



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma in Engineering

Level: Diploma

Branch: Civil Engineering

Course / Subject Code : DI01006021

Course / Subject Name : Construction Material

w. e. f. Academic Year:	2024-25
Semester:	1st
Category of the Course:	ESC -02

Prerequisite:	Students must have completed their 10th examinations from a recognized board with a minimum aggregate score. Proficiency in Mathematics and Science subjects is essential. Students have a keen interest in construction, infrastructure, and problem-solving skills.
Rationale:	Construction materials are pivotal in any construction project. Diploma civil engineers, also known as technologists, are consistently tasked with selecting materials for diverse construction engineering projects such as residential & commercial buildings, roads, metro railways, bridges, dams, tunnels, and flyovers. The evolution of advanced technology necessitates the adoption of new engineering materials. Choosing the appropriate material that is durable, cost-effective, and environmentally friendly presents a significant challenge for civil engineers. New materials enter the market regularly, prompting the development of modern techniques for their economical and safe use in engineering structures. At the diploma level, students are expected to study these aspects to enhance their understanding and develop performance-oriented skills for application in the construction industry.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
1	Develop conceptual knowledge in construction material.	R,U
2	Select appropriate natural construction material.	R,U,A
3	Select appropriate artificial construction material.	R,U,A
4	Select appropriate special type of construction material.	R,U,A
5	Select appropriate finishing and processed construction material for construction.	R,U,A

*Revised Bloom's Taxonomy (RBT)



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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
2	0	2	3	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Overview of Construction Material	04	14
	1.1. Scope of construction materials in Building Construction, Transportation Engineering, Environmental Engineering, Irrigation Engineering (applications only). 1.2. Selection of materials for different civil engineering structures on the basis of strength, durability, Eco friendly and economy. 1.3. Broad classification of materials – Natural, Artificial, special, finishing and recycled.		
2.	Natural Construction Materials	08	29
	2.1. Requirements of good building stone, general characteristics of stone. 2.2. Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber. 2.3. Asphalt, bitumen and tar used in construction, properties and uses. 2.4. Properties of lime, its types and uses. 2.5. Properties of sand and uses. 2.6. Classification of coarse aggregate according to size and its use.		
3.	Artificial Construction Materials	08	29
	3.1. Constituents of brick earth, Conventional / Traditional bricks, Modular and Standard bricks, Special bricks –fly ash bricks, Characteristics of good brick, Classification of burnt clay bricks and their suitability, Manufacturing process of burnt clay brick, fly ash bricks, Aerated concrete blocks. 3.2. Flooring tiles – Types and its uses. 3.3. Manufacturing process of Cement - dry and wet (only flow chart), types of cement and its uses.		



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	3.4. Pre-cast concrete blocks- hollow, solid, pavement blocks, and their uses. 3.5. Plywood, particle board, Veneers, laminated board and their uses. 3.6. Types of glass: soda lime glass, lead glass and borosilicate glass and their uses. 3.7. Ferrous and non-ferrous metals and their uses.		
4.	Special Construction Materials	04	14
	4.1. Types of material and suitability in construction works of following materials: Water proofing, Termite proofing; Thermal and sound insulating materials. 4.2. Fibers – Types –Jute, Glass, Plastic Asbestos Fibers. (only uses)		
5.	Processed Construction Materials	06	14
	5.1. Constituents and uses of POP (Plaster of Paris), POP finishing boards, sizes and uses. 5.2. Paints- whitewash, cement paint, Distempers, Oil Paints and Varnishes with their uses. (Situations where used). 5.3. Industrial waste materials- Fly ash, Blast furnace slag, Granite and marble polishing waste and their uses. 5.4. Agro waste materials - Rice husk, Bagasse, coir fibres and their uses. 5.5. Special processed construction materials; Geosynthetic, Ferro Crete, Artificial timber, artificial sand and their uses.		
	Total	30	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
29	42	29	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)



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References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publication
1	Construction Materials	Ghose. D. N	Tata McGraw Hill, New Delhi, 2014 ISBN: 9780074516478
2	Building Materials	Varghese, P.C.	PHI learning, New Delhi. 2014 ISBN: 8120328485
3	Engineering Materials	Rang Walla, S.C.	Charator publisher, Ahemdabad, 2015, ISBN: 9789385039171
4	Civil Engineering Materials	Somayaji, Shan	Pearson education, New Delhi, 2015 ISBN: 9788131766316
5	Engineering Materials	Rajput, R.K	S. Chand and Co., New Delhi, 2015 ISBN 8121919606
6	Engineering Materials	Sharma	PHI Learning, New Delhi, 2015 ISBN: 812032448X
7	Building Materials	Duggal, S. K.	New International, New Delhi, 2014 ISBN: 8122414354

(b) Open source software and website:

1. www.nptel.iitm.ac.in
2. <https://www.buildersmart.in>
3. <https://www.materialtree.com>
4. <https://www.buildmaadi.com>
5. <https://www.sciencedirect.com/journal/construction-and-building-materials>

