

Curriculum
For
Certificate in Clay Body and Glaze
Making

(6-Months)
Code:VI81S004
(2013)

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INTRODUCTION

This course is aimed at introducing the basic skill & knowledge of slip house (body/glaze preparation section). The trainee is introduced in step by step manner to the various elements of the discipline & their implication. Ranging from the knowledge & skills required for preparation of body, glaze and engobe and tile pressing granulates. The students are encouraged for practical work with a focus on acquiring a wide range of new skills. This course is based on competencies gained by the trainees. After completion of course, the trainee will be skilled in body preparation and glaze making.

OVERALL OBJECTIVE OF COURSE

1. The main objective of this course is to provide semi-skilled & skilled workers of slip house for local ceramic industry.
2. Semi-skilled and skilled worker produced by this training would help to enhance the quality of product and to eliminate poverty in the society.
3. This training course is designed to create job opportunities for those primary pass candidates who fail to continue their schooling due to various social and economic factors.
4. This training program will provide opportunity to those who want to equip themselves with such knowledge and skills which will be helpful for their employment in local ceramics industry.
5. Further, this Curriculum is developed by considering the requirements of local market and need of the trade enabling the pass-outs to meet the job market and to reduce the shortage of Semi Skilled and Skilled workers for ceramic industry to work as clay body and glaze maker.
6. Provide technical and vocational training which reflects the requirements of the ceramic industry.

COMPETENCIES GAINED AFTER COMPLETION OF THE COURSE

After completion of the course, the learner should be able to:

1. Explain the basic ceramic terms used in the process slip house.

2. Explain all safety & health hazards involved during the working at slip house.
3. Describe materials, their usage & properties.
4. Check the hardness of filter cake and clay blank (from pug mill).
5. Elaborate the preparation of clay body and glazes (like raw glaze, opaque and colour glazes) used in ceramic industry.
6. Describe clay body types, their properties and shrinkage.
7. Describe to handle different kind of tools, machinery/equipment of the slip house.
8. Express the knowledge of material mixing methods.
9. Work on ball mill, filter press, pug mill.
10. Make the crushing of potash/silica lumps and grinding in conical ball mill.
11. Select the required mesh size during grinding of material in conical ball mill.
12. Describe the optimal grinding of ball mill.
13. Handle the various machines with safety.
14. Do the proper cleaning of machine and materials.
15. Explain the difference between slip casting and clay body for jiggering.
16. Explain different types of clays i.e. china clay, ball clay, sindh china clay etc.
17. Explain the different types of body materials i.e. soda and potash feldspar, silica, alumina and clays etc.
18. Express knowledge of slip quality assessment.
19. Explain the grinding process i.e. grinding media, lining bricks, alumina bricks for ball mill lining etc.
20. Describe to adjust the pressure of filter press.
21. Describe the working of Pugmill e.g. adjustment of vacuum, blade clearance with the pug mill drum.

22. Select the colourants for different types of colour glazes.
23. Make the body and glazes free from iron contamination by using electromagnetic separator or magnetic bar.
24. Measure/weigh the raw material for the batching of clay body and glaze.
25. Check and adjust the viscosity/density of the casting slip and glazes.
26. Load the grinding media in the ball mill for efficient grinding.
27. Inspect the quality of casting slip (i.e. density, viscosity, residue & plasticity assessment).
28. Inspect and rectify the faults during the grinding, filter pressing and pug milling.
29. Perform the routine maintenance check of tools and equipment.

JOB OPPORTUNITIES AVAILABLE IMMEDIATELY AND IN THE FUTURE

- Ceramic Cottage Industry
- Ceramic Sanitary Industry.
- Ceramic Tile Industry
- Ceramic Training/teaching Institutes
- Ceramic Tableware Industry
- Refractory Industry
- Ceramics (Insulator) Industry
- Self employment.

