

**STATE COUNCIL OF TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA**  
**TEACHING AND EVALUATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES**

<b>DISCIPLINE: CIVIL ENGINEERING</b>						<b>SEMESTER: 4<sup>TH</sup></b>						
SL NO	SUBJECT CODE	SUBJECT	PERIODS			EVALUATION SCHEME						
			L	T	P	SESSIONAL EXAM			END SEM EXAM	TERM WORK	PRACTICAL EXAM	TOTAL MARKS
						TA	CT	Total				
<b>THEORY</b>												
1.	CET 401	ANALYSIS OF STRUCTURE	5	-	-	10	20	30	70			100
2.	CET 402	GEOTECHNICAL ENGINEERING	5	-	-	10	20	30	70			100
3.	CET 403	IRRIGATION ENGINEERING	4	-	-	10	20	30	70			100
4.	CET 404	WATER SUPPLY & WASTE WATER ENGINEERING	4	-	-	10	20	30	70			100
5.	CET 405	ESTIMATION & COST EVALUATION-I	4	-	-	10	20	30	70			100
<b>PRACTICAL/TERM WORK</b>												
6.	CEP 401	CONSTRUCTION WORKS PRACTICE	-	-	6					50	50	100
7.	CEP 402	ESTIMATING PRACTICE-I (COMPUTER-AIDED)	-	-	5					50		50
8.	CEP 403	CIVIL ENGG. DRAWING-II*	-	-	6				50	50		100
<b>GRAND TOTAL</b>			<b>22</b>		<b>17</b>	<b>50</b>	<b>100</b>	<b>150</b>	<b>400</b>	<b>150</b>	<b>50</b>	<b>750</b>

Total Contact hours per week: 39

Abbreviations: L-Lecture, T-Tutorial, P-Practical, TA- Teacher's Assignment, CT- Class test

Minimum Pass Mark in each Theory Subject is 35% and in Practical subject is 50%

\* Minimum pass mark in End Sem Exam is 35% & that in term work is 50%

\*End Examination of Civil Engineering Drawing-II will be conducted for a time duration of two hours with question supplied by the SCTE&VT and evaluation will also be done by SCTE&VT, Odisha.

## ANALYSIS OF STRUCTURE

Name of the Course: Diploma in Civil Engineering			
Course code:	CET 401	Semester	4 <sup>th</sup>
Total Period:	75(60L+15T)	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:	1P/week	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

### COURSE CONTENTS:

Chapter	Name of topics	Hours
<b>1</b>	<p><b>1.0 TRUSSES AND FRAMES</b></p> <p>1.1 Introduction –Types of trusses and frames, statically determinate and indeterminate trusses and frames, degree of indeterminacy, concept of stable and unstable structure, import, important uses of trusses and frames</p> <p>1.2 Analysis of trusses: a) Analytical method ( Method of joints, method of Section)</p> <p>1.3 b) Graphical Method (Space Diagram, load diagram, Bow's notation, Vector Diagram, Polar diagram, Funicular Polygon, Maxwel's Diagram)</p>	<b>06</b>
<b>2</b>	<p><b>2.0 SLOPE AND DEFLECTION</b></p> <p>2.1 Introduction: Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature, Importance of slope and deflection.</p> <p>2.2 Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).</p> <p>2.3 Slope and deflection of propped cantilever from principle of superposition.</p> <p>2.4 Moment Area Method – Derivation of moment area theorems for slope and deflection, Determination of slope and deflection for following cases i) Cantilever beam subjected to point load and uniformly distributed loads, ii) Simple supported beam subjected to point load and uniformly distributed loads.</p>	<b>12</b>
<b>3</b>	<p><b>3.0 Fixed Beam</b></p> <p>3.1 Advantages of fixed beam, Analysis of Fixed Beam-Determination of Fixed End Moments. Bending Moment &amp; Shear Force diagram under point load and uniformly distributed load.</p>	<b>08</b>
<b>4</b>	<p><b>4.0 CONTINUOUS BEAMS – THEOREM OF THREE MOMENTS METHOD</b></p> <p>4.1 Analysis of continuous beam (without sinking of support) by application of Three Moment Equation for simply supported ends, fixed end and overhangs under action of point load and u.d.l. Bending Moment and Shear Force diagram for the above cases.</p>	<b>10</b>
<b>5</b>	<p><b>5.0 MOMENT DISTRIBUTION METHOD FOR INDETERMINATE STRUCTURES</b></p> <p>5.1 Sign convention, carry over factor, stiffness factor, distribution factors, its application for the analysis of various types of continuous beams with simply supported ends, fixed ends and overhang, symmetrical portal frame (without sway). Bending Moment and Shear Force diagram for the above cases.</p>	<b>10</b>
<b>6</b>	<p><b>6.0 COLUMNS AND STRUTS</b></p> <p>6.1 Columns and Struts – Definition – Short and Long columns – End conditions – Equivalent length / Effective length– Slenderness ratio – Axially loaded short column - Axially loaded long column – Euler's theory of long columns – Derivation of expression for Critical load of</p>	<b>10</b>

