GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma in Civil Engineering

Semester: 3

Subject Code
Subject Name MATERIALS TECHNOLOGY

Sr. No.	Course content
1.	**Introduction :** 1.1 Aspects of study of various Civil engg. materials viz. *Engg. properties *Uses *tests *selection 1.2 Various materials used in Civil engg. constructions 1.2.1 List the materials used 1.2.1 Explain their physical, chemical & mechanical properties 1.3 Parameters to be considered while selecting appropriate alternative materials.
2.	**Clay Products :** 2.1 Classification of clay products 2.1.1 Various types of clay products commonly used in construction works such as : * Bricks * Roofing tiles * flooring files * stonewares * sanitarywares * porcelain 2.1.2 Significant uses of each clay product 2.2 Standard requirements of quality bricks as per I.S. like * size * water absorption * shape * colour * texture * compressive strength 2.3 Selection of brick by conducting field tests for * size & shape * colour * texture * sound * strength (by dropping) 2.4 Forms of special bricks 2.4.1 Various types of special bricks 2.4.2 Explain various situations where they are used 2.4.3 Purpose of using special forms of brick 2.5 Refractory bricks : * Acid bricks * Basic bricks * Neutral bricks 2.5.1 Give minimum two examples of each type 2.6 Manufacturing process of bricks 2.6.1 Steps in manufacturing brick 2.6.2 Ingredients of brick 2.6.3 Various brick manufacturing processes 2.7 Advantages of bricks over stones as a construction material 2.8 Glazing 2.8.1 Purpose of glazing clay products 2.8.2 Various types of glazing
3.	**Stones:** 3.1 Classification of rocks *igneous *sedimentary *metamorphic

	3.2 List some important stones used in construction like : *granite *basalt *trap *lime stone *sand stone *marble *slate *kotah stone *flag stone 3.3 Deserибe characteristics of each type given above with resepct to : *structure *texture *strength & gravity *porosity & absorption *Hardness & toughness *durability *appearance *weight *resistance to natural elements (chemical & weathering effects) *ease of working 3.4 State suitable use of each type of stone listed above (considering main purpose) 3.5 Preservation of stones: *necessity *materials used as preservative 3.6 Explain the terms : *natural bed of stone *plane of cleavage 3.7 Quarrying of stones : *necessity of quarrying *various methods like heating, wedging, blasting etc.
4.	**Lime :** 4.1 Define the terms : *calcination *quick lime *slaking *setting *hydraulicity 4.2 Types of lime according to actions like *setting *slaking 4.3 Functions of various types of lime (in mortar, concrete, white washing etc.) 4.4 Differentiate : Fat lime & hydraulic lime 4.5 Suggest suitable types of lime for the following situations : *mortar for masonry work *thin walls & thick walls *mortar for plastering *white washing *lime coba on roofs & floors *BBLC in foundation 4.6 Methods to improve hydraulicity & setting properties of fat lime
5.	**Materials for cement concrete :** Ingredients of cement conerete : 5.1 Cement : 5.1.1 Cement as a binding material- main function. Compare it with hydraulic lime with resepct to : slaking, setting & binding properties. 5.1.2 Raw materials for manufacturing cement 5.1.3 Classify various types of cements and mention their specific use. 5.1.4 State the situation in which the following types of cement are recommended for use: *ordinary portland cement (OPC) *Rapid hardening cement *Quick setting cement *High alumina cement *Low heat portland cement *Air entraining cement *Pozzolana cement *white cement *Hydrophobic cement *slag cement *coloured cement 5.1.5 Commerical requirements of OPC as per I.S.-269 & I.S.-600 5.1.6 Methods of storing cement & importance of freshness of cement