CURRICULUM SALIENT POINTS

Entry Level	primary/middle
Duration of Course	06 months
Total training hours	800
	34 hours (per week)
	6 days (week)
	6 hours a day (except Friday 4 hours)

Training Methodology

Practical 80 %
Theory 20 %

Medium of Instruction

Urdu

Min Qualification of Trainer

Industrial experience of five years (minimum) Or

Certificate course in respective field with two years of industrial experience

OVERVIEW ABOUT THE PROGRAM –CLAY BODY AND GLAZE MAKING

Module Title and Aim	Learning Units	Theory Days / hours	Workplace Days / hours	Timeframe of Modules
<p>Module 1:- Prepare the Raw Materials</p> <p>On completion of this module the student will be enabled to identify the different raw materials and perform crushing and grinding of the materials.</p>	<ol style="list-style-type: none"> 1. Identify Raw Materials for Body & Glaze 2. Identify Ceramics and its major types 3. Identify machinery for crushing 4. Perform Crushing of Raw materials (Stones). 	30	40	70
<p>Module 2: Preparation of slip and glazes</p> <p>On completion of this module the student will be enabled to prepare different clay bodies & glazes like raw glaze, opaque & colour glazes used in the ceramic industry</p>	<ol style="list-style-type: none"> 1. Selection of grinding media of Ball Mill. 2. Perform batching of raw materials for body and glaze. 3. Perform grinding and mixing of raw materials 4. Adjust the parameters of the ball mill. 5. Perform discharging of the ball mill 	28	210	238
<p>Module 3 : Quality control tests for slip and glazes</p> <p>The Trainee will be able to understand and perform the different tests to maintain the quality of slip and glazes</p>	<ol style="list-style-type: none"> 1. Check the quality of the raw materials 2. Perform the residue test 3. Perform the viscosity and litre weight/density tests 	20	90	110

<p>Module 4: Filter pressing and Pugmilling of the slip</p> <p>The trainee will be able to describe the working of filter press and pug mill and satisfactory operate the machinery</p>	<ol style="list-style-type: none"> 1. Perform mixing in blunger 2. Perform the filtration of slip 3. Filter cake collection 4. Vacuum kneading of the filter cake 	21	120	141
<p>Module 5: Granulates formation for tile pressing</p> <p>Enable the trainees to learn about the process of granulates formation from tile pressing.</p>	<ol style="list-style-type: none"> 1. Granulates making by drying and then grinding of filter cake/ scrap Body 2. Granulates making by spray drying 	25	90	115
<p>Module 6: Safety at work</p> <p>After completion of this module, the trainee will be able to apply all safety requirements and standards</p>	<ol style="list-style-type: none"> 1. Wear safety clothes 2. Wear Personal protective equipments 3. Prepare the workplace 4. Deal with work & health hazards. 	15	60	75
<p>Module 7: Communications with Others</p> <p>This module develops the competency to properly communicate with the engineer /supervisors, operators, and senior/junior officials of electrical, mechanical and other departments.</p>	<ol style="list-style-type: none"> 1. Communicate with senior / junior 2. Communicate with peers 3. Communicate with engineer/ Supervisor 4. Communicate with electrical department 5. Communicate with Mechanical department 5. Communicate with concerned office / stakeholder 	11	40	51

Total Hours: 160 640

CLAY BODY AND GLAZE MAKING CURRICULUM CONTENTS

Module 1 : Prepare the Raw Material

Objective: The Trainee will be able to understand the different ceramic raw materials and perform crushing and selection of the raw materials and crusher;

Duration:70..... hours **Theory:**40.....hours **Practice:**.....30.....hours

Learning Unit	Learning Outcomes	Learning Elements	Duration (HRs) Th+Pr	Materials Required	Learning Place
1. Identify raw materials for body & glaze	1.1 Able to make different batches of ceramic bodies & glaze	Knowledge of: <ul style="list-style-type: none"> - Major raw material for ceramics bodies like: clay types, filler, flux - Ceramics bodies - Deflocculants - Addition of water - Batch calculations - Properties of the slip - Glaze and its types - Glass formers - Stabilizer - Fluxes - Binders - Flocculants - Colours in glazes - Basic glaze colours (yellow, blue, pink). - Addition of colour in the glazes - Glaze calculations - Handling of raw materials 	10+10	White Board, Slides, Feldspar and silica, china clay, different oxides for colouring effects in the glaze, ball mill	Class Room/ Lab

