

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
 Scheme of Teaching and Examinations for
IIIRD SEMESTER DIPLOMA IN CERAMIC ENGINEERING
 (Effective from Session 2020-21 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHINGS SCHEME	EXAMINATION – SCHEME							Credits
				Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test (CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	
1.	Applied Mathematics	2000301	04	03	10	20	70	100	28	40	03
2.	Computer Programming Through 'C'	2000302	03	03	10	20	70	100	28	40	03
3.	Ceramic and raw Materials	2013303	03	03	10	20	70	100	28	40	03
4.	Glass Technology – I	2013304	03	03	10	20	70	100	28	40	03
5.	Enamel Technology	2013305	03	03	10	20	70	100	28	40	03
			Total: - 16				350	500			15

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME					Credits	
				Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)		Pass Marks in the Subject
						Internal (A)	External (B)			
6.	Computer Programming through "C" Lab	2000306	06 50% Physical 50% Virtual	03	15	35	50	20	03	
7.	Ceramic Processes Workshop-I	2013307	02 50% Physical 50% Virtual	03	15	35	50	20	01	
8.	Ceramic Engineering Workshop Practice – I (Glass & enamel)	2013308	02 50% Physical 50% Virtual	03	15	35	50	20	01	
9.	Ceramic Engineering Lab-I	2013309	02 50% Physical 50% Virtual	03	07	18	25	10	01	
			Total: - 12				175		06	

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME				Credits
				Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	
10.	Python / Others (TW)	2000310	02	07	18	25	10	01
11.	Ceramic Engineering Workshop Practice – I (Glass & Enamel) (TW)	2013311	03	15	35	50	20	02
			Total: - 05			75		03
Total Periods per week Each of duration one Hours = 33						Total Marks = 750	24	

APPLIED MATHEMATICS

Subject Code 2000301	Theory					Credits 03	
	No. of Periods Per Week			Full Marks	:		100
	L	T	P/S	ESE	:		70
	04	—	—	TA	:		10
	—	—	—	CT	:		20

Contents:		Hrs.	Marks
Unit -1	<p><u>Integration:</u></p> <p>1.1 Definition of integration as anti-derivative. Integration of standard function.</p> <p>1.2 Rules of integration (Integrals of sum, difference, scalar multiplication).</p> <p>1.3 Methods of Integration.</p> <p style="padding-left: 20px;">1.3.1 Integration by substitution</p> <p style="padding-left: 20px;">1.3.2 Integration of rational functions.</p> <p style="padding-left: 20px;">1.3.3 Integration by partial fractions.</p> <p style="padding-left: 20px;">1.3.4 Integration by trigonometric transformation.</p> <p style="padding-left: 20px;">1.3.5 Integration by parts.</p> <p>1.4 Definite Integration.</p> <p style="padding-left: 20px;">1.4.1 Definition of definite integral.</p> <p style="padding-left: 20px;">1.4.2 Properties of definite integral with simple problems.</p> <p>1.5 Applications of definite integrals.</p> <p style="padding-left: 20px;">1.5.1 Area under the curve.</p> <p style="padding-left: 20px;">1.5.2 Area between two curves.</p> <p style="padding-left: 20px;">1.5.3 Mean and RMS values</p>	12	20
Unit -2	<p><u>Differential Equation</u></p> <p>2.1 Definition of differential equation, order and degree of differential equation. Formation of differential equation for function containing single constant.</p> <p>2.2 Solution of differential equations of first order and first degree such as variable separable type, reducible to Variable separable, Homogeneous, Nonhomogeneous, Exact, Linear and Bernoulli equations.</p> <p>2.3 Applications of Differential equations.</p> <p style="padding-left: 20px;">2.3.1 Laws of voltage and current related to LC, RC, and LRC Circuits.</p>	10	15

