

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

**COURSE CURRICULUM
COURSE TITLE: ADVANCE WHITE WARE
(COURSE CODE: 3355203)**

Diploma Programme in which this course is offered	Semester in which offered
Ceramic Engineering	5 th Semester

1. RATIONALE

Diploma Ceramic engineers should be able to appreciate the texture effect in white ware products, special ceramic white wares, effect of heat on white wares etc. They have to deal with grain growth during sintering, vitrification process, ceramic colour and decoration for white ware bodies and kiln operations. Hence the course has been design to develop these skills and its associated cognitive, practical and effective domain learning out comes in studnets.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop required of skills in students so that they are able to acquire the following competency:

- **Plan and supervise process of production of special white ware to achieve desired quality (With minimum defects and required surface texture and finish).**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- Differentiate plastic and non plastic raw material
- Describe the texture effect and factors affecting it.
- Identify the speciality of different types of ceramic wares.
- Plan and supervise the production process of special white wares.
- Identify the reasons of defects.
- Apply decoration method for white ware.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	200
3	0	4	7	70	30	40	60	

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

5. COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Introduction	1a. Describe the scope of advance white ware	1.1 Introduction about the Advance white wares 1.2 Scope of Advance white wares.
Unit – II Raw Materials	2a. Explain about plastic and non plastic raw material. 2b. State chemical, physical properties and their behaviour at high temperature of plastic and non plastic raw material. 2c. Describe chemical compositions of plastic and non-plastic raw materials.	2.1 Plastic materials such as kaolin, ball clay and betonies, 2.2 Chemical compositions of plastic raw materials, Physical properties and their behaviour at high temperature 2.3 Non plastic materials such as flint, feldspar, talc, pyrophyllite, spodumene, lime, beryl, zircon, bone ash, sillimanite etc. 2.4 Chemical composition of non-plastic raw materials, physical properties and their behaviour at high temperature.
Unit – III Texture Effect	3a. Explain texture effect on white ware products. 3b. Describe function of quartz on white ware 3c. Describe effect of texture on removing water, controlling the particle size and properties of slip. 3d. Describe effect of processing methods on the physical properties of ceramic white wares.	3.1 Introduction 3.2 Texture effect in white wares 3.3 Function of quartz in white wares 3.4 Dewatering of porcelain slip 3.5 Practical control of slip properties 3.6 Effect of processing methods on the physical properties of ceramic white wares.
Unit – IV Special Ceramic Whitewares	4a. Explain special features of different types of ceramic wares. 4b. Describe the manufacturing process of special ceramic white wares. 4c. Give reason for increase in strength and breakdown of electric insulator. 4d. Describe low alkali porcelain as a resistor carrier	4.1 Introduction 4.2 Specialization in the technology of special ceramic white wares- bone china wares, porcelain wares, chemical wares, sanitary wares, electrical wares and ceramic fibres 4.3 Manufacture process of special ceramic white wares 4.4 Increase in strength of porcelain insulators 4.5 Factors affecting breakdown of electric insulators 4.6 Low alkali porcelain as a resistor carrier

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – V Grain Growth Sintering And Vitrification	5a. Describe method of grain growth and sintering. 5b. Explain vitrification and factors affecting the vitrification. 5b.Explain Reasons and remedies of defects.	5.1 Introduction 5.2 Method of grain growth 5.3 Method of sintering 5.4 Details about vitrification in ceramic white wares 5.5 Factors affecting the vitrification
Unit – VI Ceramic Colour And Decoration of Whitewares	6a. List various raw material used for manufacturing of ceramic colours. 6b. Explain properties of raw material used for manufacturing of ceramic colour. 6c. Describe the properties of ceramic colours. 6d. State the methods to decorate ceramic white ware. 6e. Explain modern method of decoration process. 6f. State the steps to prepare ceramic colours	6.1 Introduction 6.2 Raw materials used for manufacturing of ceramic colours. Properties and function of raw materials used in manufacture of ceramic colours 6.3 Method of manufacture of ceramic colours and Factors affecting the properties of ceramic colours 6.4 Methods of decorating ceramic white wares 6.5 Various modern processes of decoration with particular emphasis on glazed wall tiles decoration. 6.6 Preparation of ceramic colours for decoration on ceramic articles 6.7 Factors affecting decoration
Unit – VII Kilns	7a. Explain different types of kiln along with dimension. 7b. Differentiate various types of kilns. 7c. Use different techniques to control the inside temperature of kiln.	7.1 Introduction. 7.2 Details of various types of kilns with various parts and their relationship in dimension 7.3 Coal fired, oil fired and gas fired kilns 7.4 Intermittent and continuous kilns 7.5 Comparison of intermittent and continuous kilns. 7.6 Control of temperature inside kilns, manual, control automatic control. Use of computers for the same.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	4	2	2	0	4
2	Raw Materials	7	5	5	2	12
3	Texture Effect	6	3	4	3	10
4	Special Ceramic White wares	7	3	3	4	10
5	Grain Growth Sintering And Vitrification	6	4	4	3	11
6	Ceramic Colour And decoration of White wares	7	5	4	4	13
7	Kilns	5	3	4	3	10
Total		42	25	26	19	70