		Ability to: <ul style="list-style-type: none"> - Make the batches of different ceramic bodies e.g. porcelain, earthenware, stoneware, terracotta - Asses the raw materials for glazes and bodies - Asses the colour used in glazes - Use the weighting balance 			
2. Identify Ceramics and its major types	2.1 Able to understand ceramics and its basic types	Knowledge of: <ul style="list-style-type: none"> - Ceramics and its classification - Earthenware - Stoneware - Porcelain - Properties of different Ceramics bodies Ability to: <ul style="list-style-type: none"> - Identify different types of ceramics. - Identify ceramics bodies 	10 +10	Models, Wall Charts, Multimedia, White Board, Stationary, Relevant data	Class Room/ Lab
3. Perform Crushing of Raw materials (Stones).	3.1 Able to understand the procedure of crushing the stones. 3.2 Able to crush the larger stone into lumps form for further grinding.	Knowledge of: <ul style="list-style-type: none"> - Raw materials - Crushers used in the ceramics industry - Sieves of different mesh sizes - Working principal and operation of jaw crusher - Charging the crusher - Discharging crusher - Maintenance of the crusher 	20+10	Multimedia, White Board, Stationary, clay of different types, Feldspar and silica etc, Jaw Crusher, Hammer Crusher, Wheel Barrow,	Class Room/ Lab

		<ul style="list-style-type: none">- Operation of hammer crusher Ability to: <ul style="list-style-type: none">- Identify the raw materials to be crushed- Crush largest stones in smaller form.- Operate the Jaw Crusher & Hammer Crusher.- Assess the material for crushing- Operate and maintain conical ball mill- Identify sieves of different mesh sizes			
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Module 2: Preparation of the Slip, Glazes and Engobes

Objective: The Trainee will be able to prepare different clay bodies (slip), glazes and engobes used in ceramic industry.

Duration:238..... hours **Theory:**28..... hours **Practice:**.....210..... hours

Learning Unit	Learning Outcomes	Learning Elements	Duration (HRs) Th+Pr	Materials Required	Learning Place
1. Selection of Grinding media of Ball Mill	1.1 The trainee will be able to select the right grinding balls and lining bricks for ball mill	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Classification of grinding media e.g., alumina, river stone, silica flint and steel balls - Selection of grinding media - Size of the balls - Weight of the balls <p>Ability to:</p> <ul style="list-style-type: none"> - Select the grinding balls for a particular job - Measure the size of balls for a particular job - Load the mill with the balls 	7+50	Wall Charts, Multimedia, White Board, Ball mill, Slip, Different grinding medias,	Class Room/ Lab
2. Batching of Body), glaze and engobes	<p>2.1 Able to produce completely homogeneous, well ground slip, glazes and engobes that meet the required specification.</p> <p>2.2 Able to perform grinding (dry& wet)</p>	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Grinding mills: ball mill, conical ball mill and jar mill - Wet and dry grinding - Loading the ball mill with grinding media. - Weighing raw material & 	7+40	Ball mill and different raw material grinding balls. weight balance	Class Room/ Lab.

	of different raw material for preparation of body and grinding (wet) of different raw material for preparation of glazes and engobes.	<p>measurement of water content.</p> <ul style="list-style-type: none"> - Charging of ball mill. - grinding time - Unloading the ball mill. <p>Ability to:</p> <ul style="list-style-type: none"> - Load the ball mill - Adjust the RPM of the mill - Adjust the grinding time - Handle the ball mill - Handle the jar mill 			
3. Adjust the parameters of the ball mill.	3.1 The trainee will be able to operate the ball mill at optimal grinding and maximum out put	<p>Knowledge of:</p> <ul style="list-style-type: none"> - RPM of ball mill - Critical speed - Volume to charge ratio - Lining bricks of the mill and rubber pads of the lid (mouth lid) <p>Ability to:</p> <ul style="list-style-type: none"> - To operate the ball mill - Asses the grinding time - Asses the RPM of the ball mill - Check the linings of ball mill. 	7+40	Multimedia, White Board, Ball mill with rpm controller and Display	Class Room/ Lab
4. Perform discharging of the ball mill	4.1 The trainee will be able to discharge the ball mill into the Storage tank.	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Discharging the ball mill - Sieves 	7+40	Multimedia, White Board, Ball mill with rpm controller, sieve	Class Room/ Lab

		<ul style="list-style-type: none"> - Related tools <p>Ability To:</p> <ul style="list-style-type: none"> - Unload the mill - Properly select the sieve for glaze and slip 			
5. Perform weighing & measurement of water	<p>5.1 Able to determine the weighing of colourants and raw materials in terms of grams, Kilograms.</p> <p>5.2 Able to determine the measure system.</p>	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Basic mathematical calculation i.e. Addition, subtraction, division, multiplication, percentage - Weighing the colourants - Measuring the water. <p>Ability to:</p> <ul style="list-style-type: none"> - Make the calculations. - Handle the colours & raw materials. 	7+40	Weighing balance, Measuring cylinder, Beaker, water measuring meter	Class Room/ /Lab

Module3: Quality Control Tests for Slip and Glazes

Objective: The will be able to understand the quality parameters of the slip in order to achieve quality slip and glaze.