Unit - 3	<u>Laplace Transform</u> 3.1 Definition of Laplace transform, Laplace transform of standard functions. 3.2 Properties of Laplace transform such as Linearity, first shifting, second shifting, multiplication by t^n , division by t . 3.3 Inverse Laplace transforms. Properties- linearly first shifting, second shifting. Method of partial fractions, 3.4 Convolution theorem. 3.5 Laplace transform of derivatives, 3.6 Solution of differential equation using Laplace transform (up to second order equation).	08	14
Unit - 4	<u>Fourier Series</u> 4.1 Definition of Fourier series (Euler's formula). 4.2 Series expansion of continuous functions in the intervals $(0, 2l)$, $(-l, l)$, $(0, 2\pi)$, $(-\pi, \pi)$ 4.3 Series expansions of even and odd functions. 4.4 Half range series.	08	07
Unit - 5	Numerical Methods 5.1 Solution of algebraic equations Bisection method. Regula-falsi method. Newton – Raphson method. 5.2 Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method. Iterative methods- Gauss seidel and Jacobi's methods.	05 05	07 07
Total		48	70

Text/Reference Books:

Name of Authors	Titles of the Book	Name of the Publisher
Mathematics for polytechnic	S. P. Deshpande	Pune Vidyarthi Griha Prakashan, Pune
Calculus: single variable	Robert T. Smith	Tata McGraw Hill
Laplace Transform	Lipschitz	Schamus outline series.
Fourier series and boundary value problems	Brown	Tata McGraw Hill
Higher Engineering Mathematics	B. S. Grewal	Khanna Publication, New Delhi
Introductory Methods of Numerical analysis	S. S. Sastry	Prentice Hall of India, New Delhi
Numerical methods for scientific & engineering computations	M. K. Jain & others	Wiley Eastern Publication.

COMPUTER PROGRAMMING THROUGH 'C'

Subject Code 2000302	Theory			No of Period in one session :50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
				CT	:	20	

Course Learning Objective:

Computers play a vital role in present day life, more so, in the professional life of technician engineers. In order to enable the students, use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various engineering applications of computers.

Objective:

The objectives of this course are to make the students able to:

- Develop efficient algorithms for solving a problem.
- Use the various constructs of a programming language viz. conditional, iteration and recursion.
- Implement the algorithms in “C” language.
- Use simple data structures like array, stacks and linked list solving problems.
- Handling File in “C”.

Contents: Theory		Hrs.	Marks
<u>Unit -1</u>	<p><u>Introduction to computer software:</u></p> <ul style="list-style-type: none"> ➤ Classification of computer software. <ul style="list-style-type: none"> • System software. • Application software. ➤ Programming languages. <ul style="list-style-type: none"> • Machine languages. • Assembly languages. • High level programming languages. ➤ Algorithms and flowchart. 	[03]	
<u>Unit -2</u>	<p><u>Fundamental of C languages.</u></p> <ul style="list-style-type: none"> ➤ Introduction. <ul style="list-style-type: none"> • Background. • Characteristics of C. • Uses of C. ➤ Structure of a C program. ➤ Writing the first C program. ➤ Files used in a C program. <ul style="list-style-type: none"> • Source code files. • Header files. • Object files. • Binary executable files. ➤ Compiling and Executing C programs. ➤ Using comments. 	[08]	

	<ul style="list-style-type: none"> ➤ Characters used in C. ➤ Identifier. ➤ Keyword or Reserved words. ➤ Tokens. ➤ Constants. <ul style="list-style-type: none"> • Numeric constant. • String Character constant. ➤ Variables. ➤ Variable Declaration. ➤ Basic Data Types. ➤ Additional Data types. ➤ Operators and Expressions. ➤ Operator Precedence and Associativity. ➤ Type conversion and Type casting. ➤ Input/ Output statements in C. 		
<p style="text-align: center;"><u>Unit -3</u></p>	<p><u>Decision Control and Looping Statements:</u></p> <ul style="list-style-type: none"> ➤ Introduction to Decision control statements. ➤ Conditional Branching statements. <ul style="list-style-type: none"> • If statement. • If-else statement. • If-else-if statement. • Switch case. ➤ Iterative statements. <ul style="list-style-type: none"> • While loop. • Do-while loop. • For loop. ➤ Nested loops. ➤ Break and continue statements. <ul style="list-style-type: none"> • Break statement. • Continue statement. ➤ Go to statement. 		

