# National Vocational Certificate Level 2 in Fine Arts (Ceramist)

## CBT Curriculum

NATIONAL VOCATIONAL & TECHNICAL TRAINING COMMISSION

NAVTTC نیوٹک

**National Vocational & Technical Training Commission**
5th Floor, Evacuee Trust Complex
Sector F-5/1, Islamabad
Tel: +92 51 904404
Fax: +92 51 904404
Email: info@navttc.org

**Author:**
Ms. Mehwish Ahsan (Freelance Consultant)

**Reviewed by:**
Dr. Raimund Sobetzko (Team Leader, Component 2 TVET Reform Support Programme) , Mr. Muhammad Naeem Akhtar ( Deputy Team Leader Component 2 TVET Reform Support Programme )

**Layout and Design by:**
Ms. Maria Arif ( Freelance Consultant )

**Date of approval by NCRC:**
17th-18th Aug 2015

**Date of Notification:**
25th Aug 2015, vide notification no F.2-1/2013-DD(VT)

This curriculum has been produced by the National Vocational & Technical Training Commission (NAVTCC) with the technical assistance of TVET Reform Support Programme, which is funded by the European Union, the Embassay of the Kingdom of the Netherland, Federal Republic of Germany and the Royal Norwegian Embassy. The Programme has been commissioned by the German Federal Ministry for Economic Cooperation and Development and is being implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

# Table of Contents

# 1. INTRODUCTION

The ceramics certificate course has been designed to provide an introduction to the basic techniques and knowledge involved in the practice of ceramics Industry. Through practical sessions that are designed to impart a range of production approaches, students will have the experience and acquire knowledge in the aspect of slip, glazes model and mould making, drying in different dryers, different glazing techniques and it applications, firing the kiln and the quality control of the products. This course also provides students with a solid foundation to understand and operate the different Equipments involved in any ceramics Industry. Upon completion, students will understand the entire process of ceramic, and acquire the ability to work in any ceramics industry in Pakistan and international job market.

## 1.1 OVERALL OBJECTIVE OF COURSE

1. The main objective of this course is to produce semi-skilled labor (through training of fresh entrants and / or impart formal training to unskilled labor) for the ceramic industry to work as ceramicist.
2. This training course is designed to create job opportunities for the semi-literate students on the national and international level so as to impart them the requisite skills to work in different ceramics industries.
3. Further, this curriculum is developed by considering the requirements of local market and need of the trade enabling the pass-outs to meet the market-jobs with a view to reduce the shortage of semi-skilled and skilled workers in this area.
4. Provide technical and vocational training basis which reflect the requirements of the industry.
5. The course mostly focuses on practical-oriented skill aided by some theory as it is necessary for understanding the procedures and processes of performing different tasks and functions.
6. This course covers all areas of working in a Ceramics Process Industry including weighing of raw materials, mixing, forming, and finishing drying, glazing and firing.

## 1.2 COMPETENCIES GAINED AFTER COMPLETION OF COURSE

After completion of this course the student should be able to:

**2.** Explain the basic ceramic-terms and its classifications.

**3.** Describe the ceramics raw materials, their usage & properties.

**4.** Describe the classification of clay bodies and their properties.

**5.** Express the material mixing methods.

**6.** Describe the knowledge of different forming techniques used in ceramics industry.

**7.** Express knowledge of slip quality assessment.

**8.** Explain the glaze manufacturing process and its types.

**9.** Describe the tests to check the quality of the slip and glaze for the particular application.

**10.** Describe the mould and model making techniques.

**11.** Describe the plaster of Paris, its properties and setting time.

**12.** Express the knowledge of drafting, tracing & scale drawing.

**13.** Describe different types of moulds

**14.** Explain the Jiggering and Jollying process.

**15.** Describe the mechanism for drying of ceramics bodies.

**16.** Explain the working principles of different dryers used in ceramics industry.

**17.** Express the knowledge of proper moisture content required for finishing.

**18.** Elucidate basic principles of joining.

**19.** Express the knowledge of Finishing and Joining techniques.

**20.** Explain the different decoration techniques.

**21.** Express the knowledge of different glazing techniques.

**22.** Describe the different types of kiln furniture used in the kilns.

**23.** Explain the stacking of different wares.

**24.** Describe the importance of kiln reading.

**25.** Describe the combustion and complete and incomplete combustion.

**26.** Describe the different temperature, pressure and flow measuring devices.

**27.** Safety precautions applicable to ceramics industries.

**28.** Identification of different defects and their troubleshooting techniques.

**29.** Identify the raw materials used in the ceramics industry.

**30.** Perform the batching for the desired composition of body and glazes.

**31.** Perform the crushing of raw materials on Crusher.

**32.** Perform the grinding of the raw materials on Ball Mill.

**33.** Operate the blunger for the mixing of raw materials.

**34.** Perform the filter pressing of the slip.

**35.** Operate the Vacuum Pug mill.

**36.** Draft the new pattern or draw graph to map the product for making model.

**37.** Make full scale working drawings.

**38.** Apply various techniques of model making i.e. direct carving, modeling wheel etc as per situation/requirement.

**39.** Make moulds of various types i.e. press molds, slip casting molds, jiggering molds etc.

**40.** Work on a Modeling wheel.

**41.** Make models for one to three piece moulds.

**42.** Hand carve model for irregular or geometric shapes.

**43.** Develop different types of moulds.

**44.** Perform casting keeping in mind the required thickness of the piece & releasing the casted pieces.

**45.** Inspect/assess the quality of casting slip i.e. density, viscosity and residue.

**46.** Operate the Jiggering and Jollying machine

**47.** Operate the hydraulic press to make tiles

**48.** Make a joining paste

**49.** Perform trimming and finishing of the products

**50.** Perform the joining of the different parts to the body

**51.** Inspect and rectify the faults in finished pieces

**52.** Operate the different dryers like Spray dryer and Conveyor belt dryer used in the industry

**53.** Perform the loading and unloading of the kiln.

**54.** Make proper stacking of different ceramics wares.

**55.** Perform the routine maintenance of the kiln.

**56.** Identify the damaged insulation and replace it properly.

**57.** Control of the kiln important parameters like temperature and pressure.

**58.** Skills in trouble shooting of during kiln firing, along with exposure routine maintenance techniques that develop an operator.

**59.** Prepare and maintain the record of kiln reading in logbook.

**60.** Record, identify and perform corrective action during trouble shooting during kiln firing.

**61.** Identify the different defects in body and glazes

**62.** Apply all safety precautions about using tools and different equipment used in the ceramics industry.

## 1.3 JOB OPPORTUNITIES AVAILABLE IMMEDIATELY AND IN THE FUTURE

The Pass outs of this course may find job / employment opportunities in the following areas:

- ✓ Ceramics (table ware) industry
- ✓ Ceramics (Sanitary ware) Industry
- ✓ Ceramics (Wall and Floor Tiles) Industry
- ✓ Refractory manufacturing factory

- ✓ Ceramics (Insulator) Industry
- ✓ Ceramics teaching and Research Institutes
- ✓ Self-Employment

**Trainee Entry Level:** Middle

**Medium of Instruction:** Urdu, English or Local Language

## Minimum Qualification of Trainer

- DAE in Ceramics with 3 year experience
- Certificate in Ceramics with 5 year experience
- Matric with 10 years of experience in the Ceramic Industry

## Description of the structure of the course

| Module # | Title | Theory (Hours) | Practical (Hours) | Total (Hours) |
|---|---|---|---|---|
| **1** | Preparation of Slip and Glazes | 54 | 144 | 198 |
| **2** | Prepare Model and Mould | 40 | 126 | 166 |
| **3** | Form articles by different techniques | 29 | 130 | 159 |
| **4** | Perform different techniques of drying | 17 | 60 | 77 |
| **5** | Perform finishing and joining | 20 | 180 | 200 |
| **6** | Make decoration on articles | 38 | 140 | 178 |
| **7** | Demonstrate Glaze applications methods | 34 | 160 | 194 |
| **8** | Kiln firing | 42 | 190 | 232 |
| **9** | Perform the quality control | 21 | 50 | 71 |
| **10** | Perform Communications | 11 | 40 | 51 |
| **11** | Safety at work | 14 | 60 | 74 |
| **TOTAL HOURS** | | 320 | 1280 | 1600 |

## Duration of the course:

The proposed curriculum is composed of 11 modules that will be covered in 1600 hrs. It is proposed that the course may be delivered in a One Year period. The distribution of contact hours is given below:

| | | |
|---|---|---|
| **Total:** | 1600 hrs | |
| **Theory:** | 320 hrs | (20%) |
| **Practical:** | 1280 hrs | (80%) |
| **Days per week:** | 06 | |

## 2. OVERVIEW OF THE CURRICULUM FOR CERAMIST

| Module title and aim | Learning Units | Theory | Practical | Total |
|---|---|---|---|---|
| **Module 1:** Preparation of Slip and Glazes<br><br>**Aim:** On completion of this module the student will be enabled to prepare different types of clay bodies& glazes like raw glaze, opaque & color glazes used in the ceramic industry. | **LU-1:** Perform Crushing of raw materials<br>**LU-2:** Perform batching of raw materials for slip and glazes<br>**LU-3:** Perform grinding and mixing of raw materials<br>**LU-4:** Check and adjust the parameters of slip and glazes<br>**LU-5:** Perform filtration of the slip<br>**LU-6:** Perform vacuum Kneading of the filtered cake | 54 | 144 | 198 |
| **Module 2:** Prepare Model and Mould<br><br>**Aim:** The trainee will be enabled to prepare Models of the desired product, different types of Moulds by using necessary tools and equipment. | **LU-1:** Make design of the desired product<br>**LU-2:** Make Model of the desired product<br>**LU-3:** Make various types of Plaster mould | 40 | 126 | 166 |