Duration:110..... hours Theory:20..... hours Practice:..90..... hours

Learning Unit	Learning Outcomes	Learning Elements	Duration (HRs) Th+Pr	Materials Required	Learning Place
1. Check the quality of the raw materials	1.1 Able to determine the quality of the raw materials.	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Sampling procedure of the raw materials - Importance of mesh size - Physical testing on raw materials - Visual inspection of the raw materials - Moisture test - Loss on ignition test - Plasticity test - Drying and firing shrinkage - Colour after firing - Cone height of the feldspar <p>Ability to:</p> <ul style="list-style-type: none"> - Perform Sampling - Check the %moisture - Measure the plasticity - Check the loss on ignition - Identify the colour of the clay - Measure the height of the cone of feldspar 	7+30	Models, Wall Charts, Multimedia, White Board, Lab scale oven, Lab scale kiln, China clay, ball clay, pottery clay, Feldspar, Silica, Vernier calipers	Class Room/Lab

<p>2. Perform the residue test</p>	<p>2.1 Able to check the fineness of slip or glaze after grinding.</p>	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Residue test and its importance - Related tools like Sieves, Beaker, Weighting Balance <p>Ability to:</p> <ul style="list-style-type: none"> - Perform the residue test 	<p>7+30</p>	<p>White Board, Balance Sieves, lab dryer</p>	<p>Class Room/ Lab</p>
<p>3. Perform the viscosity and density tests</p>	<p>3.1 Able to check the fluidity of slip & glazes.</p> <p>3.2 Able to check the density of slip and glaze</p>	<p>Knowledge of:</p> <ul style="list-style-type: none"> - viscosity and the methods of its measurements - Related tools: viscometer, Stop watch and Beaker - density and its measurement - Related tools: specific gravity bottle Weighing Balance & Measuring Cylinder <p>Ability to:</p> <ul style="list-style-type: none"> - Check the viscosity. - Check the density. 	<p>6+30</p>	<p>White Board, Viscometer, stop watch, specific gravity bottle, Weighing Balance, Measuring Cylinder.</p>	<p>Class Room/ Lab</p>

Module 4: Filter pressing of the slip

Objective: To able the trainee to perform filter pressing and pugg mill of the body

Duration:141..... hours **Theory:**21..... hours **Practice:**.....120..... hours

Learning Unit	Learning Outcomes	Learning Elements	Duration (HRs) Th+Pr	Materials Required	Learning Place
1. Perform mixing in blunger	1.1 Able to operate the blunger for proper mixing of recycle body	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Blunger for mixing - Charge of recycle body in Blunger - Mixing time - Magnetic Separation of iron particles after blunger <p>Ability to:</p> <ul style="list-style-type: none"> - Operate the blunger - Perform mixing in blunger - Understand mixing time - Perform the removal of iron from the slip 	5+30	Multimedia, White Board, Stationary, Blunger, slip,	Class Room/ Lab
2. Perform the filtration of slip	<p>2.1 Able to understand the filtration process of slip.</p> <p>2.2 Able to understand the operation of filter</p>	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Filtration of slip - Plate and frame filter press - Filter cloth adjustment and quality check 	5+30	Wall Charts, Multimedia, White Board, Stationary, slip, Filter press, Pump	Class Room/ Lab

	press.	<ul style="list-style-type: none"> - Pressure in the press - Filtrate flow rate - Setting of the plates - Pump operation - Filtration time <p>Ability to:</p> <ul style="list-style-type: none"> - Set the filter cloth and plates of the press - Start the pump - Adjust the pressure of the filter press - Check the filtrate 			
3. Filter cake collection	3.1 Able to collect the filter cake from filter press of required hardness.	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Operation (open & close) of the filter press - Moisture Content in cake - Hardness of the cake. - Hardness tester - Follow the safety rules. <p>Ability to:</p> <ul style="list-style-type: none"> - Handling of the filter cake. - Wash the plates of the press - Measure moisture contents in the filter cake. - Asses the hardness of the cake 	5+30	Multimedia, White Board, Stationary, Plate and frame filter press, filtration cloth	Class Room/ Lab