<p><u>Unit -4</u></p>	<p><u>Functions in 'C'.</u></p> <ul style="list-style-type: none"> ➤ Uses of functions. ➤ User defined functions. ➤ Function Declaration. ➤ Calling a function. ➤ Actual and formal Arguments. ➤ Rules to call a function. ➤ Function prototype. ➤ Recursion. • Use of Recursive function. ➤ Local or Internal variables. ➤ Global or External variables. ➤ Void function. ➤ Storage classes in C. • Auto or Automatic Storage class. • Static Storage class. • Extern Storage class. • Register Storage class. 	<p>[07]</p>	
<p><u>Unit -5</u></p>	<p><u>Arrays.</u></p> <ul style="list-style-type: none"> ➤ Introduction. ➤ Declaration of Arrays. ➤ Accessing the Elements of an Array. • Calculating the address of Array elements. • Calculating the length of an Array. ➤ Storing values in Arrays. • Initializing Arrays during Declaration. • Inputting values from the keyboard. • Assigning values to Individual Elements. ➤ Operations on Arrays. • Traversing an Array. • Inserting an Element in an Array. • Deleting an Element from an Array. • Merging Two Arrays. • Searching for a value in an Array. ➤ Passing Arrays to functions. ➤ Two dimensional Arrays. • Declaring Two-dimensional Arrays. • Initializing Two-dimensional Arrays. • Accessing the Elements of two dimensional Arrays. ➤ Operations on Two-dimensional Arrays. 	<p>[07]</p>	

<p><u>Unit -6</u></p>	<p><u>Pointers.</u></p> <ul style="list-style-type: none"> ➤ Understanding the Computer’s Memory. ➤ Introduction to pointers. ➤ Declaring pointer variables. ➤ Pointer Expressions and pointer Arithmetic. ➤ Null pointers. ➤ Passing Arguments to function using pointer. ➤ Pointers and Arrays. ➤ Passing an Array to a Function. ➤ Dynamic Memory Allocation. • Malloc () function. • Calloc () function. • Realloc () function. • Free () function. 	<p>[07]</p>	
<p><u>Unit -7</u></p>	<p><u>Structures and Unions.</u></p> <ul style="list-style-type: none"> ➤ Structures. ➤ Structure variables and Arrays. • Initialization of structure variable and Array. • Dot (•) Operator. • Assigning value of a structure to Another structure. ➤ Structure within structures. ➤ Site of () of a structure. ➤ Unions. ➤ Site of () unions. ➤ Difference between a structure and an union. ➤ Enum Data Type. ➤ Typedef Declaration. 	<p>[04]</p>	

Text / Reference Books -

1. Programming with C. Second Edition. Tata McGraw-Hill, 2000 - Byron Gottfried
2. How to solve by Computer, Seventh Edition, 2001, Prentice hall of India. - R.G. Dromey
3. Programming with ANSI-C, First Edition, 1996, Tata McGraw hill. - E. Balaguruswami
4. Programming with ANSI & Turbo C. First Edition, Pearson Education. - A. Kamthane
5. Programming with C. First Edition, 1997, Tara McGraw hill. - Venugopla and Prasad
6. The C Programming Language, Second Edition, 2001, Prentice Hall of India. - B. W. Kernighan & D.M. Ritchie
7. Programming in C, Vikash Publishing House Pvt. Ltd., Jungpura, New Delhi. - R. Subburaj
8. Programming with C Language, Tara McGraw Hill, New Delhi. - C. Balagurswami
9. Programming in C, Galgotia Publications Pvt. Ltd. Dariyaganj, New Delhi. - Kris A. Jamsa
10. The Art of C Programming, Narosa Publishing House, New Delhi. - Jones, Robin & Stewart
11. Problem Solving and Programming. Prentice Hall International. - A.C. Kenneth
12. C made easy, McGraw Hill Book Company, 1987. - H. Schildt
13. Software Engineering, McGraw Hill, 1992. - R.S. Pressman
14. Pointers in C, BPB publication, New Delhi. - Yashwant Kanetkar

CERAMIC AND RAW MATERIALS

Subject Code 2013303	Theory			No of Period in one session: 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale:

Ceramic is inorganic based Technology with a num numbs of Industrial and Domestic Products such as Refractory, Cement, Crockeries & Glass etc. The course offers the Knowledge of Ceramic Spectrums in totality.

