



# **BANGLADESH TECHNICAL EDUCATION BOARD**

**Agargaon, Sher-E-Bangla Nagar  
Dhaka-1207.**

## **04-YEAR DIPLOMA IN ENGINEERING CURRICULUM COURSE STRUCTURE & SYLLABUS (PROBIDHAN-2022)**

### **CIVIL TECHNOLOGY**

**TECHNOLOGY CODE: 64**

#### **4<sup>TH</sup> SEMESTER**

**(Effective from 2022-2023 Academic Sessions)**

Sl. No.	Subject		Period Per Week		Credit	Marks Distribution						
						Theory Assessment			Practical Assessment			Grand Total
	Code	Name	Theory	Practical		Continuous	Final	Total	Continuous	Final	Total	
1	25841	Accounting	2	-	2	40	60	100	-	-	-	100
2	26441	Construction Process-II	2	3	3	40	60	100	25	25	50	150
3	26442	Estimating & Costing-I	2	3	3	40	60	100	25	25	50	150
4	26443	Civil CAD-I	1	3	2	20	30	50	25	25	50	100
5	26444	Surveying-II	2	3	3	40	60	100	25	25	50	150
6	26445	Geotechnical Engineering	2	3	3	40	60	100	25	25	50	150
7	26446	Hydrology	2	3	3	40	60	100	25	25	50	150
8	26521	Wood Workshop Practice	1	3	2	20	30	50	25	25	50	100
Total			14	21	21	280	420	700	175	175	350	1050
Total Period			35									
Theory: Practical (%)			40.0%	60.0%								

Subject code	Subject Name	Period per week		Credit
25841	Accounting	T	P	C
		2	0	2

<b>Rationale</b>	All diploma graduate will work in any institution or organization or will be an employer this subject knowledgeable skill and attitude will health the studies to make appropriate decision for their professional life. This subject will cover the topics like information technology, Evaluation of an organization, journal entry system, cash book analysis and Income Tax.
<b>Learning Outcome (Theoretical)</b>	<p>After undergoing the subject, student will be able to:</p> <ul style="list-style-type: none"> <li>▪ Describe accounting concept</li> <li>▪ Describe transaction analysis</li> <li>▪ Describe accounting entry system.</li> <li>▪ Explain the accounts of debit and credit</li> <li>▪ Interpret the journal entry system.</li> <li>▪ Evaluate the balance of ledger.</li> <li>▪ Describe the cash book analysis.</li> <li>▪ Evaluate of trial balance</li> <li>▪ Explain the financial statement</li> <li>▪ Describe income tax assessment.</li> </ul>

### Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
1.	<b>CONCEPT OF ACCOUNTING</b> 1.1 Define accounting. 1.2 State the objectives of accounting. 1.3 State the advantages of accounting. 1.4 State the necessity and scope of accounting.	2	3
2.	<b>TRANSACTION ANALYSIS</b> 2.1 Define transaction. 2.2 Define business transaction. 2.3 Describe the Characteristics of Transaction. 2.4 Discuss the different types of Transaction.	2	3
3.	<b>ENTRY SYSTEM OF ACCOUNTING</b> 3.1 Define single and double entry system. 3.2 Discuss the principles of double entry system. 3.3 Justify whether double entry system is an improvement over the single-entry system. 3.4 Distinguish between single entry and double entry system of accounting	1	3
4.	<b>CONCEPT OF ACCOUNTS</b> 4.1 Define accounts. 4.2 State the objectives of accounts. 4.3 Illustrate different type of accounts. 4.4 State the golden rules of accounting. 4.5 State the rules for debit and credit in each class of accounts. 4.6 Define accounting cycle.	2	3
5.	<b>JOURNAL ENTRY SYSTEM</b> 5.1 Define journal. 5.2 State the objective of journal. 5.3 Mention the various names of journal. 5.4 Prepare the form of journal entry system. 5.5 Solve the problem related journal entry system.	4	10
6.	<b>LEDGER</b> 6.1 Define ledger 6.2 Interpret the form of ledger 6.3 Distinguish between journal and ledger 6.4 Explain "ledger is called the king of all books of accounts" 6.5 Prepare ledger from given transaction	2	3
7.	<b>CASH BOOK ANALYSIS</b> 7.1 Define cash book. 7.2 Classify cash book. 7.3 Explain cash book as both journal and ledger. 7.4 Explain the different types of discount. 7.5 Prepare different types of cash books from given transactions showing balances.	4	10
8.	<b>TRIAL BALANCE ANALYSIS</b> 8.1 Define trial balance. 8.2 State the objective of a trial balance. 8.3 Mention the reason for non-agreement of trial balance. 8.4 Prepare trial balance from given balance.	3	3
9.	<b>FINAL ACCOUNTS</b>	10	20

	9.1 State the components of final accounts 9.2 Distinguish between trial balance and balance sheet 9.4 List the items to be posted in the trading account profit and loss account and the balance sheet 9.5 Prepare trading account profit and loss account and balance sheet from the given trial balance and other information		
<b>10.</b>	<b>INCOME TAX</b> 10.1 Define income tax. 10.2 State the objective of income tax. 10.3 Classify of assesses. 10.4 State the Taxable income of assesses. 10.5 Describe the Tax rebate. 10.6 Describe ther Income tax year, assessment year and National Board of Revenue (NBR).	<b>2</b>	<b>2</b>
	<b>Total</b>	<b>32</b>	<b>60</b>

### **REFERENCE BOOKS**

<b>SL</b>	<b>Book Name</b>	<b>Writer Name</b>
1.	Book-Keeping & Accounting	Prof. Gazi Abdus Salam
2.	Principles of Accounting	Hafiz uddin
3.	Cost Accounting	Prof. Asimuddin Mondol
4.	হিসাবরক্ষন ও হিসাববিজ্ঞান	পারেশ মন্ডল
5.	উচ্চ মাধ্যমিক হিসাববিজ্ঞান	হক ও হোসাইন
6.	আয়কর	ওয়ালীউল্লাহ

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
26441	Construction Process-II	T	P	C
		2	3	3

<b>Rationale</b>	Civil Engineering diploma graduate in Civil Engineering are supposed to effectively supervise construction of different civil works. Effective supervision is essential to provide a fault free service from contractors to users. To perform above task, it is essential that students should have knowledge, skills and Attitude of various sub components of buildings like foundations, walls, roofs, staircases, floors etc., and their constructional details as well as preventive, remedial and corrective methods of common construction faults. Therefore, the subject of Construction process is very important for Civil Engineering diploma graduate.
<b>Learning Outcome (Theoretical)</b>	<p>After undergoing the subject, students will be able to</p> <ol style="list-style-type: none"> <li>1. Describe different components and classification of building.</li> <li>2. Explain different types of walls, scaffolding, shoring, underpinning and their constructional methodology.</li> <li>3. Carry out the construction of brick wall.</li> <li>4. Illustrate the construction details of lintels and arches at appropriate level in building.</li> <li>5. Mention different types of doors, windows, floors and stairs cases in building.</li> <li>6. Recognize different parts of roof trusses and drainage system of roofs.</li> <li>7. State application procedure for different types of surfaces finishes in building i.e. plastering, pointing, painting, white washing and distempering.</li> <li>8. Evaluate the possible reason of dampness at various level in building and remedial means.</li> <li>9. Illustrate different types of possible anti termite treatments in building.</li> </ol>
<b>Learning Outcome (Practical)</b>	<p><b>After undergoing the subject, students will be able to</b></p> <ol style="list-style-type: none"> <li>1. Construct a semi-circle and segmental brick arch. (Practical: 1)</li> <li>2. Construct the floors with suitable materials. (Practical: 2)</li> <li>3. Perform a case study of dampness in building. (Practical: 3)</li> <li>4. Construct a wooden lean-to-roof. (Practical: 4)</li> <li>5. Perform cement plastering on brick walls. (Practical: 5)</li> <li>6. Perform cement plastering on RCC surface.(Practical: 6)</li> <li>7. Perform pointing works on brick wall. (Practical: 7)</li> <li>8. Construct a single layer and double layers scaffolding. (Practical: 8)</li> <li>9. Prepare form works for columns and beams. (Practical: 9)</li> <li>10. Prepare form works for lift cores and share walls. (Practical: 10)</li> <li>11. Perform painting (white washing, color washing, distempering, weather coating and plastic emulsion) on new and old surface. (Practical: 11)</li> <li>12. Perform varnishing on new and old wooden surface. (Practical: 12)</li> </ol>

## **DETAILED SYLLABUS (THEORY)**

<b>Unit</b>	<b>Topics with Contents</b>	<b>Class ( 1 Period)</b>	<b>Final Marks</b>
1.	<b>ARCHES, LINTELS, FLOOR AND ROOFS</b> 1.1 Define arch and lintel. 1.2 Mention the functions of arch and lintel. 1.3 Mention the different type of arches according to their shape, center and material. 1.4 Describe the procedures of construction of arches and lintels. 1.5 Define floor and roofs. 1.6 Mention the functions of a floor and roof. 1.7 List the different kind of a floor and roofs. 1.8 Describe the construction procedure of Terrazzo, Mosaic, Tiled, Marble, Reinforced Glass, Hollow, Composite and Epoxy paint floor. 1.9 Describe the construction procedure of lean-to-roofs and different types of roof truss.	<b>3</b>	<b>6</b>
2	<b>DOORS AND WINDOWS</b> 2.1 Define doors and windows. 2.2 Mention the functions of doors and windows. 2.2 Describe the various types of doors and windows on the basis of Suitability and uses. 2.3 List the considering factors to determine the size, shape, location and number of doors and windows in a room. 2.4 Mention the advantages and limitations of Panel door, Flush, Glazed, Composite, Louvered, Mild steel sheet, Sliding, Swing, Collapsible, Rolling shutter, Revolving and Plastic door. 2.5 Point out the advantages and limitations of Fixed, Pivoted, Steel, Sliding, uPVC channel, Louvered, Bay, Glazed, Dormer and Gable Window.	<b>3</b>	<b>6</b>
3	<b>DAMPNESS AND DAMAGES OF BUILDING</b> 3.1 Mention the causes and effects of dampness in building. 3.2 Describe the methods of damp proofing of building. 3.3 Define efflorescence. 3.4 Describe the causes and remedy of efflorescence. 3.5 Mention the requirements of an ideal damp proofing material. 3.6 Describe the damp proof course (DPC) treatment for wall with sketches. 3.7 Mention the function of PVC felt used in basement. 3.8 List different type of termites and the chemicals used for anti-termite treatment. 3.9 Point out the function of water proofing agent. 3.10 Describe the methods of pre-construction and post-	<b>3</b>	<b>7</b>

	construction anti-termite treatment.		
4	<b>PLASTERING AND POINTING FINISHING WORKS</b> 4.1 Describe the various types of plaster on the basis of suitability and uses. 4.2 Name the different kinds of pointing with sketches. 4.3 State the purposes of plastering and pointing. 4.4 Distinguish between plastering and pointing. 4.5 Mention the common tools used for plastering and pointing works with their functions. 4.6 Describe the process of applying plaster on new surface and old surface. 4.7 Mention the common defects in plastering and pointing. 4.8 State defects and rectifying process of plastering and pointing.	3	6
5	<b>FORM WORKS AND SCAFFOLDING</b> 5.1 State the meaning, necessity and uses of form works and scaffolding. 5.2 List the different types and components of scaffolding. 5.3 Distinguish among single layer, double layer, needle & suspended scaffolding. 5.4 Mention the Installation process of single layer, double layer, needle & suspended scaffolding. 5.5 Compare between timber and steel scaffolding. 5.6 Differentiate between shoring and underpinning. 5.7 Describe the safety requirements for scaffolding works. 5.8 Mention the requirements of a good form work. 5.9 Describe the process of making form works of Column, Beam, Slab, Stair, Concrete Wall, Lift core and Share wall. 5.10 Describe the removal technique of form works. 5.11 Describe Building demolition and retrofitting.	4	7
6	<b>PAINTING AND VARNISHING</b> 6.1 State the purposes of painting & varnishing. 6.2 Name the ingredients of paint & varnishes. 6.3 Mention the specific function of paint & varnishes ingredient. 6.4 Describe the characteristics of good paints & varnishes. 6.5 State the various defects in painting & varnishing. 6.6 Describe the considering factors of quality painting & varnishing work. 6.7 Differentiate between White wash and color wash, Distemper and snowcem wash, Weather coat and white wash, Oil based and water based paint, Weather coat and distemper, Plastic emulsion and synthetic enamel paint. 6.8 Describe the application procedure of White wash ,Color wash, Distemper, Weather coat, Epoxy paint, Rubber paint ,Plastic	4	6