	5.1.6.1 Precautions to be taken while stroing cement 5.1.7 Use of admixtures 5.1.7.1 Types of admixtures used and their effects on workability, strength, economy etc. 5.1.7.2 Various factors to be considered while suggesting 5.1.7.3 Pozzolana- various types & their properties 5.1.8 Test for cement - and its necessity *various tests conducted -initial setting time test -final setting time test -soundness test etc. Coarse aggregates (Kapachi) 5.2.1 Varities of coarse aggregates. I.S.- 2720 classification. 5.2.2 Size requirements as per I.S.-456 5.2.3 Use of coarse aggregates for general & specific purpose 5.2.4 Use of round & square irregular coarse aggregates 5.2.5 Tests on coarse- aggregates *abrasion test *impact test 5.3 Fine aggregates (Sand) 5.3.1 Types of fine aggregates. I.S.-2720 classification 5.3.2 Size requirements as per I.S.-456 5.3.3 Use of fine aggregates for general & specific purpose 5.3.4 Tests on fine aggregates *grading *sieve analysis *bulking *silt & clay content
6.	**Timber and timber products :** 6.1 Various uses of timber as construction material 6.2 Merits & demerits of using timber 6.3 Distinguish : soft wood & Hard wood -its recognision by visual inspection 6.4 Seasoning of timber 6.4.1 Advantages of seasoning 6.4.2 Methods of seasoning with advantages & disadvantages 6.5 Defects in timber 6.5.1 Classify defects including structural defects 6.6 Preservation of timber 6.6.1 Necessity of applying preservatives 6.6.2 List types of preservatives used 6.6.3 Describe various methods of its application 6.6.4 Method of making it fire retardant by applying chemical 6.7 Forms of timber 6.7.1 Classify various forms viz. *log *post *plank *board *batten *scantling etc. 6.8 Engg. uses of different types of timber 6.9 Reconstructed woods 6.9.1 State various types of artificial wood available in the market 6.9.2 Deserибe uses of various types of timber products in construction works
7.	**Steel products:** 7.1 Introduction : Types of ferrous metals and their properties in brief.

	7.2 Structural properties of steel 7.3 Designations & uses of different steel sections for the given situation. 7.4 Advantages of deformed bars over M.S. bars 7.4.1 Compare the yield strength 7.5 Appropriate steel of different diameter & grades for the given purpose or situation 7.6 Special purpose steels (new varities)
8.	**Miscellaneous materials :** Classification, properties and engg. uses of following materials: 8.1 Plastics and PVC (high density) 8.2 Asbestos- sheets, pipes & paints as used in industry 8.3 Glass as used in building industry 8.4 Bituminous materials- their content & origin *Asphalt, tar, bitumen - their specific uses. *Compare their properties 8.5 Adhesives - organic & synthetic 8.6 Paints & varnishes -*necessity of its application*requirement of good paint 8.7 Porcelein materials 8.8 Fire proofing materials 8.9 Insulating materials 8.9.1 Accoustic (sound insulation) materials 8.9.2 Thermal insulating materials (Glass wool)

LABORATORY EXPERIMENTS :

(A) Laboratory tests :

(i) Bricks :
* Field tests for size, shape and soundness
* Compressive strength of bricks
* Water absorption test for bricks

(ii) Course aggregrates :
* Abrasion test on aggregate
* Impact test on aggregate

(iii) Fine aggregrates :
* Sieve analysis of aggregrate and Grading of sand
* Bulking of sand, silt and clay content

(iv) Steel :
* Tensile strength of M.S bar
* Tensile strength of H.T.steel

(v) Cement :
* Initial setting time of cement
* Soundness test of cement

Note : Prepare comprehensive test reports for the above laboratory tests by giving justifications for acceptance or rejection of the material.

(B) Local Market survey : Conduct local market survey for different materials/ products available for the given job regarding cost, quality, suitability, availability and finally selection of best suitable material for the job/item.

List of materials for market survey :

* Clay products	* Plastics/PVC
* Lime/cement	* Paints/varnishes/ adhesives
* Timber/timber products	* Glass/porcelene
* Steel and iron	* Fire proofing/accoustics/ insulating products

(Atleast one material/product from each of the above list)

Note :

* Make preliminary preparations prior to visit/ market survey
* Prepare a Questionnaire for the planned visit/market survey for students & give a copy of the same to each student after the visit or market survey.

Reference Books:

1. Engineering Materials — Dr. Janardan Jha
2. Materials of Construction — A.K.Roy Chaowdhary
3. Engineering Materials — Agrawal & Arora
4. Engineering Materials — P.D.Kulkarni
5. Engineering Materials — Vazirani & Chandola
6. Engineering Materials — S.C.Rangwala
7. Relevant IS of each material be referred