

Lesson Plan

Name of Faculty : M.M.Eqbal Discipline: Ceramic Engg. Semester : 3rd

Subject : CERAMIC RAW MATERIALS

Lesson Plan Duration :

Work Load (Lecture /Practical) per week in hours: Lecture : 4 Practical NIL

Week	Theory		Practical	
	Lecture Day	Topic (Including assignment/test)	Practical Day	Topic
1 st	1	Introduction to subject Ceramic Raw Material		
	2	Introduction to Clays Geology and mineralogy of clays.		
	3	Revision of chapter 1		
	4	Clay: Definition, classification of clays with examples. Primary clays or residual clay, Secondary clays or transported clays.		
2 nd	5	Plastic Raw Materials (Clay) Kaolin clay, Ball Clays, fire clay, Alumina clays. Bentonite clay, their properties & uses in ceramic industries		
	6	Impurities in clay like silica, alumina, calcium, magnesium, titanium alkalis, and carbonaceous material.		
	7	Beneficiation and Purification of clay – mechanical and chemical methods –		
	8	sorting, sifting, air separation,		
3 rd	9	Washing methods of clays. Winning and mining of clays. magnetic separation.		
	10	Properties: Specific gravity, Moisture content, Plasticity.		
	11	Plasticity– theories of plasticity and measurement of plasticity.		
	12	Bulk Density (green and dry) Shrinkage and its effects on final product. Effect of heat on clays.		
4 th	13	Revision of chapter 2		
	14	Assignment of Unit 1		
	15	Plastic Raw Materials (Non-Clay) Talc, steatite, pyrophyllite and sericite pyrophyllite. Properties and uses.		
	16	Revision of Chapter 3		
5 th	17	Sessional Test1 as per HSBTE Calender		
	18	Non-Plastic Raw Materials Silica–Various forms of silica raw materials like quartz, sand, sandstone, quartzite, Flint		
	19	Properties and Uses. Role of silica in Ceramic bodies		
	20	Effect of heat on silica		
6 th	21	Revision of Chapter 4		

	22	Phosphate Containing Raw Materials Bone ash, Apatite		
	23	Properties & uses		
	24	Revision of Chapter 5		
7 th	25	Assignment of unit 2		
	26	Alumina: Sources of various alumina		
	27	Gibbsite, Diaspore, bauxite, corundum,		
	28	fused alumina and sintered alumina		
8 th	29	Properties and uses.		
	30	Preparation of fused alumina and sintered alumina.		
	31	Revision of chapter 6		
	32	Other Alumina & Silica Containing Raw materials Silimanite, Kyanite,- Properties & uses		
9 th	33	Andalusite & mullite- Properties & uses		
	34	Revision of chapter 7		
	35	Assignment of Unit III		
	36	Second Sessional Test as per HSBTE ACADEMIC CALENDER		
10 th	37	Fluxes Definition and introduction		
	38	Types of feldspars (Potash Feldspar, Soda feldspar)		
	39	other fluxing materials (Cornish stone, nepheline syenite)		
	40	Properties of feldspars (PotashFeldspar, Sodafeldspar) and other fluxing materials (Cornishstone, nepheline syenite)		
11 th	41	Uses of feldspars (PotashFeldspar, Sodafeldspar) and other fluxing materials (Cornishstone, nepheline syenite)		
	42	Role of feldspar in triaxial body.		
	43	Revision of chapter 8		
	44	Frit : Definition of frit, Use of fritting in glaze preparation. Purpose of fritting,		
12 th	45	Manufacturing of Frit: Smelting, Quenching		
	46	Manufacturing of Frit: Drying & milling		
	47	Revision of chapter 9		
	48	Assignment of Unit IV		
13 th	49	Synthetic Materials: Carbides: Definition and Types (silicon carbide (SiC), boron carbide (B ₄ C), tungsten carbide (WC) and calcium carbide (Ca ₂ C)).		
	50	-Properties and uses		
	51	Nitrides: Definition and Types (Silicon Nitride (Si ₃ N ₄), Boron nitride (BN)) - Properties and uses.		