Learning Outcome: At the end of this course, the students will be able to:

Explain status of ceramic industries in India.

Enlist different ceramic products and their raw materials.

Explain classification of ceramic materials.

Identify physical properties of different ceramic materials.

List the different raw materials required for manufacturing of refractory, pottery, glass, enamel, cement.

Contents (Theory)		Hrs	Marks
Unit -1	<u>INTRODUCTION OF CERAMIC</u> Introduction with its History and uses.	[05]	
Unit -2	<u>CERAMIC PRODUCTS:</u> Refractory, Pottery, Glass, Enamel, Cement, etc.	[10]	
Unit -3	<u>RAW MATERIALS:</u> Silicate Chemistry, Formation, Geology, mineralogy.	[10]	
Unit -4	<u>TYPE OF RAW MATERIALS</u> Plastic raw materials - clays, non- clay plastic raw materials - Talk etc. Non-Plastic raw materials - Refractories, fluxes, Coloring agents.	[15]	
Unit -5	<u>OTHER RAW MATERIALS:</u> Building materials, Chemical and Technical Ceramic material, Specialized Laboratory and Engineering wares materials, Electrical Industry Ceramic material, Construction and Refectory raw materials, Insulator raw materials, Special Products raw materials etc.	[20]	
Total		60	

Text/Reference Books:

Sl. No.	Title	Author
1	Industrial Ceramics	- F. Singerand S.S. Singer
2	Hand book of glass technology	- Dr. R. Chavan
3	Porcelain Enamels	- A.I. Andrews
4	Modern Pottory Manufacture	- H.N. Bose
5	Refractories	- M.L. Mishra
6	Elements of Ceramics	- F.H. Norton
7	Refractories	- F.H. Norton

GLASS TECHNOLOGY - I

Subject Code 2013304	Theory			No of Period in one session: 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
			CT	:	20		

RATIONALE:

Glass is an important Ceramic Engineering subject dealing with Glass Products such as sheet glass. Bullet proof glass, tumbler glass, safety glass, optical glass, and ophthalmic glass etc. The subject imparts knowledge on its making by using different kind of furnaces. It also deals with the raw materials used in Glass Industry.

Learning Outcome: At the end of this course, the students will be able to:

- Define glass, state properties and use of glass.
- Enlist different types of glass.
- List out different raw materials used in glass industries.
- Explain properties of different raw materials.
- Perform handling and mixing of raw materials for batch.
- Prepare batch for glass.
- Describe construction and function of different glass making furnaces.

Contents (Theory)		Hrs	Marks
Unit -1	<u>INTRODUCTION:</u> Definition, History and uses of Glass.	[10]	
Unit -2	<u>CLASSIFICATION OF GLASS:</u> Soda Lime Silica Glass, Potash Lime Silica Glass, Potash Lead Glass, Borosilicate Glass, Phosphate Silicate Glass, White and Coloured Glass, Safety Glass and Sandwich Glass etc. Network Glass such as: Fluoride Glass, Alumino-silicate Glass, Phosphate Glass and Borate Glass etc. Colloidal Glass and Glass Ceramic.	[10]	
Unit -3	<u>RAW MATERIALS AND COLOURANTS:</u> Glass Raw Materials such as: Silica, Soda Ash, Boric Oxide, Phosphoric Oxide, Sodium Oxide, Potassium Oxide, Lithium Oxide, Calcium Oxide, Barium Oxide, Lead Oxide, Aluminium Oxide, Titanium Oxide, Zinc Oxide and Magnesium Oxide etc - Origin and their properties. Colourants used for Glass such as: Chromium, Vanadium, Nickel, Cobalt, Copper, Magnese, Iron, Sulphur, Carbon, Silver, Gold and Selenium etc. Decolorizers used for glass.	[15]	
Unit -4	<u>PRINCIPLES OF GLASS MAKING:</u> Batch and Batch Calculation, Glass Problems and Solutions. Storage and Mixing of Raw Materials, Cullet, Flux, Oxidizing and Reducing Agent, Fining and Annealing of Glass.	[15]	