	Columns with hinged ends – Expressions for other standard cases of end conditions (separate derivations not required) – Numerical Problems	
7	<b>7.0 ARCHES:</b> 7.1 Types of arches, practical applications. Analysis of symmetrical three hinged parabolic arch subjected to point load and u.d.l. Bending Moment and Shear Force diagram for the above cases.	04

<b>Learning Resources</b>			
<b>Text Books</b>			
<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	R.S.Khurmi	Theory of structure	
2	S.S. Bhavikatti	Structural Analysis I	
3	S.Rammrutham,	Theory of structure	
4	V.N.Vazirani & M.M. Rathwani	Analysis of Structures-Vol.I&II -	
5	Timoshenko and Young.	Theory of structure	
6	C.K Wang.	Intermediate Structural Analysis	
7	C.S.Reddy.	Basic Structural Analysis	

## GEOTECHNICAL ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:	CET 402	Semester	4 <sup>th</sup>
Total Period:	75(60L+15T)	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:	1P/week	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

### COURSE CONTENTS:

Chapter	Name of topics	Hours
1	<b>1.0-INTRODUCTION</b> 1.1- Soil and Soil Engineering. 1.2- Scope of Soil Mechanics.	01
2	<b>2.0- PRELIMINARY DEFINITIONS AND RELATIONSHIP.</b> 2.1- Soil as a three Phase system. 2.2- Weight volume relationships: Water Content, Density, Specific gravity, Voids ratio, Porosity, Percentage of air voids, air content, degree of saturation, density Index, Bulk/Saturated/dry/submerged density.	06
3	<b>3.0- DETERMINATION OF INDEX PROPERTIES.</b> 3.1- Water Content (Pycnometer method, Oven drying method) 3.2- Specific Gravity 3.3- Particle size distribution, Sieve analysis, Wet mechanical analysis- Pipette method, Basic concept of Hydrometer Analysis 3.4 – Consistency of Soils, Atterberg's Limits, Plasticity Index, Consistency Index, Liquidity Index	04
4	<b>4.0- CLASSIFICATION OF SOIL.</b> 4.1- General. 4.2- Particle size Distribution. -Textural Classification. -HRB Classification. -Unified Soil Classifications. - I.S. Classification.	06
5	<b>5.0- PERMEABILITY AND SEEPAGE</b> 5.1- Concept of Permeability, Darcy's Law, Co-efficient of Permeability, 5.2- Factors affecting Permeability. 5.3- Constant head permeability and falling head permeability Test. 5.4- Seepage pressure, the phenomenon of quick sand 5.5- Concept of flow-net, Properties and application of flow-net.	07
6	<b>6.0- COMPACTION AND CONSOLIDATION.</b> 6.1- Compaction, Light and heavy compaction Test, Optimum Moisture Content of Soil, Maximum dry density, Zero air void line 6.2- Factors affecting Compaction. 6.3- Field compaction methods and their suitability. 6.4- Consolidation, distinction between compaction and consolidation. 6.5- Spring Analogy method, Pressure-void ratio curve, normally consolidated, under consolidated and over consolidated soil, Assumption of Terzaghi's theory of one-dimensional consolidation, Laboratory Consolidation Test, Co-efficient of Consolidation, Time Factor, Estimation of consolidation settlement, Difference between primary and secondary consolidation	08
7	<b>7.0- SHEAR STRENGTH.</b> 7.1- Concept of shear strength, Mohr- Coulomb failure theory, Cohesion, Angle of internal friction, strength envelope for different type of soil, 7.2- Measurement of shear strength;- Direct shear test, triaxial shear test,	06