Suggested Course Practical List:

Sr. No.	Practical	Unit No.	Approx. Hrs. Required
1	Conduct local market survey for common civil engineering materials to tabulate cost and quality.	1	2
2	Identification of different types of stones and lime.	2	2
3	Identify the various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report. (80, 40, 20,10 mm)	2	2



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4	Identify different types of Asphalt, Bitumen and Tar used in construction and prepare report about the specifications.	2	2
5	Identify the grain distribution pattern in given sample of teak wood in the laboratory and draw the various patterns. (along and perpendicular to the grains)	2	2
6	Measure dimensions of 10 bricks and find average dimension and weight. Perform field tests dropping, striking and scratching by nail and correlate the results obtained.	3	2
7	Identify different types of concrete blocks used in building construction and prepare report about the specifications.	3	2
8	Identify different types of flooring tiles such as vitrified tiles, ceramic tiles, glazed tiles, mosaic tiles, anti- skid tiles, cheered tiles, paving blocks and prepare report about the specifications.	3	4
9	Identify different types of Water proofing, Termite proofing; Thermal & sound insulating materials and prepare report about the specifications.	4	4
10	Identify different types of fibrous material used in construction and prepare report about the specifications.	4	4
11	Prepare mortar using cement and Fly ash or Granite/marble polishing waste in the proportion 1:6 or 1:3.	5	4
	TOTAL		30

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications	Exp. no.
1	Weighing balance	3,6,11
2	I.S Sieve set (Sizes- 80 mm, 40 mm, 20 mm, 10 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 μ , 300 μ , 150 μ) sieve shaker with adaptors	3
3	Steel tape, Portable Hammer	6,7,8
4	Oven, Digital Balance, tray	6
5	Spade, Pan (Ghamela), Trowel	11
6	Coarse Aggregate	3
7	Brick of standard size 230mm x 115mm x 75mm	6
8	Teak wood	5
9	Asphalt, Bitumen and Tar	4
10	Concrete block	7
11	Vitrified tiles, ceramic tiles, glazed tiles, mosaic tiles, anti- skid tiles, cheered tiles, paving blocks	8
12	Fly ash or Granite/marble polishing waste	11
13	Ordinary Portland cement	11



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Suggested Project List:

1. Green Building material: Prepare a report suggesting replacement of at least 10 nos. of conventional building materials with Green building materials and justify it in terms of cost and environmental impact.
2. Acoustic Material: Prepare a report on application of acoustic materials and present with portfolio of sample materials.
3. Refractory Material: Prepare a report on application of refractory materials and present with portfolio of sample materials.
4. Collect the market rates for following construction materials from various dealers/suppliers of local market for different brands.
 - 4.1. Bricks
 - 4.2. Stone/aggregate (20 mm, 40 mm and 80 mm)
 - 4.3. Teak wood
 - 4.4. Flooring tiles
 - 4.5. Ordinary Portland Cement
 - 4.6. Oil paint
 - 4.7. Cement Paint
 - 4.8. Plaster of Paris
 - 4.9. Plastic paints
 - 4.10. Recent types of paint
5. Download the IS 456 and IS 800 and attach the printout for following materials.
 - 5.1. Steel section (I-section and ISA)
 - 5.2. Mortar of proportion 1:6 and 1:4
 - 5.3. Cement concrete mix of 1:2:4, 1:3:6 and 1:4:8
6. Collect the technical brochures of following construction materials.
 - 6.1. Ordinary Portland Cement
 - 6.2. Vitrified flooring tiles
 - 6.3. Particle boards used for aluminum partitions.
 - 6.4. Paints
7. Undertake a market survey for the cost and technical specification of different brands of following construction Materials and prepare comparison chart.
 - 7.1. Cement
 - 7.2. Tiles
 - 7.3. Glass
 - 7.4. Paints



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Suggested Activities for Students:

1. Undertake a market survey of different construction materials and compare the following points.
 - a. Structure
 - b. Properties
 - c. Applications
2. Collect samples of alternative Green building material and prepare a report.
3. Undertake a market survey from local dealers for procurement of civil engineering material.
4. Perform test on given sample of fine aggregate. Sieve analysis, Silt and clay content.
5. Select first class, second class and third-class bricks from the stake of bricks and prepare report on the basis of its properties.
6. Perform lab tests on given sample of cement Initial and final setting time, Compressive strength.
7. Prepare the cement mortar of proportion 1:3 or 1:6 using artificial sand as a special processed construction material.
8. Inspect the various activities related to construction material at sites of different civil structures.
9. Teacher guided self-learning activities.
10. Course/library/internet based mini-projects.
11. Literature survey of available at institute library regarding construction material used for different purposes and situations.
12. Develop Power point presentation or animation for demonstrating laying and fixing the construction materials.
13. Seminar on any relevant topic related to construction materials.

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