Unit -5	<u>GLASS FURNACES:</u> Tank Furnace, Pot Furnace, Float Glass Furnace and Annealing Lehr.	[10]	
Total		60	

Text/Reference Books:

Sl. No.	Title		Author
1	Hand Book of Glass Technology	-	Dr. R. Charan
2	Modern Glass Practice	-	S.R. Scholes
3	Hand Book of Glass Manufacture Vol – I and II	-	F.V. Tooley
4	Glass Melting Tank Furnace	-	R. Gunther
5	Coloured Glasses	-	W.A. Weyl

ENAMEL TECHNOLOGY

Subject Code 2013305	Theory			No of Period in one session: 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

RATIONALE:

Enamel is Ceramic Engineering based product which is made by fusing powdered glass to a substrate by firing. It is used as external coating as well besides its use as high temperature resistant materials in equipment. It is also used as tray or utensils because of its clean and hygienic quality.

Learning Outcome: At the end of this course, the students will be able to:

- Define enamel and use of enamel.
- List out different raw materials used in enamel making.
- Explain properties of different raw materials for enamel.
- Prepare enamel batch, enamel slip and substrate.
- Perform application of enamel slip.
- Describe construction and function of different enameling furnace.
- Identify the defects and remedies in enamel.

Contents (Theory)		Hrs	Mark
Unit -1	Introduction Definition, History and uses of Enamel.	[10]	
Unit -2	RAW MATERIALS AND COMPOSITION OF ENAMEL: Raw Materials: Availability physical and chemical properties. Composition of: Enamel and Frit.	[10]	
Unit -3	PREPARATION OF ENAMEL AND RELATED MATERIALS: Preparation of: Frit Mill Additions, Electrolytes, Enamel Slip, Metal (Steel and Cast Iron) Surface for Enameling. Milling and Mill Equipment.	[15]	
Unit -4	APPLICATION: Application of Enamel Slip using various Processes.	[10]	
Unit -5	FURNACE AND FIRING: Smelter for Frit Making, Enameling Furnace, Firing Technique and Detail.	[10]	
Unit -6	DEFECTS AND REMEDIES: Defect, Cause and Remedy of: Pinhole, Peeling, Crack. Chipping, Fish Scaling, Blistering, Hair Lining, Jumping Off, Reboiling, Rusting, Tearing, Warping etc.	[05]	
Total		60	

Books Recommended:

Sl. No.	Title	Author
1	Porcelain Enamels	- A.I. Andrew
2	Technology of Enamel	- V.V. Vargin
3	Element of Ceramics	- F. H. Norton

COMPUTER PROGRAMMING THROUGH 'C' LAB

Subject Code 2000306	Practical			No. of Period in one session: 50			Credits
	No. of Periods Per Week			Full Marks			03
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
			External	:	35		

Course Learning Objectives:

This Lab course is intended to practice what is taught in theory class of 'Computer Programming' and become proficient in computer programming. Computer programming is all about regular practice. Students should work on solved and unsolved problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below.

Course outcomes:

Student should be able to write code snippets, and then compile, debug and execute them.

Content: Practical		Hrs	Marks
Unit – 1	Familiarization with programming environment (Editor, Compiler, etc.)		
Unit – 2	Programs using, I/O statements and various operators		
Unit – 3	Programs using expression evaluation and precedence		
Unit – 4	Programs using decision making statements and branching statements		
Unit – 5	Programs using loop statements		
Unit – 6	Programs to demonstrate applications of n dimensional arrays		
Unit – 7	Programs to demonstrate use of string manipulation functions		
Unit – 8	Programs to demonstrate parameter passing mechanism		
Unit – 9	Programs to demonstrate recursion		
Unit – 10	Programs to demonstrate use of pointers		
Unit – 11	Programs to demonstrate command line arguments		
Unit – 12	Programs to demonstrate dynamic memory allocation		
Unit – 13	Programs to demonstrate file operations		

The language of choice will be C. This is a skill course. More you practice, better it will be.

Reference Books:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.

