GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Ceramic Technology

Course / Subject Code: DI01052021

Course / Subject Name: Introduction to Ceramics

w. e. f. Academic Year:	2024-25
Semester:	1st
Category of the Course:	ESC-02

Prerequisite:	**NA**
Rationale:	This course is intended for those studying ceramics for the first time and is a Comprehensive introduction to the Ceramics. Students will explore how aesthetics, Function, society and culture have influenced historical and contemporary ceramics. Introduction to ceramics is the backbone of the ceramic engineering course. The students are advised to undergo each skill experience with remembrance, understanding and application with special emphasis on attitude of enquiry to know why and how for the Various instructions and practices imparted to them in this course.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Distinguish various branches of ceramics.	R,U
02	Define history and scope of ceramics.	R,U
03	Explain uses of different types of ceramic products.	R,U,A
04	Define advance ceramics and uses.	R,U,A
05	Dispose ceramic waste safely.	R,U,A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	0	3	70	30	00	00	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
Unit – I	**INTRODUCTION TO CERAMICS** 1.1 Introduction. 1.1.1 History and development of ceramics. 1.2 Define ceramics and explain the classification of ceramic materials. 1.2.1 Definition and classification of ceramics such as Structural ceramics, Refractory, White wares, Pottery, Insulators, Glass, Cement. 1.3 Explain Scope in ceramic engineering. 1.3.1 Different Opportunities in ceramics. 1.4 Development of ceramics 1.4.1 Development of ceramics in India and advancement in other country.	10	20%
Unit -II	**WHITE WARE & REFRACTORY** 2.1 Give Introduction of white ware materials. 2.1.2 Definition of white ware. 2.2.3 Explain the types and uses of white ware products. 2.2.4 Explain different types and applications of white ware products such as Terracotta, Bone china ware, porcelain ware, Earthen ware, Stone ware, sanitary ware, Table ware, Ceramic wall and floor tiles, Electrical insulators etc. 2.2 Give introduction of refractory materials. 2.2.1 Definition of Refractory. 2.2.2 List the different types of refractory materials with their applications. 2.2.3 Explain different types and applications of refractory products.	10	25%
Unit –III	**GLASS, ENAMEL & CEMENT** 3.1 Give Introduction of glass materials. 3.1.1 Definition of glass. 3.1.2 Explain different types of glass and its applications. 3.2 Give introduction of Enamel. 3.2.1 Definition of Enamel. 3.2.2 Explain different types of enamel and its applications. 3.3 Give introduction of cement. 3.3.1 Define cement and its various applications.	10	25%

Unit – IV	**ADVANCED CERAMICS** 4.1 Give Introduction of advanced ceramics 4.1.1 Definition of advanced ceramics. 4.14.2 Explain the types and uses of advanced ceramics.	06	20%
Unit – V	**HANDLING CERAMIC WASTE** 5.1 Justify the need of understanding ceramic waste 5.2 Establish the relationship of sustainability and ceramic waste. 5.3 Suggest methods of handling ceramic waste with examples. 5.4 Suggest methods to dispose ceramic waste	09	10%
	TOTAL	**45**	**100**

Suggested Specification Table with Marks (Theory):

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	INTRODUCTION TO CERAMICS	10	3	7	8	18
II	WHITE WARE & REFRACTORY	10	4	7	8	19
III	GLASS, ENAMEL & CEMENT	10	2	8	8	18
IV	ADVANCED CERAMICS	06	2	4	4	10
V	HANDLING CERAMIC WASTE	09	1	2	2	5
Total		**45**	**25**	**26**	**19**	**70**

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
26%	**43%**	**31%**	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Introduction to ceramics	WD Kingery	Elsevier Scientific Publishing Company, New York
2	Ceramic white wares	SudhirSen	Oxford & IBH Publishing Co., New Delhi
3	Refractories	M.L. Mishra	Oxford & IBH Publishing Co., New Delhi
4	Modern glass practice	S.G. Scholse	McGraw Hill Publishing Co. New Delhi
5	Industrial ceramics	springer	Singer and singer
6	Elements of Ceramics	F.H. Norton	McGraw-Hill Inc.,US

(b) Open source software and website:

1. https://en.wikipedia.org/wiki/Pottery
2. https://ceramicartsnetwork.org
3. http://en.wikipedia.org/wiki/ceramic
4. https://www.machinedesign.com/materials/article/21812897/advanced-ceramics.

Suggested projects for students-

- Only one project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based (group of 3 to 5). However, in the fifth and sixth semesters, the number of students in the group should not exceed three.
- The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total work load on each students due to the micro-project should be about 16 (sixteen) student engagement

hours (i.e. about one hour per week) during the course.

- The students ought to submit micro-project by the end of the semester (so that they develop the industry oriented COs).A suggestive list of projects is given here. This should relate highly with competency of the course and the COs. Similar micro-projects could be added by the concerned course teacher:
- Build a Chart showing different materials.
- Collect relevant information about materials list.
- Prepare chart on physical properties, types, characteristics, composition and application of materials.
- Prepare PowerPoint presentation on physical properties, types, characteristics, compositions and application of materials.

Suggested activities for students-

Other than the classroom and laboratory learning, following are the suggested student-related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare small reports (of 1 to 5 page for each activity). For micro project report should be as per suggested format, for other activities students and teachers together can decide the format of the report. Students should also collect/record physical evidences such as photographs/videos of the activities for their (student's) portfolio which will be useful for their placement interviews:

- Glass: Collect different types of glass samples and state differences among all the types of glasses.
- White ware and Refractory: Collect different types of white ware and Refractory sample and state its uses.
- Ceramic waste: Compile a report of handling ceramic waste with figures, tables and comparative charts and strategies used and suggested.

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