	emulsion paint, Synthetic enamel paint and Snowcem (cement based paint) on new and old surfaces.		
7	<b>CONSTRUCTION EQUIPMENT'S</b> 7.1 List the equipment required for construction works. 7.2 Mention the uses of the each equipment required for construction works. 7.3 Describe the operation and maintenance of different pumps used in construction works. 7.4 Describe the operation and maintenance of earth excavating machine, bulldozer machine, roller machine, brick cutter machine, crushing (brick/stone) machine, concrete pump machine, Describe the operation and maintenance of different conveyor used in construction works. 7.5 State the function of vibrator machine. 7.6 Describe the operation and maintenance of plate compactor, hammer/frog hammer, Compactor.	3	6
8	<b>BUILDING SERVICES</b> 8.1 State the necessity of different building services. 8.2 Classify building services. 8.3 Describe the procedure of water supply, sewage system, gas line installation in building. 8.4 Describe the layout of electrical wiring with various fittings in building. 8.5 Describe the process of installation of mechanical ventilation and air- conditioning system in building. 8.6 Describe the method of installation of elevator or lift and escalator system in a building. 8.7 Describe the fire-protection and fire & Smoke-detection system in a building. 8.8 Define smoke detector, heat detector and fire alarm. 8.9 Describe the procedure of smoke detector, heat detector and fire alarm in firefighting system.	3	6
9	<b>INSULATION IN BUILDING</b> 9.1 Define thermal and sound insulation. 9.2 State the necessity of thermal and sound insulation in building. 9.3 List various types of materials used for thermal and sound insulation. 9.4 Describe the general methods of thermal and sound insulation in building. 9.5 Describe the process of thermal insulation with neat sketches of Floor, Roof, Exposed wall, exposed door and window.	3	5
10	<b>BUILDING CODES AND LAWS</b> 10.1 State the different codes followed in construction methodology. 10.2 State the features of Bangladesh National Building Code	3	5

	(BNBC), 2020		
10.3	State the features of Building Construction Rules-2015 by Public Works Department (PWD) Bangladesh with latest update in construction industry.		
10.4	Define building by laws.		
10.5	Describe the importance of building by laws.		
10.6	Explain the municipal regulation in building planning.		
10.7	Describe the economic planning of a residential building.		
10.8	Define orientation of a building		
10.9	Describe the effects of orientation of building on the basis of local climates.		
<b>Total</b>		<b>32</b>	<b>60</b>

### **DETAILED SYLLABUS (PRACTICAL)**

<b>Sl.</b>	<b>Experiment name with procedure</b>	<b>Class (3 Period)</b>	<b>Continuous Marks</b>
1	<b>CONSTRUCT A SEMI-CIRCLE AND SEGMENTAL BRICK ARCH</b> 1.1 Select the required tools and raw materials. 1.2 Make form works with suitable materials. 1.3 Prepare cement mortar as required. 1.4 Set the bricks on proper position with cement mortar. 1.5 Perform curing of the brick work properly. 1.6 Remove the form works. 1.7 Maintain the record of performed job.	<b>1</b>	<b>2</b>
2	<b>CONSTRUCT TILED AND MARBLE FLOOR</b> 2.1 Select the required tools and raw materials. 2.2 Prepare the floor according to standard specification. 2.3 Clean the work site. 2.5 Maintain the record of performed job.	<b>2</b>	<b>2</b>
3	<b>PERFORM A CASE STUDY OF DAMPNES IN BUILDING</b> 3.1 Identify a damped building. 3.2 Investigate the reasons of dampness for major affected areas and causes. 3.3 Select the method of damp proofing. 3.4 Estimate the materials to be needed for damp proofing. 3.5 Prepare a report on the specified case of dampness in building. 3.6 Maintain the record of performed job.	<b>1</b>	<b>2</b>
4	<b>CONSTRUCT A WOODEN TRUSS</b> 4.1 Collect the required tools and raw materials. 4.2 Draw the neat sketch with dimensions. 4.3 Make the joints and assemble the members. 4.4 Erect the proper position.	<b>1</b>	<b>2</b>

	<p>4.5 Check the accuracy of the work.</p> <p>4.6 Maintain the record of performed job.</p>		
5	<p><b>PERFORM CEMENT PLASTERING TO BRICK WALLS</b></p> <p>5.1 Collect the required tools and raw materials.</p> <p>5.2 Clean the loose materials from the surface.</p> <p>5.3 Raking out all the joints up to required depth.</p> <p>5.4 Wash the surface with water.</p> <p>5.5 Prepare cement mortar as required proportion.</p> <p>5.6 Provide dots and check the thickness of cement plaster.</p> <p>5.7 Provide the screed properly.</p> <p>5.8 Apply mortar (top to bottom and left to right).</p> <p>5.9 Plain / level the surface as possible.</p> <p>5.10 Maintain the record of performed job.</p>	1	2
6	<p><b>PERFORM CEMENT PLASTERING TO RCC SURFACE</b></p> <p>6.1 Collect the required tools and raw materials.</p> <p>6.2 Clean the loose materials from the surface.</p> <p>6.3 Raking out all the joints up to required depth.</p> <p>6.4 Wash the surface with water.</p> <p>6.5 Prepare cement mortar as required proportion.</p> <p>6.6 Provide dots and check the thickness of cement plaster.</p> <p>6.7 Provide the screed properly.</p> <p>6.8 Apply mortar (top to bottom and left to right).</p> <p>6.9 Plain / level the surface as possible.</p> <p>6.10 Maintain the record of performed job.</p>	1	2
7	<p><b>PERFORM POINTING WORKS TO A BRICK WALL</b></p> <p>7.1 Collect the required tools and raw materials.</p> <p>7.2 Clean the loose materials from the surface.</p> <p>7.3 Raking out all the joints up to required depth.</p> <p>7.4 Wash the surface with water.</p> <p>7.5 Prepare cement mortar as required proportion.</p> <p>7.6 Apply mortar to the joints and press (top to bottom and left to right).</p> <p>7.7 Check the joints accordingly.</p> <p>7.8 Do curing accordingly.</p> <p>7.9 Maintain the record of performed job.</p>	1	2
8	<p><b>CONSTRUCT A SINGLE LAYER AND DOUBLE LAYERS SCAFFOLDING</b></p> <p>8.1 Collect the required tools and raw materials.</p> <p>8.2 Erect the vertical members.</p> <p>8.3 Place the horizontal members and tied with jute rope.</p> <p>8.4 Place the boards for working platform and toe board.</p> <p>8.5 Provide the bracings accordingly.</p> <p>8.6 Check the properness of the scaffolding work.</p> <p>8.7 Disassemble all the members and store the materials used.</p>	2	2

	8.9 Maintain the record of performed job.		
9	<b>PREPARE FORM WORKS FOR COLUMNS AND BEAMS</b> 9.1 Collect the required tools and raw materials. 9.2 Make the boards according to required size. 9.3 Erect the boards and attached accordingly so that they can easily remove. 9.4 Check the dimensions of the column/beam. 9.5 Disassemble the form works and store the materials used. 9.6 Maintain the record of performed job.	2	3
10	<b>PREPARE FORM WORKS FOR LIFT CORES AND SHARE WALLS</b> 10.1 Collect the required tools and raw materials. 10.2 Make the boards according to required size. 10.3 Erect the boards and attached accordingly so that they can easily remove. 10.4 Check the dimensions of the lift cores and share walls. 10.5 Disassemble the form works and store the materials used. 10.6 Maintain the record of performed job.	1	2
11	<b>PERFORM WHITE WASHING, DISTEMPERING AND PLASTIC EMULSION PAINTING ON SURFACE</b> 11.1 Collect the required tools and raw materials. 11.2 Prepare the surface as necessary. 11.3 Prepare white wash as required. 11.4 Apply first coat of white wash and allow to drying. 11.5 Apply second coat of white wash and allow to drying. 11.6 Apply the final coat of white wash. 11.7 Maintain the record of performed job.	2	2
12	<b>PERFORM VARNISHING ON NEW AND OLD WOODEN SURFACE</b> 12.1 Collect required tools and raw materials. 12.2 Prepare the surface as necessary. 12.3 Prepare varnish as required. 12.4 Apply first coat and allow to drying. 12.5 Apply second coat and allow to drying. 12.6 Apply the final coat of varnish. 12.7 Maintain the record of performed job.	1	2
	<b>Total</b>	<b>16</b>	<b>25</b>

### **NECESSARY RESOURCES (TOOLS, EQUIPMENT'S AND MACHINERY):**

SI	Item Name	Quantity
1	<b>LIST OF HAND TOOLS:</b> Chisel(Bolster, Cold), Boning rods, Hammer(Brick, Lump, Double-end Comb, Sledge), Bricklayers Line Pins, Trowel, Brickwork Gauge Rod, Water Level, Plumb Rule and Bob, Spirit Level, Jointers, Mixing Tools, Straight Edge, Saws(Hand, Masonry, Circular), Masonry Square, Bump cutter/screed,	01

	Concrete mixer, Cordless drill, Crowbar, Digging bar, End frames, Gloves, Hoe, Iron pan, Jack plane, Ladder, Measuring box, Measuring tape, Measuring wheel, Polishers, Putty knife, Rammer, Rubber Boots, Safety glasses, Safety helmet, Scratchers, Spade, Straight edge brushes.	
<b>2</b>	<b>LIST OF POWER TOOLS:</b> Tile cutter, Vibrator earth excavating machine, bulldozer machine, roller machine, brick cutter machine, crushing (brick/stone) machine, concrete pump machine, lifting equipment, 3D printer used in construction.	<b>01</b>
<b>3</b>	<b>LIST OF EQUIPMENT:</b> Sand screen machine, Wheel barrow	<b>01</b>

### **RECOMMENDED BOOKS:**

SI	Book Name	Writer Name	Publisher Name & Edition
01	Building Construction	B C Punmia	Laxmi Publishers, 5 <sup>th</sup> 2004
02	A Text Book of Construction	S P Aurora & S P Bindra	Dhanpat Rai Publishers
03	Building Construction	G J Kulkarni	Mittal Publishers
04	Building Construction	S C Rangwala	Charotar Publishers, 27 <sup>th</sup> 2009
05	Construction and Foundation Engineering	Dr. J Jha, S K Sinha	Khanna Publishers

### **WEBSITE REFERENCES:**

SI	Web Link	Remarks
01	<a href="http://www.laxmipublications.com">www.laxmipublications.com</a>	Search here with topics
02	<a href="mailto:www.ishkapur@vsnl.com">www.ishkapur@vsnl.com</a>	Search here with topics
03	<a href="http://www.kopykitab.com">www.kopykitab.com</a>	Search here with topics

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
26442	ESTIMATING & COSTING-I	T	P	C
		2	3	3

<b>Rationale</b>	<p>The syllabus for estimating and costing-I in a Diploma in Engineering program is designed to provide students with a strong foundation in the principles and techniques of estimating and costing for construction projects. The rationale behind including this subject in the curriculum is to equip students with the knowledge and skills necessary to prepare accurate and comprehensive cost estimates, manage costs during the construction phase, and communicate effectively with project stakeholders.</p> <p>This subject will cover the concept of estimating, earth work excavating of a tank; road embankment; canal digging, steps and boundary wall, roads, estimate two storied building with a verandah for super-structure, basic concept of rate analysis.</p>
<b>Learning Outcome (Theoretical)</b>	<p><b>After undergoing the subject, students will be able to</b></p> <ul style="list-style-type: none"> <li>• State the basic concept of estimating.</li> <li>• Describe the estimating process of earth work excavation of a tank.</li> <li>• Illustrate the estimating process of earth work for road embankment</li> <li>• State the volume estimating process of earth work for canal digging.</li> <li>• Describe the estimating process of steps and boundary wall.</li> <li>• State the estimating process different type of roads.</li> <li>• Describe the procedure of estimating of two storied building with a verandah for sub-structure.</li> <li>• Describe the procedure of estimating of two storied building with a verandah for super-structure.</li> <li>• State the basic concept of rate analysis</li> </ul>
<b>Learning Outcome (Practical)</b>	<p><b>After undergoing the subject, students will be able to</b></p> <ol style="list-style-type: none"> <li>1. Calculate the quantity of cement, sand and brick required for 10 cum masonry work using cement mortar (1:6).</li> <li>2. Estimate the quantity of cement, sand and brick required for 10 sqm brick masonry work (125mm thick wall) with cement mortar (1:4).</li> <li>3. Calculate the quantity of cement, sand and brick chips required for 10 cum reinforced cement concrete (1:2:4).</li> <li>4. Estimate earth work excavation of a tank.</li> <li>5. Estimate the quantity of wooden chair/ table/almirah.</li> <li>6. Calculate the quantity of RCC work of a two storied building with verandah.</li> <li>7. Calculate the cost per square meter for two storied residential building.</li> </ol>

