

Subject Code	Subject Name	Period per Week		Credit
26411	CIVIL ENGINEERING MATERIALS	T	P	C
		2	3	3

Rationale	Civil Engineering diploma holders have to supervise construction of various types of civil works involving use of various materials like stones, bricks, sand, cement, lime, tiles, timber and wood based products, paints and varnishes, metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building material and skills introducing tests to determine suitability at materials for various construction purposes. In addition, specifications of various materials should also be known (PWD/BNBC) for effective quality control.
Learning Outcome (Theoretical)	After undergoing the subject, students will be able to • State different construction materials and their properties. • Interpret different type of stones. • Mention different types of bricks and Blocks. • Describe field and laboratory tests of stone, bricks, sand, and cement. • Illustrate different types of timber. • Discuss different type of defects of timber. • Explain paints/varnishes for various types of surfaces. • State and explain different types of Modern building materials such as ceramic, glass, metals and plastic, Tiles, Geo-Textile, Paint Insulating materials and chemical.
Learning Outcome (Practical)	After undergoing the subject, students will be able to 1. Identify the various types of stone. 2. Demonstrate laboratory test of stone. 3. Perform field test and laboratory test of Bricks. 4. Practice field test and laboratory test of Cement. 5. Observe field test and laboratory test of Sand. 6. Perform laboratory test of mild steel. 7. Identify the various types of wood and artificial wood.

DETAILED SYLLABUS (THEORY)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	CIVIL ENGINEERING MATERIALS 1.1 Define civil engineering materials. 1.2 Classify civil engineering materials. 1.3 List the name of different engineering Materials.	1	02
2	STONE 2.1 Define stones. 2.2 Classify stones. 2.3 List the characteristics of good stones for construction. 2.4 Describe the dressing of stones. 2.5 Explain the field test and Laboratory test of Stone. 2.6 Mention the uses of stone in civil engineering filed.	4	09
3	BRICK & HOLLOW BLOCK 3.1 Define bricks. 3.2 Mention the raw materials of Bricks and properties of good bricks making earth. 3.3 Explain the manufacturing of bricks. 3.4 Discuss the Size of Brick as per BNBC & PWD specification. 3.5 Illustrate the field test of bricks. 3.6 Interpret Bricks Compressive strength, Water absorption, Efflorescence, Dimensional tolerance Test (as per BNBC). 3.7 List the characteristics of Hollow Block, Solid block& ceramic brick. 3.8 Mention the uses, Advantage and disadvantage of hollow block Solid block and ceramic brick. 3.9 Explain the procedure of manufacturing of Hollow Block, Solid block& ceramic brick.	4	09

4	SAND 4.1 Classify sand according to their sources. 4.2 Describe the field test and Laboratory Test of sand. 4.3 Mention the use of various grades of sand.	2	05
5	CEMENT AND LIME 1.1 Define cement and lime. 1.2 Mention the Raw materials of cement & functions of various ingredients of cement. 1.3 Draw the Flow diagram of manufacturing process of cement. 1.4 Mention the properties and uses of ordinary Portland cement and Portland composite Cement. 1.5 Explain the testing of cement as per BNBC: Strength of Cement, Fineness by sieving, Consistency, Soundness, Setting times. 1.6 State special cement. 1.7 List the uses of special cement. 1.8 Explain storage process of cement. 1.9 List the uses of Lime.	4	09
6	TILES 6.1 Define clay, concrete, Plastic, Mosaic, Marble, Glazed, Homogenous and Vitrified tile. 6.2 Explain the uses of different kinds of tiles. 6.3 Explain the field test of tiles.	02	03
7	TIMBER & WOOD BASED PRODUCTS 7.1 Classify Exogenous and Endogenous trees and cross section. 7.2 Explain Teak, Shikari, Mohegan, Gamari, Teak Chambal, Mango timber. 7.3 Mention the market forms of converted timber as per PWD. 7.4 State seasoning and method of seasoning of Timber. 7.5 Define wood-based products. 7.6 Describe manufacturing process and uses of plywood. 7.7 Explain the Veneers. 7.8 Mention the use of laminated board, block board, fiber board, MDF and HDF board, melamine board and gypsum board.	03	05

	7.9 Discuss the necessity of boards in false ceiling and Dry wall system.		
8	GLASS 8.1 Mention the constituents of glass. 8.2 Define Plate, weird, Tempered, colored, fiber, formed and float glass. 8.3 Point out the uses of Plate, weird, Tempered, colored, fiber, formed and float glass. 8.4 Describe the properties and uses of glass.	03	03
9	PAINTS AND VARNISHES 9.1 Mention the purpose and uses of paints. 9.2 Explain Distemper, plastic paint, enamels paint, cement paint, weather coat paint, and easy clean paint for outside of the building. 9.3 State the uses of Distemper, plastic paint, enamels paint, cement paint, weather coat paint, and easy clean paint for outside of the building. 9.4 Describe the properties and uses of varnish and polish. 9.5 Explain the properties and the uses of lacquers.	02	02
10	METALS AND PLASTIC 10.1 List the common types of iron used in Construction. 10.2 Mention the uses of wrought iron and cast iron. 10.3 Classify steel on the basis of carbon content. 10.4 State the uses of the Mild, alloy and stainless steel. 10.5 Describe light metal (aluminum/white metal) construction material. 10.6 Mention the uses of aluminum as construction materials. 10.7 Compare between plastic and laminating plastic. 10.8 Mention the characteristics of thermoplastic and thermosetting plastic. 10.9 Illustrate the uses of plastic and laminating plastic.	03	05
11	INSULATING MATERIALS AND GEO-TEXTILES 11.1 Define insulating materials. 11.2 Make a list of insulating materials. 11.3 Explain sound and thermal insulation. 11.4 Mention the uses of insulating Material. 11.5 Illustrate geo-textiles.	02	04

