GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: APPLIED CERAMICS
(COURSE CODE: 3355201)

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

1. RATIONALE

Diploma ceramic engineers have to deal with the selection of raw materials, forming process, drying and firing of ceramic products in industry. In addition to this they have to classify different types of ceramic products according to their applications like ceramics in construction, salt glazed pipes, ceramic products in home, electrical application of white ware products, industrial use of ceramics products, ceramic parts used in rocket and aviations, vitreous enamels, glass, abrasives etc. Hence the course has been design to develop these skills 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 required skills in the students so that they are able to acquire following competency:

- **Plan and supervise production of the ceramic products for different applications.**

3. COURSE OUTCOMES

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

i. Select the ceramic products for special applications depending upon the characteristics.
ii. Plan and supervise production of salt glazed pipes.
iii. Plan and supervise production of different refractory products for domestic use.
iv. Plan and supervise production of low and high voltage electrical insulators.

4. TEACHING AND EXAMINATION SCHEME

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

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 Introduction	1a.Classify ceramic products 1c. Describe properties of ceramic products. 1d. Define scope of ceramic products.	**Ceramic Products** Abrasives , AdvancedCeramics, Artwares , Bio medical Ceramics , Bisque , Building Ceramics , CeramicFiber , Collectables , Composite Ceramics , Cookware ,Electronic/Electrical , Fireplaces , Giftware , Glass , HouseholdItems , Kitchenware ,Molds , Mosaics , Porcelain Enamel , Pottery 1.1 Introduction of ceramic products. 1.2 Classification of ceramic products, their properties and use. 1.3 Scope of ceramic products in India and abroad.
Unit – II Ceramics In Construction	2a. List various types of ceramic products used in construction. 2b. State properties of finished products for various types of tiles and bricks. 2c. State properties of the salt glazed pipes. 2d.Describe the manufacturing methods of salt glazed pipes.	2.1 Types of ceramic products(Calcined Aluminas ,Decal paper ,Glaze Printing Medium ,Grinding Medias, Lignosulfonates, Metal Oxides, Selenium Powder, Zirconium Silicate) used in construction. 2.2 Floor tiles, glazed walls tiles, sanitary wares, brick and roofing tiles. 2.3 Requirement and properties of finished products. 2.4 Methods of manufacture of salt glazed pipes.
Unit – III Ceramic Products in Home.	3a. Describe the ceramic products for domestic use. 3b. Classify different types of wares	3.1 Ceramic products in domestic use like Kitchen ware, sanitary wares and constructions purposes. 3.2 Study the manufacturing process, properties and uses of table ware, kitchen ware, stone wares, flame resistant wares, art wares and containers.
Unit –IV Electrical Application of White Ware Products	4a.Classification of white wares products used in electrical applications. 4b.Describe high and low voltage insulators. 4c. Identify the raw material for insulator.	4.1 Different types of white wares products used in electrical applications. 4.2 Low tension electrical insulators and high tension and high voltage electrical insulation. 4.3 Methods of manufacturing insulators and raw materials used -Additives , Cements , Ceramic pigments , Ceramic Powders , Ceramic Tapes , Chemicals , Clays , Feldspar , Glazes , Metallic Powders ,Natural Stone , Other Materials ,Quartz , Wollastonite

