

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM  
COURSE TITLE: STRUCTURAL CLAY PRODUCT  
(COURSE CODE: 3355206)**

<b>Diploma Programme in which this course is offered</b>	<b>Semester in which offered</b>
Ceramic Engineering	5 <sup>th</sup> Semester

### 1. RATIONALE

Diploma Ceramic engineer have to deal with the terracotta material along with method of manufacture of terra cotta products, sanitary wares, defects and remedies and tiles. Hence the course has been design to develop these competencies and its associated cognitive, practical and effective domain learning out comes.

### 2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies

- **Plan and Supervise manufacturing terracotta products.**

### 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.

- i. Identify the clay products.
- ii. Selects the raw material for terracotta products.
- iii. Apply firing techniques for drying.
- iv. Classify sanitary wares.
- v. Remove the causes of defects.
- vi. Select raw material for tile manufacturing.
- vii. Plan production process for terracotta

### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

**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
<b>Unit – I Introduction</b>	1a. List structural Clay product.	1.1 Introduction to structural clay products.
<b>Unit – II Terracotta</b>	2a. Classify terracotta. 2b. Describe the Bricks.  2c. Identify the raw material. 2d. Describe the general properties  2e. Test various terracotta products.	2.1 Types of terracotta. 2.2 Building bricks, roofing tiles & hollow bricks 2.3 Raw materials used for body preparation 2.4 General properties shape, colour, strength, resistance to weathering and colour on firing 2.5 Specification and tests of terracotta products.
<b>Unit – III Method of Manufacture of Terra Cotta Products</b>	3a. Describe manufacturing method of terracotta product. 3b. Describe manufacturing of various tiles. 3c. Describe the drying of products 3d. Use various types of kiln for firing process.	3.1 Method of manufacture for common building bricks, face bricks, blue bricks, paving bricks, sand lime bricks, Method of aging, pugging and souring, Various methods of shaping. 3.2 Manufacture of tiles such as roofing tiles, drain tiles, hollow tiles, etc. 3.3 Methods of drying of products and firing techniques 3.4 Kilns used for firing terracotta products
<b>Unit – IV Sanitary Wares</b>	4a. Define sanitary wares 4b. Identify the raw materials for sanitary wares.	4.1 Types of sanitary wares, earthen wares and stoneware sanitary wares, Details of fire clay sanitary wares and vitreous sanitary wares 4.2 Raw materials used for manufacture of fire clay sanitary wares, earthenware and vitreous sanitary wares.
<b>Unit – V Defects and Remedies</b>	5a Explain various type of defect occur in traditional Ceramic Body. 5b. Explain remedies for various defects Occurring in Traditional ceramic.	5.1 Defects occurred in various types of traditional ceramics such as Pinholes, bubbles, cracks, bloating, crawling, rolling of glaze, spinouts, crazing and Denting etc. 5.2 Remedies of various defects occurring in various types of traditional ceramics
<b>Unit – VI Tiles</b>	6a. Differentiate the various tiles. 6b. Describe the process of Manufacturing tiles. 6c. Identify Raw material. 6d. Explain method of shaping of various tiles. 6e. List the materials used for various tiles.	Various tiles: wall , floor ,Porcelain and vitrified tiles 6.1 Introduction of tiles, 6.2 Manufacture process of various tiles. 6.3 Raw materials used for various tiles. 6.4 Method of body preparation for various Tiles. 6.5 Methods of shaping of various tiles.

## 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	3	2	3	0	05
2	Terracotta	8	3	6	5	14
3	Method Of Manufacture Of Terra Cotta Products	10	4	6	6	16
4	Sanitary Wares	7	4	4	4	12
5	Defects And Remedies	7	3	4	4	11
6	Tiles	7	4	4	4	12
<b>Total</b>		<b>42</b>	<b>20</b>	<b>27</b>	<b>23</b>	<b>70</b>

**Taxonomy:** R-Remember, U-Understand, A-apply for different cognitive levels (Blooms Revised Taxonomy)

## 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.*

S. No.	Unit No.	Practical/Exercise (outcomes in psychomotor domain)	Apprx. Hrs. Required
1	I	Demonstrate different steps in terracotta production.	4
2	II	Determine moisture content of different terracotta product.	4
3	II	Determine whiteness of terracotta product.	2
4	II	Determine mechanical strength of different terracotta product by UTM machine.	2
5	IV	Compound and fabricate earthen ware body.	6
6	IV	Determine of dry and fired properties earthen ware body.	4
7	IV	Compound and fabricate stoneware body.	6
8	IV	Determine dry and fired properties stoneware body.	4
9	IV	Compound and fabricate porcelain ware body.	6
10	IV	Determine dry and fired properties stoneware body.	4
<b>Total</b>			<b>42</b>

## 8.SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Visit to Roofing tiles Industry and prepare a report
- ii. Visit to cement mosaic tiles Industry and prepare a report
- iii. Visit to Red bricks Industry and prepare a report
- iv. Visit to sanitary wares ceramic Industry and prepare a report
- v. Visit to glaze tiles cement Industry and prepare a report
- vi. Visit to stone ware pipe Industry and prepare a report
- vii. Visit & study of D.D.kiln. Shuttle kiln, tunnel kiln & Chamber kiln and prepare a report

## 9. SPECIAL INSTRUCTIONAL STRATEGIES(if any):

- i. Display animation/videos/photographs showing production techniques of different clay products.
- ii. Give internet bases assignment on different aspect of clay product production and ask students to present in class.
- iii. Facilitate the students to set up practical apparatus on their own.

## 10. SUGGESTED LEARNING RESOURCES

### (A)List of Books:

S. No.	Title of Books	Author	Publication
1	Modern ceramic practice	A.J.Dale	Elsevier Science Ltd
2	Fine ceramics	F.H.Norton	McGraw-Hill
3.	Heavy clay Technology	F.W.Clews	
4.	Ceramics Vol. I,II,III	G.Mcnamara	Pennsylvania State College
5.	Ceramic glazes	C.W.Parmelee	CBI Publishing Co Inc.U.S
6.	Introduction to ceramics	W.D.Kingery	New York : Wiley,
7.	Ceramic	Kenneth shaw	Elsevier Science Ltd
8.	Ceramic Fabrication process	W.D.Kingery	The MIT Press

### B. List of Major Equipment/Materials

- i. Ceramic Soft Materials and Hard Materials and additives.
- ii. Different terracotta samples for study of defects.
- iii. Weighing balance with weight box, Pans, Vanier 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, Refractro meter.

### C List of Software/Learning Websites

- i. <http://www.gobookee.org/elements-of-ceramics-f-h-norton/>
- ii. <http://www.cheminfonet.org/art/ceramics101.pdf>
- iii. [http://en.wikipedia.org/wiki/Ceramic\\_engineering](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