| Module title and aim | Learning Units | Theory | Practical | Total |
|---|---|---|---|---|
| **Module 3:** Form articles by different techniques<br><br>**Aim:** After completion of this module, the trainee will be able to understand the different fabrication techniques like casting, pressing and jiggering & jollying | **LU-1:** Make Articles by casting technique<br>**LU-2:** Filling of mould<br>**LU-3:** Analyse the casting thickness and time<br>**LU-4:** Make articles by pressing technique<br>**LU-5:** Make article by Jiggering and Jollying | 29 | 130 | 159 |
| **Module 4 :**Perform different techniques of drying<br><br>**Aim:** The Trainee will be able to describe the drying, drying time and temperature and the different types of dryers used in the industry and able to dry the given product | **LU-1:** Drying in Open Air and Sun<br>**LU-2:** Perform drying in Conveyor belt dryer<br>**LU-3:** Perform drying in spray dryer | 17 | 60 | 77 |
| **Module 5:** Perform finishing and joining<br><br>**Aim:** The Trainee is able to understand the importance of the finishing and joining techniques and perform the desired finishing and joining of the given wares | **LU-1:** Inspect the green ware piece<br>**LU-2:** Perform finishing of the piece<br>**LU-3:** Perform cutting of the piece<br>**LU-4:** Perform joining of the piece<br>**LU-5:** Refinish the final piece | 20 | 180 | 200 |

| Module title and aim | Learning Units | Theory | Practical | Total |
|---|---|---|---|---|
| **Module 6 :**Make decoration in articles<br><br>**Aim:** The Trainee will be able to describe the different decoration techniques used and perform the require decoration of the given ceramics ware | **LU-1:** Make under glaze decoration<br>**LU-2:** Make engraving<br>**LU-3:** Make embossing<br>**LU-4:** Perform over glaze decoration<br>**LU-5:** Make Engobe decoration | 38 | 140 | 178 |
| **Module 7:** Demonstrate Glaze application methods<br><br>**Aim:** The Trainee will be able to understand the different techniques for glazing and its correction application to given ceramics ware | **LU-1:** Perform glazing by spraying<br>**LU-2:** Perform glazing by brushing<br>**LU-3:** Perform glazing by dipping<br>**LU-4:** Perform glazing by pouring<br>**LU-5:** Correct application of glaze | 34 | 160 | 194 |
| **Module 8 :** Kiln firing<br><br>**Aim:** After completion of this module, Trainee will be able to know the operation of the kiln | **LU-1:** Perform loading and unloading of the kiln<br>**LU-2:** Fire the Kiln<br>**LU-3:** Record the kiln data<br>**LU-4:** Maintenance of the kiln<br>**LU-5:** Demonstrate the process of Trouble shooting Kiln | 42 | 190 | 232 |

| Module title and aim | Learning Units | Theory | Practical | Total |
|---|---|---|---|---|
| **Module 9:** Perform the Quality Control<br><br>**Aim:** The Trainee will be able to understand the importance of quality control and different types of defects in the body and perform the sorting of different wares as per the quality control policy of the company | **LU-1:** Evaluate the raw materials<br>**LU-2:** Identify the defects on glazed surface<br>**LU-3:** Identify the defects of fire body<br>**LU-4:** Perform grading of the products. | 21 | 50 | 71 |
| **Module 10:** Perform Communication<br><br>**Aim:** This module develop the competency to properly communicate with the peers, engineer, seniors/juniors, electrical and mechanical department and the concerned office | **LU-1:** Communicate with seniors / juniors<br>**LU-2:** Communicate with engineer/ Supervisor<br>**LU-3:** Communicate with electrical department | 11 | 40 | 51 |
| **Module 11:-** Safety at work<br><br>**Aim:** After completion of this module, the trainee will be able to describe the precautions, safe working environment procedures and how to cope with hazards during working | **LU-1:** Identify the protective procedures<br>**LU-2:** Ensure the cleaning of the working area<br>**LU-3:** Use of Fire Extinguisher, and safety alarms | 14 | 60 | 74 |

# 3. CERAMIST TEACHING AND LEARNING GUIDE

## Module 1: PREPARATION OF SLIP AND GLAZES

**Objective: The** Trainee will be able to understand the different processes like crushing, grinding, filtration and the de-airation. Also able to understand the operation of the equipment used in slip house and prepare the slip and glazes of the required composition

**Duration:** 198 Hours ……. **Theory:** 54 Hours ……. **Practice:** 144 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Perform Crushing of raw materials | **Trainee will be able to:**<br>• Understand the Ceramics, different raw materials use in ceramics industry<br>• Perform the crushing of the raw materials in the Jaw Crusher | • Ceramics and Raw Materials<br>• Types of Crusher<br>• Working Principal and operation of jaw Crusher<br>• Feed size and product size<br>• Trouble shooting during crushing<br>○ Understand the ceramics and the related raw materials<br>○ Feed the crusher Properly<br>○ Operate the Jaw Crusher<br>○ Assess the material for crushing | **Theory:** 8 hrs<br>**Practical:** 20 hrs | ○ Models<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Jaw crusher<br>○ Sandstone | Class Room/ Lab |
| **LU-2.** Perform batching of raw materials for slip and glaze | **Trainee will be able to:**<br>• Understand the role of different raw materials used for making slip and glazes<br>• Prepare the batches of | • Slip Body Introduction<br>• Fluxes like feldspar<br>• Filler like quartz<br>• Clays like china, ball and fire clay<br>• Batch Calculations for slip<br>• Addition of Deflocculants<br>• Addition of suitable amount of water<br>• Types of clay bodies<br>• Glaze and its types | **Theory:** 14 hrs<br>**Practical:** 30 hrs | ○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Weighting scale | Class Room/ Lab |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| | different ceramics bodies, transparent and colored glazes | • Glass formers<br>• Stabilizers<br>• Fluxes<br>• Binders<br>• Opacifiers<br>• Pigments used for colours<br>• Addition of Deflocculants<br>• Addition of Different colors<br>• Addition of required amount of water<br>• Weighting Balance<br>• Addition of water<br>• Glaze Calculations<br>○ Operate the weighting Balance<br>○ Identify the materials for Body and glaze<br>○ Perform Calculation of different batches of Body and glazes<br>○ Prepare and add the Deflocculants<br>○ Add the suitable water to the slip and glazes<br>○ Prepare batches of different colored glazes<br>○ Make different batches of glazes | | ○ Raw materials | |
| **LU-3.** Perform grinding and mixing of raw materials | **Trainee will be able to:**<br>• Understand the importance and working of different grinders<br>• Able to perform the grinding of mixing of the batch in the ball mill | • Types of Grinders<br>• Working principle and operation of Ball mill and jar mill<br>• Selection of grinding media used in the mill<br>• dry grinding<br>• wet grinding<br>• Grinding of colours<br>• liners in ball mill<br>• RPM of Mill<br>• Grinding time<br>• Loading and unloading of the ball mill<br>○ Load the ball mill<br>○ Charge the mill with the grinding media and batch | **Theory:** 16 hrs<br>**Practical:** 36 hrs | ○ Models,<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Ball mill<br>○ grinding balls | Class Room/ Lab |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| | | ○ Calculate the grinding time<br>○ Make adjustment on the rpm of the mill<br>○ Operate the ball mill<br>○ Operate the jar mill<br>○ Unload the ball mill properly | | | |
| **LU-4.** Check and adjust the parameters of slip and glazes | **Trainee will be able to:**<br>• Understand the parameters like viscosity, density and residue<br>• Examine and adjust the quality for slip and glazes | • Factors affecting quality of slip 2and glazes<br>• Density of slip and glazes<br>• Viscosity of slip and glazes<br>• Residue test for slip and glazes<br>• Related Apparatus like Viscometer Hydrometer, Sieves Stop watch<br>• Adjustment of the parameters<br>• PSA, water percent, particular size analyzer.<br>• Select the viscosity of slip and glaze<br>• Measure and maintain the required density of slip and glazes<br>• Perform the residue test<br>• Add suitable amount of water, Deflocculants and clay if necessary.<br>• Perform the PSA, and water test | **Theory:**<br>06 hrs<br>**Practical:**<br>28 hrs | ○ Wall Charts<br>○ Multimedia<br>White Board<br>○ Stationary<br>○ Torsion balance viscometer<br>○ Hydrometer<br>○ Sieves set | Class Room/ Lab |
| **LU-5.** Perform filtration of the slip | **Trainee will be able to:**<br>• Mix and filter the slip in the blunger and the filter press | • Working principal of Blunger<br>• Filling the blunger<br>• How to Calculate the mixing time<br>• Filtration process of slip<br>• Operation and working of Filter Press<br>• Pumping of slip to press<br>• Selection of Filter cloth<br>• Plates adjustment<br>• Filtrate flow rate& pressure in Press<br>○ Charge the blunger Properly<br>○ Adjust the mixing time<br>○ Operate the Pump | **Theory:**<br>06 hrs<br>**Practical:**<br>20 hrs | ○ Models,<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Blunger<br>○ Pug mill | Class Room/ Lab |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| | | ○ Adjust the filter cloth in plate<br>○ Adjust and measure the required pressure in the press<br>○ Operate the filter press<br>○ Check the filtrate flow rate<br>○ Dissemble the plates<br>○ Collect the cake from the press | | ○ Filter press | |
| **LU-6.** Perform vacuum Kneading of the Filter Cake | **Trainee will be able to:**<br>• Understand the operation of the Vacuum Pug mill<br>• Able to perform the vacuum kneading in the Pug mill | • Vacuum Kneading<br>• Operation of the Pug Mill<br>• Use of Vacuum pump in the mill<br>• Dies<br>• Moisture Content of the cake<br>• Blank Collection<br>• Troubleshooting and de-airing of pug mill.<br>○ Charge the cake in the hopper accordingly<br>○ Operate the Pug mill with vacuum<br>○ Collect the blank of the required size.<br>○ Troubleshoot and de-air pug mill | **Theory:**<br>04 hrs<br>**Practical:**<br>10 hrs | ○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Pug mill | Class Room/ Lab |

## Module 2: PREPARE MODEL AND MOULD

**Objective**: The Trainee will be able to make model of the desired product, also make plaster mould and different types of mould