	52	Silicides: Definition and Types, General Properties and uses.		
14 th	53	Processing Additives: De-flocculants: Role and types		
	54	Binders: Role of binder, Types of Binders (Clay Binders, Molecular, Vinyl Binders, Cellulose Binders, Polyethylene Glycol Binders, Waxes.)		
	55	Lubricants, Types and role. Colouring Oxides		
	56	Industrial Wastes as Raw Materials: Sources & utilization of industrial wastes.		
15	57	Industrial wastes like Cullets, Grog, Fly Ash, Blast Furnace Slag.		
	58	Revision of Unit V and assignment		
	59	Revision		
	60	Third Sessional Test as per HSBTE ACADEMIC CALENDER		

Lesson Plan

Name of Faculty: Ashwani Kumar

Discipline : Ceramic Engg.

Semester : 3rd

Subject : Industrial Operations Lab

Lesson Plan Duration :

Work Load (Lecture /Practical) per week in hours: Lecture : NIL

Practical 4

Week	Theory		Practical	
	Lecture Day	Topic (Including assignment/ test)	Practical Day	Topic
1 st			1	Introduction to Industrial operations lab.
			2	Introduction of all Practicals.
2 nd			3	Dictation of Bernoulli's theorem on hydraulic bench
			4	To prove Bernoulli's theorem on hydraulic bench.
3 rd			5	Dictation of To observe the pattern of laminar and turbulent flow.
			6	To observe the pattern of laminar and turbulent flow.
4 th			7	Dictation of To carry out the sieve analysis of different raw material.
			8	To carry out the sieve analysis of different raw material.
5 th			9	Dictation of To determine the size of materials with the help of screens.
			10	To determine the size of materials with the help of screens.
6 th			11	First sessional test as per HSBTE Calender
			12	First sessional test as per HSBTE Calender
7 th			13	Dictation of To determine the drying characteristics of ceramic ware and draw the drying curve.
			14	To determine the drying characteristics of ceramic ware and draw the drying curve.
8 th			15	Dictation of To determine the specific gravity of ceramic raw materials.
			16	To determine the specific gravity of ceramic raw materials.
9 th			17	Dictation of To carry out chemical analysis of ball clay.
			18	To carry out chemical analysis of ball clay.
10			19	Dictation of Demonstration of sedimentation behavior of slurry.
			20	Demonstration of sedimentation behavior of slurry.
11			21	Second sessional test as per HSBTE Calender
			22	Second sessional test as per HSBTE Calender
12			23	Dictation of Determination of critical speed of ball mill.
			24	Determination of critical speed of ball mill.
13			25	Dictation of Demonstration of pressing operations with pressing parameters
			26	Demonstration of pressing operations with pressing parameters.
14			27	Dictation of To study kiln firing schedule.
			28	To study kiln firing schedule.

15			29	Third sessional test as per HSBTE Calender
			30	Third sessional test as per HSBTE Calender
16			31	Revision
			32	Revision

Lesson Plan

Name of Faculty: M.M.Eqbal/ VN Jha

Discipline : Ceramic Engg.

Semester : 3rd

Subject : Ceramic Moulding Lab

Lesson Plan Duration :

Work Load (Lecture /Practical) per week in hours: Lecture : NIL

Practical 4

Week	Theory		Practical	
	Lecture Day	Topic (Including assignment/ test)	Practical Day	Topic
1 st			1	Introduction to Ceramic Moulding.
			2	Introduction of all Practicals.
2 nd			3	Dictation of Determine the moisture content of plaster of Paris.
			4	Determine the moisture content of plaster of Paris.
3 rd			5	Dictation of determine the particle size analysis of plaster of Paris by sieve method
			6	Determine the particle size analysis of plaster of Paris by sieve method.
4 th			7	Dictation of Determine the setting time of plaster of Paris.
			8	Determine the setting time of plaster of Paris.
5 th			9	Dictation of Determine the rise of temperature for plaster of Paris.
			10	Determine the rise of temperature for plaster of Paris.
6 th			11	First sessional test as per HSBTE Calender
			12	First sessional test as per HSBTE Calender
7 th			13	Dictation of Determine the Water absorption of plaster of Paris after setting.
			14	Determine the Water absorption of plaster of Paris after setting.
8 th			15	Dictation of Determine the Strength for plaster of Paris.
			16	Determine the Strength for plaster of Paris.
9 th			17	Dictation of Determine the expansion and contraction of plaster of Paris
			18	Determine the expansion and contraction of plaster of Paris
10			19	Second sessional test as per HSBTE Calender
			20	Second sessional test as per HSBTE Calender
11			21	Dictation of Prepare the pattern for the given article by using clay material.