## **DETAILED SYLLABUS (THEORY)**

<b>Unit</b>	<b>Topics with Contents</b>	<b>Class (1 Period)</b>	<b>Final Marks</b>
1.	<b>BASIC CONCEPT OF ESTIMATING</b> 1.1 Define estimating. 1.2 State the methods of estimating. 1.3 Mention the measurement rules and estimating methods. 1.4 Mention the rules of deduction for opening, bearing portion in masonry works. 1.5 List the unit weight of different materials used in construction works. 1.6 Mention the unit of different items of construction works as per standard practice.	<b>02</b>	<b>06</b>
2	<b>EARTH WORK EXCAVATING OF A TANK</b> 2.1 Mention the rules to find out the volume of earth work by mid area, mean area & prismoidal method. 2.2 Mention the comparison with computing volume by three methods. 2.3 Calculate the volume of earth work in excavation of a tank by mid area method. 2.4 Calculate the volume of earth work in excavation of a tank by mean area method. 2.5 Calculate the volume of earth work in excavation of a tank by prismoidal method.	<b>03</b>	<b>06</b>
3	<b>EARTH WORK FOR ROAD EMBANKMENT</b> 3.1 Mention the side slopes for different heights of road embankment. 3.2 Mention the cross section of road embankment. 3.3 State the method to find out the volume of earth work in embankment by mid area method, mean area method & prismoidal method. 3.4 State the process to find out the volume of earthwork partly cutting & partly filling of road. 3.5 Calculate the volume of earth work in embankment by mean area method. 3.6 Calculate the volume of earth work in embankment by mid area method. 3.7 Calculate the volume of earth work in embankment by prismoidal method. 3.8 Calculate the volume of earth work for a road partly cutting and partly filling.	<b>04</b>	<b>08</b>
4	<b>EARTH WORK FOR CANAL DIGGING</b> 4.1 State the different types of canal cross section. 4.2 Mention the cross section of partly filling and partly cutting of a canal. 4.3 Explain the method to find out volume of earth work for partly cutting and partly filling. 4.4 Explain lead and lift.	<b>02</b>	<b>04</b>
5	<b>STEPS AND BOUNDARY WALL</b> 5.1 Describe different parts of a step. 5.2 Prepare an estimate the brick quantities of three steps according to standard measurement.	<b>04</b>	<b>06</b>

	<p>5.3 List different items of works in a boundary wall.</p> <p>5.4 Describe the estimating process for construction of 100m long Brick boundary wall and RCC boundary wall.</p> <p>5.5 Prepare an estimate for construction of 100m long Brick boundary wall and RCC boundary wall.</p>		
6	<p><b>ROADS</b></p> <p>6.1 Describe the different types of roads.</p> <p>6.2 List different items of works in a bituminous road.</p> <p>6.3 List different items of works in a RCC road.</p> <p>6.4 Describe the estimating process for construction of 100m long bituminous road and RCC road.</p> <p>6.5 Prepare an estimate for construction of 100m long RCC road and bituminous road.</p>	04	06
7	<p><b>TWO STORIED BUILDING WITH A VERANDAH FOR SUB-STRUCTURE.</b></p> <p>7.1 Define sub-structure.</p> <p>7.2 State center line and separate wall method.</p> <p>7.3 Mention the advantage and disadvantage of center line and separate wall methods.</p> <p>7.4 Describe the estimating process for the earth work in excavation of foundation trenches.</p> <p>7.5 Describe the estimating process of the RCC work (1:2:4) from foundation to grade beam.</p> <p>7.6 Prepare an estimate for the earth work in excavation of foundation trenches.</p> <p>7.7 Prepare an estimate for the RCC work (1:2:4) from foundation to grade beam.</p>	04	08
8	<p><b>TWO STORIED BUILDING WITH A VERANDAH FOR SUPER-STRUCTURE.</b></p> <p>8.1 Define super-structure.</p> <p>8.2 Explain the methods of deduction for opening or over lapping.</p> <p>8.3 Describe the estimating process of RCC work (1:2:4) for Isolated Column, lintel, beams, roof slab, stair, sunshade and drop wall.</p> <p>8.4 Describe the estimating process of cement plaster to both sides of brick wall.</p> <p>8.5 Describe the estimating process of grill work for windows.</p> <p>8.6 Describe the estimating process of wood work in door and window frames.</p> <p>8.7 Describe the estimating process of wood work in door and window shutters.</p>	04	08
9	<p><b>BASIC CONCEPT OF RATE ANALYSIS.</b></p> <p>9.1 State the meaning of rate analysis.</p> <p>9.2 Mention the purposes of rate analysis.</p> <p>9.3 Explain contractor's profit, overhead charges, contingency sundries and lump sum (LS).</p> <p>9.4 Explain the unit rate of materials &amp; labour.</p> <p>9.5 Mention the advantage of rate analysis to prepare cost estimate.</p> <p>9.6 Mention the rates analysis for Brick flat soling &amp; herring bone bond (10 sqm).</p> <p>9.7 Mention the rates analysis for 125 mm thick &amp; 250 mm thick brick work (10cum).</p>	05	08



	9.8 State the rates analysis for 10 cum Cement concrete (1:3:6) work. 9.9 Mention the rates analysis for 10 cum R.C.C. works (1:2:4). 9.10 State the rates analysis for 10 sqm Plastering work with cement mortar (1:6).		
	<b>Total</b>	<b>32</b>	<b>60</b>

### **DETAILED SYLLABUS (PRACTICAL)**

<b>Sl.</b>	<b>Experiment Name</b>	<b>Class (3 Period)</b>	<b>Marks (Continuous)</b>
1	<b>Calculate the quantity of cement, sand and brick required for 10 cum masonry work using (1:6) mortar.</b> 1.1 Collect the necessary tools and equipment's. 1.2 Determine the quantities of cement, sand and bricks. 1.3 Maintain the record of performed task.	<b>1</b>	<b>2</b>
2	<b>Calculate the quantity of cement, sand and brick required for 10 sqm brick masonry work (125mm thick wall) with 1:4 mortar.</b> 2.1 Collect the necessary tools and equipment's. 2.2 Determine the quantities of cement, sand and bricks. 2.3 Maintain the record of performed task.	<b>1</b>	<b>2</b>
3	<b>Calculate the quantity of cement, sand and brick chips required for 10 cum reinforced cement concrete (1:2:4) work.</b> 3.1 Collect the necessary tools and equipment's. 3.2 Determine the quantities of cement, sand and bricks chips. 3.3 Maintain the record of performed task.	<b>1</b>	<b>2</b>
4	<b>Estimate for construction of a tank.</b> 4.1 Collect the necessary tools and equipment's. 4.2 Perform earthwork excavation 4.3 Prepare brick flat soling 4.4 Determine the quantities of cement, sand and bricks 4.5 Construct CC and RCC casting 4.6 Maintain the record of performed task.	<b>1</b>	<b>2</b>
5	<b>Estimate for making wooden chair/ table/almirah.</b> 5.1 Collect the necessary tools and equipment's. 5.2 Prepare or collect the drawing of a chair, table and almirah 5.3 Calculate the quantity of wood of chair, table and almirah. 5.4 Maintain the record of performed task.	<b>2</b>	<b>2</b>
6	<b>Calculate the quantity of a foundation detail of a frame structure building (Sub-structure).</b> 6.1 Collect the details drawing of a foundation. 6.2 Calculate the quantity of earth work in excavation of foundation trenches. 6.3 Calculate the quantity of sand filling in plinth. 6.4 Calculate the quantity brick flat soling and mass concrete in foundation and floor. 6.5 Estimate the reinforced cement concrete work in foundation up to plinth level.	<b>3</b>	<b>6</b>

	6.6 Calculate the quantity of brick work up to plinth level. 6.7 Cement plaster to plinth wall and skirting with neat cement finishing (NCF). 6.8 Maintain the record of performed task.		
7	<b>Calculate the details quantity of a Super-structure item of a frame structure building.</b> 7.1 Prepare or collect the details drawing of a frame structure building (Super-structure) 7.2 Calculate the quantity of brick work in ground floor and above 125 mm wall). 7.3 Estimate the cement plaster work on brick wall (1:6) and RCC surfaces (1:4). 7.4 Estimate the RCC work of ground floor and 1st floor. 7.5 Estimate the quantity of wood work in frame and shutters. 7.6 Estimate the wood, steel and aluminum work in window frames and Shutters. 7.7 Estimate the grill works for window and verandah. 7.8 Estimate the patent stone flooring and tiles works. 7.9 Estimate the quantity of white wash, distemper and paints. 7.10 Estimate the painting of grills and varnishing works of doors. 7.11 Maintain the record of performed task.	4	6
8	<b>Calculate the cost per square meter for two storied residential building.</b> 8.1 Prepare or collect the details drawing of two storied frame structure Building. 8.2 Calculate details quantity of residential building. 8.3 Calculate the cost per square meter according to PWD standard. 8.4 Maintain the record of performed task.	3	3
	<b>Total</b>	<b>16</b>	<b>25</b>

### **NECESSARY RESOURCES (TOOLS, EQUIPMENT'S AND MACHINERY):**

SI	Item Name	Quantity
01	Drawing Sheet	As Necessary
02	Pencil & Erasers	100 nos
03	Set Square	100 nos
04	Try Square	100 nos
05	Mason's square	100 nos
06	Measuring box	100 nos
07	Measuring tape	100 nos
08	Computer	10 nos
09	CAD Software	As Necessary
10	Scanner	04 nos
11	Printer	04 nos

**RECOMMENDED BOOKS:**

SI	Book Name	Writer Name	Publisher Name & Edition
1	Estimating and costing in Civil Engineering	B N Datta	CBS, 28 <sup>th</sup> Edition.
2	Estimating, Costing and Valuation	Gurucharan Singh & Jagdish Singh	Standard Publishers Distributors, 3 <sup>rd</sup> Edition.
3	Estimating and Costing	B.N. Suresh	B. Harnath Reddy, 1 <sup>st</sup> Edition 2006

**WEBSITE REFERENCES:**

SI	Web Link	Remarks
01	<a href="http://www.youtube.com">www.youtube.com</a>	Search here with topics
02	<a href="http://www.google.com">www.google.com</a>	Search here with topics

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
26443	CIVIL CAD-1	T	P	C
		1	3	2

<b>Rationale</b>	<p>CAD is computer-aided design software. It allows users to create and edit digital 2D and 3D designs faster and more readily than hand. AutoCAD is a design tool which will reduce the human efforts compared manual drafting. The data can also be saved and kept in the cloud, making them accessible from anywhere at any time. CAD is a software application that is used to create drafting solutions. CAD is available in mobile, cloud-based, and web-based versions. Civil diploma Students must create drawing appropriately in their Civil Engineering projects, outlining every facet of the same. As a result, Civil Engineering students can utilize this CAD program to create simple and effective drawing for their Civil Engineering projects.</p>
<b>Learning Outcome (Theoretical)</b>	<p>After undergoing the subject, students will be able to</p> <ul style="list-style-type: none"> <li>• Describe fundamental of CAD commands</li> <li>• Mention Functions and Uses of CAD Commands</li> <li>• Mention different Features of a Building.</li> <li>• Draw Plan, Section, Elevation of a Residential Building Preparing Procedure by CAD.</li> <li>• Explain Layout Plan and Sectional Elevation of an Underground Water Reservoir, Septic Tank, Truss and Plot the drawing.</li> <li>• State Increases Productivity, Improves Accuracy, Decreases Errors, Better Quality, Quick Sharing for Collaboration and save time.</li> </ul>
<b>Learning Outcome (Practical)</b>	<p>After undergoing the subject, students will be able to</p> <ol style="list-style-type: none"> <li>1. Demonstrate CAD commands</li> <li>2. Practice Auto CAD commands</li> <li>3. Perform Plan, Section, Elevation of a Residential Building by CAD.</li> <li>4. Perform Plan and Sectional Elevation of an Underground Water Reservoir, Septic Tank and Truss.</li> </ol>

