GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering
Level: Diploma
Branch: Ceramic Technology
Subject Code: DI04052031
Subject Name: Quality Control

w.e.f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	PCC

Prerequisite:	**NA**
Rationale:	Quality control is a crucial process in various industries and sectors, designed to ensure that products or services meet specified quality standards and criteria. It involves monitoring and evaluating the characteristics, performance, and attributes of a product or service throughout its production or delivery process. Diploma Ceramic engineer have to deal with the Processing of raw materials, Manufacturing process, raw materials testing, quality control of green articles, testing of finished products etc. Quality control is a subject that imparts Knowledge of the above mentioned topics. Hence the course has been design to develop these skills 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	Differentiate Quality control and Quality assurance with examples.	R,U
02	Select suitable parameters to control quality of raw materials	U,A
03	Select required parameters to control quality during mixing, forming and drying process.	U,A
04	Select required parameters to control quality during glazing and firing process.	U,A

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**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 Define quality control and quality assurance with examples. 1.2 Theory of sampling for testing specimen.	02	4%
Unit – II Raw Materials Inspection	2.1. Chemical composition 2.2. Particle size distribution 2.3. Moisture content 2.4. Impurities and contaminations 2.5. Consistency and Homogeneity 2.6. Purity and Quality standard 2.7. Packaging and Transportation 2.8. Documentation and Record keeping 2.9. Sample Techniques Supplier Relationship	09	20%
Unit – III Mixing and forming process	3.1 Batch consistency 3.2 Uniform distribution 3.3 Moisture control 3.4 Mixing time and speed 3.5 Die and Mould Inspection 3.6 Pressure and Temperature control 3.7 De-airing process 3.8 Visual Inspection 3.9 Quality of formed products Employee training	09	20%
Unit – IV Drying process	4.1 Moisture content control 4.2 Drying environment 4.3 Drying time 4.4 Drying racks and Shelves 4.5 Ventilation 4.6 Visual Inspection 4.7 Temperature monitoring 4.8 Humidity control 4.9 Employee training	08	18%
Unit – V Glazing process	5.1. Glaze material Inspection 5.2. Batch consistency 5.3. Application Thickness 5.4. Uniformity check 5.5. Drying time and conditions 5.6. Glaze composition testing	08	18%

	5.7. Adherence to safety standards 5.8. Colour evaluation 5.9. Surface Inspection		
Unit– VI Firing process	6.1. Kiln Inspection 6.2. Loading and Unloading 6.3. Firing schedule 6.4. Temperature monitoring 6.5. Uniformity check 6.6. Ventilation 6.7. Cooling process 6.8. Visual inspection 6.9. Dimension checks 6.10. Dimensional stability 6.11. Kiln furniture inspection 6.12. Density and Porosity testing Crazing and shivering evaluation	09	20%

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	2	1	1	1	3
II	Raw Materials Inspection	9	2	5	7	14
III	Mixing and forming process	9	2	5	7	14
IV	Drying process	8	2	5	6	13
V	Glazing process	8	2	5	6	13
VI	Firing process	9	2	5	6	13
Total		**45**	**11**	**26**	**33**	**70**

Distribution of Theory Marks (in%)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
16%	**37%**	**47%**	**-**	**-**	**-**

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:

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Industrial Ceramics	Felix Singer , Sonja S. Singer	Springer Dordrecht 978-94-017-5257-2
2	Fine ceramics	F.H.Norton	Ohmsha, 1988 with ISBN 10: 0444011935 ISBN 13: 9780444011930.
3	Principles of Ceramic Processing	James's Reed	John Wiley & Sons with ISBN 13 9780471597216
4	Properties of Ceramic Raw Materials	W.RYAN	1978 Elsevier Ltd with ISBN no. 978-0-08-022113-7

(b) Open source software and website:

a) https://standardsbis.bsbedge.com/
b) https://www.qualicer.org/recopilatorio/ponencias/pdfs/9813071e.pdf
c) https://www.researchgate.net/publication/325498738_Quality_control_in_porcelain_industry_based_on_computer_vision_techniques
d) https://www.ceramicindustry.com/articles/88882-quality-control
e) https://www.lucideon.com/consultancy/process-optimisation/ceramics-manufacturing-process-optimisation

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Determination of particle size distribution by sieve analysis of ceramic raw materials.	II	4
2	Determination of plasticity of clay.	II	4
3	Determination of moisture content of ceramic raw materials.	II&III	4
4	Determination of the density of ceramic product sample.	VI	6
5	Determination of the viscosity of casting slip.	III	6
6	Determination of drying shrinkage of given sample.	IV	6
7	Determination of Green strength of ceramic sample.	IV	6
8	Determination of glaze fluidity.	V	6
9	Determination of thermal shock resistance of ceramic sample.	VI	4
10	Determination of fired strength of ceramic sample.	VI	6
11	Determination of water absorption of ceramic wares.	VI	6

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Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
12	Determination of modulus of rupture of ceramic sample.	VI	4
13	Determine Cold Crushing Strength of a given ceramic sample.	VI	4
14	Perform Coating of ceramic article by glazing process.	V	6
15	Industrial visit of ceramic manufacturing unit and prepare a report.	I-V	08
	Minimum practical required #		**30Hrs**

List of Laboratory/Learning Resources Required:

S. No.	Equipment Name with Broad Specifications	Practical .No.
1	Sieve shaker with sieve set	1
2	Pot mill,B4 cone	5,6,7
3	Digital weighing balance	1,4,6,7,11
4	Universal testing machine	7,10,12,13
5	Autoclave testing machine	11,
6	Water Bath with capacity (0 to 200 centigrade temp.)	9
7	Dryer and Muffle furnace	1,3,7,8,11
8	Spray gun for coating glaze and enamel	14
9	Portable air compressed unite	14

Suggested Micro- Project List:

A suggestive list of micro-projects is given here. This should relate highly with competency of the course and the COs. Similar micro-projects could be added by the concerned course teacher:

a) Collect information regarding quality control techniques used in Tile industries and prepare a report.
b) Collect information regarding quality control techniques used in sanitary ware industries and prepare a report.
c) Collect information regarding quality control techniques used in Refractory industries and prepare a report.
d) Collect information regarding quality control techniques used in Insulator industries and prepare a report.
e) Collect information regarding quality control techniques used in glass industries and prepare 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 this course: Students should perform following activities in group and preparere ports of about 5 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) Prepare list of ceramic articles with their utilization.
b) Undertake micro-projects in teams
c) Give seminar on any relevant topic.
d) Undertake a market survey regarding advance machinery available for quality control in ceramic industries.
e) Identify various quality control techniques used by local industries.
f) Prepare list of Quality control techniques follow by various countries
g) 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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