			22	Prepare the pattern for the given article by using clay material.
12			23	Dictation of Prepare POP mould/Master mould with the help of given sample.
			24	Prepare POP mould/Master mould with the help of given sample.
13			25	Dictation of Prepare working case mould.
			26	Prepare working case mould.
14			27	Dictation of Prepare one piece, two piece POP mould.
			28	Prepare one piece, two piece POP mould.
15			29	Third sessional test as per HSBTE Calender
			30	Third sessional test as per HSBTE Calender
16			31	Revision
			32	Revision

Lesson Plan

Name of Faculty : Niraj Kumar Singh

Discipline : Ceramic Engg.

Semester : 3rd

Subject : **Ceramic Machineries**

Lesson Plan Duration :

Work Load (Lecture /Practical) per week in hours: Lecture : 3 Practical 2

Week	Theory		Practical	
	Lecture Day	Topic (Including assignment/test)	Practical Day	Topic
1 st	1	Introduction to subject	1	To grind a given sample in ball mill.
	2	Size Reduction: Selection of crushing & grinding equipment.		To grind a given sample in ball mill.
	3	Description of closed and open circuit operations.		
2 nd	4	Classification of size reduction machinery. Crushers: Introduction, single and double toggle jaw crushers,	2	To study the operation of crushers.
	5	Gyratory crushers, Crushing rolls and hammer mills, edge runner etc.		To study the operation of crushers.
	6	Grinding: Introduction, pan grinding, ring roll mills, ball mills,		
3 rd	7	pot mills, pebble mill, rod and tube mills, cylindrical ball mill,	3	To study the operation of magnetic separator.
	8	conical mills, ball tube mills and their parts, quantity of balls,		To study the operation of magnetic separator.
	9	size of balls. Factors affecting grinding efficiency.		
4 th	10	quantity of balls, size of balls. Factors effecting grinding efficiency (Assignment of Unit -1)	4	To filter the flow of slip through filter press.
	11	Size Separation Wet classifiers, Air, Electromagnetic / magnet separators, vibrating sieve,		To filter the flow of slip through filter press.
	12	slip lifting & Diaphragm pump, Filter press, Vacuum filter, Centrifugal De-watering.		
5 th	13	Mixing and Body Making De-airing single and double arc pug mills and plugging equipment. Extruders, kneading equipment,	5	Demonstration of operation of jigger and jollying machine.
	14	wet pan mill, muller mixer, ribbon mixer, blunger, agitator etc.		Demonstration of operation of jigger and jollying

				machine.
	15	Assignment Unit -2		
6 th	16	Revision Unit -2		
	17	Shaping Machine Potters wheel, Jigger & Jolly, Batting machine, Semi & fully automatic jiggers,	6	Demo of operation of pressing machine with pressing parameters.
	18	Roller machines, Extrusion wire cutting machines		Demo of operation of pressing machine with pressing parameters.
7 th	19	Pressing Machines Important parameters of pressing (Die, Powder & Pressure),	7	Demo of operation of vibrating machine.
	20	Screw press, friction press, Hydraulic press, vibratory compaction machine		Demo of operation of vibrating machine.
	21	Isostatic press, Hot isostatic press (HIP), Injection moulding, Tape casting,		
8 th	22	Assignment Unit -3	8	Demo of operation of Blunger machine.
	23	Revision Unit 3		Demo of operation of Blunger machine.
	24	Dryers Unheated Dryers, Heated Dryers,		
9 th	25	Batch Dryers, Chamber and Corridor dryers.	9	Demo of operation of Agitator machine.
	26	Humidity dryers, Continuous dryers, Tunnel dryers.		Demo of operation of Agitator machine.
	27	Kilns : Tunnel kiln (Roller hearth Kiln, Slab Kiln),		
10 th	28	Shuttle Kiln	10	Study of natural and artificial drying.
	29	Material Handling Equipment: Portable power driven machines,		Study of natural and artificial drying.
	30	permanent installations, flight, belt & screw conveyors,		
11 th	31	conveying through pipes, slurry pumps, bucket elevator.	11	Demo of autoclave machine.
	32	Assignment Unit -4		Demo of autoclave machine.
	33	Revision Unit -4		
12 th	34	Testing Equipment Vicat apparatus, Le-Chatlier apparatus,	12	Practice maintaining firing schedule in lab furnace