**Duration:** 166 Hours ……. **Theory:** 40 Hours ……. **Practice:** 126 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Make pattern of the desire product | **Trainee will be able to:**<br>• Draft the basic pattern of any shape | • Relevant Units and their conversion<br>• Basics of drafting i.e Side elevation, top, bottom, front etc.<br>• scale basic drawing<br>• Understanding of the tracing of patterns<br>• Selecting of the proper measuring instruments and tools for jobs<br>✓ Select the basic tools for measuring,<br>✓ Perform basic mathematical calculations and unit conversions.<br>✓ Do freehand drawing<br>✓ Perform basic scale Drawings | **Theory:** 12 hrs<br>**Practical:** 30 hrs | ○ Models,<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Graph papers Boards<br>○ Scale<br>○ Vernier Calipers | Class Room/ Lab |
| **LU-2.** Make Model of the desired product | **Trainee will be able to:**<br>• Understand different materials, shrinkage margins and tools used for model making<br>• Able to Prepare models on Vertical Lathe or Modeling wheel. | • Materials used for the model making<br>• Plastic clay and shrinkage Usage<br>• Plaster of Paris usage<br>• Modeling wheel<br>• Different modeling tools<br>• Water and plaster ratio<br>• Water and plaster Mixing<br>✓ Take shrinkage margins<br>✓ Operate the modeling wheel<br>✓ Asses the proper modeling tools<br>✓ Place the Plaster on lathe<br>✓ Operate the lathe machine<br>✓ Use turning tools<br>✓ Sharpen the tool<br>✓ Transfer and finishing the design<br>✓ Do Centering and hardness of plaster as required | **Theory:** 10 hrs<br>**Practical:** 30 hrs | ○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Plaster of Paris<br>○ Clay Modeling wheel<br>○ Lathe tools | Class Room/ Lab |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-3.** Make various types of Plaster mould | **Trainee will be able to:**<br>• Identify the tools and equipment required<br>• Arrange the tools and equipment required<br>• Identify the type of mould required to perform certain job.<br>• Prepare different types of requires Moulds | • Batching of plaster and water ratio<br>• Handling Modeling Wheel<br>• Different mould types:<br>— Master mould<br>— Case mould<br>— working mould<br>— multiple piece mould<br>• separator and mould sealer<br>• setting of the mould<br>• Jiggering and press mould<br>• tools used in mould making<br>✓ Make Plaster mould<br>✓ Keep the mould in proper alignment.<br>✓ Finish the interior & exterior of the mould<br>✓ Employ the soap and shellac<br>✓ Use of the turning box<br>✓ Make Jiggering and pressing mould<br>✓ Create different types of moulds | **Theory:**<br>18 hrs<br>**Practical:**<br>66 hrs | ○ Models<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Plaster of Paris<br>○ Turning tools<br>○ Shellac,<br>○ Soap | Class Room/ Lab |

## Module 3: FORMING OF ARTICLES BY DIFFERENT TECHNIQUES

**Objective:** The trainee will be able to understand the different forming techniques and from articles by casting, pressing and jiggering and jollying techniques

**Duration:** 159 Hours ……. **Theory:** 29 Hours ……. **Practice:** 130 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Make Articles by casting technique | **Trainee will be able to:**<br>• Describe the slip casting and its application | • Slip casting and related tools<br>• Application of slip casting<br>• Slip casting moulds<br>• Slip properties and quality<br>✓ Value the casting<br>✓ Arrange the tools<br>✓ Identify slip casting moulds<br>✓ Check the faults in slip | **Theory:**<br>08 hrs | ○ Models<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Slip casting Moulds | Class Room |
| **LU-2.** Mould Filling | **Trainee will be able to:**<br>• Fill the mould properly | • Filling speed<br>• Defects due to filling speed<br>• Draining<br>• Draining Speed<br>✓ Control the filling speed of slip in the mould<br>✓ Manage the position of the poured slip<br>✓ Drain excess slip from the mould. | **Theory:**<br>06 hrs<br>**Practical :** 30 hrs | ○ Models<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Slip Pouring Container<br>○ Moulds | Class room/Lab |
| **LU-3.** Analyze the Casting thickness and time | **Trainee will be able to:**<br>• Cast the piece of the required thickness at specific time | • Thickness of the cast<br>• Steady Draining speed<br>• Angle of Drain<br>• Avoiding of bubbles<br>• Casting time<br>• Relation of casting time with the size of mould<br>• Casting time and environment temperature<br>✓ Get the desired thickness of the cast<br>✓ Estimate the casting time<br>✓ Recognize the reasons of casting faults **-** | **Theory:**<br>05 hrs<br>**Practical :** 50 hrs | ○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Slip Pouring Container<br>○ Moulds | Class room/Lab |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-4.** Make articles by pressing techniques | **Trainee will be able to:**<br>• Identify different pressing techniques<br>• Operate the hydraulic press | • Pressing as fabrication techniques<br>• Applications<br>• Types of Press use in Industries<br>• Dies<br>• Pressure Requirements<br>• Hydraulic and hand Press working principal<br>• Moisture content in the cake<br>• Heaters Dies Compressor Gauge<br>• Maintenance of the Hydraulic press<br>• Granulating<br>• Safety measures<br>✓ Comprehend the pressing process<br>✓ Identify the moisture required for pressing<br>✓ Generalised material for pressing<br>✓ Fill same amount of material in press<br>✓ Check the pressure of the press<br>✓ Press the stroke<br>✓ Operate the hydraulic press to make tile<br>✓ Lubricate the dies<br>✓ Perform inspection of the dies<br>✓ Understand the importance of safety precautions | **Theory:** 08 hrs<br>**Practical :** 30 hrs | ○ Models<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Slip Pouring Container<br>○ Hydraulic press<br>○ Cake | Class room/Lab |
| **LU-5.** Make articles by Jiggering & Jollying | **Trainee will be able to:**<br>• Handle the operation and working of the jiggering and jollying machine appropriately | • Jiggering & Jollying Process<br>• Dies and Moulds<br>• Heating System<br>• Adjustment of Cutter<br>• Cutting of Blank<br>• Moisture Content in Blank<br>• Stroke<br>✓ Asses the amount of cake for the jiggering & Jollying Process<br>✓ Perform the Stroke of the machine<br>✓ Cut the Spare line<br>✓ Operate the machine | **Theory:** 02 hrs<br>**Practical :** 20 hrs | ○ Models<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Moulds<br>○ Cutters<br>○ Machine | Class room/Lab |

## Module 4: PERFORM DIFFERENT TECHNIQUES OF DRYING

**Objective:** To make enable the Trainee to understand the importance of drying, its types and the factors that affect the drying rate.

**Duration:** 77 Hours ……. **Theory:** 17 Hours ……. **Practice:** 60 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Drying in Open Air and Sun | **Trainee will be able to:**<br>• Handle the article after the achievement of required shape is achieved.<br>• Assemble the articles properly at the designated place in open air/ sun. | • Proper drying process in Open air/Sun<br>✓ Understand the importance of drying.<br>✓ Explain the process and importance of drying.<br>✓ Identify the method through which the articles are dried in open air/ sun.<br>✓ Dry article in open air/sun<br>✓ Identify the defects of drying article in open air/Sun | **Theory:** 06 hrs<br>**Practical:** 10 hrs | ○ Models,<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Dryer | Class Room/ Lab |
| **LU-2.** Perform drying in Conveyor belt dryer | **Trainee will be able to:**<br>• Do drying as required<br>• Observe drying rate<br>• Monitor operation of the Conveyor belt dryer<br>• Control Temperature and RPM<br>• Identify Warping defects | **Knowledge of:**<br>• Drying and Drying Equipments<br>• Working of Conveyor- belt dryer<br>• Applications<br>• Drying Rate<br>• Temperature and RPM<br>• warping defect in drying<br>**Ability to:**<br>✓ Understand the drying rate and drying temperature<br>✓ Measure and change the temperature in the dryer<br>✓ Adjust the RPM of the conveyor belt<br>✓ proper dry the article | **Theory:** 05 hrs<br>**Practical:** 25 hrs | ○ Models<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Dryer<br>○ Conveyor Belt | Class Room/ Lab |

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-3.** Perform drying in spray dryer | **Trainee will be able to:**<br>• Operate spray dryer<br>• Control the parameters<br>• Dry the slip to make granulates using spray dryer | **Knowledge of:**<br>• Application of Spray Dryer<br>• Working principal and operation of spray dryer<br>• Flow rate and temperature adjustment in spray dryer<br>• Cleaning of spray Dryer<br>• Atomizing Nozzle<br><br>**Ability to:**<br>✓ Control the flow of steam in dryer<br>✓ Control the flow of slip in dryer<br>✓ Perform cleaning of the spray dryer<br>✓ Adjust the temperature of the dryer<br>✓ Operate the spray dryer | **Theory:**<br>06 hrs<br>**Practical:**<br>25 hrs | ○ Models,<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Dryer | Class Room/ Lab |

## Module 5: PERFORM FINISHING AND JOINING

**Objective:** To make able the trainee to understand the finishing and joining Operations and perform the finishing and joining of the related articles

**Duration:** 200 Hours ……. **Theory:** 20 Hours ……. **Practice:** 180 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Inspect green ware piece | **Trainee will be able to:**<br>• Observe quality<br>• Identify the defects of the given piece | **Knowledge of:**<br>• Green ware and green are strength<br>• Defects in green ware<br>• Warpage<br>• Crack<br>• Pin holes<br><br>**Ability to:**<br>✓ Verify Cracks<br>✓ Check deformation<br>✓ Test out for pin holes<br>✓ Observe the weight proportions | **Theory:** 03 hrs<br>**Practical:** 20 hrs | ○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Eraser<br>○ Wheel | Class Room/ Lab |
| **LU-2.** Perform the Finishing of the piece | **Trainee will be able to:**<br>• Identify the area for the filling<br>• Fill manually desired area as per | **Knowledge of:**<br>• Final shape of the product<br>• Finishing tools and wheel<br>• Spare line of the piece | **Theory:** 04 hrs<br>**Practical:** 44 hrs | ○ Multimedia<br>○ White Board<br>○ Stationary | Class Room/ Lab |

| | | | | | |
|---|---|---|---|---|---|
| | requirement<br>• Maintain the desired moisture level in the piece<br>• Remove the unwanted spare line in the piece<br>• Operate the tools properly for the finishing<br>• Prepare the desired shape. | • Related Mould<br>• Moisture content in the piece<br>• Dimension of the piece<br><br>**Ability to:**<br>✓ Explain the importance of finishing<br>✓ Identify and remove the spare line from the piece<br>✓ Understand the tools and wheel<br>✓ Make level the base of the piece<br>✓ Make the corners of the piece equal<br>✓ Verify final shape & spare lines of the green ware. | | ○ Eraser<br>○ Wheel<br>○ Knife<br>○ Foam<br>○ Duster | |
| **LU-3.** Make the cutting of the piece | **Trainee will be able to:**<br>• Perform cutting with appropriate tools<br>• Cut the Piece of the required size | **Knowledge of:**<br>• Shape of the final article<br>• cutting tools<br>• Cutting requirements of the piece<br>• places for holes i.e. lamps, teapots etc | **Theory:** 04 hrs<br>**Practical:** 60 hrs | ○ White board<br>○ Stationery<br>○ Apron<br>○ Knife<br>○ Foam<br>○ Sponge | Class room/Lab |

