PROFESSIONAL MATHEMATICS

<table>
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Rationale:
A technical diploma holder is engaged generally as first line supervisor. He forms a bridge between workers and management. He has to understand the language of the modern management and communicate with the workers in their language. This subject will help accomplish the task of stipulated time, develop attitude towards cost effectiveness, selection of most effective alternative methods. This course will also help the student to tackle different numerical methods and computational techniques for problem solving in research organization as a programmer.

Objectives:
The course enables students to:

- Managerial skill based on mathematical footing
- The ability to find approximate solutions and/or answers to the problems where analytical methods become more complex.
- To choose correct numerical techniques for a given problem.

S.No. | Topics | Periods
--- | --- | ---
01 | GROUP –A (Numerical Methods & Computational Techniques) | (20)
02 | GROUP-B (Statistical Techniques) | (20)
03 | GROUP-C (Management Techniques) | (20)

Total: (60)

CONTENTS:

GROUP-A  
(NUCLEAR METHODS & COMPUTATIONAL TECHNIQUES) [20]

01.01 Introduction to Numerical methods: Approximation and errors (Truncation & Round off). Floating, point presentation of numbers, arithmetic operations with normalized floating point.


01.03 Solution of Linear Simultaneous Equations: Gaussian Elimination method and Gauss-Jordan method.


01.05 Numerical Differentiation & Integration: Newton’s forward and backward differentiation formula. Trapezoidal Rule and Simpson’s 1/3 rule for numerical integration.

01.06 Numerical solution of 1st order ordinary differential equations: Taylor’s Series. Euler’s method. Modified Euler’s method Runge-Kutta methods.

GROUP-B  
(STATUTICAL TECHNIQUES) [20]

02.01 Introduction to statistics: Measure of central tendencies: measures of dispersions: standard deviation and variance for discrete and grouped data: assumed mean and step deviation methods.


02.03 Probability Distribution: Introduction to Arithmetic Mean and Standard Deviation of a probability distribution. Important probability distribution – Binomial distribution. Poisson’s distribution and normal distribution. Their means and variance.

02.04 Sampling Distribution: Sampling Distribution of Mean and Standard Deviation.

02.05 Quality Control: P-Chart and R-Chart.

GROUP-C  
(MANAGEMENT TECHNIQUES) [20]

03.01 Linear Models

03.01.01 Introduction to Operations Research (O.R) Steps of O.R.

03.01.02 Linear Programming Problems: Step in information of a LPP. Mathematical Modelling and Solution Procedure.

03.01.03 Solution by Simplex Method: Basic Feasible Solution (Degenerator and Non-degenerator) Procedure including Big-M Method. Example.

03.01.04 Transportation problem: Introduction and Solution Procedure-
(i) Finding the initial basic feasible solution by N-W Corner Rule and Vogel’s Approximation Method.
(ii) Finding the Optimal Solution by U-V Method.

03.01.05 Assignment Problem: Introduction and Solution Procedure–Fundamental theory underlying Hungarian Method.

03.02 Network Analysis. CPM & PERT: Introduction.

03.02.01 Basic concepts – Activities. Nodes. Edges. Networking of a project. Various times calculations. CPM to determine the optimal project schedule.

03.02.02 PERT- Definition, difference between CPM & PERT. Pessimistic times, optimistic times. Most likely times of various activities, probability of meeting the schedule time, standard deviation of the schedule time.


Books Recommended: Text Books


SCHEME OF EXAMINATION FOR FINAL EXAMINATION  
F.M :80
Rationale:
The subject forms an important part of Engineering curricula for developing the concepts required in the design of various structures. The subject deals with the basic concept of mechanics of body and the behaviour of material used in practice and in structures under varying load conditions. The first part of the subject deals with the applied mechanics science. Which describe the condition of body in rest or motion under the action of forces. In its preview come variety of general and specialized engineering disciplines concerned with analysis of structures and machines and the mechanism of their parts.

In the Second part, the principles of strength of materials is introduced in which the student will learn to distinguish between different types of stress and strain and also the qualitative assessment of stress and strains in material element under the action of internal forces.

Objective:
Knowledge Workers will be able to:
- Analyze and understand the physical behaviour of members of engineering structures.
- Acquire knowledge of various elements of structures.
- Utilise the basic principles.
- Develop skill to tackle field problem.
- Solve the problems by the application of basic principles.
- Judge the suitability of materials in design process.

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<tr>
<td>02</td>
<td>Vector Methods</td>
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<tr>
<td>03</td>
<td>Introduction to system of forces and equilibrium</td>
<td>(06)</td>
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<tr>
<td>04</td>
<td>Friction</td>
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<td>Kinematics and kinetics of a particle</td>
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<td>06</td>
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<td>07</td>
<td>Impulse and Momentum</td>
<td>(02)</td>
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<td>01</td>
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<tr>
<td>02</td>
<td>Elastic constants</td>
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<td>03</td>
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<td>05</td>
<td>Shearing force and bending moments</td>
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### CONTENTS:

**PART A**

**TOPIC: 01 – INTRODUCTION:**
Idealisation of mechanics; Concept of rigid body; External forces (Body forces & surface forces) Law of Mechanics.