	35	Fired MOR testing machine,		Practice maintaining firing schedule in lab furnace
	36	Autoclave machine,		
13th	37	abrasion testing machine,		
	38	Infrared moisture balance,		
	39	Impact testing machine (Izod and Ball type)		
14 th	40	Maintenance of Machineries: Concept of Preventive maintenance,		
	41	Maintenance of Machineries: Concept of Predictive maintenance.		
	42	Maintenance of Machineries: Concept of Break down maintenance.		
15 th	43	Schedule of maintenance.		
	44	Assignment Unit -5		
	45	Revision Unit 5		

Lesson Plan

Name of Faculty : SATENDER VASHISHTHA
 Discipline : CERAMIC ENGINEERING
 Semester : 4th
 Subject : CEMENT TECHNOLOGY
 Lesson Plan Duration : 15 WEEKS

Work Load (Lecture /Practical) per week in hours : Lecture : 3 Practical 4

Week	Theory		Practical	
	Lecture Day	Topic (Including assignment/test)	Practical Day	Topic
1	1	Definition and Classification of cements	1	Physical identification of cement: Colour and Specific gravity.
1	2	Different types of cements Portland cement, Pozzolona cement	2	Physical identification of cement: Colour and Specific gravity.
1	3	Slag cement, Quick setting cement, Rapid hardening cement		
2	4	Low heat cement, High alumina cement, White & coloured cement	3	Physical identification of limestone: Colour and Specific gravity
2	5	Oil well cement, Iron ore cement, Water proof cement	4	Physical identification of limestone: Colour and Specific gravity
2	6	Sulphate resisting cement, Acid proof cement, Hydrophobic cement		
3	7	Ordinary Portland cement of different grades (33,43,& 53)	5	Determination of fineness of cement.
3	8	Assignment of chapter 1	6	Determination of fineness of cement.
3	9	Raw Materials and Additives Raw materials, and their selection		
4	10	Calcareous Raw materials: Limestone, Chalk, Marl.	7	Determination of water cement ratio.
4	11	Argillaceous Raw materials: Silica and its Sources, Alumina, Iron oxide, Shale.	8	Determination of water cement ratio.
4	12	Other raw materials: Fly ash, blast furnace slag, lime sludge.		
5	13	Additives: Definition, Types and purposes. Effect of gypsum on cement properties	9	Determination of initial & final setting time of cement.
5	14	Assignment of chapter 2	10	Determination of initial & final setting time of cement.
5	15	Sessional test 1 as per HSBTE academic calendar		
6	16	Effect of raw materials and constituents on the properties of cement	11	Determination of soundness of cement by Le Chateliers apparatus.

6	17	General composition of cement.	12	Determination of soundness of cement by Le Chatelier's apparatus.
6	18	Phases of cement and their effect on the properties of Cement		
7	19	Calculations of raw mix:- Estimation of silica modulus, alumina modulus,	13	Determination of soundness of cement by Le Chatelier's apparatus.
7	20	Hydraulic modulus, Lime saturation factor, Liquid content.	14	Determination of soundness of cement by Le Chatelier's apparatus.
7	21	Impact of modulus on cement manufacturing process and clinker.		
8	22	Hydration of portland cement, Hydration and heat of hydration of cement,	15	Prepare a sequential flow Diagram for Dry process and wet process
8	23	mechanism of hydration	16	Prepare a sequential flow Diagram for Dry process and wet process
8	24	hydration of C ₂ S, C ₃ S and C ₃ A setting and hardening of Portland cement.		
9	25	Physical and mechanical properties of portland cement.	17	Prepare a sequential flow Diagram for Dry process and wet process
9	26	Assignment chapter 3	18	Prepare a sequential flow Diagram for Dry process and wet process
9	27	Sessional test 2 as per HSBTE academic calendar		
10	28	Wet and dry process, advantages and disadvantages of each process,	19	Prepare a cement plant Layout
10	29	Types of kilns used in Kiln used in cement manufacture.	20	Prepare a cement plant Layout
10	30	Raw mill Grinding, Mixing and homogenization, Burning,		
11	31	Refractories used in Kiln and Coating Formation,	21	Prepare a cement plant Layout
11	32	Thermo chemistry of clinker formation, sequence of reaction.	22	Prepare a cement plant Layout
11	33	Cooling - Importance of cooling.		
12	34	Grinding of clinker - in tube mill, ball mills,	23	Slide show of a Cement plant
12	35	Role of gypsum. Effect of temperature on gypsum during grinding of clinkers	24	Slide show of a Cement plant
12	36	Lime and other building materials, different classes of lime,		