| | | | | | |
|---|---|---|---|---|---|
| | | **Ability to:**<br>✓ Use cutting tools properly<br>✓ Make holes of the required size<br>✓ Cut the Piece according to perception drawings<br>✓ Complete the job as per requirement | | | |
| **LU-4.**<br>Perform the joining of the piece | **Trainee will be able to:**<br>• Identify the pieces to be joined<br>• Prepare the paste as required<br>• Perform joining and pressing of different pieces<br>• Ensure the proper cleaning is done after joining according to health and safety rules | **Knowledge of:**<br>• Paste for joining pieces<br>• Composition of the paste<br>• viscosity and water ratio of the paste<br>• Slip as paste<br>• Importance of cleaning<br>• proper pressing of the joined piece<br><br>**Ability to**<br>✓ Explain the different techniques for the joining of the pieces<br>✓ Prepare mixture of joining | **Theory:** 05 hrs<br>**Practical:** 38 hrs | ○ White board<br>○ Stationery<br>○ Apron<br>○ Knife<br>○ Foam<br>○ Sponge | Class room/Lab |

| | | | | | |
|---|---|---|---|---|---|
| | | ✓ Describes the paste used for joining.<br>✓ Understand the pieces to be joined like kettle etc.<br>✓ Apply the paste to the right place<br>✓ Explain the importance of cleaning after joining<br>✓ Clean the piece properly<br>✓ Press the piece | | | |
| **LU-5.** Re-finish the final piece | **Trainee will be able to:**<br>• Use appropriate tools to refinish the job<br>• Clean the piece as per requirement<br>• Finalise the product | **Knowledge of:**<br>• Final shape of the product<br>• tools for finishing<br><br>**Ability to**<br>✓ Finalise the piece | **Theory:** 04 hrs<br>**Practical:** 18 hrs | ○ White board<br>○ Stationery<br>○ Apron<br>○ Knife<br>○ Foam<br>○ Sponge | Class room/Lab |

## Module 6: MAKE DECORATION ON ARTICLES

**Objective:** To enable the trainee to understand the different decoration techniques like under glaze, over glaze, engraving, embossing and Engobe decorations and make the decorated ceramics wares

**Duration:** 178 Hours ……. **Theory:** 38 Hours ……. **Practice:** 140 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Make under glaze decoration | **Trainee will be able to:**<br>• Perform under glaze decoration on the ceramic wares<br>• Select the design<br>• Sketch/copy the selected design on Green/dry ware<br>• Prepare the colour solution<br>• Review the colour solution<br>• Apply colour on the ware as required | **Knowledge of:**<br>• Under glaze decoration techniques<br>• Applications<br>• Sketch<br>• Tools and brushes<br>• Coloring scheme<br>• Stroke<br>• Color Solution properties<br><br>**Ability to:**<br>✓ Understand the selected Sketch on the green ware<br>✓ Explain Coloring the ware as the desire scheme<br>✓ Asses the coloring solution<br>✓ Identify the different techniques Under glaze | **Theory:** 08 hrs<br>**Practical:** 40 hrs | ○ Slides<br>○ White Board<br>○ Brushes of different size<br>○ Pencils<br>○ Chromium oxide<br>○ Colours: Red and Yellow | Class Room/lab |

| | | | | | |
|---|---|---|---|---|---|
| | | decoration<br>✓ Describe Application of design<br>✓ Define the color properties | | | |
| **LU-2.** Make engraving | **Trainee will be able to:**<br>• Understand the engraving techniques<br>• Use the relevant tools accordingly<br>• Sketch different engraving patterns on the ware<br>• Handle the ware properly | **Knowledge of:**<br>• engraving technique for ceramics<br>• tools for engraving like blades, cutters<br>• Cutting and handling of green wares<br>• Pattern for cutting<br>**Ability to:**<br>✓ Use the cutting tools Properly<br>✓ Make different engraving patterns on the wares<br>✓ Recognise different engraving techniques for ceramics ware<br>✓ Identify various methods of cutting | **Theory:** 04 hrs<br>**Practical:** 20 hrs | ○ Slides<br>○ Whiteboard<br>○ Pencils<br>○ Papers<br>○ Knives set<br>○ Cutters | Class Room/lab |

| | | | | | |
|---|---|---|---|---|---|
| **LU-3.** Perform embossing | **Trainee will be able to:**<br>• Value the embossing techniques<br>• Recognise he relevant tools<br>• Select a design for Embossing<br>• Transfer selected design on the ware<br>• Demonstrate embossing the required design using appropriate tools | **Knowledge of:**<br>• Embossing technique for ceramics<br>• Pattern<br>• Coil making<br>• Joining<br>• tools used for embossing<br><br>**Ability to:**<br>✓ Make embossing on the articles<br>✓ Explain different embossing techniques of ceramic ware e.g.<br>▪ Pattern<br>▪ Tools<br>▪ Joining, etc | **Theory:** 04 hrs<br>**Practical:** 20 hrs | ○ Slides<br>○ Whiteboard<br>○ Pencils<br>○ Coil<br>○ Cake<br>○ Knives set<br>○ Cutters | Class Room/lab |
| **LU-4.** Perform over glaze decoration | **Trainee will be able to:**<br>• Identify the various over glazing techniques e.g. enameling, luster, brushing spraying, Stickers<br>• and the related tools<br>• Decorate the surface of the glaze with the help of different | **Knowledge of:**<br>• Over glaze decorations techniques<br>• Enamels<br>• Screen printing Machine<br>• Application of enamels<br>• Proper pressing of Enamels paste | **Theory:** 08 hrs<br>**Practical:** 30 hrs | ○ White Board<br>○ Slides<br>○ Media<br>○ Enamels<br>○ Stickers<br>○ Luster<br>○ Spray gun | Class Room/lab |

| | | | | | |
|---|---|---|---|---|---|
| | glazing techniques<br>• Ensure luster viscosity and density<br>• Decorate the piece using spray gun<br>• Operate the screen printing machine accordingly | • Luster<br>• Luster Application and tools<br>• Luster viscosity<br>• Brushing techniques<br>• Glaze properties for brushing<br>• Brushes<br>• spraying techniques<br>• Spray gun<br>• Glaze properties for spraying<br>• Sticker printing<br>• Cutting of Sticker<br>• Proper sticking to the glazed surface<br><br>**Ability to:**<br>✓ Understand different over glaze decoration techniques<br>✓ Operate the screen printing machine<br>✓ Apply enamels to the wares<br>✓ Apply luster to piece<br>✓ Apply decoration with the spray gun<br>✓ Apply sticker to piece | | ○ Brushes<br>○ Fired glazed ware | |

| | | | | | |
|---|---|---|---|---|---|
| **LU-5.** Make Engobe Decoration | **Trainee will be able to:**<br>• Apply the Engobe fit to the surface of the body by pouring<br>• Demonstrate Engobe application methods e.g.<br>— Pouring<br>— Spraying<br>• Inspect Engobe defects | **Knowledge of:**<br>• Engobe slip applications<br>• Making of engobe<br>• Colour Adjustment and addition<br>• Engobe adjustment to the wares<br>• Engobe composition<br>• Engobe applications like Dipping, pouring, brushing<br>• Engobe by pouring method<br>• Cleanliness of body<br>• Pores of the body<br><br>**Ability to:**<br>✓ Understand various Engobe decoration techniques<br>✓ Classify different Engobe application methods<br>✓ Describe the Engobe application process<br>✓ Explain the process of composition of Engobe<br>✓ Apply Engobe to body by pouring | **Theory:** 14 hrs<br>**Practical:** 30 hrs | ○ White Board<br>○ Slides Engobe<br>○ Tub<br>○ Brushes of different sizes | Class Room/lab |

| | | | | | |
|---|---|---|---|---|---|
| | | ✓ Fit the Engobe to the body Properly<br>✓ Record Engobe defects<br>✓ Know the cleanliness of the surface of ware | | | |

## Module 7: DEMONSTRATE GLAZE APPLICATION METHODS

**Objective**: To make enable trainees to glaze the articles by different techniques like spraying, brushing, dipping and pouring.

**Duration:** 194 Hours ……. **Theory:** 34 Hours ……. **Practice:** 160 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Perform glazing by spraying | **Trainee will be able to:**<br>• Use tools and equipment for spraying glazes<br>• Examine the glaze for spraying<br>• Evaluate the viscosity of glaze for spraying<br>• Adjust the glaze thickness<br>• Apply glaze to the surface with the help of Spray gun<br>• Make sure that the booth Exhaust Fan is on<br>• Store tools after washing according to health & safety rules | **Knowledge of:**<br>• Glazing by spraying applications<br>• Tools for spraying glazes<br>• Air Brush<br>• Spray gun with compressor<br>• Spray booth<br>• Turning wheel<br>• Spray gun Nozzle adjustment<br>• Cleaning after use<br>• Glaze thickness for spraying<br><br>**Ability to:**<br>✓ Explain glazing by the method of spraying<br>✓ Recognise spraying tools<br>✓ Asses the viscosity for glazing<br>✓ Adjust the glaze thickness<br>✓ Adjust the spray head | **Theory:** 06 hrs<br>**Practical:** 30 hrs | ○ White Board<br>○ Slides<br>○ Glaze solution<br>○ Spray gun with compressor<br>○ Turning wheel<br>○ Spray booth | Class room/Lab |