	unconfined compression test and vane-shear test	
<b>8</b>	<p><b>8.0- EARTH PRESSURE ON RETAINING STRUCTURES.</b></p> <p>8.1- Active earth pressure, Passive earth pressure, Earth pressure at rest.</p> <p>8.2- Use of Rankine's formula for the following cases (cohesion-less soil only)</p> <p>(i) Backfill with no surcharge, (ii) backfill with uniform surcharge. iii) submerged backfill</p>	<b>08</b>
<b>9</b>	<p><b>9.0- FOUNDATION ENGINEERING.</b></p> <p>9.1- Functions of foundations, shallow and deep foundation, different type of shallow and deep foundations with sketches. Types of failure (General shear, Local shear &amp; punching shear)</p> <p>9.2- Bearing capacity of soil, bearing capacity of soils using Terzaghi's formulae &amp; IS Code formulae for strip, Circular and square footings.</p> <p>9.3 Machine Foundation: Introduction to Soil dynamics, Terms associated with soil dynamics, Free vibration and Forced vibration, Natural frequency, Types of machines and machine foundation, General requirements, Design of machine foundations: Reciprocating type , Centrifugal type, Impact type, Isolation of foundations.</p>	<b>14</b>

<b>Learning Resources</b>			
<b>Text Books</b>			
<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	Braja M. Das	Principles of Geotechnical Engineering	
2	T.N.Ramamurthy&T.G.Sitaram	Geotechnical Engineering	
3	Dr. B.C.Punmia	Soil Mechanics & Foundation Engineering	
4	Dr. K.R.Arora	Soil Mechanics& Foundation Engineering	
5	Dr. V.N.S. Murthy	Soil Mechanics& Foundation Engineering, Vol-I	
6	Braja M. Das	Principle of Foundation Engineering	
7	Gulhati & Dutta	Geotechnical Engineering	
8	Ranjan Gopal & A. S. R. Rao	Basic And Applied Soil Mechanics	

## IRRIGATION ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:	CET 403	Semester	4 <sup>th</sup>
Total Period:	60(60L)	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

### COURSE CONTENTS:

Chapter	Name of topics	Hours
<b>1</b>	<b>1.0 INTRODUCTION :</b> 1.1 History of development of irrigation in India 1.2 Types of irrigation 1.3 Sources of irrigation water	<b>03</b>
<b>2</b>	<b>2.0 HYDROLOGY</b> 2.1 Hydrology Cycle 2.2 Rainfall: types, intensity, hyetograph 2.3 Estimation of rainfall, rain gauges, types- automatic and Non-automatic 2.4 Concept of catchment area, types, run-off, estimation of flood discharge by Dicken's and Ryve's formulae 2.5 Concepts of Hydrograph, definition and explanation, unit hydrograph	<b>08</b>
<b>3</b>	<b>3.0 WATER REQUIREMENT OF CROPS</b> 3.1 Crop season 3.2 Duty, Delta and base Period, their relationship 3.3 Gross command area, culturable command area, Intensity of Irrigation, irrigable area 3.4 Field capacity, Permanent wilting point, frequency of irrigation	<b>08</b>
<b>4</b>	<b>4.0 FLOW IRRIGATION</b> 4.1 Irrigation canals 4.2 Perennial irrigation 4.3 Different components of irrigation canals and their functions 4.4 Sketches of different canal cross-sections 4.5 Classification of canals according to their alignment Various types of canal lining – Advantages and disadvantages	<b>05</b>
<b>5</b>	<b>5.0 WATER LOGGING AND DRAINAGE :</b> 5.1 Causes and effects of water logging, detection, prevention and remedies	<b>03</b>
<b>6</b>	<b>6.0 DIVERSION HEAD WORKS AND REGULATORY STRUCTURES</b> 6.1 Necessity and objectives of diversion head works 6.2 General layout, functions of different parts of barrage 6.3 Difference between weir and barrage 6.4 Functions of regulatory structures 6.5 Cross and Head regulators 6.6 Falls 6.7 Energy dissipaters 6.8 Outlets – different types 6.9 Escapes	<b>06</b>
<b>7</b>	<b>7.0 CROSS DRAINAGE WORKS :</b>	<b>05</b>

