

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE			
Course Title	Ceramic Materials		
Course Code	MTPE11	No. of Credits	03
Department	MME	Faculty	Dr.N.RameshBabu
Pre-requisites Course Code	Nil		
Course Coordinator(s) (if, applicable)	NA		
Other Course Teacher(s)/Tutor(s) E-mail	NA	Telephone No. Email	3464 nrb@nitt.edu
Course Type	Elective course		
COURSE OVERVIEW			
<p>Ceramic Materials is an important programme elective course for B.Tech Metallurgical and Materials Engineering. There is no prerequisite to register for the course. This course is intended for introducing the structure, properties, and processing of ceramic materials. An understanding of the material's behavior, the mechanism responsible for their behavior, the effect of composition, structure, and external environment on the properties of the materials, and the development of materials for different applications will be discussed.</p>			
COURSE OBJECTIVES			
<p>To study the fundamentals (structure, properties, and processing) of ceramic materials to understand its advantages and limitations and to apply those fundamentals for selecting and developing ceramic materials for different engineering applications.</p>			
COURSE OUTCOMES (CO)			
Course Outcomes	Aligned Programme Outcomes (PO) (Enter Numbers only)		
<p>Upon completion of this course, the student will be able to:</p> <p>Know the structure and properties of different ceramic materials</p>	[1, 2, 3, 5, 12]		

Understand the phase diagrams and comprehend the phase transformations in ceramic materials	[1, 2, 3, 5, 12]
Understand the testing methods for evaluating the mechanical properties of ceramic materials	[2, 5, 11]
Understand and design the electrical, magnetic and optical properties of ceramic systems	[1, 2, 3, 11]
Select ceramic materials and to develop new ceramics for different engineering applications	[1, 3, 10, 12]

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week	Topic	Mode of Delivery
1.	I-III	Ceramics as a class of engineering materials; general characteristics of ceramics; classification of ceramics; production of ceramic powders; bonding in ceramic Materials, variations in properties as a function of bonding; the concept of co-ordination number, the ratio of ionic radii, and corresponding crystal structures of oxides, silicates, other non-oxide ceramics, the theoretical density of ceramics, polymorphism in ceramics.	Online classes, VC Mode PPTs
2.	IV-VI	Defects in crystalline ceramics, non-stoichiometry, Kroger-Vink notations, the significance of defects with respect to applications; Glasses: types, structure, bridging and non-bridging oxygen, the significance of oxygen to silicon ratio, commercial oxide glasses, devitrification; Introduction to glass–ceramics, and tempering of glasses.	
3.	VII-IX	Introduction to ceramics processing, densification methods, the theory of sintering, crystalline and non-crystalline phases in ceramic microstructures; mechanical properties of ceramic materials and testing of ceramic materials;	

4.	X-XII	Toughening Mechanisms. Electrical, magnetic, and optical properties of important ceramic systems, correlation of properties with structure	
5.	XIII-XV	Classification of refractories, characteristics of refractories. Production of refractories, properties, and applications of various refractories. Ceramics for sensor applications, Introduction to bio-ceramics and bio-glass. Applications of bio-ceramics	

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assignment -I	V	1 hour	20
2	Mid test	VIII week	2 hours	30
3	Assignment -II	XI/XII week	1 hour	20
	Retest	XIII week	1.5 hour	30 If any student misses the mid-test for medical reasons
4	End semester exam	After XV week	2 hours	30

ESSENTIAL READINGS : Textbooks, Reference books, Website addresses, Journals, etc

1. Richerson D. W., 'Modern Ceramic Engineering - Properties Processing and Use in Design, 3rd Edition, CRC Press, 2006
2. Chiang Y.M., Birnie D. P., Kingery W.D., Physical Ceramics: Principles for Ceramic Science and Engineering, John Wiley, 199
3. Kingery W. D., Bowen, H. K., Uhlhmen D. R., 'Introduction to Ceramics', 2nd Edition, John Wiley, 1976
4. James E. Shelby., 'Introduction to Glass Science and Technology' 2nd Edition, The Royal Society of Chemistry Publications, 2005 Journal of Americal Ceramic Society (published by American Ceramic Society).

5. Ceramics International (Journal published by Elsevier)
6. Progress in Materials Science (Journal published by Elsevier)
7. Transactions of the Indian Ceramic Society (published by Taylor and Francis)

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

The student's feedback will be assessed based on the questionnaire prepared by the Institute and the expected attainment to be greater 80%. The feedback collected from the students by the Institute is to be informed to the teacher to improve the course content and delivery.

COURSE POLICY

(Including plagiarism, academic honesty, attendance, grading, etc.)

1. No grade will be awarded for attendance and there is no specific % attendance requirement for writing the semester examination. The students are advised to attend all the classes except for medical reasons. Students are advised to meet the institute requirements for % attendance.
2. The relative grading policy will be followed and the passing minimum marks will be fixed based on Institute guidelines.

ADDITIONAL COURSE INFORMATION

Students can contact the Course Coordinator at any time through email/phone. The Course Coordinator is available for consultation by appointment through email/phone. The Course Coordinator email id/phone number are available in this course plan.

For senate consideration



Course Faculty



Class Committee Chairman



HOD/MME