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –V Industrial Use of Ceramics Products.	5a. Differentiate Abrasion, chemical, heat resistant bodies. 5b. Use white wares in different industries 5c. Describe the high temperature material. 5d. Apply ceramic in metallurgical industries	5.1 Abrasion resistant bodies, chemical resistant and heat resistant bodies. 5.2 Industrial applications of white ware bodies in chemical industries as a laboratory chemical wares; electrical Porcelain, low tension electrical porcelain insulator, high tension electrical insulator. 5.3 High temperature materials: thermocouple tubes, Sager, muffles and kiln cars and other kiln furniture. 5.4 Use of ceramic in metallurgical industries eg. Refractory material used in various kiln, furnaces, recuperative tubes and other heating chambers.
Unit –VI Applications of Ceramic And Glass Products	6a. Distinguish Various Glass Wares. 6b. Apply Optical Glasses In Instrumentation. 6c. Perform Grinding And Polishing 6d. Characterize Ceramic Products For Different Uses. 6b Identify The Use Of Glass And Ceramic Products.	6.1 Glass wares : 6.2 Glass articles used in construction- glass pans, sheets, wired glass, figured glass and glass bottles. 6.3 Optical glass and their uses in various optical and telescopic instruments. 6.4 Abrasive products and Methods of grinding and polishing operation. Uses of abrasives. 6.5 Use of ceramic as hospital utensils, domestic utensils, reflectors and sign board. Characteristics of the products. 6.6 Products used in for rocket and aviation. 6.7 Properties and specific use of products - Additives , Cements , Ceramic Pigments , Ceramic Powders , Ceramic Tapes ,Chemicals , Clays , Feldspar , Glazes , Metallic Powders , Natural Stone , Other Materials , Quartz , Wollastonite

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
I	Introduction	5	5	2	0	**7**
II	Ceramics In Construction	7	2	5	7	**14**
III	Ceramic Products In Home	7	2	4	4	**10**
IV	Electrical Application Of White Ware Products.	7	2	3	5	**10**
V	Industrial Use Of Ceramics Products.	8	2	5	7	**14**

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
VI	Properties And Applications Of Ceramic Products	8	2	5	8	**15**
Total		**42**	**15**	**24**	**31**	**70**

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.
1	II	List out applications of ceramic products in construction.	4
2	III	List out applications of various ceramic products which are used in home.	4
3	IV	Visit to a refractory industry & prepare a report.	4
4	IV	Visit to a ceramic glaze tiles factory & prepare a report	4
5	IV	Visit to a stone ware jar factory & prepare a report.	4
6	IV	Visit to a cement mosaic factory & prepare a report.	4
7	IV	Visit to a ceramic sanitary ware factory & prepare a report	4
TOTAL			28

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Visit to a nearest Ceramic industries.
ii. Group discussion on Industrial Visit.
iii. Collect samples of different Ceramic products.
iv. Prepare Charts for properties of different Ceramic products.

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.

ii. Ask student to explore internet to study production and testing procedure, techniques and machines used in different parts of the world 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	Industrial ceramic	Singer & Singer	London, Chapman & Hall
3	Ceramic white wares	Sudhir sen	Oxford & IBH Publishing Company Private
4	Fine ceramics	F. H. Norton	Krieger Pub Co (June 1978)
5	Modern glass practice	S. R. Scholes	Ceramic Books and Literature Service,spain
6	Porcelain Enamel	Charles Baldwin	A john wiley&sons,lnc.,publication

B. List of Major Equipment/Materials:

i. Advance ceramic products samples for study.

C List of Software/Learning Websites

i. http://en.wikipedia.org/wiki/Salt_glaze_pottery
ii. http://en.wikipedia.org/wiki/Enamel_sign
iii. http://www.sciencedirect.com/
iv. http://www.behnmeyer.com/0911300305%C2%BBCeramics_-%C3%A5-_Construction.aspx
v. http://www.behnmeyer.com/0911300307%C2%BBTextiles.aspx

B. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. B. B. Patel** , Lecturer L.E.College, Morbi
- **Prof. S. B .Upadhyay,** Lecturer L.E.College, Morbi
- **Prof. P. M. Swami,** Lecturer L.E.College, Morbi
- **Prof. Y.R. Gupta,** Lecturer L. E. College, Morbi

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Abhilash Thakur.** Associate Professor, Department of Applied Sciences NITTTR Bhopal

- **Dr. Bashirullah Shaikh,** Assistant Professor, Department of Applied Sciences NITTTR Bhopal