GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3133603
Semester – III

Subject Name: Introduction to Glass & Ceramics -I

Type of course: Professional Core Course

Prerequisite: The students should have a clear concept on basic chemistry, geology and Mineralogy that will help them to have an easy grasp of the subject.

Rationale: The main objective of this subject is to offer an overview over the fundamentals and basics of glass and ceramic materials, the raw feed materials for batch preparation, their availability, their properties, their beneficiation processes, process of recovery and their application.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	0	4	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	**Natural raw materials:** Structure & properties of silicates, various clays, alumino-silicates, mica, talc, Properties of non – plastic materials, Polymorphic forms of SiO_2 & their transformation, Properties, composition, thermal effects, uses of natural materials such as pyrophillite, talc, sillimanite minerals, zircon etc.	**10**
2	**Plastic raw materials:** Classification of clays, composition, particle size & shape of clays, flocculation & deflocculation, plasticity etc. Major deposits of clays for ceramic industry.	**7**
3	**Refractory materials:** Properties & deposits of materials such as Bauxite, Magnesite, Dolomite, Limestone, Graphite etc.	**7**
4	**Fluxing agents:** Composition, availability & properties of different fluxing agents such as Nepheline Syenite, Bone ash, Wollastonite etc.	**7**

5	**Synthetic raw materials:** Properties , characteristics, importance & synthesis of important raw materials such as Al_2O_3, TiO_2, Barium titanate, Sodium aluminum silicate, ZrO_2, Fumed silica etc.	**10**
6	**Importance of Physical properties:** Particle shape, size, porosity, density & other physical properties.	**5**

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
19	**36**	**13**	**11**	**11**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Elements of ceramics ,Norton F.H, Longman higher education, 2nd Ed, 2001
2. Introduction to ceramics, Barsoum, Institute of Physics Publishing (gb) 2002
3. Introduction to Ceramics, Kingery W.D,. Wiley New York :, 2nd Ed, 1976
4. Material Science ,Smith, Mcgraw Hill Higher Education, 4th Ed,2005
5. Industrial ceramics ,Singer & Singer, , Oxford &Ibh (From Technip), 1st Ed.,2008
6. Textbook of physical Geology ,Mukherjee, , CBS Publishers & Distributors-New Delhi 1st Ed.,2011
7. Textbook of Mineralogy, Tyrrel. W, CBS Publishers & Distributors, 4th Ed.,2006
8. Textbook of Geology, J B Mahapatra, CBS Publishers & Distributors, 2nd Ed. ,2008

Course Outcomes:

Sr. No.	**CO statement**	**Marks % weightage**
CO-1	To identify the differences in the variety of structure of various silicates and its modifications in various raw materials.	16
CO-2	To determine batch composition for different glasses and ceramic products for batch design	17
CO-3	To analyze the knowledge and skills for the preparation of other related highly technical subjects in the Glass & Ceramic Technology course	17

	curriculum	
CO-4	To formulate various crystal structure of ceramic materials, silicate materials	17
CO-5	To ascertain the role of an engineer on how to assess the ceramic materials based on their impurity content, grain size, crystallinity etc.	17
CO-6	To correlate the knowledge of this subject with the vast domain of ceramic materials	16

List of Open Source Software/learning website:

1. NPTEL
2. MIT Open course lecture available on Internet etc
3. Delnet