**DETAILED SYLLABUS (THEORY) :**

<b>Unit</b>	<b>Topics with Contents</b>	<b>Class (1 Period)</b>	<b>Final Marks</b>
<b>1.</b>	<b>FUNDAMENTAL OF CAD</b> 1.1 Define Computer Aided Design (CAD). 1.2 State start and exit procedure of CAD. 1.3 List different tools used in CAD. 1.4 State WCS icon and UCS icon of CAD. 1.5 Describe the classifications of co-ordinate system. 1.6 Mention the necessity of drawing units and limits.	<b>2</b>	<b>2</b>
<b>2</b>	<b>FUNCTIONS AND USES OF CAD COMMANDS</b> 2.1 State the drawing process of line, poly line, rectangle, triangles, polygons, circles and arcs. 2.2 Mention the functions of copy, move, offset, trim, fillet, array, chamfer, extend, break, rotate, stretch, mirror, change, scale and edit command. 2.3 Mention the functions block, insert, explode, divide command. 2.4 Mention the functions of distance, area, Id, list command. 2.5 Mention the functions of layout, view port, model space, paper space command. 2.6 Mention the functions of dimension style, leader, linear, radius & diameter, aligned, continue and base dimension command. 2.7 Mention the functions of donut, solid, trace, p line, x line, ray, fill, hatch and text command. 2.8 Mention the functions of zoom, pan, undo, redo, save, command. 2.9 Define Layer, Layer on/off and formation of Layer. 2.10 Mention the advantages of Layers in drawing using CAD.	<b>4</b>	<b>8</b>
<b>3</b>	<b>FEATURES OF A BUILDING</b> 3.1 Define single and multistoried building. 3.2 Define site and lay-out Plan. 3.2 Differentiate between site plan and lay-out plan. 3.3 Mention the types of building 3.4 Describe Setback rules and FAR 3.5 Describe the main features of residential building. 3.6 Describe the different component of a building. 3.7 Describe the procedure of drawing for a one unit residential building.	<b>2</b>	<b>4</b>
<b>4</b>	<b>PLAN, SECTION, ELEVATION OF A RESIDENTIAL BUILDING PREPARING PROCEDURE BY CAD</b> 4.1 Describe the procedure of drawing site plan and layout plan of a Single storied building. 4.2 Describe the procedure of drawing floor plan, elevation and sectional elevation of a residential building. 4.3 Describe the procedure of drawing plan of square and rectangular column with footing showing reinforcement. 4.4 Describe the procedure of making detailed drawing of RCC	<b>4</b>	<b>7</b>

	lintel with sunshade showing reinforcement. 4.5 Describe the procedure of making detailed drawing of Furniture lay-out plan. 4.6 Describe the setting procedure of plumbing fixture for toilet. 4.7 Describe the setting procedure of component for kitchen. 4.8 Describe the setting procedure of electrical layout diagram. 4.9 List the drawings of a residential building necessary for approval of the relevant authorities.		
5	<b>A PLAN AND SECTIONAL ELEVATION OF A SEPTIC TANK, UNDERGROUND WATER RESERVOIR AND TRUSS</b> 5.1 Describe the procedure of plan and sectional elevation of a septic tank. 5.2 Describe the procedure of plan and section of soak pit and inspection pit. 5.3 Describe the procedure of plan and sectional elevation of an underground water reservoir showing the reinforcement. 5.4 Describe the procedure of detail drawing of a water closet including trap. 5.5 Draw an elevation of King post and Queen post wooden truss with showing different components. 5.6 Draw an elevation of steel truss with showing different components.	3	6
6	<b>LAYOUT AND PLOT THE DRAWING</b> 6.1 Define layout for plot/print using paper space and model space. 6.2 State the scale & assign pen (if necessary) for plot/print. 6.3 Describe the paper & plotter for plotting/printing. 6.4 Describe the process of Plot/Print the drawing. 6.5 Discuss about various drawing in different scale in a paper through layout. <b>6.6</b> Describe the process of drawing in PDF format.	1	3
	<b>Total</b>	<b>16</b>	<b>30</b>

### **DETAILED SYLLABUS (PRACTICAL)**

Sl.	Experiment Name	Class (3 Period)	Marks (Continuous)
1.	<b>PREPARE PAGE LAYOUT USING CAD.</b> 1.1 Open CAD 1.2 Create CAD new file 1.3 Set up the units and dimension style 1.4 Set up the drawing limits. 1.5 Set zoom all 1.6 Exit from CAD	1	2
2	<b>PERFORM DRAW AND SAVE DRAWING USING CAD.</b> 2.1 Draw a line using CAD.		

	2.2 Draw different types of rectangles using CAD. 2.3 Draw circles, arcs using CAD. 2.4 Draw triangles using CAD. 2.5 Draw different types of polygons using CAD. 2.6 Save the drawing.	<b>1</b>	<b>2</b>
<b>3</b>	<b>EDIT THE EXISTING DRAWING USING CAD.</b> 3.1 Erase a line or object. 3.2 Perform pan, undo and redo commands. 3.3 Apply different types of Zoom commands. 3.4 Perform Cut, Trim and extend commands. 3.6 Apply move and copy commands. 3.7 Perform the uses of the following commands: offset, rotate, stretch, array, mirror, scale, P edit and explode, block, fillet, chamfer.	<b>2</b>	<b>3</b>
<b>4.</b>	<b>PERFORM DIMENSION OF DRAWING USING CAD.</b> 4.1 Perform dimensioning. 4.2 Perform linear dimensions in the drawing. 4.3 Perform aligned dimensions in the drawing. 4.4 Use radius dimensions in the drawing. 4.5 Use angular dimensions in the drawing. 4.6 Use modify dimension style in the drawing.	<b>1</b>	<b>2</b>
<b>5</b>	<b>LAYERS, TEXT AND HATCHES THE DRAWING USING CAD.</b> 5.1 Create different layers for line, dimension, text, hatches, etc. 5.2 Select different colors for different layers. 5.3 Select the type and scale of the hatch for a drawing. 5.4 Select the type and size of the text for a drawing. 5.5 Insert text in the drawing.	<b>1</b>	<b>3</b>
<b>6</b>	<b>SET THE LAYOUT AND PLOT THE DRAWING.</b> 6.1 Create layout for plot/print using paper space and model space. 6.2 Set up the scale & assign pen (if necessary) for plot/print. 6.3 Select the paper & plotter for plotting/printing. 6.4 Set various drawing in different scale in a paper through layout. 6.5 Plot/Print the drawing. 6.6 Save the drawing in PDF format.	<b>2</b>	<b>3</b>
<b>7</b>	<b>PERFORM A PLAN, SECTION AND ELEVATION OF A RESIDENTIAL BUILDING BY CAD.</b> 7.1 Create a plan of a residential building with setback rules or FAR 7.2 Draw an elevation of a residential building. 7.3 Draw a sectional elevation of a residential building. 7.4 Set a furniture layout plan for a residential building.	<b>2</b>	<b>3</b>
<b>8</b>	<b>PERFORM A PLAN, SECTION AND ELEVATION OF A RESIDENTIAL BUILDING BY CAD.</b>	<b>3</b>	<b>3</b>

	8.1 Create a column footing working drawing showing reinforcement. 8.2 Create lintel with sun shed working drawing showing reinforcement. 8.3 Create a Plumbing plan for a toilet and kitchen. 8.4 Create a Electrical layout Plan.		
<b>9</b>	<b>PERFORM UNDERGROUND WATER RESERVOIR BY CAD.</b> 9.1 Create a plan and sectional elevation of an underground water reservoir. 9.2 Create a Section of underground water reservoir showing the reinforcement. 9.3 Draw the pipe line diagram for UGW.	<b>2</b>	<b>2</b>
<b>10</b>	<b>PERFORM SEPTIC TANK BY CAD.</b> 10.1 Create a plan for Septic tank. 10.2 Create a sectional elevation of a septic tank. 10.3 Draw the plan and section of soak pit and inspection pit.	<b>1</b>	<b>2</b>
	<b>Total</b>	<b>16</b>	<b>25</b>

### **NECESSARY RESOURCES (TOOLS, EQUIPMENT'S AND MACHINERY):**

<b>SI</b>	<b>Item Name</b>	<b>Quantity</b>
01	Desktop Computer	26 Set
02	Multimedia Projector	2 nos
03	Projector screen	2 nos
04	Smart Board	1 nos
05	Air Condition (Two Ton Capacity)	2 nos
06	Sound System	2 nos

### **RECOMMENDED BOOKS:**

<b>SI</b>	<b>Book Name</b>	<b>Writer Name</b>	<b>Publisher Name &amp; Edition</b>
01.	Civil Engineering Drawing	Guru Charan Singh	
02.	AutoCAD	Engr. Md. Shah Alam	
03.	Mastering AutoCAD	Engr. Samuel Mallik	
04.	Mastering AutoCAD	George Omura	
05.	Structural Detailing	Peter H Newton	

### **WEB SITE REFERENCES:**

<b>SI</b>	<b>Web Link</b>	<b>Remarks</b>
01	Link <a href="https://youtu.be/tNATCAHSgzY">https://youtu.be/tNATCAHSgzY</a> Link <a href="https://youtu.be/S99bWdvOd4o">https://youtu.be/S99bWdvOd4o</a> Link <a href="https://youtu.be/9d9oRoZXxJk">https://youtu.be/9d9oRoZXxJk</a>	
02	Link <a href="https://youtu.be/fri2NEKrorw">https://youtu.be/fri2NEKrorw</a>	
03	<a href="https://youtu.be/zrpWYucKEQU">https://youtu.be/zrpWYucKEQU</a>	
04	<a href="https://youtu.be/6BASEeZ83wE">https://youtu.be/6BASEeZ83wE</a>	



SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
		T	P	
26444	SURVEYING - II	2	3	3

<b>Rationale</b>	Diploma Engineering graduate have to perform different kind of survey in their professional work. To acquire this ability student will learn Construction supervision; prepare planning, estimating & time scheduling. Evaluation & reporting of existing structure and land survey in this subject. They should have pre requisite knowledge, skills and attitude about surveying that will achieve by the SURVEYING – I.
<b>Learning Outcome (Theoretical)</b>	<p><b>After undergoing the subject, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Describe operating procedure of level and theodolite.</li> <li>• State leveling work.</li> <li>• Illustrate preparing method and uses of contour.</li> <li>• State conducts traversing computation process and plotting with theodolite.</li> <li>• State the process of horizontal and vertical distances of inaccessible points.</li> </ul>
<b>Learning Outcome (Practical)</b>	<p><b>After undergoing the subject, students will be able to</b></p> <ol style="list-style-type: none"> <li>1. Illustrate Leveling.</li> <li>2. Identify the various types Survey Instruments.</li> <li>3. Identify the facilities of Digital Survey equipment.</li> <li>4. Find the elevation of different various points.</li> <li>5. Perform field leveling and contouring.</li> <li>6. Perform angle measurement of different points.</li> <li>7. Identify geo coordinate and uses in various types of survey.</li> <li>8. Perform traversing and accuracy checking of survey.</li> </ol>

