

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

**COURSE CURRICULUM
COURSE TITLE: QUALITY CONTROL
(COURSE CODE: 3355205)**

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

1. RATIONALE

Diploma Ceramic engineer have to deal with the Processing of raw materials, Manufacturing process, raw materials testing, properties, 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.

2. COMPETENCY

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

- **Apply various quality control techniques on raw materials and finished 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.

- Differentiate quality control and quality assurance.
- Determine the effect of soluble salts on ceramic.
- Characterize plasticity and fluidity.
- Identify the dimension of the crake and shrinkage.
- Identify various properties for ceramic products.
- Apply various specifications for finished products.

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 – I Introduction	1a. Define quality control and quality assurance. 1b. Explain sampling theory for testing specimen.	1.1 Introduction of quality control and quality assurance. 1.2 Theory of sampling for testing specimen.
Unit – II Raw Materials Testing	2a. List different types of tests carried out on raw-materials. 2b. Describe method of sieve analysis and particle size distribution. 2c. Explain method of determining flow test of feldspar.	Different tests carried out on raw-materials. 2.1. Chemical analysis 2.2 Rationale analysis 2.3 Determination of soluble salts and effect of soluble salts on ceramic manufacture 2.4 Method of sieve analysis and determination of particle size distribution and control of fineness. 2.5 Method of determining flow test of feldspar.
Unit – III Properties	3a. Describe the steps to determine the Water of plasticity, 3b. Define plasticity, slip fluidity, density and viscosity of bodies and glazes.	3.1 Method of determining water of plasticity, green modulus of rupture of clays. 3.2 Study of plasticity, slip fluidity, rate of casting, Density or litre weight, moisture content and control of density and viscosity of bodies and glazes
Unit – IV Quality Control of Green Articles	4a. Apply different method for green control 4b. Describe the detection of crack dimension, shrinkage during drying and firing of green articles.	4. 1 Method of controlling green strength, detection of crack dimension, shrinkage during drying and firing.
Unit – V Testing of Finished Products	5a. List out different properties of finished product. 5b. Describe Method of controlling gloss and appearance of glaze articles. 5c. Describe the method of determination of modulus of rupture, compressive strength, impact strength, abrasion resistance, Thermal shock resistance 5d. Describe the testing the - crazing resistance, lead solubility and acid alkali resistance of ceramic products	5. Method of determination of modulus of rupture, compressive strength, impact strength, abrasion resistance, Thermal shock resistance etc. 5.2 Method of controlling gloss and appearance of glaze articles 5.3 Detail study for controlling porosity, water absorption, bulk density of refractory products. 5.4 Detail study of crazing resistance, lead solubility and acid alkali resistance of ceramic products

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit –VI Testing of Insulators	6a. Describe testing of electro mechanical strength, flash over test, dry and wet, dielectric constant, powerless factor, Crazing test for insulators 6b. Explain various requisites of finished products used for specific purpose. 6c. Describe application of computers for quality control	6.1 Study of electro mechanical strength, flash over test, dry and wet, dielectric constant, powerless factor, Crazing test. 6.2 Various requisites of finished products used for specific purpose. 6.3 Scope of computer application for quality control of ceramic product

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	4	4	2	0	6
II	Raw Materials Testing	8	3	4	5	12
III	Properties	6	2	6	6	14
IV	Quality Control of Green Articles	8	2	6	6	14
V	Testing of Finished Products	8	3	6	3	12
VI	Testing of Insulators	8	2	5	5	12
Total		42	16	29	25	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**.

S. No.	Unit No.	Practical/Exercise (outcomes in psychomotor domain)	Approx. Hrs. Required
1	II	Determine particle size distribution by sieve analysis of ceramic raw materials.	2
2	II	Determine moisture content of ceramic raw materials.	4
3	V	Determine the density of ceramic products and measurement of viscosity of slip.	8
4	IV	Detect cracks and determination of green strength of article.	8
5	V	List out defects occur in glazed ceramic articles.	2
6	V	Determine modulus of rupture of given ceramic sample.	2
7	III	Determine water absorption of ceramic sample.	2
8	III	Use statistical quality control techniques in given situation.	4
9	V	Verify specifications of different ceramic products.	4
10	III	Determine thermal shock resistance of ceramic sample.	4
11	III	Determine water of plasticity of ceramic sample.	4
12	III	Determine Cold Crushing Strength of a ceramic sample.	2
13	All	Prepare Industrial visit Report for any ceramic product industry 1. Prepare flow chart for manufacturing process 2. Identify different suitable raw materials for Product. 3. Explain processing of raw materials 4. Explain different shaping techniques 5. Explain drying and firing of ceramic products. 6. Explain properties and application of ceramic Product. 7. Explain different steps for Q.C and pollution control.	6
Total (Perform any practical's from above for total 28 hours so that most units are covered)			52

8. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Teacher guided self-learning activities.
- ii. Library/internet survey regarding Q.C techniques used in different industries.
- iii. Presentation on different Q.C techniques based on above survey.

9. SPECIAL INSTRUCTIONAL STRATEGY (IF ANY)

- i. Demonstration lectures using different charts and video films/photographs
- ii. Arrange visits two one or two Industries and show different quality control techniques being followed and ask students to prepare a report.
- iii. Give Course/topic related internet based assignments.

10. SUGGESTED LEARNING RESOURCES

A. List of Books

S. No.	Title of Books	Author	Publication
1	Fine ceramics	F. H. Norton	McGraw-Hill
2	Industrial ceramics	Singer & Singer	London, Chapman & Hall
3	Chemistry and physics of clay and allied ceramic products	Grimshaw	Wiley-Interscience, 1971

B. List of Major Equipment/Materials

- i. Weighing Balance,
- ii. Varnier scale,
- iii. sieving machine with sieves.
- iv. Lab Type Ordinary Pug Mill,
- v. De-arising Pug Mill,
- vi. Mixers
- vii. Lab Type Toggle press, Hydraulic Press, Universal Testing Machine
- viii. Lab Type Tray dryer,
- ix. Hot Plate Dryer,
- x. rapid moisture Meter
- xi. Lab Type Chamber Kiln

C List of Software/Learning Websites

- i. http://en.wikipedia.org/wiki/Category:Refractory_materials
- ii. http://nptel.iitm.ac.in/courses/113104059/lecture_pdf/Lecture%209.pdf
- iii. <http://www.cosmile.org/Manual/pdf/chapter12.pdf>

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

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

Coordinator and Faculty Members from NITTTR Bhopal

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