	<p>7.1 Functions and necessity of Cross drainage works - aqueduct, siphon, super-passage, level crossing, inlet and outlet</p> <p>7.2 Details of each with help of neat sketch</p>	
<b>8</b>	<p><b>8.0 DAMS</b></p> <p>8.1 Necessity of storage reservoirs, types of dams</p> <p>8.2 Earthen dams: types, description, causes of failure and protection measures.</p> <p>8.3 Gravity dam- types, description, Causes of failure and protection measures.</p> <p>8.4 Spillways- types, description, Causes of failure and protection measures.</p>	<b>10</b>
<b>9</b>	<p><b>9.0 GROUND WATER HYDROLOGY :</b></p> <p>9.1 Introduction, occurrence and quantity of ground water, explanation of terms- water table, aquifer- confined and unconfined aquifers, aquiclude, radius of influence, depression head, cone of depression etc</p> <p>9.2 Types of wells – shallow and deep well, construction of open wells and tube wells, Yield of an open well</p> <p>9.3 Types of tube wells, methods of construction of tube wells, boring, installation of well assembly, development of well, pump selection, installation and maintenance.</p>	<b>12</b>

<b>Learning Resources</b>			
<b>Text Books</b>			
<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	S.K.Garg	Irrigation Engineering & Hydraulics Structures	
2	Dr. B.C.Punmia,	Introductory Irrigation Engineering	
3	N.N.Basak.	Irrigation Engineering	
4	Bharat Singh.	Fundamentals of Irrigation Engineering	
5	R.K.Sharma&T.K.Sharma	Irrigation Engineering	
6	Das and Saikia	Irrigation & Water Power Engineering	

## WATER SUPPLY AND WASTE WATER ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:	CET 404	Semester	4 <sup>th</sup>
Total Period:	60(60L)	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

### COURSE CONTENT:

Chapter	Name of topics	Hours
<b>A: WATER SUPPLY</b>		
<b>1</b>	<b>1.0 INTRODUCTION:</b> 1.1 Necessity of treated water supply 1.2 Historical development	<b>01</b>
<b>2</b>	<b>2.0 QUANTITY OF WATER</b> 2.1 Water requirements for different uses 2.2 Per capita demand, variation in demand and factors affecting demand 2.3 Methods of forecasting population, Numerical problems using different methods	<b>02</b>
<b>3</b>	<b>3.0 SOURCES OF WATER ;</b> 3.1 Surface sources – Lake, stream, river and impounded reservoir 3.2 Underground sources – aquifer type & occurrence – Infiltration gallery, infiltration well, springs, well – types, suitability 3.3 Yield from well- methods of determination, Numerical problems using yield formulae ( deduction excluded) 3.4 Sinking of wells, Well components, Well development 3.5 Sanitary protection of wells and maintenance of well 3.6 Well pumps – type, selection, installation	<b>01</b>
<b>4</b>	<b>4.0 CONVEYANCE OF WATER :</b> 4.1 Intakes – types, description of river intake, reservoir intake, canal intake 4.2 Pumps for conveyance & distribution – types, selection, installation, most economic diameter of pumping main 4.3 Pipe materials – necessity, suitability, merits & demerits of each type, selection of pipe material 4.4 Pipe joints – necessity, types of joints, suitability, methods of jointing [Note : Detailed study covered under practical, hence students may be asked to prepare detailed sketches as home assignment ] 4.5 Laying of pipes – method, testing 4.6 Pipe corrosion – cause and remedies	<b>02</b>
<b>5</b>	<b>5 QUALITY OF WATER :</b> 5.1 Impurities in water – organic and inorganic, classification 5.2 Harmful effects of impurities 5.3 Analysis of water – sampling and tests for physical, chemical and bacteriological quality, significance of tests (detailed methods of tests will be discussed in laboratory class ) 5.4 Water quality standards for different uses	<b>03</b>
<b>6</b>	<b>6 TREATMENT OF WATER :</b> <i>Note:1. Design of treatment units excluded.</i> <i>2. Students may be asked to prepare detailed sketches of units, preferably from working drawing, as home assignment</i> <i>3. Field visit to treatment plant, under practical should arranged after</i>	<b>12</b>