<p>4. Vacuum kneading of the filter cake</p>	<p>4.1 Able to understand the operation of pug mill.</p>	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Importance of the vacuum kneading of the filter cake - Operation of the pug mill - Vacuum pressure in pug mill - Moisture control of the filter cake - Cutting the blank of required size <p>Ability to:</p> <ul style="list-style-type: none"> - Charge the pug mill with cake - Adjust the vacuum pressure of the pug mill - Cut the blank of required size from the pug mill - Operate the pug mill 	<p>6+30</p>	<p>Wall Charts, Multimedia, White Board, Stationary, Pug mill, blade, vacuum pump</p>	<p>Class Room/ Lab</p>
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Module 5: Granulates formation for tile pressing

Objective: enable the trainee to learn about the process of granulates formation for tile pressing.

Duration:115..... hours

Theory:25..... hours

Practice:...90..... hours

Learning Unit	Learning Outcomes	Learning Elements	Duration (HRs) Th+Pr	Materials Required	Learning Place
1. Granulates making by grinding of filter cake/ scrap body	1.1 able to make granulates through grinding of filter cake.	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Organize the work place. - Grinder (blade type), sieve - Rotating brush on the sieves - Moisture control during/after grinding. - Process of granulates formation. - Follow the safety rules. - Homogenization of granulates. <p>Ability to:</p> <ul style="list-style-type: none"> - Check the blades of grinder. - Check the sieves. - Check the moisture 	10+40	Grinder, Sieves Set, Rotating brush, Dry filter cake, PPEs, Plastic or SS tank,	Class Room/ Lab
2. Granulate making by spray dryer	<p>2.1 Able to understand granulate formation by spray dryer.</p> <p>2.2 Able to adjust the nozzles of spray</p>	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Organize the work place. - Operations of conveyer belts & vibrating sieves. - Operations of spray 	15+50	Spray Dryer, Conveyer belts, Sieves, PPEs, SS tanks.	

	dryer.	<p>dryer.</p> <ul style="list-style-type: none"> - Washing the nozzles of spray dryer. - Moisture control. - Temperature control in spray dryer - Follow the safety rules. <p>Ability to:</p> <ul style="list-style-type: none"> - Check the sieves before start of spray dryer. - Check the moisture. - Fix the nozzle set. - Handling of valves. - Adjust and maintain temperature in spray dryer 			
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Module: 6: Safety at work

Objective of the Module: To apply safety requirements and standards

Duration: 75 hours Theory: 15 hours Practice: 60 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration (HRs) Th+Pr	Materials Required	Learning Place
1. Wear safety clothes	1.1. Able to understand the importance of personnel safety 1.2. Able to work while wearing the aprons. 1.3. Able to explain the advantages of the safety clothes.	Knowledge of: <ul style="list-style-type: none"> - Work safety & environment - Type of safety dresses. - Importance of safety dresses. Ability to: <ul style="list-style-type: none"> - Perform at workplace while wearing safety cloths - Identify the work environment and selecting proper safety equipment 	4+15	<ul style="list-style-type: none"> - Apron - Dangri - Paint, Shirt 	Class Room Workshop
2. Wear Personal protective equipments	2.1 Able to know the safety equipment used 2.2 Able to understand and purpose of each equipment	Knowledge of: <ul style="list-style-type: none"> - Personal protective equipments. Apron, Safety Shoes, dust masks, etc - Safety at work & its importance Ability to: <ul style="list-style-type: none"> - Understand personal protective equipment - Perform protection of hands and arms - Wear safety glasses - Wear hearing protection like 	4+15	<ul style="list-style-type: none"> - Apron - Dust Mask - Safety Shoes - Safety Glasses 	Class Room Workshop

		earmuff, ear plugs - Wear safety mask			
3 Prepare the Work place	3.1 Able to know the importance of the safe work place and its advantages 3.2 Gather tools & equipment required to perform the job.	Knowledge of: - Housekeeping and work place preparation to start the activity - Safe working environment and its advantages - Relation of organized workplace & Performance Ability to: - Select and identify the tools required - Place and handle the tools and equipment involved	4+15	- White/ Black board - Working Table - Information sheets - Exercise sheets - Work sheets - Clean Equipment - Sponge - Moping -	Class room Workshop
4. Deal with work & health hazards	4.1 Able to understand the work & health hazards 4.2 Able to know about the possible injuries 4.3 Able to know about the first aid	Knowledge of: - Health hazards - Possible work hazards & injuries - First Aid provision and Emergency response. Ability to: - Remain composed and provide first aid to the fellow who is suffering - Respond and call in the first aid	5+15	- White/ Black board - OHP - Transparencess - Information sheets - Exercise sheets - Work sheets - First aid box	Class room Workshop