| | | | | | |
|---|---|---|---|---|---|
| | | ✓ Check the Spray Nozzle<br>✓ Place the piece in the spary booth<br>✓ Start the Exhaust in the booth<br>✓ Do glazing by spraying<br>✓ Perform washing the relevant tools after use<br>✓ Use the spray both and turning wheel | | | |
| **LU-2.** Perform glazing by brushing | **Trainee will be able to:**<br>• Adjust the viscosity of glaze for brushing<br>• Perform glazing with brushing<br>• Check the thickness of glaze<br>• Glaze the ware with the help of brushes | **Knowledge of:**<br>□ Glazing by brushing<br>□ Types of brushes<br>□ Pattern of the design<br>□ Properties of the glaze solution<br><br>Thickness of the glaze<br><br>**Ability to:**<br>✓ Explain the method of glazing with brushing method<br>✓ Classify the types of brushes<br>✓ Make Pattern on the ware<br>✓ perform glazing with brushes<br>✓ Adjust the desired viscosity<br>✓ Identify the defects of brushing method | **Theory:** 04 hrs<br>**Practical:** 40 hrs. | ○ White Board<br>○ Slides<br>○ Glaze solution<br>○ Brushes of different sizes | Class room/Lab |

| | | | | | |
|---|---|---|---|---|---|
| **LU-3.** Perform glazing by dipping | **Trainee will be able to:**<br>• Demonstrate the application of glazing of different wares by dipping technique<br>• Dip the pieces in glaze<br>• Adjust the viscosity of glaze for dipping<br>• Apply the glaze as per requirement<br>• Handle the piece properly<br>• Perform double dipping | **Knowledge of:**<br>• Glaze applications by dipping<br>• Related tools like Bowl ,Sponge etc<br>• Mixing during application time<br>• Proper holding of Piece for dipping<br>• Dipping time<br>• Dipping of tiles in glazes while moving side ways<br>• Double dipping<br><br>**Ability to:**<br>✓ Explain the dipping method<br>✓ Recognise the dipping equipment<br>✓ Maintain the consistency of glaze during dipping<br>✓ Properly dip the piece in glaze<br>✓ Understand holding the piece and dipping time | **Theory:** 08 hrs<br>**Practical:** 30 hrs | ○ White Board<br>○ Slides Glaze solution<br>○ Tubs | Class room/Lab |
| 4. Perform glazing by pouring | **Trainee will be able to:**<br>• Demonstrate pouring method for glazes | **Knowledge of:**<br>• Glaze applications by pouring<br>• water fall glazing method<br>• Speed of the conveyor belt | **Theory:** 08 hrs<br>**Practical:** 28 hrs | ○ White Board<br>○ Slides<br>○ Glaze | Class room/Lab |

| | | | | | |
|---|---|---|---|---|---|
| | • Adjust the viscosity of glaze for pouring<br>• Control the flow rate of glaze<br>• Operate the water fall glazing system<br>• Control the speed of conveyer belt<br>• Manage the glaze thickness | • Amount of glaze flow<br>• Glaze thickness<br>• Wetting of piece before glazing<br><br>**Ability to:**<br>✓ Understand water fall glazing method<br>✓ Control the glaze thickness by controlling RPM<br>✓ Control the flow rate of glaze<br>✓ Pump back the excess glaze<br>✓ Understand the importance of wetting piece before application of glaze<br>✓ Identify the thickness of glaze | | solution | |
| **LU-2.** Correct application of glaze | **Trainee will be able to:**<br>• Recognise the factors which affect the correct application of glazes<br>• Organise the workplace according to the rules of health & Safety<br>• Adjust the viscosity/flow rate and density of glaze for | **Knowledge of:**<br>• Organize the work place<br>• Importance of the clean area<br>• Parameters affecting correction applications of glazes like<br>• Density of the glaze<br>• Viscosity of the glaze<br>• Porosity of the biscuit | **Theory:** 08 hrs<br>**Practical:** 32 hrs | ○ White Board<br>○ Slides<br>○ Glaze Solution<br>○ Sieves<br>○ Viscometer<br>○ Hydrometer<br>○ Beakers | Class room/Lab |

| | | | | | |
|---|---|---|---|---|---|
| | application of each technique<br>• Check the thickness of glaze | • Thickness of the piece<br><br>**Ability to:**<br>✓ Adjust the viscosity for each application technique<br>✓ Flocculate the glaze<br>✓ Cleaning the glazing tools after use<br>✓ Understand the importance of Safe & clean work area<br>✓ Explain the density, viscosity/flow rate and thickness of glaze | | ○ Measuring cylinder | |

## Module 8: Kiln Firing

**Objective:** The Trainee will be able to understand the firing phenomena in the kiln, types of kilns, kiln furniture, importance of the maintaince of the kiln and the factors which affect the performance of the kiln

**Duration:** 232 Hours ……. **Theory:** 42 Hours ……. **Practice:** 190 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Perform loading and unloading of kiln<br>.<br>. | **Trainee will be able to:**<br>• Recognise different types of kiln and furniture<br>• Load/unload different ceramics wares properly<br>• Store the green wares safely<br>• Level the kiln cars<br>• Distribute uniform load and space onto the Slabs.<br>• Store the fired products with identification | **Knowledge of:**<br>• Kiln Classifications<br>• Kiln furniture classification<br>• Saggers, Slabs, Roller, Kiln Trolley, Shelves<br>• Stacking of different wares<br>• Loading for required firing<br><br>**Ability to:**<br>✓ Identify the different types of kiln furniture<br>✓ Perform stacking of different wares like sanitary, bricks, tiles and table wares<br>✓ Load the kiln for the glazed wares<br>✓ Calculate the loading capacity of the kiln car /slabs | **Theory:** 08 hrs<br>**Practical:** 40 hrs | ○ Models,<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Shuttle kiln with SIC Slabs and supports<br>○ Saggers<br>○ Different types of green wares e.g. sanitary, bricks, tiles, table wares | Class Room/ Lab |

| | | | | | |
|---|---|---|---|---|---|
| | | ✓ Review the cleanliness of the slabs before loading<br>✓ Identify levelling apparatus. | | | |
| **LU-2.** Fire the Kin | **Trainee will be able to:**<br>• Perform the routine inspection of kiln and its related accessories<br>• Draw firing curve<br>• Adjust air / gas ratio for the burners<br>• Adjust the tie rods of kiln as needed<br>• Ignite the burners<br>• Maintain different zones of the kiln<br>• Adjust pushing speed of the cars<br>• Adjust dampers of the kiln.<br>• Use appropriate safe technique when pushing and pulling the cars<br>• Operate standby generators | **Knowledge of:**<br>• Firing requirement (oxidation / reduction)<br>• Electric Voltage for firing<br>• Gas pressure<br>• Various Material Nature<br>• Kiln Pressure<br><br>**Ability to:**<br>▪ Understand the firing requirement of the ware (oxidation / reduction)<br>▪ Explain electric voltage accordingly<br>▪ Define the required gas pressure<br>▪ Assess the color of the flame<br>▪ Identify the pressure of the kiln<br>▪ Classify the nature of materials to be fired. | **Theory:** 10 hrs<br>**Practical:** 46 hrs | ○ Models,<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Kilns | Class Room/ Lab |

| | | | | | |
|---|---|---|---|---|---|
| **LU-3.**<br>Record the Kiln data | **Trainee will be able to:**<br>• Maintain the record of the Kiln<br>• Check air / gas ratio<br>• Examine kiln pressure, gas pressure<br>• Maintain the log book<br>• Monitor temperature of different zones of the kiln at specified intervals. | **Knowledge of:**<br>• Importance of kiln reading<br>• Log book<br>• Firing curve<br>• Trouble shooting data in log book<br><br>**Ability to:**<br>✓ Record the log book<br>✓ Measure firing cycle<br>✓ Record and analyze trouble shooting data<br>✓ Use measuring instruments<br>✓ Log the kiln and production data<br>✓ Monitor any abnormal operation / behavior of the kiln | **Theory:** 06 hrs<br>**Practical:** 20 hrs | ○ Models,<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Kiln<br>○ log book | Class Room/ Lab |
| **LU-4.**<br>Perform the proper maintenance of the kiln | **Trainee will be able to:**<br>• Perform the routine inspection of kiln and its related accessories<br>• Clean the burners regularly<br>• Lubricate / grease the moving parts of the kiln.<br>• Clean the control panels properly | **Knowledge of:**<br>• Importance of maintenance of kiln furniture<br>• Composition of the kiln wash<br>• maintenance of burners<br>• Proper ignition of burners<br>• Lubrication of mechanical parts like rollers, | **Theory:** 10 hrs<br>**Practical:** 46 hrs | ○ Models,<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Kiln<br>○ log book | Class Room/ Lab |

| | | | | | |
|---|---|---|---|---|---|
| | • Insulate the hot areas where required<br>• Replace damaged refractory bricks<br>• Clean gas and air filters regularly<br>• Adjust air /gas ratios<br>• Clean slabs /rollers periodically<br>• Apply coating to the slabs<br>• Develop preventive maintenance schedules | compressor/blower<br>• Cracked insulation in the kiln<br><br>**Ability to:**<br>✓ Identify and replace the contaminated kiln furniture<br>✓ Make and apply kiln wash to furniture<br>✓ Identify lubricants / greases<br>✓ Use vacuum cleaning of the electronic parts<br>✓ Assess materials for coating of slabs / rollers<br>✓ Identify various types of the insulation materials and bricks<br>✓ Use different tools<br>✓ Identify the need for calibration of thermocouples<br>✓ Maintain the required materials for maintenance<br>✓ Identify the need for changing the slabs<br>✓ Perform the cleaning of the spark plug<br>✓ Identify the lubrication needs of the rollers and the | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | compressor/blower<br>✓ Identify the wear and tears | | | |
| **LU-5.**<br>Trouble shooting of the Kiln | **Trainee will be able to:**<br>• Identify the trouble shooting phenomena during kiln firing<br>• Take quick action to minimize the defects.<br>• Restart the kiln after power shutdown<br>• Adjust the air / gas ratios<br>• Purge the kiln before every starting cycle | **Knowledge of:**<br>• Trouble shooting in kiln like<br>• Tile Break<br>• Smoke in the zone<br>• Slabs/ Roller break<br>• Gas leakage<br>• Over firing and under firing<br><br>**Ability to:**<br>✓ Identify the defects due to firing<br>✓ Make Temperature adjustment to remove the defect<br>✓ Remove the tile during firing<br>✓ Change the Roller/ Slabs<br>✓ Clean the burner<br>✓ Detect the leakage in line<br>✓ Stop the leakage<br>✓ Understand the kiln alarms<br>✓ Understand the kiln operating / maintenance manuals | **Theory:** 08 hrs<br>**Practical:** 36 hrs | ○ Models,<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Kiln<br>○ log book | Class Room/ Lab |