	<p><i>covering this unit.</i></p> <p>6.1 Flow diagram of conventional water treatment system</p> <p>6.2 Treatment process / units :</p> <p>6.2.1 Aeration ; Necessity, types of aerators, essential features</p> <p>6.2.2 Plain Sedimentation : Necessity, working principles, Sedimentation tanks – types, essential features, operation &amp; maintenance</p> <p>6.2.3 Sedimentation with coagulation: Necessity, principles of coagulation, types of coagulants, determination of coagulant dose (procedure of jar test to be covered under practical)</p> <ul style="list-style-type: none"> <li>• Flash Mixer – types, essential features, operation</li> <li>• Flocculators - types, essential features, operation &amp; maintenance</li> <li>• Clarifier - types, essential features, operation &amp; maintenance</li> </ul> <p>6.2.4 Filtration : Necessity, principles, types of filters</p> <ul style="list-style-type: none"> <li>• Slow Sand Filter - essential features, operation, clearing &amp; maintenance</li> <li>• Rapid Sand Filter - essential features, operation, clearing &amp; maintenance, comparison with slow sand filter, description &amp; working of operating accessories – rate controller, head – loss gauge etc., Filter operational troubles &amp; remedies</li> <li>• Pressure Filter - essential features, operation, &amp; maintenance, suitability of use</li> </ul> <p>6.2.5 Disinfection : Necessity, methods of disinfection, types of chemical disinfectants, criterion for ideal disinfectants</p> <ul style="list-style-type: none"> <li>• Chlorination – free and combined chlorine demand, available chlorine, residual chlorine, pre-chlorination, break point chlorination, super- chlorination, determination of chlorine dose (testing procedure to be covered under practical), chlorinators – types, feeding</li> </ul> <p>6.2.6 Miscellaneous treatment methods :</p> <ul style="list-style-type: none"> <li>• Removal of iron &amp; manganese – Necessity, working principles</li> <li>• Softening of water – Necessity, Methods of softening – Lime soda process, Ion exchange method, working principles</li> <li>• Removal of arsenic &amp; fluoride – Necessity, working principles</li> </ul> <p>6.3 Chemicals required in various treatment units, their uses and feeding devices</p> <p>6.4 Determination of dosage of chemical requirement for coagulation, chlorination, (jar test, Residual chlorine test to be discussed in laboratory), softening, numerical problems on dosage calculation.</p>	
<b>7</b>	<p><b>7 DISTRIBUTION SYSTEM :</b></p> <p>7.3 General requirements, types of distribution system-gravity, direct and combined</p> <p>7.1 Methods of supply – intermittent and continuous</p> <p>7.2 Maintenance of required pressure in distribution system head loss in system, Calculation of size of pipes – application of Hazen – William’s formula, numerical problems on determination of size of pipes</p> <p>7.3 Storage – necessity, types – underground, ground level, overhead reservoirs, suitability, accessories</p> <p>7.4 Distribution system layout – types, comparison, suitability</p> <p>7.5 Loss and wastage – cause, detection, remedial measure</p>	<b>06</b>
<b>8</b>	<p><b>8 APPURTENANCE IN DISTRIBUTION SYSTEM :</b></p> <p>8.1 Valves-types, features, uses, purpose-slucice valves, check valves, air</p>	<b>04</b>