### **DETAILED SYLLABUS (THEORY)**

<b>Unit</b>	<b>Topics with Contents</b>	<b>Class ( 1 Period)</b>	<b>Final Marks</b>
1.	<b>BASIC CONCEPT OF LEVELING</b> 1.1 Define Level and Leveling. 1.2 Mention the purposes of leveling. 1.3 State Level surface, Level line, Horizontal surface, horizontal line, Vertical plane & Vertical line. 1.4 State Mean Sea level, Datum surface, Datum line, reduced level and Formation level. 1.5 Define bench mark. 1.6 Describe different types of bench mark.	<b>2</b>	<b>03</b>
2	<b>FEATURES AND APPLICATION METHOD OF LEVELING.</b> 2.1 List the equipment and accessories required for leveling. 2.1 Mention the different types of level. 2.2 Point out the different parts of a level. 2.3 Explain Line of collimation, Axis of telescope, Axis of bubble tube, Vertical axis. 2.4 Explain Height of instrument, Diaphragm, line of collimation, Focusing, Parallax. 2.5 Describe the purposes of leveling staff. 2.6 Mention different types of leveling staff. 2.7 Describe the positions of setting up level. 2.8 State the procedure of holding a leveling staff. 2.9 Mention the procedure of taking staff reading.	<b>2</b>	<b>06</b>
3	<b>ADJUSTMENT OF LEVEL</b> 3.1 State different types of adjustments of level. 3.2 Mention the different steps of temporary adjustment. 3.3 List the fundamental lines of level with relationship. 3.4 Describe permanent adjustment of level. 3.5 Describe two peg test. 3.6 State the necessity of two peg test in leveling. 3.7 Solve the problems related to permanent adjustments of level.	<b>2</b>	<b>05</b>
4	<b>BOOKING OF STAFF READING AND REDUCTION OF LEVEL</b> 4.1 Define back sight, foresight and intermediate sight reading, change point, negative staff reading and station. 4.2 State the necessity of different types of level book. 4.3 Mention the procedure of booking of staff reading into level book. 4.4 Describe reduction of leveling. 4.5 Mention the methods of reduction of leveling 4.5 Compare between Height of Instrument and Rise and Fall	<b>3</b>	<b>04</b>

	<p>Method.</p> <p>4.6 Solve problems on reduction of leveling.</p> <p>4.7 Solve problems on calculation of missing data of old level book.</p>		
5	<p><b>TYPES OF LEVELING</b></p> <p>5.1 List different types of leveling.</p> <p>5.2 State the purposes of fly leveling; profile leveling, cross sectioning, check leveling and reciprocal leveling.</p> <p>5.3 Describe the procedure of fly leveling; profile leveling, Cross sectioning, check leveling and reciprocal leveling.</p> <p>5.4 Solve different problems on fly leveling; profile leveling, cross sectioning, check leveling and reciprocal leveling.</p> <p>5.5 Describe the procedure of plotting long and cross-section of leveling works.</p> <p>5.6 Prepare longitudinal profile and cross section profile from Given Data.</p>	3	06
6	<p><b>OBSTACLES AND ERRORS IN LEVELING</b></p> <p>6.1 Mention obstacles in leveling.</p> <p>6.2 Explain the procedure of Ascending and descending a hill, Staff too nears the level, Staff too low or too high, Staff station above the line of collimation, Wall on the alignment.</p> <p>6.3 List the instrumental and user's error in leveling.</p> <p>6.4 Explain the effects of earth's curvature and refraction of light on leveling.</p> <p>6.5 Interpret the formula for earth curvature and refraction of light.</p> <p>6.6 Solve problems on errors due to curvature and refraction.</p> <p>6.7 Deduce the formula for distance to the visible horizon and dip of the horizon.</p> <p>6.8 Solve problems on visible horizon and dip of the horizon.</p> <p>6.9 State magnitude and permissible limits of closing error in leveling.</p>	3	03
7	<p><b>ASPECTS OF CONTOURING AND MAPPING</b></p> <p>7.1 Define contour, contouring, horizontal equivalent and vertical interval.</p> <p>7.2 Mention the characteristics of contour.</p> <p>7.3 Describe the uses of contour.</p> <p>7.4 Mention the different methods of contouring.</p> <p>7.5 State the procedure of different methods of contouring.</p> <p>7.6 Explain interpolation of contour by estimation method.</p> <p>7.7 Mention the procedure of drawing contour map of hill, reservoir, valley and pond.</p> <p>7.8 Mention various uses of contour map.</p> <p>7.9 State the procedure of locating the proposed route for a road, canal and drainage work.</p>	03	05
8	<p><b>BASIC CONCEPTS OF THEODOLITE</b></p> <p>8.1 State different parts of theodolite.</p> <p>8.2 Mention the functions of different parts of theodolite.</p> <p>8.3 State the procedure of centering, Leveling, swing &amp;</p>	02	05

	<p>Transiting of theodolite.</p> <p>8.4 Describe different types of adjustment of theodolite</p> <p>8.5 State different steps of temporary adjustment of theodolite.</p> <p>8.6 Describe the fundamental lines of theodolite.</p> <p>8.7 Mention the relationship among the fundamental lines.</p> <p>8.8 Describe the permanent adjustments of theodolite.</p> <p>8.9 Describe Stadia rod and Tachometer.</p> <p>8.10 Mention the uses of Stadia rod and Tachometer.</p>		
9	<p><b>PRINCIPLES OF MEASURING ANGLE AND BEARING WITH THEODOLITE</b></p> <p>9.1 Explain Geodetic co-ordinates, Bearing, True bearing, Magnetic bearing, Azimuth &amp; Grid Azimuth.</p> <p>9.2 State whole circle bearing &amp; Reduced bearing.</p> <p>9.3 Describe the procedure of measuring horizontal angles with theodolite.</p> <p>9.4 Describe the procedure of measuring vertical angles.</p> <p>9.5 Describe the procedure of measuring magnetic bearing of a line.</p> <p>9.6 State polar star.</p> <p>9.7 Describe the procedure of determining true bearing of a line by observing pole star.</p>	03	06
10	<p><b>APPLICATION OF TRIGONOMETRICAL LEVELING.</b></p> <p>10.1 Explain the basic principle of trigonometric leveling.</p> <p>10.2 Describe the method of measuring height when the object is accessible.</p> <p>10.3 Deduce the formula for measuring height and horizontal distance when the object is at accessible in the case of object and the station are in different levels.</p> <p>10.4 Deduce the formula for measuring height and horizontal distance when the object is inaccessible in the case of object and the station are in different levels.</p> <p>10.5 Describe Barometric &amp; Hypsometric leveling.</p> <p>10.6 Solve problems on finding heights and distances.</p>	02	04
11	<p><b>PRINCIPLES OF TRAVERSE SURVEY</b></p> <p>11.1 Explain traverse.</p> <p>11.2 List the field works in theodolite traversing.</p> <p>11.3 Describe the traversing by methods of included angles and deflection angle.</p> <p>11.4 Explain checking of traverse.</p> <p>11.5 Explain the process of plotting a traverse.</p> <p>11.6 Calculate the bearing from angles of traverse.</p> <p>11.7 Compute the coordinates of a traverse.</p> <p>11.8 Describe the Bowditch's rule and Transit rule.</p> <p>11.9 Define Balancing of closed traverse.</p>	03	06

12	<b>PROBLEM AND THEIR SOLUTION IN TRAVERSING</b> 12.1 Describe different types of problems in traversing. 12.2 State the sources of errors in theodolite work. 12.3 List the common mistakes in theodolite work 12.4 State the way to avoid errors & mistakes in theodolite Work. 12.5 Calculate the length and bearing of a missing side and any included angle of a traverse. 12.6 Compute the area of closed traverse by coordinate, latitude and double meridian, departure and total latitude methods.	04	07
	<b>Total</b>	<b>32</b>	<b>60</b>

### **DETAILED SYLLABUS (PRACTICAL)**

Sl.	Experiment Name	Class (3 Period)	Marks (Continuous)
1	<b>APPLY INSTRUMENTS AND ACCESSORIES FOR LEVEL SURVEY.</b> 1.1 Select the required tools and Equipment. 1.2 Tag the tools and equipment. 1.3 Collect the appropriate tools and equipment. 1.4 Maintain the record of performed job.	1	2
2	<b>PERFORM TEMPORARY ADJUSTMENTS OF LEVEL.</b> 1.1. Select the required tools and Equipment. 1.2. Set the tripod. 1.3. Set the level over the tripod. 1.4. Check the temporary adjustments. 1.5. Check the accuracy of adjustment. 1.6. Maintain the record of performed job.	1	2
3	<b>PERFORM TWO-PEG TEST OF LEVELING</b> 1.1. Select the required tools and Equipment. 1.2. Set the tripod. 1.3. Set the level over the tripod. 1.4. Check the temporary adjustments. 1.5. Check the accuracy of adjustment. 1.6. Maintain the record of performed job.	1	2
4	<b>PERFORM FLY AND CHECK LEVELING.</b> 1.1. Select the required tools and Equipment. 1.2. Set the tripod. 1.3. Set the level over the tripod. 1.4. Check the temporary adjustments. 1.5. Take staff reading. 1.6. Check the calculation. 1.7. Maintain the record of performed job.	2	2
5	<b>PERFORM RECIPROCAL LEVELING</b> 1.1. Select the required tools and Equipment. 1.2. Set the tripod. 1.3. Set the level over the tripod.	1	2

	1.4. Check the temporary adjustments. 1.5. Take staff reading and data on field book. 1.6. Check the calculation. 1.7. Maintain the record of performed job.		
6	<b>CONDUCT PROFILE LEVELING, SHOWING LONG AND CROSS SECTION.</b> 1.1. Select the required tools and Equipment. 1.2. Set the tripod. 1.3. Set the level over the tripod. 1.4. Check the temporary adjustments. 1.5. Take staff reading and data on field book. 1.6. Check the calculation. 1.7. Maintain the record of performed job.	2	3
7	<b>PREPARE A CONTOUR MAP BY SPOT/GRID LEVEL OVER A LOW LYING AREA.</b> 1.1. Select the required tools and Equipment. 1.2. Set the tripod. 1.3. Set the level over the tripod. 1.4. Check the temporary adjustments. 1.5. Take staff reading and BM on field book. 1.6. Check the calculation. 1.7. Maintain the record of performed job.	1	2
8	<b>PREPARE CONTOUR MAP AND CONDUCTING SPOT LEVELING OVER A HIGH ELEVATED AREA.</b> 1.1. Select the required tools and Equipment. 1.2. Set the tripod. 1.3. Set the level over the tripod. 1.4. Check the temporary adjustments. 1.5. Take staff reading and necessary data on field book. 1.6. Check the calculation. 1.7. Maintain the record of performed job.	2	2
9	<b>DETERMINE HORIZONTAL ANGLE AND VERTICAL ANGLE USING DIGITAL THEODOLITE.</b> 1.1. Select the required tools and Equipment. 1.2. Set the tripod. 1.3. Set the theodolite over the tripod. 1.4. Check the temporary adjustments. 1.5. Take angle and distance on field book. 1.6. Check the calculation. 1.7. Maintain the record of performed job.	2	2
10	<b>DETERMINE HEIGHT AND DISTANCE OF A TOWER USING DIGITAL THEODOLITE</b> 1.1. Select the required tools and Equipment. 1.2. Set the tripod. 1.3. Set the theodolite over the tripod. 1.4. Check the temporary adjustments. 1.5. Take angle and distance. 1.6. Check the calculation. 1.7. Maintain the record of performed job.	1	3
11	<b>CONDUCT TRAVERSING WITH A THEODOLITE AND PLOT MAPS INCLUDING COMPUTATION OF AREA.</b> 1.1. Select the required tools and Equipment.	2	3

	1.2. Set the tripod. 1.3. Set the theodolite over the tripod. 1.4. Check the temporary adjustments. 1.5. Take angle and distance of the plot. 1.6. Draw a plot drawing. 1.7. Check the calculation. 1.8. Maintain the record of performed job.		
	<b>Total</b>	<b>16</b>	<b>25</b>

### **NECESSARY RESOURCES (TOOLS, EQUIPMENTS AND MACHINERY):**

Sl. No.	Item Name	Quantity
01	Level Machine	5 no's /Item
02	Digital Theodolite	5 no's /Item
03	Tripod	10 no's /Item
05	Staff	5 no's /Item
06	Measuring Tape (100 feet/ 30 meter)	10 no's /Item
07	Plumb bob	5 no's /Item
08	Arrow	30 no's /Item
09	Ranging pole	30 no's /Item
10	Chalk powder	50 kgs /Item
11	String/thread	500 gm

