



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Ceramic Technology

Course / Subject Code: DI03052011

Course/Subject Name: Ceramic Process Calculations

w.e.f. :	2024-25
Semester:	3 rd
Category of the Course:	ESC

Prerequisite:	NA
Rationale:	The course Ceramic Process Calculations refers to various calculations done in ceramic Industries for process control. This course is introduced to provide knowledge on calculations used in the manufacturing stream and to provide foundation for diploma ceramic engineers who want to further specialize in the field of ceramics. In this course the students are trained to find moisture and loss on ignition of raw materials, understand shrinkage in wares, manage dimensional changes in the product, control the density of slurry for wet processing, understanding pore structure and its effect and method to find porosity, water absorption and density.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the significance of moisture content and its determination.	A
02	Predict and evaluate the dimensional changes of the ceramic product.	A
03	Calculate the density, porosity and absorption characteristics of porous body	A
04	Calculate and manipulate the density of ceramic suspensions.	A
05	Compute the strength of ceramic bodies.	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
L	T	PR		C	Theory		Tutorial/ Practical	
			ESE (E)		PA (M)	PA (I)	ESE (V)	
3	0	0	3	70	30	0	0	100



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Course Content:

Unit No.	Content	No.of Hours	% of Weightage
Unit – I Moisture content	1.1 Define Moisture content. 1.2 Describe different types of moisture content mechanical, hygroscopic & chemical water 1.3 Explain the effect on quality and price of the material and determination of moisture content, calculations of moisture content and its equipments. 1.4 Describe significance of loss on ignition and water of plasticity.	08	14%
Unit – II Dimensional Changes	2.1 Definition drying & firing shrinkage, Types of shrinkage linear shrinkage & volume shrinkage. 2.2 Effect of moisture content on shrinkage 2.3 Calculation of linear drying & firing shrinkage, volume drying and firing shrinkage & total shrinkage. Estimate the green size and final size of the product with known shrinkage factors.	08	21%
Unit– III Porous Solids	3.1 Identify various Pores structures. 3.2 Open pore, closed pore, solid volume & apparent solid volume. Calculate volume of porous and nonporous solids 3.3 Calculate Bulk density, Specific Gravity, Apparent Porosity and Water Absorption of ceramic materials.	08	22%
Unit– IV Ceramic Suspensions	4.1 Definition of slip. Explain the preparation of slip. 4.2 Calculating density of a body batch & slip, adjusting density of batch, preparing slip of known density. 4.3 Calculations relating to Mixtures of solid particles and water, use of Brongniart's formula in fluid calculations- calculating dry content in slip, Increasing the density of slip by adding dry content & Dilution problems.	10	21%
Unit– V Strength of Ceramic bodies	5.1 Define strength, Study the factors affecting strength of a body. 5.2 cold crushing strength, tensile strength, Modulus of Rupture. 5.3 Calculations on Cold Crushing Strength, Tensile Strength, Modulus of Rupture. 5.4 List of equipments used for measuring of strength.	11	22%
	Total	45	



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Suggested Specification Table with Marks (Theory):

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Moisture content	08	2	3	5	10
II	Dimensional changes	08	3	4	8	15
III	Porous Solids	08	4	4	7	15
IV	Ceramic Suspensions	10	4	4	7	15
V	Strength of Ceramic bodies	11	4	4	7	15
Total		45	17	19	34	70

Distribution of Theory Marks(in%)					
R Level	U Level	A Level	N Level	E Level	C Level
24%	27%	49%	-	-	-

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	Calculation in ceramics	R. GRIFFITHS & Radford ceramics	New impression edition, 0950560405
2	Ceramics test & calculation	By A. I ANDREWS.	John Wiley and Sons, publishers B001I002Z0
3	Industrial ceramics	springer	Singer and singer



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(b) Open sources of tw are and website:

- 1) <http://www.calculatoredge.com/new/avgdiameter.htm>
- 2) <http://www.ilmc.org/Publications/ILMCFinalCombo8-02B.pdf>

Suggested Project List:

AsuggestivelistofProjectsisgivenhere.This hastomatchthe competencyandtheCOs.Similar micro-projects could be added by the concerned course teacher:

PROJECT 1: Make a report on modern instruments used in finding moisture content of material.

PROJECT 2: Make a report on any other methods of finding density of slurry in industry.

PROJECT 3: Make a report on instruments used in finding mechanical strength of ceramic products.

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 perform following activities in group and prepare reports of about 5pages for each activity. They should also collect/record physical evidences for their (student's) portfolio which may be useful for their placement interviews:

- a) Under take micro-projects in team/individually.
- b) Encourage Students for creating and designing new products using waste materials.
- c) Students are encouraged to register themselves in various **MOOCs** such as: **Swayam, edx, Coursera, Udemy** etc to further enhance their learning.

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