CERAMIC PROCESSES WORKSHOP-I

Subject Code 2013307	Practical			No of Period in one session: 90			Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
				External	:	35	

Rationale:

The rationale behind this workshop is to familiarize the student with various conventional and modern processtechniques used in making various ceramic product.

Learning Outcome: At the end of this course, the students will be able to:

- Apply Processing techniques used in pottery making.
- Explain Process adopted in making refractories.
- Explain Glass forming methods by using process techniques and machine.
- Perform Cement and Concrete application.
- Perform Decoration techniques with finishing.
- Prepare Mouldid

Contents (Theory)		Hrs.	Mark
Unit -1	Introduction of shaping, mounding, casting, pressing and all other processes.		
Unit -2	Cement and concrete application.		
Unit -3	Decoration and finishing of pottery and other ceramic wares techniques		
Unit -4	Mouldid making		
Total			

Books Recommended:

1	The craft of Ceramic	-	Ceza de vegh and Alber Mande
2	Industrial Ceramic	-	Singer and Singer

CERAMIC ENGINEERING WORKSHOP PRACTICE – I (GLASS AND ENAMEL)

Subject Code 2013308	Practical			Credits		
	No. of Periods Per Week			Full Marks	:	50
	L	T	P/S	ESE	:	50
	—	—	02	Internal	:	15
				External	:	35
					01	

RATIONALE:

This Workshop is kept mainly to get students work with hand on various process involved in making glass and Enamel products.

It provides practical knowledge on operations required to be carried out in industry on laboratory scale.

Learning Outcome: At the end of this course, the students will be able to:

- Prepare the raw materials for different glass.
- Perform batching and mixing of glass batch.
- Explain Glass melting techniques and decoration.
- Prepare metal surface for enameling.
- Prepare frit batch and make enamel slip.
- Apply enamel on metal plate.

Contents (Practical)		Hrs	Mark
<u>GLASS</u>			
Unit -1	<u>PREPARATION OF RAW MATERIALS:</u> For: soda Lime Silica Glass, Potash Glass and Colored Glass etc.		
Unit -2	<u>FORMATION AND MIXING OF BATCH:</u> For all kind of Glasses with Frit and Colours and Mixing of the Prepared Batch.		
Unit -3	<u>MELTING OF GLASS:</u> In Pot Furnace of different Batch.		
Unit -4	<u>DECORATION OF GLASS:</u> Decoration of Glass using methods of Etching etc.		
<u>ENAMEL:</u>			
Unit -1	<u>METAL SURFACE PREPARATION:</u> Such as: Cleaning, Pickling and Neutralization etc.		
Unit -2	<u>FRIT PREPARATION AND MELTING:</u> Making of Frit Batch. Mixing. Charging in Smelter. Melting and Quenching.		
Unit -3	<u>ENAMEL SLIP MAKING WITH FRIT AND APPLICATION:</u> Enamel slip Making using Frit and Enamel Composition. Application by: Dipping, Brushing etc.		
Unit -4	<u>DRYING AND FIRING OF ENAMEL WARE:</u> Drying using Dryer. Firing using Muffle Furnace.		
Total			

Text/ Reference Books:

1	Hand Book of Glass Technology	-	Dr. R. Charan
2	Porcelain Enamel	-	A. I. Andrew

CERAMIC ENGINEERING LAB – I

Subject Code 2013309	Practical			Full Marks			Credits
	No. of Periods Per Week						
	L	T	P/S	ESE			
	—	—	02	Internal			
				External			
			25	:	25	01	
			07	:	07		
			18	:	18		

RATIONALE:

Ceramic Engineering Laboratory has been kept for studying properties of Clay and carrying out various lab tests on pottery, Refractory, Glass, Enamel materials and Products.

Learning Outcome: At the end of this course, the students will be able to:

- Explain physical properties of clay.
- Perform testing of different properties of pottery, refractory, glass and enamel.
- Explain defects of enamel.

