GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Ceramic Technology

Course / Subject Code: DI03052031

Course/Subject Name: White ware

w.e.f. Academic Year:	2024-25
Semester:	3rd
Category of the Course:	PCC

Prerequisite:	**NA**
Rationale:	A diploma ceramic engineer have to deal with manufacturing of white ware articles, they have to work with formulation, calculation of body and glaze mixture, drying and firing, Properties of raw materials and finished products. It is also foundation for next curriculum "Advance White Ware". Hence the course has been design to develop these competencies and its associated cognitive, practical and effective domain learning out comes.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Define white ware, classification of white ware products.	R
02	Select suitable raw materials for white ware products.	A
03	Select suitable raw materials processing and shaping methods for white ware products.	A
04	Describe the decoration techniques for white ware body and glaze.	U
05	Identify the defects in white ware body and glaze.	U

**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 (M)	PA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

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Course Content:

Unit No.	Content	No.of Hours	% of Weightage
Unit–I Introduction	1.1 Definition of white ware. 1.2 Explain History, current and future scope of white ware industries in India, List of white ware manufacturing industries. 1.3 Describe Brief classification and there characteristics of tiles, crockery ware, sanitary ware, electrical and chemical porcelain. 1.4 Explain the Applications of white ware products in different fields like home, industrial and for decoration purpose.	07	16%
Unit – II Raw materials	2.1 List out different raw materials used in white ware industry, Details regarding various materials used in white ware body and glaze making like plastic materials, nonplastic materials. 2.2 etails regarding various additives used in white ware body and glaze making. 2.3 ethodof batch calculations ofdifferent white ware bodies i.e. batch composition, molecular formula of raw materials. 2.4 ethod of batch calculations of different glazes i.e. batch composition, molecular formula of raw materials.	10	22%
Unit – III Processing	3.1 Methods of crushing and grinding of raw materials like wet and dry method, construction and functions of various machines such as jaw crusher, roller crusher, disintegrators and pulverizes etc. Theory of Grinding in Ball Mill. 3.2 orming methods such as Throwing, jiggering & Jollying, extrusion, casting etc. Detail study of blungers, agitators, and magnetic separators, vibrating sieves, diaphragm pumps, filter press and pug mill. 3.3 tudy of drying and firing of white ware bodies, biscuit firing and glost firing.	10	22%
Unit – IV Finishing and Decoration.	4.1 Methods of finishing the wares such as trimming, Sizing and Sponging process and Turning of green articles etc. 4.2 mold effect, screen printing, hand decoration etc. 4.3 hand painting, screen printing, digital printing etc.	09	20%
Unit – V	5.1 Study of body defects like Cracks, warpage, shrinkage, pin holes, black spots, different core etc.		

Defects and remedies.	5.2 Study of glaze defects like crazing, blisters, dunting, crawling, pin holes, chipping etc. 5.3 Study of reason and remedies for body and glaze defects.	09	20%
	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	07	5	5	2	12
II	Raw Materials	10	7	5	2	14
III	Processing	10	7	6	3	16
IV	Finishing and Decoration	09	7	6	3	16
V	Defects and remedies	09	4	6	2	12
Total		**45**	**30**	**28**	**12**	**70**

Distribution of Theory Marks (in%)					
R Level	U Level	A Level	N Level	E Level	C Level
37%	41%	22%	-	-	-

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	Hand Book of Modern Pottery Manufacture	H.N.Bose	**Ceramic Publishing House, Bhagalpur**
2	Ceramic glazes	kennethshaw	Amsterdam, London, New York, Elsevier
3	Element of Ceramic	F.H.Norton	Addison- Wesley Pub. Co.

4	ceramic White Wares	SudhirSen	oxford &IBH publishing Co., New Delhi
5	industrial Ceramics	Felix Singer , Sonja S. Singer	Springer Dordrecht 978-94-017-5257-2

(b) Open source software and website:

1. http://www.gobookee.org/elements-of-ceramics-f-h-norton/
2. http://www.cheminfonet.org/art/ceramics101.pdf
3. http://en.wikipedia.org/wiki/Ceramic_engineering

Suggested Course Practical List:

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Collect different types of white ware products and identify based on their physical appearance.	I	04
2	Perform crushing and grinding operation for given raw materials.	III	04
3	Determine the moisture content of given raw material.	II	04
4	Determine the drying shrinkage of given clay sample.	II	04
5	Determine the water of plasticity of given clay sample.	II	04
6	Determine the loss on ignition test of given raw materials.	II	04
7	Prepare white ware body of given composition by hand molding method	III	04
8	Prepare white ware body of given composition by pressing method.	III	04
9	Prepare white ware body of given composition by extrusion method.	III	04
10	Prepare white ware body of given composition by slip casting method.	III	04
11	Prepare glaze for different white ware products.	IV	04
12	Apply different glaze application methods on white ware products.	IV	04
13	List out various body defects in white ware products.	V	04
14	List out various glaze defects in white ware products.	V	04
15	Industrial visit of white ware manufacturing unit. 1. Prepare flow chart of Product preparation 2. Identify different suitable raw materials for Product. 3. Explain process used for Body and glaze making. 4. Explain shaping process for articles. 5. Explain Drying and Firing process for articles. 6. Explain process for glaze application. Identify different defects from products.	I-V	08
	Minimum practical required #		**30Hrs**

List of Laboratory/Learning Resources Required:

S.No	Equipment Name with Broad Specifications	PrO.No.
1	Pot mill, Sieve shaker with sieve set	2-12
2	Digital weight balance	2-12
3	Hot air oven	1,2
4	Muffle Furnace	3
5	Potter's wheel	3
6	Pressing machine	3
7	Pug mill/extruder	3

Suggested Project List:

A suggestive list of Projects is given here. This has to match the competency and the COs. Similar micro- projects could be added by the concerned course teacher:

PROJECT1: Collect different raw material samples used in white ware industries.

PROJECT 2: Collect different types of white ware products and lable them.

PROJECT 3: Prepare any one type of white ware product in laboratory and make a report.

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 thiscourse: Students should perform following activities in group and prepare reports of about5 pages for each activity. They should also collect/record physical evidences for their (student's) portfolio which may be useful for their placement interviews:

a) Undertake 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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