GUJARAT TECHNOLOGICAL UNIVERSITY

NANO TECHNOLOGY (39)

NANO CERAMIC AND APPLICATIONS
SUBJECT CODE:2153902
B.E. 5th SEMESTER

Type of course: Material Science

Prerequisite: Basics of material science and fundamental of physics and chemistry

Rationale: The purpose of this course is to develop understanding of nanoparticles behavior in ceramic materials for various applications.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**INTRODUCTION:** oxide and non-oxide ceramics, their chemical formulae, crystal and defect structures, non-stoichiometry and typical properties	12	19%
2	**NANO-CERAMICS:**Basic principles, preparation and applications	12	18%
3	**TRANSPARENT CERAMICS, COATINGS AND FILMS:** Preparation and applications	13	20%
4	**MECHANICAL BEHAVIOUR:** Fracture mechanics	13	20%
5	**ELECTRICAL BEHAVIOUR:** Insulating (dielectric, ferroelectric, piezoelectric, pyroelectric) semiconducting, conducting, superconducting and ionically conducting, specific materials and their applications.	14	23%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
18	**17**	**28**	**7**	--	--

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. FUNDAMENTAL OF CERAMICS by Michel W. Barsoum, McGraw Hill International edition, 1997
2. MODERN CERAMIC ENGINEERING by David. W. Richerson, Mercel Dekker, NY 1992
3. CERAMIC PROCESSING AND SINTERING by M. N. Rahman, Mercel Dekker, 2003
4. HANDBOOK OF ADVANCED CERAMICS by S. Somiya, Academic Press 2003
5. HANDBOOK OF ADVANCED CERAMICS, Parts 1 and 2, S. Somiya, Academic Press, 2006

Course Outcome:

After learning the course the students should be able to:

1. Understand oxide and non-oxide ceramics and their typical properties
2. Understand nano- ceramics their basic principles, preparation and applications.
3. Introduced with Transparent ceramics, ceramic coatings, and ceramic thin films,
4. understand preparation and applications of Transparent ceramics.
5. Understand mechanical and electrical behavior of ceramic and nano ceramics.

List of Open Source Software/learning website:

1. **www.virtual.itg.uiuc.edu**

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. The best three works should submit to GTU.