Contents (Practical)		Hrs	Marks
Unit -1	STUDY CLAY: Study The Physical Proportion of Clay.		
Unit -2	DETERMINATION OF PROPERTIES:- POTTERY MATERIALS: Water Content in Clay, Shrinkage of Clay and Plasticity of Clay etc.		
Unit -3	DETERMINATION OF PROPERTIES: REFRACTORY MATERIALS: Apparent Porosity, Specific Gravity and Bulk Density of refractory Bricks etc.		
Unit -4	DETERMINATION OF PROPERTIES: - GLASS MATERIALS: Sieve analysis of Glass Sand, Density of Glass and Thermal Endurance of Glass etc.		
Unit -5	DETERMINATION OF PROPERTIES: ENAMEL MATERIALS: Study the Defects in Enamel and Thermal Expansion etc.		
Total			

Text/ Reference Books:

1	Porcelain Enamel	-	A.I. Andrew
2	Hand book of Glass Technology	-	Dr. R. Charan
3	Modern Pottery manufacture	-	H. N. Bose
4	Refractories	-	M. L. Mishra

PYTHON / Others (TW)

Subject Code 2000310	Term Work			No of Period in one session: 30			Credits 01
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	07	
	—	—	02	External	:	18	

CONTENTS		Hrs.	Marks
UNIT – 01	Write a program to demonstrate basic data type in python.		
UNIT – 02	Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)		
UNIT – 03	Write a python program Using for loop, write a program that prints out the decimal equivalent of $1+\frac{1}{2}+\frac{1}{3}+\dots+\frac{1}{n}$		
UNIT – 04	Write a Python program to find first n prime numbers. Write a program to demonstrate list and tuple in python.		
UNIT – 05	Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number and prints a countdown from that number to zero.		
UNIT – 06	Write a Python Program to add matrices. Write a Python program to multiply matrices.		
UNIT – 07	Write a Python program to check if a string is palindrome or not.		
UNIT – 08	Write a Python program to Extract Unique values dictionary values		
UNIT – 09	Write a Python program to read file word by word Write a Python program to Get number of characters, words.		
UNIT – 10	Write a Python program for Linear Search		

CERAMIC ENGG. WORKSHOP PRACTICE – 1

(GLASS AND ENAMEL) (TW)

Subject Code 2013311	Term Work			No of Period in one session: 30			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal Examiner	:	50	
	—	—	03	External Examiner	:	15	

RATIONALE:

This Workshop is kept mainly to get students work with hand on various process involved in making glass and Enamel products. It provides practical knowledge on operations required to be carried out in industry on laboratory scale.

Learning Outcome: At the end of this course, the students will be able to:

- Prepare the raw materials for different glass.
- Perform batching and mixing of glass batch.
- Explain Glass melting techniques and decoration.
- Prepare metal surface for enameling.
- Prepare frit batch and make enamel slip.
- Apply enamel on metal plate.

Contents (Term Work)		Hrs	Mark
<u>GLASS</u>			
Unit -1	<u>PREPARATION OF RAW MATERIALS:</u> For: soda Lime Silica Glass, Potash Glass and Colored Glass etc.	[03]	
Unit -2	<u>FORMATION AND MIXING OF BATCH:</u> For all kind of Glasses with Frit and colors and Mixing of the Prepared Batch.	[04]	
Unit -3	<u>MELTING OF GLASS:</u> In Pot Furnace of different Batch.	[05]	
Unit -4	<u>DECORATION OF GLASS:</u> Decoration of Glass using methods of Etching etc.	[03]	
<u>ENAMEL:</u>			
Unit -1	<u>METAL SURFACE PREPARATION:</u> Such as: Cleaning, Pickling and Neutralization etc.	[05]	
Unit -2	<u>FRIT PREPARATION AND MELTING:</u> Making of Frit Batch. Mixing. Charging in Smelter. Melting and Quenching.	[04]	
Unit -3	<u>ENAMEL SLIP MAKING WITH FRIT AND APPLICATION:</u> Enamel slip Making using Frit and Enamel Composition. Application by: Dipping, Brushing etc.	[02]	
Unit -4	<u>DRYING AND FIRING OF ENAMEL WARE:</u> Drying using Dryer. Firing using Muffle Furnace.	[04]	
Total		30	

Text/ Reference Books:

1	Hand Book of Glass Technology	-	Dr. R. Charan
2	Porcelain Enamel	-	A. I. Andrew