12	CONSTRUCTION CHEMICALS & WATER PROOFING MATERIALS AND BITUMEN 12.1 Describe Construction chemicals/Admixture, PC based chemical and bitumen. 12.2 List of construction chemicals. 12.3 Mention the uses of construction chemicals. 12.4 Define water proofing Materials. 12.5 list water proofing materials. 12.6 Point out the uses of water proofing materials. 12.7 Mention the advantage of PC based Chemical. 12.8 Illustrate the use of Bitumen.	02	04
	Total	32	60

DETAILED SYLLABUS (PRACTICAL)

Sl.	Experiment Name	Class (3 Period)	Marks (Continuous)
1	CONDUCT FIELD TEST OF STONE 1.1 Observe Color. 1.2 Observe Structure and Texture. 1.3 Determine Weight. 1.4 Determine Hardness. 1.5 Determine Toughness. 1.6 Observe Abrasion Resistance. 1.7 Maintain the record of performed task.	1	2
2	CONDUCT LABORATORY TEST OF STONE 2.1 Perform LA Test. 2.2 Perform Bard's test 2.3 Perform Acid Test 2.4 Perform Smith's Test 2.5 Perform Strength Test 2.6 Maintain the record of performed task.	2	3
3	CONDUCT FIELD TEST OF BRICKS 3.1 Identif 1 st class, 2 nd class, 3 rd class bricks and jhama bricks 3.2 Determine Shape, Size and color. 3.3 Observe Soundness.	2	3

	3.4 Observe Hardness. 3.5 Maintain the record of performed task.		
4	CONDUCT LABORATORY TEST OF BRICKS 4.1 Perform Compression test 4.2 Perform Absorption test 4.3 Determine average weight of a brick. 4.4 Maintain the record of performed task.	2	3
5	CONDUCT LABORATORY TEST OF CEMENT 5.1 Make cement paste of Normal Consistency (CPNC). 5.2 Determine initial setting time. 5.3 Perform final setting time. 5.4 Perform compressive strength test. 5.5 Perform tensile strength test. 5.6 Perform fineness test. 5.8 Maintain the record of performed task.	3	4
6	CONDUCT FIELD TEST OF CEMENT 6.1 Observe Date of Manufacturing. 6.2 Observe Color. 6.3 Observe Temperature inside cement bag. 6.4 Observe Smoothness. 6.5 Observe Water Sinking 6.6 Observe smell of cement paste. 6.4 Maintain the record of performed.	2	3
7	CONDUCT FIELD TEST OF SAND 7.1 Observe Color. 7.2 Observe Texture. 7.3 Observe Salinity. 7.4 Observe Smoothness. 7.5 Maintain the record of performed	1	1
8	PERFORM LABORATORY TEST OF SAND 8.1 Create Bulking of sand. 8.2 Find FM of sand. 8.3 Determine Specific gravity of sand. 8.4 Maintain the record of performed task.	1	2

9	PERFORM TEST OF MILD STEEL 9.1 Perform Tensile strength Test. 9.2 Demonstrate Elongation Test. 9.3 Measure Diameter. 9.4 Perform Bend and Re-Bend Test. 9.5 Maintain the record of performed task.	1	2
10	OBSERVE WOOD AND ARTIFICIAL WOOD 10.1 Identify Veneers, Plywood. 10.2 Identify laminated board, Block board, Fiber board, Gypsum board. 7.3 Maintain the record of performed task.	1	2
	Total	16	25

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

SI	Item Name	Quantity
01	Oven	2 nos
02	Sieve set	5 nos
03	Balance	5 nos
05	Measuring Tape	5 nos
06	Hack Saw	5 nos
07	Chisel	5 nos
08	Trowel	5 nos
09	Bucket	5 nos
10	Pan	5 nos
11	Glass plate	5 nos
12	Stop Watch	5 nos
13	Cube Mould	5 nos
14	Vibrator	5 nos
15	Universal Testing Machine	2 nos
16	Fanel	10 nos
17	Brass	10 nos
18	Spatula	10 nos
19	Tensile strength testing machine for Cement	5 nos
20	Compressive Strength testing machine	5 nos
21	Los-Angeles Abrasion Test Machine	2 nos
22	Brick Cutting Machine	5 nos

23	Le Chatelier machine	5 nos
24	Vicat's Apparatus	5 nos
25	Briquette Mould	5 nos
26	Sample Bricks (1 st , 2 nd , 3 rd etc)	5 nos for each class
27	Sample Sand	As per Requirement
28	Sample Tiles	As per Requirement
29	Sample Stone	As per Requirement
30	Sample Lime	As per Requirement
31	Sample Cement	As per Requirement
32	Wood Based Product (Ply wood, Veneers, Laminated Board, Particle board etc.)	As per Requirement
33	Geo-Textiles	As per Requirement
34	Admixtures	As per Requirement

RECOMMENDED BOOKS:

Sl	Book Name	Writer Name	Publisher Name & Edition
01.	Engineering Materials	Gurcharan Singh	Delhi Standard Publisher Distributors.
02.	Engineering Materials	Sharma SK and Mathur	Delhi-Jalandhar, S. Chand and Co.
03.	A Text book of Engineering Materials	G.J. Kulkarni	
04.	Engineering Materials	Dr. M.A. Aziz	

WEBSITE REFERENCES:

Sl	Web Link	Remarks
01	www.youtube.com	Search here with topics
02	www.google.com	Search here with topics