## Module 9: PERFORM THE QUALITY CONTROL

**Objective:** The Trainee should be able to understand the importance of quality control of the raw materials and the fired products

**Duration:** 71 Hours ……. **Theory:** 21 Hours ……. **Practice:** 50 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Evaluate the Ceramics raw materials | **Trainee will be able to:**<br>• Perform the physical analysis of the raw materials for the quality control<br>• Inspect the raw materials visually<br>• Test the Plasticity<br>• Check the Mesh size<br>• Check the Moisture<br>• Inspect the Colour after firing | **Knowledge of:**<br>• Sampling (quartering and Coning)of the different raw materials<br>• Mesh size<br>• Physical testing on raw materials<br>• Visual inspection of the raw materials<br>• Moisture test<br>• Loss on Ignition test<br>• Plasticity test<br>• Drying and firing shrinkage<br>• Color after firing<br><br>**Ability to:**<br>✓ Understand the importance of these tests<br>✓ Perform the sampling of the | **Theory:** 08 hrs<br>**Practical:** 20 hrs | ○ Models<br>○ Wall Charts<br>○ Multimedia<br>○ White Board<br>○ Stationary<br>○ Oven<br>○ Kiln<br>○ Crucibles<br>○ Scale<br>○ Analytical Balance | Class Room/ Lab |

| | | | | | |
|---|---|---|---|---|---|
| | | raw materials<br>✓ Measure mesh size<br>✓ Identify the plasticity of the clay<br>✓ Measure % age moisture and %age Loss on ignition (LOI)<br>✓ Identify color after firing<br>✓ Measure shrinkage | | | |
| **LU-2.**<br>Identify the defects on the glazed | **Trainee will be able to:**<br>• Identify the different defects of the glazed material of the products e.g. crazing, pin holes, crawling, shiverage etc. | **Knowledge of:**<br>• different defects of glazes like<br>• Crazing, shivering, pin holes<br>• Describe their remedies<br><br>**Ability to:**<br>✓ Understand the glazing defects<br>✓ Identify the pin hole<br>✓ Identify the crazing<br>✓ Identify the shivering<br>✓ Identify the crawling<br>✓ Understand the reasons and their remedies | **Theory:** 05 hrs<br>**Practical:** 10 hrs | ○ Slides<br>○ Models<br>○ Whiteboard<br>○ Sheets<br>○ Defected glazed products<br>○ Oven<br>○ Kiln<br>○ Inks | Class Room/ Lab |

| | | | | | |
|---|---|---|---|---|---|
| **LU-3.** Identify the defects on fired body | **Trainee will be able to:**<br>• Identify the defects in ceramics bodies e.g. warpage, crack etc | **Knowledge of:**<br>• Defects in bodies like warpage crack etc.<br>• Describe their remedies<br><br>**Ability to:**<br>✓ Understand the body defects<br>✓ Identify the warpage<br>✓ Remove the defects | **Theory:** 05 hrs<br>**Practical:** 10 hrs | ○ Slides<br>○ Models<br>○ Whiteboard<br>○ Sheets<br>○ Defected glazed products<br>○ Oven<br>○ Kiln<br>○ Inks | Class Room/ Lab |
| **LU-4.** Perform grading of the products. | **Trainee will be able to:**<br>• Make grading on the basis of defects<br>• Draw the table for the grading | **Knowledge of:**<br>• Importance of the grading the products<br>• Quality control policy of the company<br><br>**Ability to:**<br>✓ Understand the importance of grading<br>✓ Perform grading | **Theory:** 03 hrs<br>**Practical:** 10 hrs | ○ Slides<br>○ Models<br>○ Whiteboard<br>○ Sheets<br>○ Oven<br>○ Kiln<br>○ Inks | Class R |

## Module 10: PERFORM COMMUNICATION

**Objective: To** makes enable the trainee to properly communicate with the related persons in the Industry

**Duration:** 51 Hours ……. **Theory:** 11 Hours ……. **Practice:** 40 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Communicate with seniors / juniors | **Trainee will be able to:**<br>• Demonstrate communication skill with seniors / juniors<br>• Communicate verbally according to the status of seniors/joiners.<br>• Select the suitable channel and communicate in written. | **Knowledge of:**<br>• Verbal communication, channel of communication and written communication<br><br>**Ability to:**<br>✓ Communicate verbally according to the status of seniors / juniors<br>✓ Select the suitable channel and communicate in written. | **Theory:** 02 hrs<br>**Practical:** 08 | ○ Related books<br>○ White Board<br>○ Papers | Class Room/ Lab |
| **LU-2.** Communicate with engineers/ Supervisor | **Trainee will be able to:**<br>• Demonstrate the communication skill<br>• Communicate with engineers/ supervisor | **Knowledge of:**<br>• Verbal communication<br>• Different Channel of communication<br>• Importance of written communication. | **Theory:** 02 hrs<br>**Practical:** 08 | ○ Related books<br>○ White Board<br>○ Papers | Class Room/ Lab |

| | | | | | |
|---|---|---|---|---|---|
| | | **Ability to:**<br>✓ Communication verbally according to the status of engineer / overseer<br>✓ Select the suitable channel<br>✓ Communicate in written. | | | |
| **LU-3.** Communicate with electrical department | **Trainee will be able to:**<br>• Demonstrate the communication skill<br>• Communication with electrical department | **Knowledge of:**<br>• Verbal communication, channel of communication and written communication.<br><br>**Ability to:**<br>✓ Communicate verbally/ written according to the status of electrical faults. | **Theory:** 02 hrs<br>**Practical:** 08 | ○ Related books<br>○ White Board<br>○ Papers | Class Room/ Lab |

**Module 11: Safety at Work**

**Objective**: The Trainee should be able to describe the safe working environment procedures, precautions and how to cope with hazards during accidents

**Duration:** 74 Hours ……. **Theory:** 14 Hours ……. **Practice:** 60 Hours

| Learning Unit | Learning Outcomes | Learning Elements | Duration | Materials Required | Learning Place |
|---|---|---|---|---|---|
| **LU-1.** Identify the protective procedures | **Trainee will be able to:**<br>• Identify the various types of protective clothing their uses<br>• Recognise Protective equipment and their uses | **Knowledge of:**<br>• Personal protective equipment, tools and their uses<br>• Overalls<br>• Ear defender/plugs<br>• Safety boots<br>• Safety Gloves<br>• Safety Helmets<br>• Safety Masks<br>• Safety Goggles<br><br>**Ability to:**<br>✓ Protect him from accident | **Theory:** 06 hrs<br>**Practical:** 20 hrs | ○ Whiteboard<br>○ Sheets<br>○ Safety cloths<br>○ Overalls<br>○ Ear defender/plugs<br>○ Safety boots<br>○ Safety Gloves<br>○ Safety Helmets<br>○ Safety Masks<br>○ Safety Goggles | Class room/lab |

| | | | | | |
|---|---|---|---|---|---|
| **LU-2.** Ensure the cleaning of the working area | **Trainee will be able to:**<br>• Keep the work place clean<br>• Provide the Basic first aid treatment<br>• Maintain the work place properly.<br>• Clean and store the tools safely. | **Knowledge of:**<br>• importance of safe working environment<br>• importance of the proper positioning of the related tools<br>• first aid treatment<br>• Electrical Shock<br>• Bleeding<br>• Breakage of bones<br>• Minor burns<br>• Eye Injuries<br><br>**Ability to:**<br>✓ Deal with minor accidents and injuries<br>✓ Make proper placement of tools in the work place<br>✓ Provide first aid treatment | **Theory:** 03 hrs<br>**Practical:** 20 hrs | ○ Whiteboard<br>○ Sheets<br>○ Safety cloths<br>○ Overalls<br>○ Ear defender/plugs<br>○ Safety boots<br>○ Safety Gloves<br>○ Safety Helmets<br>○ Safety Masks<br>○ Safety Goggles | Class room/lab |
| **LU-3.** Use of Fire Extinguisher and safety alarms | **Trainee will be able to:**<br>• Use the fire extinguisher and Safety Alarms at the time of emergency | **Knowledge of:**<br>• Fire Extinguishers and their uses<br>• Safety alarms<br><br>**Ability to:** | **Theory:** 05 hrs<br>**Practical:** 20 hrs | ○ Whiteboard<br>○ Sheets<br>○ Safety cloths<br>○ Overalls<br>○ Ear | Class room/lab |

| | | | | | |
|---|---|---|---|---|---|
| | | ✓ Use at the time of fire due to electrical short circuit or combustion<br>✓ Use the alarm during fire | | defender/plugs<br>○ Safety boots<br>○ Safety Gloves<br>○ Safety Helmets<br>○ Safety Masks<br>○ Safety Goggles<br>○ Fir Extinguisher | |

# 4. ASSESSMENT

| MODULE 1:- PREPARATION OF SLIP AND GLAZES | | | | | |
|---|---|---|---|---|---|
| **Learning Units** | **Theory hours** | **Workplace Days/hours** | **Recommended formative assessment** | **Recommended Methodology** | **Scheduled Dates** |
| **LU-1.** Perform Crushing of raw materials | 8 | 20 | ▪ Explain the different types of raw materials used in the ceramics industries<br>▪ Explain the working principle and operation of different crushers like Jaw Crusher, Gyratory crusher<br>▪ Demonstrate the Crushing of Sand stone in the Jaw Crusher | Short Question and answer, Oral test, Task | |
| **LU-2.** Perform batching of raw materials for slip and glaze | 14 | 30 | ▪ Explain the types of the different clay bodies w.r.t composition<br>▪ Explain the Flux, binder and filler used in the slip body<br>▪ Describe the preparation of slip<br>▪ Describe the use of Deflocculants in the slip<br>▪ Describe Glaze and its types<br>▪ Explain the different colors used in making colored glazes<br>▪ Demonstrate the batch | Short Question and answer, Oral test, Task | |