	valves, scour valves 8.2 Fire hydrants 8.3 Water meters – types, uses, fixing <i>[Note: detailed study covered under practical. Students may be asked to prepare sketches as home assignment]</i>	
<b>9</b>	<b>9 W/S PLUMBING IN BUILDING :</b> 9.1 Method of connection from water mains to building supply 9.2 General layout of plumbing arrangement for water supply in single storied and multi-storied building as per I.S. code. 9.3 Water supply fittings-features, uses, purpose, fixing and jointing 9.4 Hot water supply – Electric water supply, Solar water heater features, fittings and fixing	<b>03</b>
<b>B:SANITARY ENGINEERING</b>		
<b>10</b>	<b>10 INTRODUCTION</b> 10.1 Aims and objectives of sanitary engineering 10.2 Definition of terms related to sanitary engineering 10.3 Systems of collection of wastes– Conservancy and Water Carriage System – features, comparison, suitability	<b>01</b>
<b>11</b>	<b>11 QUANTITY OF SEWAGE :</b> 11.1 Quantity of sanitary sewage – domestic & industrial sewage, variation in sewage flow, numerical problem on computation quantity of sanitary sewage, Storm water flow-rational method of computation of flow 11.2 Computation of size of sewer, application of Chazy’s formula, Limiting velocities of flow : self-cleaning and scouring	<b>02</b>
<b>12</b>	<b>12 SEWORAGE SYSTEM :</b> 12.1 Types of system-separate, combined, partially separate , features, comparison between the types, suitability 12.2 Shapes of sewer – rectangular, circular, avoid-features, suitability 12.3 Sewer materials-features, suitability, handing & maintenance – stoneware, cast iron, cement concrete, asbestos cement, precast & cast in situ sewer 12.4 Laying of sewer-setting out sewer alignment, excavation and supporting, checking the gradient, preparation of bedding, handling, lowering, laying and jointing, testing of sewer, backfilling, ventilation of sewer, cleaning	<b>01</b>
<b>13</b>	<b>13 SEWER APPURTENANCES ;</b> 13.1 Manholes and Lamp holes – types, features, location, function, construction 13.2 Inlets, Grease & oil trap – features, location, function, construction 13.3 Storm regulator, inverted siphon - features, location, function, construction 13.4 Sewage Pumping – necessity, ejectors, location, components of pumping station, types of pumps and selection.	<b>02</b>
<b>14</b>	<b>14 SEWAGE CHARACTERSTICS :</b> 14.1 General importance, strength of sewage, Characteristics of sewage-physical, chemical & biological 14.2 Analysis of sewage-sampling, tests for – solids, pH, dissolved oxygen, BOD, COD, Nitrogen(Detailed methods of tests to be discussed in laboratory) 14.3 Significance of parameters 14.4 Bacteriology of sewage-decomposition cycles of sewage – aerobic & an-aerobic – C, N, S cycle	<b>01</b>
<b>15</b>	<b>15 SEWAGE DISPOSAL :</b> 15.1 Disposal on land – sewage farming, sewage application and dosing,	<b>02</b>

	<p>sewage sickness-causes and remedies</p> <p>15.2 Disposal by dilution – standards for disposal in different types of water bodies, self purification of stream</p>	
<b>16</b>	<p><b>16 SEWAGE TREATMENT :</b>  <i>(Note: 1.Design of treatment units excluded.</i>  <i>2.Students may be asked to prepare detailed sketches of units,preferably from working drawing, as home assignment.</i>  <i>3.Field visit to treatment plant, under practical should be arranged after covering this unit.)</i></p> <p>16.1 Principles of treatment, flow diagram of conventional treatment</p> <p>16.2 Primary treatment – necessity, principles, essential features, functions, operation and maintenance of different units – Screens and racks, Grit chamber, primary sedimentation tank</p> <p>16.3 Secondary treatment – necessity, principles, essential features, functions, operation and maintenance of different units – contact bed, tricking filter, activated sludge process, aerated lagoon, oxidation ditch, rotating biological disc</p> <p>16.4 Sludge disposal – sludge digestion - necessity, principles, essential features, operation, construction of sludge digesters, disposal of digested sludge</p> <p>16.5 Isolated treatment units – features, principles, operation, construction, maintenance of septic tank and soak pit/soak trench, design of septic tank according to I.S. code; oxidation pond – principles &amp; essential features</p>	<b>10</b>
<b>17</b>	<p><b>17 SANITARY PLUMBING FOR BUILDING :</b></p> <p>17.1 Requirements of building drainage, layout of lavatory blocks in residential buildings, layout of building drainage</p> <p>17.2 Plumbing arrangement of single storied &amp; multi storied building as per I.S. code practice</p> <p>17.3 Sanitary fixtures – features, function, and maintenance and fixing of the fixtures – water closets, flushing cisterns, urinals, inspection chambers, traps, anti-syphonage pipe</p> <p>17.4 Inspection, testing and maintenance of sanitary fixtures</p>	<b>05</b>
<b>18</b>	<p><b>18 RURAL WATER SUPPLY &amp; SANITATION :</b></p> <p>18.1 Spring water source – development, sanitary protection, Maintenance</p> <p>18.2 Roof top rain water harvesting – techniques, elementary Treatment, storage, maintenance</p> <p>18.3 Single pit &amp; two pit latrine – features, construction, Maintenance, disposal of sludge</p>	<b>02</b>

<b>Learning Resources</b>			
<b>Text Books</b>			
<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	G.S.Birdie	Text book on water supply and sanitary engineering	
2	K.N.Duggal	Elements of Environmental Engineering	
3	N.N Basak	Environmental Engineering	
4	A.K. Chatterjee	Environmental Engineering	
5	S.K.Garg	Water Supply Engineering	
6	S.K.Garg	Waste Water Disposal Engg.	
7	S.K.Hussain	Public Health Engg.	