13	37	Properties and uses of Lime	25	Slide show of a Cement plant
13	38	Pollutants from cement industry and pollution control measures.	26	Slide show of a Cement plant
13	39	Electro Static Precipitators, Cyclone dust collector,		
14	40	Scrubbers and wet collectors.	27	Video demonstration on safety measures taken in cement plant.
14	41	Water consistency, initial setting time, final setting time,	28	Video demonstration on safety measures taken in cement plant.
14	42	fineness, soundness and compressive strength		
15	43	Health and Safety Measures taken in cement industries.	29	Video demonstration on safety measures taken in cement plant.
15	44	Precautions for environmental pollution.	30	Video demonstration on safety measures taken in cement plant.
15	45	3 rd sessional Test as per hsbte academic calendar		

Lesson Plan

Name of Faculty : V.N. Jha / MME
 Discipline : Ceramic Engg.
 Semester : 3rd
 Subject : **FUELS AND FURNACES**

Lesson Plan Duration :

Work Load (Lecture /Practical) per week in hours: Lecture : 4 Practical 2

Week	Theory		Practical	
	Lecture Day	Topic (Including assignment/test)	Practical Day	Topic
1 st	1	Introduction of Fuel	1	To determine the moisture content of a solid fuel.
	2	Classification of fuels - Solid, Liquid and Gaseous fuels with examples.	2	To determine the moisture content of a solid fuel.
	3	Theory of C o m b u s t i o n Actual air required for combustion,.		
	4	Theoretical and excess air.		
2 nd	5	Simple problems related to combustion	3	To determine the moisture content of a solid fuel.
	6	Revision and assignment of Unit 1	4	To determine the moisture content of a solid fuel.
	7	Solid Fuel General properties, varieties of solid fuel (wood, coal, saw dust, charcoal)		
	8	Coal and Coke, Classification of coal,		
3 rd	9	Properties of coal and coke.	5	To determine the calorific value of coal by bomb calorimeter.
	10	Spontaneous combustion, its causes and remedy.	6	To determine the calorific value of coal by bomb calorimeter.
	11	Combustible and Non-combustible constituents, Ignition temperature.		
	12	Pulverised coal and its utilisation.		
4 th	13	Testing of fuels - Proximate analysis (like moisture, ash, volatile matter, fixed carbon content)	7	To determine the calorific value of coal by bomb calorimeter.
	14	Testing of fuels - Proximate analysis (like moisture, ash, volatile matter, fixed carbon content)	8	To determine the calorific value of coal by bomb calorimeter.
	15	Ultimate analysis (Carbon, Hydrogen, Nitrogen, sulphur, Oxygen)		
	16	Ultimate analysis (Carbon, Hydrogen, Nitrogen, sulphur, Oxygen)		