| | | | | | |
|---|---|---|---|---|---|
| | | | calculations of the stone ware, Porcelain and tera cotta bodies<br>▪ Demonstrate to make batch for different types of glazes | | |
| **LU-3.** Perform grinding and mixing of raw materials | 16 | ▪ 36 | ▪ Explain the working principle and operation of different grinding mills<br>▪ Explain the types of grinding and the selection factors for choosing of the grinding media.<br>▪ Demonstrate to do the complete grinding of raw materials in the ball mill | Short Question and answer, Oral test, Task | |
| **LU-4.** Check and adjust the parameters of slip and glazes | 6 | ▪ 28 | ▪ Explain the different parameters affecting quality of slip and glazes<br>▪ Demonstrate the density measurement of the given slip<br>▪ Demonstrate to perform the residue test<br>▪ Demonstrate the viscosity measurement test of the slip and glaze | Short Question and answer, Oral test, Task | |
| **LU-5.** Perform filtration of the slip | 6 | 20 | ▪ Define and explain the filtration<br>▪ Explain the operating principal of the filter press<br>▪ Explain the working principal of | Short Question and answer, Oral test, Task | |

| | | | | | |
|---|---|---|---|---|---|
| | | | blunger<br>▪ Perform filter pressing of the slip<br>▪ Perform the mixing in the blunger | | |
| 6. Perform the vacuum kneading of the filter cake | 4 | 10 | ▪ Explain the Vacuum Kneading process<br>▪ Describe the working operation and principal of the pug mill<br>▪ Explain the role of the vacuum pump, dies, cutter in the mill<br>▪ Demonstrate to operate the pug mill and make the blank | Short Question and answer, Oral test, Task | |
| **MODULE 2:- PREPARE MODEL AND MOULD** | | | | | |
| **Learning Units** | **Theory hours** | **Workplace Days/hours** | **Recommended formative assessment** | **Recommended Methodology** | **Scheduled Dates** |
| 1. Make design of the desire product | 12 | 30 | ▪ Explain different Units of Length, Area and Volume<br>▪ Perform the Conversion of these units<br>▪ Describe the basics of drafting i.e Side elevation, Top, bottom, front etc.<br>▪ Explain scale drawings<br>▪ Demonstrate the tracing of the given pattern | Short Question and answer, Oral test, Task | |

| | | | | | |
|---|---|---|---|---|---|
| | | | ▪ Demonstrate the use of the Vernier Calipers, Scale etc.<br>▪ Demonstrate the free hand and scale drawing | | |
| 2. Make Model of the desired product | 10 | 30 | ▪ Describe different materials used for the model making<br>▪ Explain the different tools used for Model making<br>▪ Demonstrate the Model making of the given pattern | Short Question and answer, Oral test, Task | |
| 3. Make various types of Plaster mould | 18 | 65 | ▪ Explain the different types of Moulds<br>▪ Demonstrate the making of the given size of jiggering mould<br>▪ Demonstrate the making of the Case, Master and working mould<br>▪ 4. Demonstrate the making of the multi pieces mold | Short Question and answer, Oral test, Task | |

## Module 3: Forming of Articles by Different Techniques

| Learning Units | Theory hours | Workplace Days/hours | Recommended formative assessment | Recommended Methodology | Scheduled Dates |
|---|---|---|---|---|---|
| **LU-1.** Make Articles by casting technique | 8 | 0 | ▪ Explain the different forming techniques used in the ceramics | Short Question and answer, Oral test, | |

| | | | | | |
|---|---|---|---|---|---|
| | | | industries. | | |
| **LU-2.** Mould Filling | 6 | 30 | ▪ Explain the filling of the mould with slip<br>▪ Demonstrate the filling of the given mould | Short Question and answer, Oral test, Task | |
| **LU-3.** Analyze the Casting thickness and time | 5 | 50 | ▪ Explain the factors for controlling casting thickness<br>▪ Explain casting time<br>▪ Demonstrate to cast the slip for the controlled thickness | Short Question and answer, Oral test, Task | |
| **LU-4.** Make articles by pressing techniques | 8 | 30 | ▪ Explain the articles made by pressing<br>▪ Explain the different pressing techniques<br>▪ Demonstrate to make the tile manual or automatic | Short Question and answer, Oral test, Task | |
| **LU-5.** Perform Jiggering and jollying | 2 | 20 | ▪ Describe the Jiggering & Jollying Process<br>▪ Explain the Dies and Moulds used for this process<br>▪ Demonstrate to make cup and plate from the machine | Short Question and answer, Oral test, Task | |

| MODULE 4: PERFORM DIFFERENT TECHNIQUES OF DRYING | | | | | |
|---|---|---|---|---|---|
| **Learning Units** | **Theory hours** | **Workplace Days/hours** | **Recommended formative assessment** | **Recommended Methodology** | **Scheduled Dates** |
| **LU-1.** Perform drying of the articles | 8 | 25 | ▪ Define drying and explain the different drying equipments used in the ceramics industries<br>▪ Perform the drying in dryer | Short Question and answer, Oral test, Task | |
| **LU-2.** Perform drying in spray dryer | 9 | 35 | ▪ Explain the working principal and construction of the Spray dryer<br>▪ Explain the importance of grain size, Atomization and the controlling factors of low of slip and steam<br>▪ Demonstrate the drying of the slip in the spray dryer | Short Question and answer, Oral test, Task | |
| **LU-3.** Perform the joining of the pieces | 5 | 38 | ▪ Explain the joining materials for joining of pieces<br>▪ Demonstrate to make a paste<br>▪ Demonstrate the joining of the given pieces | Short Question and answer, Oral test, Task | |
| **LU-4.** Re-finishing of the pieces | 4 | 18 | ▪ Explain the need of refinishing the piece<br>▪ Explain refinishing and the tools | Short Question and answer, Oral test, Task | |

| | | | | | |
|---|---|---|---|---|---|
| | | | ▪ Demonstrate the re-finishing of the given pieces | | |
| **Module 6: Make decoration in articles** | | | | | |
| **Learning Units** | **Theory hours** | **Workplace Days/hours** | **Recommended formative assessment** | **Recommended Methodology** | **Scheduled Dates** |
| **LU-1.** Make under glaze decoration | 8 | 40 | ▪ Explain the under glaze decoration<br>▪ Describe the related tools and the properties of color solution<br>▪ Demonstrate to make the pattern for the under glaze decoration in the given piece | Short Question and answer, Oral test, Task | |
| **LU-2.** Make engraving | 4 | 20 | ▪ Explain engraving technique and the related tools<br>▪ Demonstrate the engraving in the given piece | Short Question and answer, Oral test, Task | |
| **LU-3.** Perform embossing | 4 | 20 | ▪ Explain embossing technique and the related tools<br>▪ Demonstrate the embossing in the given piece | Short Question and answer, Oral test, Task | |
| **LU-4.** Perform over glaze decoration | 8 | 30 | ▪ Explain the types of Over glaze decoration<br>▪ Explain the enameling and its applications methods<br>▪ Explain luster, Spraying and | Short Question and answer, Oral test, Task | |

| | | | | | |
|---|---|---|---|---|---|
| | | | brushing and their related tools<br>▪ Demonstrate to apply the screen printing, Spraying, ,brushing Luster and sticker pasting in the given piece | | |
| **LU-5.** Make Engobe decoration | 14 | 30 | ▪ Explain the Engobe, its making, adjustment and application methods<br>▪ Demonstrate to apply the Engobe the body with the help of pouring technique | Short Question and answer, Oral test, Task | |
| **MODULE 7: GLAZE APPLICATION METHODS** | | | | | |
| **Learning Units** | **Theory hours** | **Workplace Days/hours** | **Recommended formative assessment** | **Recommended Methodology** | **Scheduled Dates** |
| **LU-1.** Perform glazing by spraying | 6 | 30 | ▪ Explain the glazing by spray gun and its applications.<br>▪ Explain the working principal and use of the spray gun.<br>▪ Explain the role of Wheel and Spray booth on spray glazing<br>▪ Demonstrate the glazing on the given item with the help of spray gun | Short Question and answer, Oral test, Task | |

| | | | | | |
|---|---|---|---|---|---|
| **LU-2.** Perform glazing by brushing | 4 | 40 | ▪ Explain the application of glazing by brushing technique<br>▪ Demonstrate the glazing on the piece with brush | Short Question and answer, Oral test, Task | |
| **LU-3.** Perform glazing by dipping | 8 | 30 | ▪ Explain the application of glazing by dipping techniques and the factors of controlling glaze consistency<br>▪ Demonstrate the glazing on the different pieces with dipping technique | Short Question and answer, Oral test, Task | |
| 4. Perform glazing by pouring | 8 | 28 | ▪ Describe the application of glazes by pouring<br>▪ Explain the water fall glazing method<br>▪ Demonstrate the glazing on the piece with pouring in the water fall glazing system | Short Question and answer, Oral test, Task | |
| 5. Correct application of glaze | 8 | 32 | ▪ Explain the parameters that affect the application of glazing<br>▪ Demonstrate to apply the given glaze on the ware by adjusting the related parameters | Short Question and answer, Oral test, Task | |

| MODULE 8: KILN FIRING | | | | | |
|---|---|---|---|---|---|
| **Learning Units** | **Theory hours** | **Workplace Days/hours** | **Recommended formative assessment** | **Recommended Methodology** | **Scheduled Dates** |
| **LU-1.** Perform loading and unloading of kiln | 8 | 40 | ▪ Define kiln, explain the kiln furniture and its types<br>▪ Describe staking<br>▪ Perform the loading of the given different types of wares on the kiln furniture | Short Question and answer, Oral test, Task | |
| **LU-2.** Perform the proper maintenance of the kiln | 10 | 46 | ▪ Describe the maintenance of the kiln furniture<br>▪ Describe the maintenance of the burners<br>▪ Describe the importance of the insulation and mechanical parts of the kiln<br>▪ Demonstrate to perform the maintenance of the kiln | Short Question and answer, Oral test, Task | |
| **LU-3.** Ensure the proper control of the kiln | 10 | 48 | ▪ Describe the different parameters for affecting the control of the kiln<br>▪ Combustion ratio<br>▪ Temperature<br>▪ Pressure<br>▪ Flow<br>▪ Demonstrate the control of the | Short Question and answer, Oral test, Task | |

| | | | | | |
|---|---|---|---|---|---|
| | | | running kiln by adjusting these above parameters | | |
| **LU-4.** Record the Kiln data | 6 | 20 | ▪ Describe the importance of kiln reading<br>▪ Describe Log book and its application<br>▪ Explain the firing curve<br>▪ Describe trouble shooting data<br>▪ 5. Demonstrate to add the data in the log book | Short Question and answer, Oral test, Task | |
| **LU-5.** Trouble shooting of the Kiln | 8 | 36 | ▪<br>▪ Describe the trouble shooting data in kiln<br>▪ Explain Over firing and under firing<br>▪ Demonstrate to minimize the gas leakage and change the break roller/ slabs during firing<br>▪ Demonstrate to identify and remove the smoke from the kiln zone | Short Question and answer, Oral test, Task | |