8	by Ministry of Urban Development, Govt. of India.	CPHEEO manual Water supply	
9	by Ministry of Urban Development, Govt. of India.	CPHEC Mannual- Sewage & Sewage Treatment - by Ministry of Urban Development, Govt. of India.	

## ESTIMATING & COST EVALUATION – I

Name of the Course: Diploma in Civil Engineering			
Course code:	CET 405	Semester	4 <sup>th</sup>
Total Period:	60(60L)	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

### COURSE CONTENTS:

Chapter	Name of topics	Hours
1	<b>1.0 INTRODUCTION :</b> 1.1 Types of estimates – Plinth area, floor area / carpet area 1.2 Units and modes of measurements as per IS 1200 1.3 Accuracy of measurement for different item of work	02
2	<b>2.0 QUANTITY ESTIMATE OF BUILDING</b> 2.1 Short wall long wall method and centre line method, deductions in masonry, plastering, white washing, painting etc., multiplying factor (paint coefficients) for painting of doors and windows (paneled/glazed), grills etc. as per OPWD scheduled of rates. 2.2 Detailed estimate of single storied flat roof building with shallow foundation and RCC roof slab with leak proof treatment over it including staircase and mummy room. 2.3 Detailed estimate of a simple inclined roof building with gabled / hipped roof and A.C. sheet / G.C.I. sheet roofing.	36
3	<b>3.0 ANALYSIS OF RATES AS PER OPWD SPECIFICATIONS / STANDARDS</b> 3.1 Analysis of rates for cement concrete, brick masonry in Cement Mortar, laterite stone masonry in Cement Mortar, cement plaster, white washing, Artificial Stone flooring, concrete flooring, R.C.C. with centering and shuttering, reinforcing steel, Painting of doors and windows etc. 3.2 Calculation of lead, lift, conveyance charges, royalty of materials, etc. as per Orissa P.W.D. system 3.3 Abstract of cost of estimate.	20
4	<b>4.0 ADMINISTRATIVE SET-UP OF ENGINEERING ORGANISATIONS:</b> 4.1 Administrative set-up and hierarchy of Engineering Deptt. Duties of responsibilities of Engineers at different positions /levels	02

Learning Resources			
Text Books			
Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	M.Chakraborty.	Estimating, Costing, specification & Valuation in Civil Engineering	
2	D.Kohli & R.C Kohli	A text Book of Estimating & Costing	
3	B.N.Dutta	Estimating & Costing	
4	Birdi & Ahuja	Estimating & Costing	
5		Latest Orissa PWD Schedule of Rates & Analysis of rates	

## CONSTRUCTION WORKS PRACTICE

Name of the Course: Diploma in Civil Engineering			
Course code:	CEP 401	Semester	4 <sup>th</sup>
Total Period:	90	Examination	4 hrs
Lab. periods:	6P/week	Term Work	50
Maximum marks:	100	End Semester Examination:	50

- 1.0 Study of tools required for construction of masonry.
- 2.0 Lay out Plan of a building.
- 2.1 Construction of 1 & 1 ½ Brick thick walls in English Bond in Mud mortar including a corner.
- 3.0 Construction of 1 & 1 ½ Brick thick Pillar in Mud mortar .
- 4.0 Fabrication of timber or steel formwork for a beam.
- 5.0 Fabrication of timber or steel formwork for a slab.
- 6.0 Fabrication of timber or steel formwork for a Column.
- 7.0 Bar bending and fabrication of reinforcements for a beam.
- 8.0 Bar bending and fabrication of reinforcements for a slab.
- 9.0 Bar bending and fabrication of reinforcements for a lintel with chajja & column.
- 10.0 Bar bending and fabrication of reinforcements for a column.
- 11.0 Conducting a Non destructive compressive strength test on concrete beam using rebound Hammer as per I.S:1311(Part-2)-1992.
- 12.0 Study of Pipe Joints and Plumbing fixtures.
- 13.0 Study of Toposheets
- 14.0 Field visits.

Visit to a construction site of a building where the following works are in progress.