### **RECOMMENDED BOOKS:**

Sl	Book Name	Writer Name	Publisher Name & Edition
01.	Surveying and Leveling Volume 1 & 2	Dr. B.C Pun Mia	Delhi Standard Publisher Distributors.
01.	Surveying and leveling	T.P Kanetkar	Delhi Standard Publisher Distributors.
03.	Surveying and Levelling	R Subramanian	
04.	Surveying	Norman Thomas	
05	Surveying and leveling	M N Bashak	

### **Web site:**

1. <https://www.youtube.com/watch?v=74zfSBKdLaA>
2. <https://www.youtube.com/watch?v=j8poe2vvD2Q>
3. <https://www.youtube.com/watch?v=2XW11CQ4hfM>
4. <https://www.youtube.com/shorts/uBLSov7zV7M>
5. <https://www.youtube.com/shorts/Dh9KyKuaegw>
6. <https://www.youtube.com/shorts/U5Zl7kXihXM>
7. <https://theconstructor.org/surveying/parts-working-digital-theodolite/87806/>
8. <https://www.youtube.com/watch?v=BZi0owCSsso>
9. <https://www.youtube.com/watch?v=MeSkbM3BWNo>
10. <https://www.youtube.com/watch?v=1KCqxx8r5Y4&t=61s>
11. <https://www.youtube.com/watch?v=VBMEv51iCUE>

SUBJECT CODE	SUBJECT NAME	PERIOD PER WEEK		CREDIT
26445	GEOTECHNICAL ENGINEERING	T	P	C
		2	3	3

<b>Rationale</b>	Geotechnical engineering is the important for every structure, since all structures rest on soil. The stability of these structures depends upon behavior of soil and bearing capacity of soil to carry loads under different loading conditions. Formation of soil and rocks, defects in rocks, soil behavior, and soil as an engineering material are essential parameter to an engineer. The design of foundation of buildings, dam, towers, embankments, roads, railways, retaining walls, bridges is mainly governed by these above stated parameters. The content of this subject are also useful in designing basement, underground tank and under water structures. Knowledge of geology, soil characteristics and stress distribution under loading on soil, bearing capacity of soil is also useful to every engineer in the design, execution and stability analysis of structures.
<b>Learning Outcome (Theoretical)</b>	<p><b>After undergoing the subject, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Describe origin, composition, classification and properties of soil.</li> <li>• State plasticity characteristics of soil.</li> <li>• Define hydraulic properties of soil.</li> <li>• Describe consolidation and compaction characteristics of soil.</li> <li>• Define lateral earth pressure of soil.</li> <li>• Describe subsurface investigation and method of sample collection.</li> <li>• Calculate the bearing capacity of soil.</li> </ul>
<b>Learning Outcome (Practical)</b>	<p><b>After undergoing the subject, students will be able to</b></p> <ol style="list-style-type: none"> <li>1. Determine the water content of soil by oven drying method.</li> <li>2. Determine the specific gravity of soil by Pycnometer method.</li> <li>3. Determine the particle size of soil by sieve analysis method.</li> <li>4. Determine the liquid limit and plastic limit of soil.</li> <li>5. Perform the co-efficient of permeability of soil by constant head test.</li> <li>6. Determine the bearing capacity of soil from Standard Penetration Test (SPT).</li> <li>7. Perform standard proctor test of the soil.</li> <li>8. Perform unconfined compression test of the soil.</li> <li>9. Perform unit weight of soil by core cutter method.</li> <li>10. Perform unit weight of soil by sand replacement method.</li> </ol>



## **DETAILED SYLLABUS (THEORY)**

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	<b>CONCEPT OF GEOTECHNICAL ENGINEERING.</b> 1.1 Define rock, soil and soil engineering. 1.2 Describe origin and formation of soil. 1.3 Describe major soil deposits in Bangladesh. 1.4 Explain limitation of soil engineering. 1.5 Mention the classification system of soil. 1.6 State textural, unified and ASTM system. 1.7 State dilatancy and toughness. 1.8 State dry strength test & shaking test. 1.9 State dispersion test. 1.10 Mention general properties of soil.	04	08
2	<b>PRELIMINARY SOIL TESTS</b> 2.1 Define void ratio, porosity, degree of saturation, percentage of air voids, air content, water content, bulk unit weight, dry unit weight, saturated unit weight, submerged unit weight, unit weight of solids, specific gravity of solids and density index. 2.2 Explain three-phase diagram on the basis of void ratio. 2.3 Explain three-phase diagram on the basis of porosity. 2.4 Solve problems related on soil properties. 2.5 Explain water content determination by oven drying method 2.6 Explain specific gravity determination by pycnometer method	04	06
3	<b>PARTICLE SIZE OF SOIL.</b> 3.1 Describe index properties of soil. 3.2 State mechanical analysis of soil. 3.3 Describe sieve analysis. 3.4 State stoke's law.	02	06
4	<b>PLASTICITY CHARACTERISTICS OF SOIL.</b> 4.1 Define plasticity of soil, Atterberg limit, liquid limit, plastic limit, shrinkage limit. 4.2 Explain plasticity index, liquidity index, consistency index, flow index and toughness index. 4.3 State the method of measurement of consistency. 4.4 Define sensitivity and thixotropy. 4.5 Mention the uses of consistency (Atterberg) limits.	03	06
5	<b>HYDRAULIC PROPERTIES OF SOIL</b> 5.1 Define Permeability of soil, hydraulic head, piezometric head and position head. 5.2 State & Explain Darcy's law. 5.3 State the constant head and variable head permeability test for determination of co-efficient of permeability. 5.4 Describe the pumping out tests for determination of coefficient of permeability. 5.5 Compute effective pressure and pore water pressure. 5.6 Mention the factors affecting on permeability of soil. 5.7 Define seepage pressure, seepage velocity, equipotential line and flow net.	04	06

6	<b>CONSOLIDATION AND COMPACTION OF SOIL</b> 6.1 Define consolidation and compaction. 6.2 Classify consolidation 6.3 State behavior of saturated soil under pressure. 6.4 Describe purpose of compaction. 6.5 Describe process of compaction. 6.6 Differentiate between consolidation and compaction of soil. 6.7 State standard proctor test of compaction. 6.8 Explain optimum moisture content & percent compaction. 6.9 State confined and unconfined compression test.	04	08
7	<b>SUBSURFACE INVESTIGATION OF SOIL</b> 7.1 State subsurface investigation of soil. 7.2 Mention the stages in subsurface explorations. 7.3 Mention the purposes of subsurface investigation of soil. 7.4 Compute the depth and lateral extent of explorations. 7.5 Describe the open excavation (Test Pit) methods of explorations. 7.6 Describe auger boring, wash boring, and rotary drilling. 7.7 Mention the various types of soil samples. 7.8 Mention the necessities boring accessories for collecting samples. 7.9 Describe the method of standard penetration test (SPT). 7.10 State the procedure of writing subsoil investigation report.	04	08
8	<b>LATERAL EARTH PRESSURE OF SOIL</b> 8.1 State at-rest pressure, active earth pressure and passive earth pressure. 8.2 Explain active and passive earth pressure of Rankine's theory with non-surge. 8.3 State the formula of active earth pressure of Rankine's theory with surge. 8.4 State the fundamental assumptions of Coulomb's wedge theory. 8.5 State the formula of active earth pressure of Coulomb's theory with surge.	4	06
9	<b>BEARING CAPACITY OF SOIL</b> 9.1 Define bearing capacity of soil. 9.2 Correlate between penetration resistance and unconfined compressive strength for cohesive soil. 9.3 Correlate between penetration resistance and angle of shearing resistance for cohesion less soil. 9.4 Explain the bearing capacity from Standard Penetration Test (SPT). 9.5 Mention the causes of foundation settlement. 9.6 Explain the California Bearing Ratio (CBR).	3	6
<b>Total</b>		<b>32</b>	<b>60</b>

### **DETAILED SYLLABUS (PRACTICAL)**

Sl.	Experiment Name	Class (3 Period)	Marks (Continuous)
1	<b>Determine the water content of soil by oven drying method.</b> 1.1 Put up the soil sample in to the oven. 1.2 Adjust the oven temperature. 1.3 Calculate the water content.	2	2

	1.4 Maintain the record of performed task.		
2	<b>Determine the specific gravity of soil by Pycnometer method.</b> 2.1 Put up the soil sample in to the pycnometer. 2.2 Use Vacuum pump, balance, and oven. 2.3 Calculate the specific gravity. 2.4 Maintain the record of performed task.	1	3
3	<b>Determine the particle size of soil by sieve analysis.</b> 3.1 Set up the sieve with shaker. 3.2 Put up the soil sample on the sieve. 3.3 Use balance, oven etc. 3.4 Calculate particle size of soil sample 3.5 Maintain the record of performed task.	1	2
4	<b>Determine the liquid limit of soil.</b> 4.1 Set up the liquid limit device. 4.2 Place the soil paste in the cup of the device. 4.3 Groove on the soil paste by grooving tools. 4.4 Blow the cup and count blows. 4.5 Calculate liquid limit. 4.6 Maintain the record of performed task.	2	2
5	<b>Determine the plastic limit of soil.</b> 5.1 Set up glass plate on the table. 5.2 Roll the soil paste by hand or rolling device. 5.3 Put the sample in to oven in specified temperature. 5.4 Calculate plastic limit. 5.5 Maintain the record of performed task.	2	2
6	<b>Perform the co-efficient of permeability of soil by constant head test.</b> 6.1 Set up permeability tank on the table. 6.2 Apply water through the sample in constant level. 6.3 Observe and collect water in certain time. 6.4 Calculate co-efficient of permeability 6.5 Maintain the record of performed task.	1	2
7	<b>Determine the bearing capacity of soil from Standard Penetration Test (SPT).</b> 7.1 Erect the tripod over the test hole and assemble the unit. 7.2 Apply spoon to rest on the bottom of the hole. 7.3 Drive the spoon with blows by the hammer. 7.4 Record the number of blows required for each 15 cm of penetration. 7.5 Maintain the record of performed task.	2	3
8	<b>Perform standard proctor test of the soil.</b> 8.1 Set up cylindrical Metal Mold on a base plate. 8.2 Put up the soil sample in to the mold and compact by the hammer. 8.3 Calculate water content for each trail & corresponding dry density. 8.4 Plot the compaction curve between water-content with dry density. 8.5 Maintain the record of performed task.	2	3
9	<b>Perform unconfined compression test of the soil.</b> 9.1 Set up unconfined compression testing machine. 9.2 Apply load on soil sample and record deformation by dial gauge.	1	2

	9.3 Calculate unconfined compression strength. 9.4 Maintain the record of performed task.		
10	<b>Perform unit weight of soil in field by core cutter method.</b> 10.1 Set up the Core cutter on a clean soil surface. 10.2 Place the dolly over the cutter and ram it gently into the soil. 10.3 Collect sample and weight it. 10.4 Calculate unit weight. 10.5 Maintain the record of performed task.	<b>1</b>	<b>2</b>
11	<b>Perform unit weight of soil in field by sand replacement method.</b> 11.1 Clean soil surface and collect sample in a tray. 11.2 Use sand pouring cylinder to fill up the hole. 11.3 Calculate hole volume and unit weight. 11.4 Maintain the record of performed task.	<b>1</b>	<b>2</b>
12	<b>Field Visit</b>		
	<b>Total</b>	<b>16</b>	<b>25</b>

