitions – Formats for detailed and abstract estimates. Preliminary or Approximate Estimate – Plinth area estimate – Cubic rate Estimate methods Problems in Preliminary estimate for residential and non-residential buildings

Unit II

Detailed Estimates of Buildings Detailed estimate for a Compound wall ,Single roomed building (load bearing type structure) Two roomed building (load bearing type structure) Two storeyed residential building with number of rooms (load bearing type structure) Primary School building, Analysis of Rates and Abstract Estimates Cost of materials at source and at site. Cost of labour-Types of labour-Schedule of rates. Lead and lift-Leads statement Abstract Estimate for Two roomed building with verandah Two/Three bed room building , Estimation of quantities of steel of R.C.C elements Simply supported singly reinforced R.C.C beams.Simply supported R.C.C lintels simply supported one way slab Preparation of bar bending schedule for above

Unit III

Earth Work Calculations Trapezoidal-Prismoidal-Mid-ordinate –mean sectional area rules for computing volumes in level sections for roads and canals. Leads and Lifts and their standard values Taking out quantities from L.S and C.S in cutting and embankment of level sectionsCapacity of reservoirs from contours maps Detailed Estimates of Roads, Culverts, Open well and public health Engineering Works Water bound macadam road Road with Bitumen Surface dressing Cement concrete road Pipe culvert R.C.C slab culvert with straight returns. Open well with masonry steining R.C.C Overhead Water tank. Septic tank with dispersion trench/soak pit

Unit IV

Basic Principles of Valuation Definition,meaning and purpose of valuation. Factors governing valuation-Life of structure, type location maintenance, legal control Scrap value, salvage value, market value and book value sinking fund Calculation of depreciation by different methods. Methods of valuation. Rent fixation of Buildings Rental value based on plinth area method.

Suggested Reading:

1. *Estimating And Costing* By B N DATTA

2. *Estimating By Gurucharan Singh*
3. *Estimating And Costing By A.K.Upadhyay*
4. *Quantity Surveying By A. Kamala*
5. *Civil Engineering Contracts & Estimates By B.S. Patil.*

Program: Diploma

Semester: Fifth
Course: Waste Management
Course Code: 5AD.324

L	T	P	C
3	0	0	3

Course Objective:

- Study the basic characteristics of industrial waste water.
- Understand the environmental impacts caused by the industrial effluents
- Learn about different treatment processes of industrial wastewater
- Review the sources and control of indoor air pollution
- Address the simple air quality models
- To have adequate knowledge on advanced waste water treatment processes.
- To Study various Industrial manufacturing processes and understand their waste treatment requirements and air quality management

Unit I

Solid waste – sources and engineering classification, characterization, generation and quantification. Transport - collection systems, collection equipment, transfer stations, collection route optimization. Treatment methods - various methods of refuse processing, recovery, recycle and reuse, composting – aerobic and anaerobic, incineration, pyrolysis and energy recovery, Disposal methods – Impacts of open dumping, site selection, sanitary land filling – design criteria and design examples, leachate and gas collection systems, leachate treatment.

Unit II

Hazardous Waste Management- Introduction, Sources, Classification, Physico-chemical, Chemical and Biological Treatment of hazardous waste, regulations. Thermal treatment - Incineration and pyrolysis.

Unit III

Biomedical Waste management - Definition, sources, classification, collection, segregation Treatment and disposal. Radioactive waste management - Definition, Sources, Low level and high level radioactive wastes and their management, Radiation standard by ICRP and AERB

Unit IV

E- waste management: Waste characteristics, generation, collection, transport and disposal Soil contamination and site remediation – bioremediation processes, monitoring of disposal sites.

Suggested Reading:

1. Tchobanoglous G., Theissen H., And Eiiassen R.(1991), “Solid Waste Engineering - Principles And Management Issues”, Mcgraw Hill, New York.

References:

1. Pavoni J.L.(1973)., “Handbook Of Solid Waste Disposa L”.
2. Peavy, Rowe And Tchobanoglous (1985), “Environmenta L Engineering”, Mcgraw Hill Co. 4th Edition
3. Mantell C.L., (1975), “Solid Waste Management”, Joh N Wiley.
4. CPHEEO, Manual On Municipal Solid Waste Management, Central Public Health And Environmental

5. *Engineering Organisation, Government Of India, New Delhi, 2000.*
6. *WHO Manual On Solid Waste Management.*
7. *Vesiland A.(2002), "Solid Waste Engineering", Thomp Son Books.*
8. *Hazardous Waste (Management And Handling) Rules, 2001*
9. *Biomedical (Handling And Management) Rules 2008*

Program: Diploma

L	T	P	C
---	---	---	---

Semester: Fifth
Course: Water Supply and Sanitary Engineering
Course Code: 5AD.323

3	0	0	3
---	---	---	---

Course Objective:

- Identify the source of water and water demand
- Apply the water treatment concept and methods
- Apply water distribution processes and operation and maintenance of water supply

Unit I

General requirement for water supply, sources, quality of water, intake, pumping and transportation of water. Physical, chemical and biological characteristics of water and their significance, water quality criteria, water borne diseases, natural purification of water sources.

Unit II

Engineered systems for water treatment : aeration, sedimentation, softening coagulation, filtration, adsorption, ion exchange, and disinfection. Design of water distribution system.

Unit III

Generation and collection of waste water, sanitary, storm and combined sewerage systems, quantities of sanitary waste and storm water, design of sewerage system Primary, secondary and tertiary treatment of wastewater. Waste water disposal standards,

Unit IV

Basic of microbiology. Biological wastewater treatment system : Aerobic processes activated sludge process and its modifications, trickling filter, RBC, Anaerobic Processes conventional anaerobic digester, High rate and hybrid anaerobic reactors, Sludge digestion and handling, Disposal of effluent and sludge, Design problems on water distribution, sewerage, water treatment units, wastewater treatment units and sludge digestion.

Suggested Reading:

1. *Water Supply Engineering-Environmental Engineering v.1* by S.K.Garg, Khanna Publishers
2. *Sewage Disposal and Air Pollution Engineering - Environmental Engineering v.2* by S.K.Garg, Khanna Publishers
3. *Water Supply and Sanitary Engineering* by B.S.Birdi Dhanpat Rai Publishing Company

Reference Books:

4. *Water Supply Engineering* by B. C. Punmia and A.K.Jain, Laxmi Publications
5. *Water and Wastewater Technology* by M.J.Hammer, PHI