Module 7: Communication with others

Objective : To enable the trainee to be able 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 (HRs) Th+Pr	Materials Required	Learning Place
1. Communicate with senior / junior	1.1 Understand the communication skill and communicate with senior / junior	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Verbal and written communication, and channel of communication <p>Ability to:</p> <ol style="list-style-type: none"> 1. Communicate verbally according to the status of senior / junior, select the suitable channel and communicate in writing. 	<p>2hrs (Theory)</p> <p>7 hrs (Practical)</p>	Related books, White Board, Papers	Class Room/ Lab
2. Communicate with peers	2.1 Understand the communication	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Communication technique and communication skill <p>Ability to:</p> <ol style="list-style-type: none"> 1. Communicate with different level of personnel 	<p>2hrs (Theory)</p> <p>7 hrs (Practical)</p>	Related books, White Board, Papers	Class Room/ Lab

3. Communicate with engineer/ Supervisor	3.1 Understand the communication skill and communicate with engineer/ supervisor	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Verbal and written communication, and channel of communication <p>Ability to:</p> <ol style="list-style-type: none"> 1. Communicate verbally according to the status of engineer / overseer, select the suitable channel and communicate in written. 	2hrs (Theory) 7 hrs (Practical)	Related books, White Board, Papers	Class Room/ Lab
4. Communicate with electrical department	4.1 Understand the communication skill and communication with electrical department	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Verbal and written communication, and channel of communication <p>Ability to:</p> <ol style="list-style-type: none"> 1. Communicate verbally according to the status of electrician, select the suitable channel and communicate in written. 	2hrs (Theory) 7 hrs (Practical)	Related books, White Board, Papers	Class Room/ Lab

<p>5. Communicate with Mechanical department</p>	<p>5.1 Understand the communication skill and communication with mechanical departments</p>	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Verbal and written communication, and channel of communication <p>Ability to:</p> <ol style="list-style-type: none"> 1. Communicate verbally according to the status of mechanical fault 2. Select the suitable channel and communicate in written. 	<p>2hrs (Theory) 6 hrs (Practical)</p>	<p>Related books, White Board, Papers</p>	<p>Class Room/ Lab</p>
<p>6. Communicate with concerned office / stakeholder</p>	<p>6.1 Understand the communication and communicate with office / stakeholder</p>	<p>Knowledge of:</p> <ul style="list-style-type: none"> - Verbal and written communication, and channel of communication <p>Ability to:</p> <ol style="list-style-type: none"> 1. Communicate verbally according to the status of office / stakeholder, select the suitable channel and communicate in writing. 	<p>2hrs (Theory) 6 hrs (Practical)</p>	<p>Related books, White Board, Papers</p>	<p>Class Room/ Lab</p>

ASSESSMENT

Module 1:- Prepare the raw materials

Learning Units	Theory hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Identify Raw Materials for Body & Glaze			1- Explain the basic raw materials for ceramics making 2- Explain the types of clay 3- Explain the types of feldspar 4- Explain the sources of quartz	Short Question and answer, Oral test, Task	
2. Identify the Ceramics and its major types			1- Explain Ceramics and its classification 2- Describe the different ceramics bodies 3- Properties of different Ceramics bodies 4-		
3. Perform Crushing of Raw materials			1- Explain the crushing of raw materials 2- Explain the types of crusher 3- Explain the working principal of jaw crusher 4- Demonstrate the visual identification in the given raw material 5- Demonstrate the operation of the Jaw crusher	Short Question and answer, Oral test, Task	4. Perform Crushing of Raw materials