### **NECESSARY RESOURCES (TOOLS, EQUIPMENT'S AND MACHINERY):**

<b>SI</b>	<b>Item Name</b>	<b>Quantity</b>
01	Spatula	3 nos
02	Wooden hammer	3 nos
03	Pycnometer (volumetric bottle)	3 nos
04	Distilled water	10 liters
05	Balance (0.01g sensitivity)	1 nos
06	Thermostatically controlled Drying oven	1 nos
07	Gloves	5 Set
08	Funnel	2 nos
09	Thermometer	03 nos
10	Spoon	03 nos
11	ASTM Sieve #4, #8, #16, #30, #50, #100, #200, Pan, Lead.	02 set
12	Sieve shaker machine	01 nos
13	Brush	03 nos
14	Moisture Container	20 nos
15	Steel tray	03 nos
16	Atterberg Limit Test Apparatus (Casagrande) set	02 set
17	Porcelain (Evaporating) dish	03 nos
18	Glass plate	03 nos
19	Permeability test apparatus set	01 set
20	1000ml glass Cylinders	03 nos
21	Stopwatch	03 nos
22	Thermometer	03 nos
23	Filter paper	5 Box
24	Standard and Modified proctor compaction test set (Mold, Manual rammer, Extruder)	02 set
25	Straight Edge	02 nos
26	Unconfined Compression Test Apparatus set	01 set
27	Core cutter apparatus set (Cylindrical core cutter, rammer,	02 set

	dolly)	
28	Palette knife	02 nos
29	Sand replacement apparatus set (Pouring cylinder, Calibrating container, Metal tray with a central hole)	02 set
30	Dry sand/ Ottawa Sand (Passing through 600µm sieve)	As required

### **RECOMMENDED BOOKS:**

SI	Book Name	Writer Name	Publisher Name & Edition
01	Soil Mechanics and Foundation Engineering	Punmia, B.C.	Laxmi Publication (P) Ltd., New Delhi.
02	A Text book of soil mechanics and foundation Engineering	Murthy, V.N.S.	CBS Publishers & Distributions Pvt. Ltd., New Delhi 2016
03	Geotechnical Engineering (Soil Mechanics)	Ramamurthy, T.N & Sitharam, T.G	S Chand and Company Ltd.
04	Geotechnical Engineering	Kasamalkar, B.J	Pearson India, New Delhi 2014

### **WEBSITE REFERENCES:**

SI	Web Link	Remarks
01	<a href="http://www.youtube.com">www.youtube.com</a>	Channel : 1. AKTU Digital Education, 2. atiqurrahman
02	<a href="http://www.google.com">www.google.com</a>	Search here with topics
03	<a href="http://www.whatisgeotech.org">www.whatisgeotech.org</a>	Search here with topics
04	<a href="http://www.nptelvideos.in">www.nptelvideos.in</a>	Search here with topics

<b>SUBJECT CODE</b>	<b>SUBJECT NAME</b>	<b>PERIOD PER WEEK</b>		<b>CREDIT</b>
<b>26446</b>	<b>HYDROLOGY</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>3</b>	<b>3</b>

<b>Rationale</b>	<p>Hydrology is an extremely important field of study, dealing with one of the most valuable resources on Earth water. All aspects of the Earth's available water are studied by experts from many disciplines, from geologists to civil engineers, to obtain the information needed to manage this vital resource.</p> <p>Thus, considering the importance above mentioned, this discipline has been included in the diploma level as a subject to be graduate in the sector. The syllabus includes concept of engineering hydrology, hydrology cycle, hydrometeorology, introduction to precipitation, measurement of precipitation, analysis and interpretation of rainfall data, stream flow measurement, evaporation and evapotranspiration, infiltration, rainfall and runoff relationship, hydrograph analysis and flood routing modules/contents, blue economy and Delta plan in Bangladesh to be studied in the teaching learning process.</p>
<b>Learning Outcome (Theoretical)</b>	<p><b>After undergoing the subject, students will be able to</b></p> <ol style="list-style-type: none"> <li>1. Mention elements of hydrologic cycle.</li> <li>2. Explain hydrologic cycle elements.</li> <li>3. Compare among rain, snow, hail, drizzle, sleet &amp; dew.</li> <li>4. Illustrate system elements.</li> <li>5. Mention the uses of hydrometeorology.</li> <li>6. Distinguish among the different types of precipitation.</li> <li>7. Interpret rainfall-runoff relationship.</li> <li>8. Analyze evaporation and evapotranspiration.</li> <li>9. Analyze hydrograph.</li> <li>10. Distinguish between measuring instruments and methods</li> <li>11. Analyze rainfall measurements and distribution</li> <li>12. Compare frequency analysis results derived from different methods</li> <li>13. Explain blue economy.</li> <li>14. Explain delta plan in Bangladesh.</li> </ol>
<b>Learning Outcome (Practical)</b>	<p><b>After undergoing the subject, students will be able to</b></p> <ol style="list-style-type: none"> <li>1. Measure Rainfall.</li> <li>2. Determine the intensity of rainfall.</li> <li>3. Prepare a rainfall map.</li> <li>4. Prepare rainfall mass curve.</li> <li>5. Determine relative humidity of air.</li> <li>6. Calculate temperature and pressure of air.</li> <li>7. Calculate the wind velocity and make wind rose diagram.</li> <li>8. Calculate stream flow and total discharge at a stream cross-section.</li> <li>9. Calculate evaporation rate.</li> <li>10. Observe the sky and predict the specific weather conditions.</li> <li>11. Prepare and present a field visit report.</li> </ol>

## **DETAILED SYLLABUS (THEORY)**

<b>Unit</b>	<b>Topics with Contents</b>	<b>Class (1 Period)</b>	<b>Final Marks</b>
1.	<b>Concept of engineering hydrology</b> 1.1 Define hydrology. 1.2 Mention the features of hydrology. 1.3 State the application of hydrology in Civil Engineering 1.4 Define hydrometrology, meteorology, climatology, potamology, limnology, cryology, glaciology, oceanology, hydrogeology, geohydrology, geomorphology and agronomy.	<b>02</b>	<b>05</b>
2.	<b>Hydrology cycle</b> 2.1 Describe hydrologic cycle. 2.2 Define Hydrologic Data and Measurement. 2.3 Discuss water Sheds and drainage basins. 2.4 Draw a descriptive representation of hydrologic cycle.	<b>02</b>	<b>03</b>
3.	<b>Hydrometeorology</b> 3.1 Define hydrometeorology. 3.2 Describe the instruments of hydro meteorological. 3.3 Mention the constituents of the atmosphere. 3.4 Describe the vertical structure of the atmosphere. 3.5 Describe solar radiation. 3.6 Describe the general circulation of the northern hemisphere. 3.7 Describe the triple cell circulation at the earth's surface. 3.8 Describe air mass, air front, cyclone, anticyclone, thunderstorm and tornado.	<b>03</b>	<b>06</b>
4.	<b>Introduction to Precipitation</b> 4.1 Define precipitation. 4.2 Describe the formation of precipitation. 4.3 Describe different types of precipitation. 4.4 Describe drizzle, rain, glaze, sleet snow, hail and dew. 4.5 Describe the climate and weather seasons in Bangladesh. 4.6 Describe the meteorological parameters and measurements.	<b>03</b>	<b>05</b>
5.	<b>Measurement of precipitation</b> 5.1 Describe the measurement method of precipitation. 5.2 Describe non-recording rain gauges. 5.3 State recording rain gauges. 5.4 Describe the tipping buckle rain gauge with sketch. 5.5 Describe the weighing buckle rain gauge with sketch. 5.6 Describe float type rain gauge. 5.7 Describe the radar measurement of rainfall. 5.8 Describe the satellite measurement of rainfall.	<b>03</b>	<b>06</b>
6.	<b>Analysis and interpretation of rainfall data</b> 6.1 Define rainfall data. 6.2 Describe the analysis and interpretation of rainfall data. 6.3 Describe the rainfall mass curve and rainfall hyetograph. 6.4 Describe the intensity frequency duration analysis of rainfall. 6.5 Describe the average depth of precipitation over an area. 6.6 Describe the annual rainfall in Bangladesh.	<b>02</b>	<b>05</b>
7.	<b>Stream flow measurement</b> 7.1 Define stream flow. 7.2 List the instruments of stream flow. 7.3 Describe the measurement of stage. 7.4 Describe the discharge measurement by area velocity method.	<b>03</b>	<b>06</b>

	7.5 Describe stage discharge relation. 7.6 Describe the selection of stream gauging site. 7.7 Explain stage and discharge hydrographic. 7.8 Mention the units of stream flow.		
8.	<b>Evaporation and evapotranspiration.</b> 8.1 Define evaporation, sublimation, transpiration and evapotranspiration. 8.2 Describe process of evaporation 8.3 Describe affecting factors of evaporation. 8.4 Describe the estimation of evaporation. 8.5 Describe the measurement of evaporation by atmometers. 8.6 Describe the measurement of evaporation by evaporation pans. 8.7 Describe the affecting factors the process of transpiration. 8.8 Describe the affecting factors of the evapotranspiration. 8.9 Describe the measurement of evapotranspiration.	03	05
9.	<b>Infiltration</b> 9.1 Define infiltration. 9.2 Describe the affecting factors of infiltration capacity. 9.3 Describe various types of infiltrometers. 9.4 Describe hydrograph analysis. 9.5 Describe infiltration equations. 9.6 Explain infiltration indices.	02	04
10.	<b>Rainfall and runoff relationship</b> 10.1 Define runoff. 10.2 Mention the unit of runoff. 10.3 Describe the factors affecting the runoff. 10.4 Describe the components of runoff. 10.5 Describe surface runoff. 10.6 Describe basin yield. 10.7 Relate between rainfall and runoff. 10.8 Describe the flow duration curve. 10.9 Describe the flow mass curve.	03	05
11.	<b>Hydrograph analysis</b> 11.1 Define hydrograph. 11.2 Describe the feature of hydrograph. 11.3 Describe the hydrograph separation. 11.4 Describe the unit of hydrograph theory. 11.5 Describe the derivation of unit hydrograph. 11.6 Describe distribution graph. 11.7 Describe the application of unit hydrograph.	02	04
12.	<b>Flood routing</b> 12.1 Define flood routing. 12.2 Mention the elements of flood routing. 12.3 Describe Types of flood routing. 12.4 Explain flood impact analysis. 12.5 Describe reservoir routing. 12.6 Describe channel routing.	02	02
13	<b>Blue Economy</b> 13.1 Define blue economy. 13.2 Explain major prospects of blue economy in Bangladesh. 13.3 Describe components of blue economy. 13.4 Mention the benefits of blue economy. 13.5 State the Promoting policy the blue economy in Bangladesh.	01	02



	136 Describe the impact of blue economy on the Economy in Bangladesh		
14	<b>Delta Plan</b> 14.1 State delta plan in Bangladesh. 14.2 Explain the importance of delta plan in Bangladesh. 14.3 Describe various hotspots (zone) in Bangladesh delta plan. 14.4 Describe different delta plan project in Bangladesh. 14.5 Mention the benefits of delta plan project in Bangladesh.	01	02
	<b>Total</b>	<b>32</b>	<b>60</b>

### **DETAILED SYLLABUS (PRACTICAL)**

Sl.	Experiment Name	Class (3 Period)	Marks (Continuous)
1.	Measure and determine the intensity of rainfall by rain gauge. 1.1 Collect rain Gauge 1.2 Observe rainfall 1.3 Measure rainfall 1.4 Measure intensity of rainfall 1.5 Maintain the record of performed task.	02	03
2.	Prepare a rainfall map from analysis and interpretation of rainfall data. 2.1 Collect rain Gauge 2.2 Observe rainfall 2.3 Measure rainfall 2.4 Collect graph paper and prepare rainfall map. 2.5 Interpret the rainfall data. 2.6 Maintain the record of performed task.	01	02
3.	Prepare a rainfall mass curve and rainfall hydrograph. 3.1 Collect rainfall data. 3.2 Calculate data with statistical tool. 3.3 Prepare graph paper and rainfall mass curve 3.4 Prepare rain fall hydrograph. 3.5 Maintain the record of performed task.	01	02
4.	Determine relative humidity of air. 4.1 Observe weather station monitor. 4.2 Identify relative humidity of air data. 4.3 Record time and RH result 4.4 Maintain the record of performed task.	01	02
5.	Determine temperature and pressure of air. 5.1 Observe weather station monitor. 5.2 Identify temperature and pressure of air data. 5.3 Record time and temperature and pressure. 5.4 Record highest & lowest temperature in specific period. 5.6 Maintain the record of performed task.	01	02
6.	Determine the wind velocity and make wind rose diagram. 6.1 Observe weather station monitor. 6.2 Determine the wind velocity 6.3 Record time, velocity & direction of air data. 6.4 Make wind rose diagram with data. 6.5 Maintain the record of performed task.	01	02
7.	Measure stream flow. 7.1 Visit a nearby river/stream. 7.2 Calculate the x-section area of river/stream	01	02

