

**GUJARAT TECHNOLOGICAL UNIVERSITY**

**CHEMICAL TECHNOLOGY (36)**

**ADVANCED CERAMICS**

**SUBJECT CODE: 2183612**

**B.E. VIII<sup>th</sup> SEMESTER**

**Type of course:** Chemical Technology

**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 and GC09.

**Rationale:** The main objective of this subject is to offer an overview over the fundamentals and basics of advanced Ceramic materials, typical concepts of materials science, engineering materials and their application.

**Teaching Scheme:**

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M) PA ALA		ESE (V) ESE OEP		PA (I)		
4	0	0	4	70	20	10	0	0	0	100

**Content:**

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
1	<b>Engineering Ceramics</b> : Carbides : Boron carbide, Silicon carbide, Titanium carbide, Zirconium carbide, Hafnium carbide & Uranium carbide. Nitrides : Boron, Silicon & Aluminium nitrides. Silicides : Molybdenum disilicide. Borides. Sialon. Graphites. Cermets & Composites.	10	20
2	<b>Ceramics used in advanced applications:</b> Nuclear energy, Magneto- hydrodynamic generation, Gas turbine blades, Abrasives, Aerospace, Diesel engines, Heat Exchangers, Cutting Tools, Wear Applications	10	20
3	<b>Ceramics for Medical and Scientific products:</b> Tissue attachment mechanism, Bio- active materials, nearly inert crystalline ceramics, porous ceramics, bioactive glass and glass ceramics, calcium phosphate ceramics, carbon base implant materials, ceramics for dental applications	10	20

4	<b>Ceramics for optical applications:</b> CRT and TV picture tubes, Telecommunication and related uses, Information display, Laser, Fibre optics, Electromagnetic windows.	10	20
5	<b>Ceramics in Electrochemical cells:</b> Sodium sulphate cell (with $\beta$ – alumina), Electrical ceramics for fuel cell and high energy batteries.	10	20

**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
<b>18</b>	<b>32</b>	<b>19</b>	<b>7.5</b>	<b>7.5</b>	<b>-</b>

**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. Ceramic Materials for Electronics : R.C Buchanon
2. Electronic Ceramics : B.C.H Steele
3. Ceramics & Glass (vol. 4) ASM International

**Course Outcome:** After learning the course the students should be able:

1. To express their technical knowledge over fundamentals of the subject.
2. To be able to utilize their knowledge and skills for the preparation of other related highly technical subjects in the Glass & Ceramic Technology course curriculum
3. To be able to apply this knowledge in their higher study, research work with related technical subjects.
4. To build a bridge between theoretical and practical concept used in industry.

**List of Open Source Software/learning website:**

1. Literature available on internet
2. Glass & Ceramic dictionaries
3. Delnet
4. Literature available under R&D in Ceramic & Glass industry.
5. Ceramic & Glass journals

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide.