GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: Fuels & Furnaces
(Code: 3335205)

Diploma Programme in which this course is offered	Semester in which offered
Diploma Ceramic Technology	3rd semester

1. RATIONALE

Drying and Firing process is a heart of ceramic manufacturing process. Diploma ceramic students should have knowledge of Fuels, Burners and Furnaces to understand firing technique of ceramic industry. It is essential foundation for next curriculum of Drying & Firing.

2. COMPETENCY

Plan and perform firing operation for both kiln and furnace.

3. 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	100
3	0	0	3	70	30	0	0	

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

4. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – 1 INTRODUCTION	1a. State History of kiln and furnaces. 1b.Explain principle of firing. 1c.Explain importance of kiln & furnaces.	1.1 Kilns & furnaces used in the ancient age 1.2 Importance of fuels in ceramic industry. 1.3Principles of combustion. 1.4Importance of kilns and furnaces 1.5 Present status of kilns & furnaces in the ceramic industries
Unit – 2 CLASSIFICATION OF FUELS	2a.Give classification of fuels. 2b. Explain manufacturing process of synthetic fuels.	2.1 Various types of fules, Solid, Liquid, Gaseous, Electricity. 2.2 Method of manufacturing of various types synthetic fuels.
Unit – 3 PROPERTIES OF FUELS	3a.Explain properties of different fuels. 3b. Calculate calorific value of fuels 3c. Identify suitable fuels for ceramic industry.	3.1 Properties of solid fuels. 3.2 Properties of liquid fuels. 3.3 Properties of gaseous fuels. 3.4 Properties of synthetic and electric fuels. 3.5 Method of determining calorific value of fuels. 3.6 Efficiency of fuels. 3.7 Suitability of fuels for ceramic industries.
Unit – 4 CLASSIFICATION OF KILNS FOR CERAMIC INDUSTRY	4a.Give classification of kilns & Furnaces. 4b.Explain construction and function of kilns.	4.1 Classification of kilns & furnaces 4.2 Details of Hoffman's kilns 4.3 Types of pottery kilns 4.4 Construction and function of up draft kilns and down draft kilns 4.5 Construction and function a circular and rectangular tunnel kilns 4.6 Muffle type tunnel kilns & open flame tunnel kilns 4.7 Construction and functions of modern type of shuttle kilns and roller kilns
Unit – 5 GLASS AND ENAMELING FURNACES	5a. Explain construction and function of furnaces.	5.1 Construction and function of pot furnace 5.2 Construction and function of tank furnaces 5.3 Construction and function of recuperative and regenerative type of furnaces 5.4 Construction and function of muffle furnace for enamelling 5.5 Construction and function of frit furnace, muffle type and rotary types of frit furnace
Unit – 6 BURNERS	6a.Explain fuel efficient burners used in ceramic industries. 6b. Explain operation and temperature controlling system of burners. 6c.Explain Handling of fuels.	6.1Know the fuel efficient burners used in ceramic industries. 6.2Selection of burners and their operation. 6.3Method of controlling temperature by adjustment of burners. 6.4Handling of fuels.
Unit – 7 TEMPERATURE AND ITS MEASUREMENT	7a.Explain temperature measurement process inside the kiln. 7b.Discuss temperature measurement equipment.	7.1 Detail study of measurement inside the kilns temperature. 7.2 Details of various equipments for measurements to such as thermo couple pyrometers, pyroscopes, thermo-couple, 7.3 Details of optical pyrometer, resistance pyrometer and radiation pyrometer

5. 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	3	2	0	5
2	CLASSIFICATION OF FUELS	6	2	3	3	8
3	PROPERTIES OF FUELS	6	2	4	4	10
4	CLASSIFICATION OF KILNS FOR CERAMIC INDUSTR	8	3	5	5	13
5	GLASS AND ENAMELING FURNACES	7	3	5	5	13
6	BURNERS	5	3	5	4	12
7	TEMPERATURE AND ITS MEASUREMENT	6	2	3	3	8
Total		**42**				**70**

8. SUGGESTED LEARNING RESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
1	Fuels furnaces and refractory	O.P.Gupta	Khanna publisher
2	Industrial Ceramic	Singer & Singer	New York : Chapman and Hall, 1987.
3	Refractories	F.H.Norton	McGraw-Hill

B. List of Major Equipment/Materials

C . List of Software/Learning Websites

1. http://www.em-ea.org/Guide%20Books/book2/2.1%20Fuels%20and%20combustion.pdf
2. en.wikipedia.org/wiki/Natural_gas
3. en.wikipedia.org/wiki/Synthetic_fuel

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

1. Shri B.B.Patel (Lecturer L.E.College, Morbi)
2. Shri H.B.Dedania (Retired Lecturer L.E.College, Morbi)
3. Shri S.Prasaad (Retired Lecturer L.E.College, Morbi)