5 th	17	Orsat analysis	9	To determine the flash point and fire point of liquid fuel.
	18	Determination of calorific value by Bomb Calorimeter.	10	To determine the flash point and fire point of liquid fuel.
	19	Revision and assignment of Unit 2		
	20	Liquid Fuels -Indian resources of crude oil, liquid petroleum products - petrol, kerosene		
6 th	21	Fuel oil and coke, properties of various petroleum products.	11	To determine the flash point and fire point of liquid fuel.
	22	Testing of liquid fuels, octane and cetane number,	12	To determine the flash point and fire point of liquid fuel.
	23	Calorific value		
	24	flash point and fire point,		
7 th	25	viscosity determination	13	Determination of viscosity of oil by Redwood viscometer or Torsion viscometer.
	26	Burner for liquid fuels (atomizer, cup & cone burner, squirrel gauge).	14	Determination of viscosity of oil by Redwood viscometer or Torsion viscometer.
	27	Burner for liquid fuels (atomizer, cup & cone burner, squirrel gauge).		
	28	Storage and handling practices in industry.		
8 th	29	Types of Gaseous fuels (Natural, producer, water, carburetted water gas, coke oven gas, blast furnace gas, Refinery gas).	15	Demonstration of working of furnace and kiln.
	30	Composition, calorific value and uses of producer gas	16	Demonstration of working of furnace and kiln.
	31	Composition, calorific value and uses of water gas		
	32	Composition, calorific value and uses of Natural gas		
9 th	33	Composition, calorific value and uses of LPG	17	Proximate analysis of solid fuel.
	34	Burners for gaseous fuels	18	Proximate analysis of solid fuel.
	35	Suppliers of fuels.		
	36	Revision & Assignment of Unit-3		
10 th	37	Furnaces -Definition of furnace.	19	Proximate analysis of solid fuel.
	38	Furnaces: Classification of furnaces based on Heat Source, Mode of operation, Method of Handling	20	Proximate analysis of solid fuel.

	39	Furnaces: Classification of furnaces based on Heat Source, Mode of operation, Method of Handling		
	40	Material, types of Fuel used, types of firing & Type of Heat Recovery.		
11 th	41	Furnace atmosphere, Regenerators and recuperators	21	High temperature measurement by infrared gun or optical pyrometer.
	42	description of muffle furnace	22	High temperature measurement by infrared gun or optical pyrometer.
	43	description of tank furnace,		
	44	description of blast furnace		
12 th	45	Description of electrical furnace and annealing furnace.	23	High temperature measurement by infrared gun or optical pyrometer.
	46	Kilns:- Definition of kiln, Classification of kilns,	24	High temperature measurement by infrared gun or optical pyrometer.
	47	Batch Kilns -Description of Updraught, Downdraught (Round and rectangular),		
	48	description of Shuttle kiln,		
13 th	49	Continuous Kilns: Fundamentals of continuous kilns	25	Draw the wiring diagram of typical temperature controller used for lab furnace
	50	construction, working and firing circuits of tunnel kiln, roller kiln, and maintenance.	26	Draw the wiring diagram of typical temperature controller used for lab furnace
	51	Muffle kilns: Muffle tunnel kiln, principle of working, advantages of muffle type tunnel kiln.		
	52	Factors affecting furnace efficiency. Safety measures to be taken while working with furnace environments		
14 th	53	Revision & Assignment of Unit-4	27	Illustrate working of the temperature controller (as a switch) used in your lab model furnace/drier
	54	Furnace and Kiln Accessories Brief explanation about fire box, chimney, crown, damper and stack.	28	Illustrate working of the temperature controller (as a switch) used in your lab model furnace/drier
	55	Definition, type and mechanism of draught and dampers. Kiln furniture and accessories.		

	56	Pyrometry and Pyroscope Need for temperature measurement in kiln.		
15	57	Introduction to pyroscopes, such as seger cones, Behaviour of cones, holdcrafts bar, bullers ring.	29	Identify the inside temperature of furnace by observing the inside color.
	58	working and uses of seger cones, Behaviour of cones, holdcrafts bar, bullers ring.	30	
	59	Introduction to Pyrometers and various types of pyrometers.		
	60	Optical, Radiation, Infrared, Resistance.		
16	61	Thermocouple pyrometer (thermo electric pyrometers) General principle	31	Identify the inside temperature of furnace by observing the inside color.
	62	Types of thermocouple : chromel - Alumel, Platinum - Rhodium etc., Indicators, recorders	32	Identify the inside temperature of furnace by observing the inside color.
	63	Advantage of thermo electric method of measuring temperature.		
	64	Revision & Assignment of Unit-5		