Module 2:- Preparation of Slip and Glazes

Learning Units	Theory hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Selection of Grinding media of Ball Mill			<ol style="list-style-type: none"> 1- Explain the different grinding media used in the ball mill 2- Explain the lining used in the ball mill 3- Demonstrate to charge the batch and the grinding media in the mill 	Short Question and answer, Oral test, Task	
2. Perform Batching of Raw Material for Body & Glaze			<ol style="list-style-type: none"> 1- Define batch and explain the slip house equipments 2- Describe the different deflocculents used in the slip and glaze preparation 3- Explain the binders 4- Explain glazes and the different colours used for making coloured glazes 5- Perform the batching of different types of glazes and ceramics bodies 6- Demonstrate the batching of the different coloured glazes 	Short Question and answer, Oral test, Task	
3. Perform grinding and mixing of raw material			<ol style="list-style-type: none"> 1- Describe the different grinders used in the ceramics industry 2- Explain the construction, working principal and operation of the ball mill 3- Demonstrate the grinding and mixing of batch in the ball mill 	Short Question and answer, Oral test, Task	
4. Adjust the parameters of the ball mill.			<ol style="list-style-type: none"> 1- Explain the effect of grinding on mill rotation 2- Explain the grinding time 3- Grind the material by selecting and assessing the grinding time 	Short Question and answer, Oral test, Task	
5. Perform discharging of the ball mill			<ol style="list-style-type: none"> 1- Explain the maintenance of the ball mill 2- Describe the loading and 	Short Question and answer, Oral test, Task	

			unloading procedure of the ball mill 3- Demonstrate the charging and unloading of the slip from the ball mill		
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Module 3: Quality Control tests for slip and glazes

Learning Units	Theory hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Check the quality of the raw materials			<ol style="list-style-type: none"> 1. Explain the importance of the sampling of the raw materials 2. Perform the cone test on feldspar 3. Demonstrate the sieving of raw materials 4. Explain the physical testing of raw materials 5. Demonstrate the %age moisture, % LOI, visual test, colour after firing, drying and firing shrinkage and feldspar height test on the raw materials 	Short Question and answer, Oral test, Task	
2. Check the residue of the slip			<ol style="list-style-type: none"> 1. Explain the residue test and its importance 2. -Describe the sieves use in the test 3. Demonstrate the residue test of glazes and feldspar 	Short Question and answer, Oral test, Task	
3. Check the viscosity and density			<ol style="list-style-type: none"> 1. Define and explain viscosity of the slip and glazes 2. Explain the methods of its measurement 3. Explain the density and specific gravity and its measurement 4. Demonstrate the viscosity and density measurement test of the slip & glaze. 	Short Question and answer, Oral test, Task	

Module4: Filter pressing of the slip

Learning Units	Theory hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Perform mixing in blunger			<ol style="list-style-type: none"> 1. Define blunger and explain its working principal and operation 2. Explain the magnetic separation process 3. Demonstrate the mixing of recycle body in the blunger 4. Perform the removal of iron particles in slip with the help of magnetic separator 	Short Question and answer, Oral test, Task	
2. Perform filtration of slip			<ol style="list-style-type: none"> 1. Explain the filtration process and the equipments used in ceramics industry 2. Explain the working principal of filter press 3. Explain the parameters affecting the performance of the press 4. Demonstrate the filtration of slip in the filter press 	Short Question and answer, Oral test, Task	
3. Filter cake collection			<ol style="list-style-type: none"> 1. Explain the opening and closing of the plate and frame filter press 2. Explain the testing parameters of the filter cake 3. Perform the separation of cake from the filter press 	Short Question and answer, Oral test, Task	
4. Vacuum kneading of the filter cake			<ol style="list-style-type: none"> 1. Explain the working principal and operation of the pugmill 2. Describe the importance of the pugging of cake 3. Demonstrate to collect the blank of required length from the pugmill 	Short Question and answer, Oral test, Task	

Module 5:- Granulate formation for Tiles Pressing

Learning Units	Theory hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Granulates making by grinding of filter cake/ scrap Body			<ol style="list-style-type: none"> 1. Explain the Granulates making by grinding of filter cake/ scrap Body 2. Demonstrate the Granulate making 	Short Question and answer, Oral test, Task	
2. Granulates making by spray dryer			<ol style="list-style-type: none"> 3. Describe operation of spray dryer 4. Demonstrate the Granulate making by spray drying 		