	7.3 Apply current meter or flow meters. 7.4 Observe the measurement flow at various points of water and record data. 7.5 Estimate the total flow rate. 7.6 Maintain the record of performed task.		
8.	Determine evaporation rate. 8.1 Collect evaporimeter. 8.2 Observe evaporation rate. 8.3 Determine evaporation rate. 8.4 Maintain the record of performed task.	01	02
9.	Visit a metrological station in Bangladesh and write a report. 9.1 Visit a metrological station. 9.2 Observe metrological station. 9.3 Prepare a Report as a Presentation. 9.4 Perform Presentation. 9.5 Maintain the record of performed task.	05	04
10.	Prepare a presentation on delta plan. 10.1 Visit a hotspots zone. 10.2 Prepare a Report as a Presentation. 10.3 Perform Presentation. 10.4 Maintain the record of performed task.	02	03
	<b>Total</b>	<b>16</b>	<b>24</b>

### **NECESSARY RESOURCES (TOOLS, EQUIPMENT'S AND MACHINERY):**

Sl	Item Name	Quantity
01.	Recording rain gauge	5 nos
02.	Weather station	1 set.
03.	Current meter/ Flow meter	5 nos

### **RECOMMENDED BOOKS:**

Sl	Book Name	Writer Name	Publisher Name & Edition
01.	A Text Book of Hydrology	Dr. P. Jayarami Reddi (1996)	Laxmi Publication (Pvt) Ltd, New Delhi.
02.	Hydrology	Raghunath HM (1985);	Wiley Eastern, New Delhi.
03.	Handbook of Applied Hydrology	Chow V.T. (1964)	McGraw-Hill Book Company, New York
04.	Applied Hydrology	Chow V.T, Maidment D.R and L. W Mays (1988)	McGraw-Hill Book Company, New York

### **WEBSITE REFERENCES:**

Sl	Web Link	Remarks
01.	<a href="http://www.youtube.com">www.youtube.com</a>	Search here with topics
02.	<a href="http://www.google.com">www.google.com</a>	Search here with topics

Subject Code	Subject Name	Period per Week		Credit
26521	WOOD WORKSHOP PRACTICE	T	P	C
		1	3	2

<b>Rationale</b>	<p>Wood Workshop practice is the backbone of the real Wood industrial environment. This subject will help to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and wood workshops. This course intends to impart basic know-how of various hand &amp; power tools and their use in different sections of furniture manufacturing. Irrespective of branch, the use of workshop practices in day to day industrials well domestic life helps to dissolve the problems. The workshop experiences would help to build the understanding of the complexity of the industrial job, along with time and skills requirements of the job. Workshop curricula build the hands on experiences which would help to learn manufacturing processes and production technology courses in successive semesters. Workshop practice is also important since only practice can make the man perfect. The subject covers only such topics which will enable the diploma engineers to identify and classify the different types of wooden joints, OSH &amp; Safety, Hand &amp; Power tools. The emphasis will be more on teaching practical aspect rather than theory.</p>
<b>Learning Outcome (Theoretical)</b>	<p>After undergoing the subject, students will be able to:  <b>OSH practice, Different types hand and power tools, Wooden joint and their uses.</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Describe OSH and Safety.</li> <li><input type="checkbox"/> Explain the measuring and marking tools.</li> <li><input type="checkbox"/> Mention different types of hand tools.</li> <li><input type="checkbox"/> Describe the different types of power tools.</li> <li><input type="checkbox"/> State procedure the different types of wooden joint.</li> </ul>
<b>Learning Outcome (Practical)</b>	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Apply OSH and safety.</li> <li><input type="checkbox"/> Uses of measuring, marking hand &amp; power tools.</li> <li><input type="checkbox"/> Show skill in sawing, planning and cutting of wood piece.</li> <li><input type="checkbox"/> Show skill in making different types of wood joint.</li> <li><input type="checkbox"/> Apply polish to wooden works.</li> <li><input type="checkbox"/> Prepare one complete job as project work.</li> </ul>

## Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	<b>OSH PRACTICES AND SAFETY IN THE WORKPLACE.</b>  1.1 Define OSH Practices. 1.2 Mention Safety Signs and symbols. 1.3 Mention personal protective equipment (PPE). 1.4 Describe the improving OSH performance are identified and raised with relevant personnel. 1.5 State the safety records according to workshop policies. 1.6 State the Importance of wood workshop OSH and safety. 1.7 Mention the wood workshop safety rules. 1.8 Describe the safety procedures when using wood working machines and tools.	3	6
2	<b>MEASURING AND MARKING INSTRUMENTS FOR WOOD WORKS.</b>  2.1 Define measuring and marking tools. 2.2 Mention the measuring and marking tools. 2.3 State folding rule, steel rule and steel tape. 2.4 State the marking Gauge, Mortise Gauge, Compass, Divider, Scriber or marking knife and Carpenter's vice. 2.5 State the measure and marking procedure of wood works. 2.6 State the Importance of the measurement and marking of wood works. 2.7 Describe the marking out tools in wood work. 2.8 Classify measuring and marking out tools. 2.9 Mention the uses of measuring & marking tools.	3	6
3	<b>WOOD WORKING HAND TOOLS.</b>  3.1 Mention common and basic hand tools required in carpentry works. 3.2 Classify the wood workshop hand tools. 3.3 State the basic hand tools required to undertake a simple carpentry works. 3.4 Describe the minor maintenance and sharpening of tools used for wood works. 3.5 Explain the safety procedure during working in the wood shop. 3.6 Describe the Clean work place and store tools and equipment. 3.7 Define the traditional wood working hand tools. 3.8 Explain the Dust collection and workshop vacuums.	3	6
4	<b>WOOD WORKING PORTABLE MACHINE.</b>  4.1 Mention wood working portable power tools. 4.2 List down the Essential power tools 4.3 Mention the uses of power tools. 4.3 Describe the different types of portable saw and planner machine. 4.4 Describe the different types of drill and sanding machine.	3	6

	4.5 Explain the procedure of nail gun, air gun, air-compressor, screw gun, lacquers spray gun. 4.6 Mention the Maintenance procedure of power tools machine. 4.7 Mention the sharpen procedure of power tools. 4.8 List down the different types of portable machine blade, saw and bits.		
5	<b>WOOD JOINT.</b>  5.1 Define wood working joint. 5.2 Mention the wood joints. 5.3 Mention the unique purposes of wood joints. 5.4 Introduction to various types of wooden joints, their relative advantages and uses. 5.5 Importance of wooden joint. 5.6 Mention the different strongest wood joint. 5.7 Methods of joining wood. 5.8 Explain the different Materials used for wood joint. 5.9 Describe the Polishing method for wooden work.	4	6
	<b>Total</b>	<b>16</b>	<b>30</b>

### **Detailed Syllabus (Practical)**

Sl.	Experiment name with procedure	Class (3 Period)	Continuou s Marks
1	<b>APPLY OSH PRACTICES &amp; SAFETY IN THE WORKPLACE.</b>  1.1 Check the OSH hazards and Safety in workplace. 1.2 Identify and corrective action for Hazards. 1.3 Make OSH hazards and incidents report in workplace. 1.4 Apply OSH practices in the workplace. 1.5 Select and worn personal protective equipment (PPE). 1.6 Identify Risks measure in the work area. 1.7 Show emergency response procedures in the workplace. 1.8 Maintain and improve health and safety in the workplace. 1.9 Maintain the record of performed job.	1	2
2	<b>PREPARE WOOD FOR WORK</b>  2.1 Select Wood and wood substitutes for performed job. 2.2 Check the quality of wood for as per work. 2.3 Take Dimension of wood work piece. 2.4 Use preservatives of wood. 2.5 Maintain the record of performed job.	1	3
3	<b>USE MEASURING TOOLS &amp; EQUIPMENT</b>  3.1 Select the Measuring tools and equipment. 3.2 Tolerance and clearance limit for performed job. 3.3 Taken Measurement according to drawing or specification. 3.4 Check Measurement against job requirement. 3.5 Clean & Store measuring instruments. 3.6 Dispose the Waste materials form the workplace. 3.7 Maintain the record of performed job.	1	2

<b>34</b>	<b>USE HAND TOOLS FOR WOOD WORKSHOP.</b>  4.1 Select the hand tools as per task. 4.2 Prepare Hand tools for work. 4.3 Check Hand tools 4.4 Repair unsafe or faulty tools. 4.5 Operate the Hand tools. 4.6 Clean and store Hand tools. 4.7 Maintain the record of performed job.	<b>1</b>	<b>2</b>
<b>5</b>	<b>USE POWER TOOLS FOR WOOD WORKSHOP.</b>  5.1 Select Power tools as per task. 5.2 Collect Power tools for work. 5.3 Check Power tools. 5.4 Identify unsafe or faulty tools. 5.5 Check the holding and clamping devices. 5.6 Operate the Power tools. 5.7 Clean and store Power tools. 5.8 Maintain the record of performed job.	<b>2</b>	<b>3</b>
<b>6</b>	<b>SAWING, PLANNING AND CUTTING OF WOOD PIECE.</b>  6.1 Select Sawing, Planning and Cutting machine according to job requirements. 6.2 Perform different types of sawing on different parts. 6.3 Follow safety procedures during sawing. 6.4 Identify the planning tools for required job. 6.5 Follow the procedure of planning. 6.6 Select the right size and types of cutting tools. 6.7 Observe the safe procedure for cutting. 6.8 Clean work place and equipments. 6.9 Maintain the record of performed job.	<b>2</b>	<b>3</b>
<b>7</b>	<b>MAKE DIFFERENT TYPES OF WOOD JOINT.</b>  7.1 Select appropriate size of wood used in the job. 7.2 Select tools and equipment for the specific job. 7.3 Put marking the wood for jobs.(As per Drawing). 7.4 Make Cross lap joint, Rabbet joint, Butt joint, Tongue and Groove joint, T-halving joint, Tenon & Mortise joint, Half lap dovetail joint, Corner dove tail joint. 7.5 Make hole in wood, counter shank and wood joint with screw and nailing. 7.6 Clean work place and equipments. 7.7 Maintain the record of performed job.	<b>2</b>	<b>3</b>
<b>8</b>	<b>APPLY POLISH TO WOODEN WORKS.</b>  8.1 Select common materials use in polish on wooden surface. 8.2 Select sand paper of different grads. 8.3 Perform sand papering on wooden surface. 8.4 Apply putty on wooden surface. 8.5 Show the procedure of polish. 8.6 Apply polish along the grain of wood. 8.7 Clean work place and equipments. 8.8 Maintain the record of performed job.	<b>2</b>	<b>2</b>
<b>9</b>	<b>APPLY THE BASIC RULES OF FREE HAND SKETCHING OF FURNITURE.</b>  9.1 Identify the required materials for free hand sketching	<b>2</b>	<b>2</b>

	9.2 Draw working drawing of the following furniture. A. Book self B. Armless chair C. Reading table D. Wooden Stool 9.3 Maintain the record of performed job.		
<b>10</b>	<b>PREPARE A COMPLETE JOB AS PROJECT WORK (SIMPLE WOODEN FURNITURE)</b>  10.1 Perform one of the following furniture with costing/ including finishing work (varnishing / Lacquer). A. Book self B. Armless chair C. Reading table D. Wooden Stool 10.2 Clean work place equipments. 10.3 Maintain the record of performed job.	<b>2</b>	<b>3</b>
	<b>Total</b>	<b>16</b>	<b>25</b>

### Necessary Resources (Tools, equipment's and Machinery):

SI	Item Name	Quantity
<b>01</b>	Wood Working Hand tools	--
<b>02</b>	Wood Working Power tools	--
<b>03</b>	Wooden Finishing materials	--

### Recommended Books:

SI	Book Name	Writer Name	Publisher Name & Edition
<b>01</b>	Principles of wood working	Herman Hjorth	--
<b>02</b>	Wood working hand tools	Mohammad Abdul Matin Howladar	BTEB
<b>03</b>	Wood working Drawing-I,II	Mohammad Abdul Matin Howladar	BTEB
<b>04</b>	Raw & Finishing materials	Mohammad Abdul Matin Howladar	BTEB
<b>05</b>	National certificate in furniture sector (Carpenter)	--	BTEB