

# GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD

## CERAMIC MATERIALS

### 1. RATIONALE

Technicians of Ceramic Technology are expected to work most in the ceramic industries. They dealt with production of ceramic products. Hence they will be well versed with the various materials like clays, felspar, quartz, bauxite etc. used in the ceramic industries.

### 2. SCHEME OF TEACHING AND ASSESSMENT:

SR NO.	TOPICS	LECT.	PRACT.	TOTAL	% WEIGHTAGE
1.	Elements of mineralogy	4	2	06	05
2.	Clay mineralogy	4	6	10	15
3.	Winning of clays	6	4	10	10
4.	Whiteware materials	4	4	08	10
5.	Clays for structural products	3	2	05	08
6.	Refractory materials	3	2	05	10
7.	Glass materials	4	2	06	12
8.	Enamels	4	2	06	10
9.	Cement lime and plaster	6	4	10	10
10.	Abrasives	4	2	06	10
	Total	42	28	70	100

### 3. OBJECTIVES

1. Know the mineralogy.
2. Know the various ceramic materials.
3. Know the contents and composition of materials.
4. Know the occurrences of raw materials.
5. Know the suitability to select the raw materials.
6. Know the winning and mining process of raw materials.
7. Know the properties and uses of raw materials.
8. Know the types of tests to be carried out for testing the raw materials

### 4. TOPICS & SUB TOPICS

#### Topic 1. Elements of mineralogy

- 1.1 Introduction to mineralogy

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1.2 Study of simple common rock forming minerals such as :

- (i) Quartz
- (ii) Felspar
- (iii) Ferro magnesium sillicates
- (iv) Amphiboles pyroxenes
- (i) Olivins
- (ii) Feldspatheida mica

### **Topic 2. Clay mineralogy**

- 2.1 Details of clay mineral groups, Kaolinite, Illite, Montmorillonite, Chlorite, Vermiculite, serpentine, Ball clay.
- 2.2 Atomic and molecular structures of above mentioned clay groups.
- 2.3 Physical properties of clay minerals such as elasticity, plasticity, swelling capacity, ion exchange, shrinkage, drying strength etc.

### **Topic 3. Winning of clays**

- 3.1 Methods for winning ceramic materials from earth.
- 3.2 Methods of mining such as open pit, underground etc.
- 3.3 Use of mining machinery.
- 3.4 Use of conveying machinery and storage and benification

### **Topic 4. Whiteware Materials.**

- 4.1 White burning clays such as China clay, kaolin, ball clay, fire clay
- 4.2 Stony matter such as felspar, quartz, zinc oxide, lead oxide, zirconium silicate
- 4.3 Opacifiers, colourants and glaze oxides, zirconium oxides, talc, pyrophyllite, nepheline syenite etc.

### **Topic 5. Clays for structural products.**

- 5.1 Red burning clays, Silts, Black cotton soil.
- 5.2 Ochres.

### **Topic 6. Refractory Materials.**

- 6.1 Fire clay bauxite, diaspore, sillimanite and andalusite
- 6.2 Mullite, alumina, zirconia, zircon, high temperature oxides, carbonates nitrides.

### **Topic 7. Glass materials.**

- 7.1 Silica sand, sand stone, lime, calcite, dolomite, feld spar.
- 7.2 Soda ash, sodium nitrate, red lead colourants and other minor ingredient.

### **Topic 8. Enamel.**

- 8.1 Ferrous and nonferrous materials used in enamel making
- 8.2 Materials used for enamel frit making with their properties and use

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### Topic 9. Cement, lime and plasters.

9.1 Lime stone sand and clays

9.2 Gypsum, types of gypsum, properties and uses

### Topic 10. Abrasives.

10.1 Raw materials used for making abrasives like bauxite, corundum Carborundum

10.2 Naturally occurring emery and silica used as abrasives

## 5. LABORATORY EXPERIENCES

	hrs.
1. To study the physical properties of the minerals.	6
2. To study the occurrences of ceramic raw materials in Gujarat state.	4
3. To study the physical properties of clays.	4
4. To study the physical properties of kyanite, andalusite, chromite, bauxite, graphite.	6
5. To study physical properties of gypsum, olivine, argite, microline, felspar, various forms of felspar, quartz and silica bearing raw materials.	4
6. To study the physical properties of talc, asbestos, calcite, corundum, and mica.	4
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	28

## 6. REFERENCES

1. Refractory Materials by A.B.Searle
2. Ceramic Raw Materials by M.L.Mishra
3. Modern Pottery Manufacturing by H.N.Bose
4. Industrial Ceramics by Singer & Singer