Module 6: Safety at work

Learning Units	Theory hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Wear safety clothes			<ol style="list-style-type: none"> 1. Select and use the safety clothes according to the work and environment 2. Wear work clothes 	Short Question and answer, Oral test, Task	
2. Wear Personal protective equipments			<ol style="list-style-type: none"> 1. Identify and select the PPEs during work operations 2. Wear PPEs 	Short Question and answer, Oral test, Task	
3. Prepare the workplace			<ol style="list-style-type: none"> 1. Know how to prepare workplace for various jobs involved in execution of project. 2. Prepare the workplace 	Short Question and answer, Oral test, Task	
4. Deal with work hazards, accidents & injuries			<ol style="list-style-type: none"> 1. Know work hazards, injuries & required first aid 2. Know about the electrical and fire hazards and safety measures involved in the operation of various machinery 3. Explain work hazards, accidents & injuries 	Short Question and answer, Oral test, Task	

Module 7: Communications with Others

Learning Units	Theory hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Communicate with senior / junior			<ol style="list-style-type: none"> 1. Explain communication technique and communication skills with senior/junior. 2. Demonstrate to perform the communication with the related person 	Short Question and answers, Quiz, Task	
2. Communicate with peers			<ol style="list-style-type: none"> 1. Explain communication technique and communication skills with peers 2. Demonstrate to perform the communication with the related person 	Short Question and answers, Quiz, Task	
3. Communicate with engineer/ Supervisor			<ol style="list-style-type: none"> 1. Explain communication technique and communication skills with engineer/supervisor. 2. Demonstrate to perform the communication with the related person 	Short Question and answers, Quiz, Task	
4. Communicate with electrical department			<ol style="list-style-type: none"> 1. Explain communication technique and communications skill with electrician/Electrical department 2. Demonstrate to perform the communication with the related person 	Short Question and answers, Quiz, Task	
5. Communicate with Mechanical/Electrical department			<ol style="list-style-type: none"> 1. Explain communication technique and communication skills with Mechanical/Electrical department 2. Demonstrate to perform the communication with the related person 	Short Question and answers, Quiz, Task	
6. Communicate			<ol style="list-style-type: none"> 1. Explain communication technique 	Short Question	

with concerned office / stakeholder			and communication skills with concerned office/stakeholder 2. Demonstrate to perform the communication with the related person	and answers, Quiz, Task	
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SUPPORTIVE NOTES

Assessment context

This module has to be assessed in the class as well as on the job

Critical aspects

- ❖ Able to identify the different raw materials
- ❖ Ability to perform crushing of raw materials of body and glaze
- ❖ Ability to make different batches
- ❖ Ability to operate the ball mill for grinding of body and glaze
- ❖ Ability to operate the filter press
- ❖ Ability to form the granulates for tile
- ❖ Ability to follow safety rules

Assessment condition

- Each unit should be assessed separately.
- The candidate will have access to all the related tools, Kiln and material.
- The candidate will be required verbally 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

All the tools, instruments, equipments, machines and related material listed in the column “Material required” of this module

LIST OF TOOLS, MACHINERY & EQUIPMENT

SR. NO.	NOMENCLATURE OF EQUIPMENT / TOOLS	QUANTITY
1.	Jaw Crusher	02 No. (Imported)
2.	Ball mill with all accessories, Conical Ball Mill	02 No.
3	Blunger	02 No.
4	Jar Mill	02 No.
5	Pug Mill	1 No.
6	Sieve Shaker	1 No.
7	Lab Scale Oven Vol: 500 L	1 No.
8	Laboratory Kiln Tmax = 1400 Deg C	1 No.

9	Plate and frame Filter Press with all accessories	1 No.
10	Specific gravity bottle	1 No.
11	Viscometer	03 No.
12	Weighing Balance	03 No.
13	Spray Dryer	1 No
14	Clay Grinder	1 No
15	Magnet	1 No
16	Magnetic Separator	1 No
17	Sieves of different mesh	1 No
18	Mechanical Tool Kit	1 No

1. List of Consumable Supplies

SR. NO.	Consumable Items	QUANTITY
3.	China Clay, Ball Clay, Pottery Clay, Fire Clay	1 ton each
4	Soda Feldspar, Potash Feldspar, Lime stone, Quartz	1 ton each
5	Measuring cylinders, Beakers,	05 No. each
6	Colourants (High temp. ceramic colour)	
7	Frit	50 kg
8	Silicate	5 kg

REFERENCE BOOKS

1. Singer, F. & Singer, S. S. (1963), "Industrial Ceramics", Chapman & Hall, London.
2. Cooper, E., (2004), "The Potter's Book of Glaze Recipes" A & C Black Publishers Limited, London.
3. McCabe, W. L., Smith, J. C., and Harriott, P., "Unit Operations of Chemical Engineering", McGraw-Hill

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