Legends: R = Remember U = Understand; A = Apply and above levels (Bloom's revised 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.

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

Note: It is preferable to use 8051 Trainer kits rather than Simulation tools for better hands on practice.

S. No.	Unit No.	Practical/Exercise (outcomes in psychomotor domain)	Apprx. Hrs. Required
1	II	Determine water of plasticity of various clays.	8
2	II	Determine loss on ignition of plastic and non-plastic materials.	8
3	II	Prepare samples of plaster of Paris in Laboratory.	8
4	III	Determine the effect of electrolyte and their behaviour on clays.	4

S. No.	Unit No.	Practical/Exercise (outcomes in psychomotor domain)	Apprx. Hrs. Required
5	IV	Prepare different porcelain ware body samples.	8
6	IV	Prepare different types of ceramic stains.	4
7	IV	Prepare coloured glaze and its different application.	8
8	VI	Demonstrate the method of decorating ceramic wares.	4
9	VII	Identify various defects in ceramic products and suggest their remedies.	4
Total			56

8. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Visit to a nearest White ware industries.
- ii. Group discussion on Industrial Visit.
- iii. Collect samples of different White ware products.
- iv. Prepare Chart on different properties of White ware.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If any)

- i. Show video films/photographs of production and testing procedure, techniques and machines used in different parts of the world for making special white ware.
- ii. Ask student to explore internet to study production and testing procedure, techniques and machines used in different parts of the world for making special white ware and then present in class .

10. SUGGESTED LEARNING RESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
1	A Hand Book of Modern Pottery Manufacture	H.N.Bose	Ceramic Publishing House, Bhagalpur
2	Ceramic glazes	Kenneth shaw	Amsterdam, London, New York, Elsevier
3.	Element of Ceramic	F.H.Norton	Addison-Wesley Pub. Co.
4.	Ceramic White Wares	Sudhir Sen	Oxford & IBH Pulishing Co., New Delhi
5	Fine ceramics	F.H.Norton	Krieger Pub Co Malabar, Florida, U.S.A.
6	Industrial Ceramics	Singert Singer	Chemical Publishing Co, Boston, USA
7	Tests and Calculation	A.I. Andrew	
8.	Ceramic glaze	W. Parmlee	Cahners Books,
9	Drying	R.W.Ford	Pergamon Press UK

B. List of Major Equipment/Materials

- i. Ceramic plastic and non-plastic materials, additives.
- ii. Different White ware samples for study of defects.
- iii. Weighing balance with weight box, Pans, Veneer scale, measuring cylinder.
- iv. Lab type Jaw Crusher, Edge Runner Mill, Disintegrators, Pulveriser.
- v. Lab type Blunger, Pot mill, Magnetic separator, Vibrating sieves.
- vi. Lab type Hot air Oven, Electric Muffle Kiln.
- vii. Lab type Universal testing machine, Refractrometer.

C List of Software/Learning Websites

- i. <http://www.gobooke.org/elements-of-ceramics-f-h-norton/>
- ii. <http://www.cheminfonet.org/art/ceramics101.pdf>
- iii. http://en.wikipedia.org/wiki/Ceramic_engineering

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof. B.B. Patel**, Lecturer L.E. College, Morbi
- **Prof. H.B. Dedania**, Retired Lecturer L.E. College, Morbi
- **Prof. S. Prasad**, Retired Lecturer L. E. College, Morbi

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Abhilash Thakur**, Associate Professor, Department of Applied Sciences
- **Dr. Bashirullah Shaikh**, Assistant Professor, Department of Applied Sciences