| MODULE 9: PERFORM QUALITY CONTROL | | | | | |
|---|---|---|---|---|---|
| **Learning Units** | **Theory hours** | **Workplace Days/hours** | **Recommended formative assessment** | **Recommended Methodology** | **Scheduled Dates** |
| **LU-1.** Evaluate the Ceramics raw materials | 8 | 20 | ▪ Explain the sampling technique for the raw materials<br>▪ Explain the physical tests used for the raw materials<br>▪ Demonstrate the sampling of the raw materials<br>▪ Demonstrate the physical testing like, moisture, % LOI, plasticity, color after firing on the given raw materials | Short Question and answer, Oral test, Task | |
| **LU-2.** Identify defects on the glazed body | 5 | 10 | ▪ Explain the different defects on the surface of glazes<br>▪ Describe the reasons of these defects<br>▪ Identify the different defects on glazed surface | Short Question and answer, Oral test, Task | |
| **LU-3.** Identify the defects on the fired body | 5 | 10 | ▪ Explain the different defects on bodies<br>▪ Describe the reasons of these defects<br>▪ Identify the different defects on surface | Short Question and answer, Oral test, Task | |

| | | | | | |
|---|---|---|---|---|---|
| **LU-.** Perform grading of the products. | 3 | **10** | ▪ Explain the importance of grading and the quality control<br>▪ Demonstrate the grading of the given materials | Short Question and answer, Oral test, Task | |

## MODULE 10: PERFORM COMMUNICATION

| Learning Units | Theory hours | Workplace Days/hours | Recommended formative assessment | Recommended Methodology | Scheduled Dates |
|---|---|---|---|---|---|
| **LU-1.** Communicate with seniors / juniors | 2 | 8 | ▪ Explain communication technique and communications skill with seniors/juniors.<br>▪ Demonstrate to perform the communication with the related person | Short Question and answers, Quiz, Task | |
| **LU-2.** Communicate with engineer/ Supervisor | 2 | 8 | ▪ Explain communication technique and communications skill with engineer/supervisor.<br>▪ Demonstrate to perform the communication with the related person | Short Question and answers, Quiz, Task | |
| **LU-3.** Communicate with electrical department | 2 | 8 | ▪ Explain communication technique and communications skill with electrician/Electrical department<br>▪ Demonstrate to perform the communication with the related | Short Question and answers, Quiz, Task | |

| | | | | | |
|---|---|---|---|---|---|
| | | | person | | |

| MODULE 11:SAFETY AT WORK | | | | | |
|---|---|---|---|---|---|
| **Learning Units** | **Theory hours** | **Workplace Days/hours** | **Recommended formative assessment** | **Recommended Methodology** | **Scheduled Dates** |
| **LU-1.** Identify the protective procedures | 6 | 20 | ▪ Describe different personal protective equipments, tools and their uses<br>▪ Demonstrate to wear the safety equipment for eyes, hands, body and feet | Short Question and answers, Quiz,Task | |
| **LU-2.** Ensure the cleaning of the working area | 3 | 20 | ▪ Describe the importance of safe working environment<br>▪ Describe first aid treatment<br>▪ Explain different types of injuries<br>▪ Demonstrate the arrangement of tools and equipments for the clean work place | Short Question and answers, Quiz, task | |
| **LU-3.** Use Fire Extinguisher and safety Alarms | 5 | 20 | ▪ Explain the different types of fire extinguishers.<br>▪ Describe the importance of safety alarms<br>▪ Demonstrate the extinguishing of fire with the help of fire extinguisher | Short Question and answers, Quiz, Task | |

# 5. SUPPORTIVE NOTES

## Assessment context:

This unit has to be assessed on the job, off the job, or a combination of on and off the job demonstrated by an individual work.

## Critical aspects:-

- ✓ Able to make different batches for body and glazes
- ✓ Ability to operate all the machinery in the slip house
- ✓ Able to make different types of Plaster of Paris moulds
- ✓ Ability to make different items by casting, jiggering and jollying and pressing techniques
- ✓ Ability to operate the dryers
- ✓ Ability to perform finishing and joining
- ✓ Ability to apply glaze on the ceramics ware by spraying dipping pouring and brushing techniques
- ✓ Ability to decorate the ceramics ware by different techniques
- ✓ Ability to operate the kiln
- ✓ Ability to record the kiln data
- ✓ Ability to perform sorting
- ✓ Ability to properly communicate
- ✓ Follow safety rules

## Assessment condition:-

- Each unit should be assessed separately.
- The candidate will have to access all the related tools, equipment, material and demonstrations required.
- The candidate will be required orally or by other methods of communication to answer questions asked by the assessor.
- Present evidence related to the skills.

- Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by criteria and that he possesses the required knowledge and skill.

## Resources required for assessment:-

It includes all tools, equipment and related material, listed in the curriculum

# 11. LIST OF TOOLS, MACHINERY & EQUIPMENT$_{SR}$

| NO. | NOMENCLATURE OF EQUIPMENT / TOOLS | QUANTITY |
|---|---|---|
| **1.** | • Shuttle kiln with all accessories<br>• Volume:- 500 liter<br>• Maximum temperature:- 1300 deg C<br>• Fuel- Natural gas fired<br>• Blower as per specification of the Kiln<br>• , Suitable for oxidizing & Reduction firing<br>• Equipped with all temp/fuel control system<br>• Kiln Furnitures<br>• SiC Slabs, Saggers, Pilleretc | 1 No. (Imported) |
| **2.** | • Ball Mill with complete accessories<br>• Capacity: 100 kg<br>• Grinding Media: Stone balls<br>• Rubber Linning<br>• Speed Reducer with RPM controller | 1 No. |
| **3** | • Jaw Crusher<br>• Feed size 130<br>• Product size 10 mm | 1 No. |
| **4** | • Vibrating Sieve Shaker<br>• With Standard Sieves sets | 25 set. |
| **5** | • Blunger | 1 No. |

| | | |
|---|---|---|
| **6** | • Filter Press<br>• Cylinder capacity: 30 to 300 m<br>• Filter plate material: Pure Polypropylene | 1 No. |
| **7** | • Jiggering and jollying Machine | 1 No. |
| **8** | • Laboratory Oven<br>• Capacity 500 L<br>• Max Temperature: 300 deg C | 1 No. |
| **9** | • Pug Mill with vacuum | 1 No. |
| **10** | • Portable Spray Gun | 4 No |
| **11** | • Modeling Wheel | 5 No |
| **12** | • Torsion Balance Viscometer | 1 No |
| **13** | • MagneticSeparator | 1 No. |
| **14** | • Spray Booth | 4 No |
| **15** | • Lab Scale Kiln<br>• Max Temperature 1200 deg C<br>• Volume 20 L | 1 No. |
| **16** | • Plaster Modeling Wheel | 5 No |
| **17** | • Plaster Mixing Machine | 1 No |
| **18** | • Analytical weighting Scale | 1 No |
| **19** | • Buckets, jugs | 10 No |
| **20** | • Spoons & whisks | 20 No |
| **21** | • Wooden Boards | 60 No |

| | | |
|---|---|---|
| **22** | • Plaster Bats | 20 No |
| **24** | • Plaster’s Turning Tools Set | 2 No |
| **25** | • Scrapers or Metal Kidneys | 10 No |
| **26** | • Carpenter’s Saw | 2 No |
| **27** | • Surforms Blades | 30 No |
| **28** | • Forged Steel Tools | 20 No |
| **29** | • Hacksaw Blades | 20 No |
| **30** | • Variety of Files, Knives, Gouges, chisels | 50 No |
| **31** | • Weighing scale | 1 No. |
| **32** | • Calipers | 10 No |
| **33** | • Flexi curves | 10 No |
| **34** | • Compasses | 20 No |

# 6. LIST OFCONSUMABLE SUPPLIES

| SR. NO. | Consumable Items | QUANTITY |
|---|---|---|
| **1.** | Green wares like<br>▪ Plates<br>▪ Bowls<br>▪ Dishes<br>▪ Basins<br>▪ Commodes<br>▪ Bricks | 100 each |
| **2.** | Pyrometric sager cones | 20 set |
| **3.** | Insulating Wool | 10 set |
| **4.** | Kiln furniture like SiC Slabs etc. | 20 No |
| **5.** | China Clay, | 2 Ton |
| **6.** | Ball Clay | 2 Ton |
| **7.** | Pottery Clay | 2 Ton |
| **8.** | Soda Feldspar | 2 Ton |
| **9.** | Potash feldspar | 2 Ton |
| **10.** | Quartz | 2 Ton |
| **11.** | Lime Stone | 1 Ton |
| **12.** | Talc | 500 Kg |

| | | |
|---|---|---|
| **13.** | Zironia | 300 Kg |
| **14.** | Corundum | 100 Kg |

# 7. REFERENCE BOOKS


- HenrikNorsker, The Self-Reliant Potter: Refractories and Kilns, Dt. ZentrumfnrEntwicklungstechnologienÃ¹GATE, 1987 , ISBN 3-528-02031-8
- LoretteEspi,Step by Step Pottery & Ceramics, Crescent Books, New York
- Susan Peterson, The Craft and Art of Clay, Overlook Press, 1996
- DaraBillington, The technique of Pottery, BT Batsford Ltd, London
- O.P.Gupta: Elements of Fuels, Furnaces and Refractories, Khanna Publishers
- Ghulam RasoolChaudhry, Ceramic kiln, Punjab Small Industry Co.
- F. H. Norton: Refractories.(McGraw-HiH, New York 1949)
- D. Rhodes: Kilns. (Pitman, London 1969)
- Introduction to Ceramics, 2nd Edition [W. David Kingery,
- Jeff Zamek, Safety in the Ceramics Studio: How to Handle Ceramic Materials Safely

**National Vocational & Technical Training Commission (NAVTTC)**
5th Floor Evacuee Trust Complex Sector F-5/1,
Islamabad.
T +92 51 904404
F +92 51 904404
E info@navttc.org
I http://www.navttc.org/