- a) Excavation of foundation
- b) Masonry works
- c) White washing
- d) Painting (interior exterior),
- e) Wood works
- f) Fabrication & concreting works,
- g) Flooring

### RECOMMENDED BOOKS:

1. Building Construction -S.C.Rangawala.
2. A text book of Building Construction -Gupta,SusilKumar,Singia,D.R.,and Juneja.
3. A text book of Building Construction -R.S Despande and G.V.Vartak.
4. A text book of Building Construction -S.P.Arora and S.P.Bindra.
5. Building Construction -Susil Kumar.
6. Hand Book on Reinforcement Detailing (SP-34) -BIS Publication

## ESTIMATING PRACTICE- I

Name of the Course: Diploma in Civil Engineering			
Course code:	CEP 402	Semester	4 <sup>th</sup>
Total Period:	75	Examination	
Lab. periods:	5P/week	Term Work	50
Maximum marks:	50	End Semester Examination:	

- 1.0 Preparation of plinth area estimate & detailed estimate for the following ; **40**
- 1.1 Single storeyed two roomed building with specification as per Orissa P.W.D. schedule of rates and analysis of rates
- 1.2 A two storeyed pucca Building with specification as per Orissa P.W.D. schedule of rates and analysis of rates
- 1.3 A two roomed gabled / hipped roof building on wooden king post truss with tiled/ A.C. sheet / G.C.I. Sheet roofing as per Orissa P.W.D. schedule of rates and analysis of rates
- 2.0 Analysis of rates in detail for the above items of works basing on Orissa Govt. analysis of rate with help of **MS Excel software**. **15**
- 3.0 Calculation of dry materials for different items of building basing on Orissa Govt. analysis of rate with help of **MS Excel software** **10**
- 4.0 Preparation of abstract of cost and bill of quantities of the estimates as per item no. 1.0 above with help of **MS Excel software** **10**

### **RECOMMENDED BOOKS:**

1. Estimating, Costing, specification & Valuation in Civil Engineering - M.Chakraborty.
2. A text Book of Estimating & Costing -D.Kohli &RC Kohli,
3. Estimating & Costing -B.N.Dutta.
4. Estimating & Costing -Birdi & Ahuja.
5. Latest Orissa PWD Schedule of Rates & Analysis of rates.

## CIVIL ENGINEERING DRAWING – II

Name of the Course: Diploma in Civil Engineering			
Course code:	CEP 403	Semester	4 <sup>th</sup>
Total Period:	90	Examination	2 hrs
Lab. periods:	6P/week	Term Work	50
Maximum marks:	100	End Semester Examination:	50

### **COURSE CONTENT:**

- 1.0 Detailed drawing of culvert 45**
- 1.1 Half foundation plan and half top plan, cross sectional elevation and longitudinal section of
- i) Hume pipe culvert with right angled wing wall (manually on drawing sheet)
  - ii) Hume pipe culvert with splayed wing wall (using AutoCAD software)
  - iii) RCC Slab Culvert with right angled wing wall (using AutoCAD software)
  - iv) RCC Slab Culvert with splayed wing wall (manually on drawing sheet)
- 2.0 Irrigation Structures 35**
- 2.1 Detail drawing of a vertical drop type fall (Sarada Type) from given specifications (using AutoCAD software)
- 2.2 Drawing of a canal siphon from given specifications (manually on drawing sheet)
- 2.3 Drawing of a siphon aqueduct from given specifications (using AutoCAD software)
- 3 Plumbing and Sanitary connections and fittings of a two roomed building 14**  
(Manually on drawing sheet)
- 4 Detailed drawing of septic tank up to 50 users with soak pit and necessary connection from the water closet. (using AutoCAD software) 14

### **RECOMMENDED BOOKS:**

1. Civil Engg. Drawing -M.Chakrobarty.
2. Civil Engineering Drawing & House Planning -B.P.Verma.
3. A Course in Civil Engg Drawing -VB Sikka
3. Civil Engineering drawing Manual -TTTI,Bhopal.
4. IS: 12556-1967, 10713-1983 & I.S: 696-1972 of BIS Publication.
5. Civil Engineering drawing Manual -V.Thanikachalan &K. V Natarajan.
6. Harnessing AutoCAD - Autodesk Manual
7. Auto Cad -Omura
8. AutoCAD (Architecture) 2011 -William G. Wyatt