**TOPIC: 02 Vector Methods:**
Equality and equivalence of vectors; Free and Bound vector; Moment of a force about a point and a line; Couple and moment of a couple; couple moment as free vector. Wrench.

**TOPIC: 03 – INTRODUCTION TO SYSTEM OF FORCES AND EQUILIBRIUM:**
Statically equivalent force system; simplest equivalent of a system of forces; force analysis, free body diagram, equation of equilibrium.

**TOPIC: 04 – FRICTION:**
Types of Friction (Static, Dynamic, Sliding, Rolling, Fluid) Rope & Belt Friction etc.

**TOPIC: 05 – KINEMATICS AND KINETICS OF A PARTICLE:**
Rectilinear and curvilinear translations; normal and tangential component of acceleration; radial and transverse component of acceleration.

**TOPIC: 06 – KINEMATICS AND KINETICS OF RIGID BODY:**
Angular Velocity and angular acceleration; Effective forces on a rigid body. D’ Alembert’s principle.

**TOPIC: 07 – IMPULSE AND MOMENTUM:**
Linear impulse and linear momentum, angular impulse and angular momentum.

**TOPIC: 08 – WORK, ENERGY AND POWER:**
Work done by forces and couples, potential and kinetic energy, work-energy; conservation of energy; concept of power and efficiency.

**PART B**

**TOPIC: 01 – SIMPLE STRESSES & STRAIN:**
Definition of various terms and their units (S.I. Units)


01.02 Stress & strain in varying sectional bar & composite bar. Stress & strain due to temperature variation in homogeneous and composite bars.

01.04 Shrinking on hoop’s stresses.

**TOPIC: 02 – ELASTIC STRESS & STRAIN:**

[03]
02.01 Linear strain and lateral strain, poisson’s ratio, volumetric strain
02.02 Change in volume due to axial, biaxial & triaxial loading. Bulk modulus.
02.03 Shear stress and strain, modulus of rigidity.
02.04 Various relations between modulus of elasticity, modulus of rigidity & bulk modulus.
02.05 Simple shear. Complementary shear stress, stress on oblique section.

**TOPIC: 03 – CENTER OF GRAVITY (CENTROID):**
03.01 Definition of center of gravity & centroid.
03.02 Determination of C.G of various sections symmetrical and unsymmetrical sections.
03.03 Determination of C.G of perforated sections. C.G of semi circle, quadrant circle.

**TOPIC: 04 – MOMENT OF INERTIA:**
04.01 Definition of M.I.; radius of gyration, second moment of area.
04.02 Parallel axis theorem & perpendicular axis theorem.
04.03 Derivation of M.I. of regular area-rectangular, triangular circular about centroidal axis.
04.04 M.I. of built up section, symmetrical and unsymmetrical about centroidal axis, modulus of sections.

**TOPIC: 05 – SHEARING FORCE & BENDING MOMENT:**
05.01 Types of beams and types of supports, types of loading.
05.02 Concept and definitions of shear force and bending moment, sign convention.
05.03 Shear force and bending moment diagrams for cantilever, simply supported beam, over hanging beam for various types of loading & couples, point of contraflexure.
05.04 Relation between B.M, S.F. and rate of loading.

**Books Recommended:**

**Text Books**

**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**

| F.M. : 80 |
Rationale:
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 arrays, stacks and linked list solving problems.
- Handling File in “C”.

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<td>02</td>
<td>Algorithm for Problem Solving</td>
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<td>Introduction to ‘C’ Language</td>
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<td>Condition and Loops</td>
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<td>Functions</td>
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<td>Pointers</td>
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<td>09</td>
<td>Self Referential Structures and Linked Lists</td>
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<td>File Processing</td>
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Continued...

CONTENTS:

**TOPIC: 01 – INTRODUCTION TO PROGRAMMING:**

**TOPIC: 02 – ALGORITHM FOR PROBLEM SOLVING:**
Exchanging values of two variables, summation of a set of numbers. Decimal Base to Binary Base conversion. Reversing digits of an integer, GCD (Greatest Common Division) of two numbers. Test whether a number is prime. Organize numbers in ascending order. Find square root of a number, factorial computation, Fibonacci sequence. Evaluate ‘sin x’ as sum of a series. Compute sine Series. Check whether a given number is Palindrome or not. Find Square root of a quadratic equation. Generate LCM & GCD. Reverse order of elements of an array. Find largest number in an array. Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial.

**TOPIC: 03 – INTRODUCTION TO ‘C’ LANGUAGE:**
03.01 Character set, Variable and Identifiers, Built-in Data Types, Variable Definition, Declaration, C Key Words-Rules & Guidelines for Naming Variables.
03.02 Arithmetic operators and Expressions, Constants and Literals, Precedence & Order of Evaluation.
03.03 Simple assignment statement. Basic input/output statement.
03.04 Simple ‘C’ programs.

**TOPIC: 04 – CONDITIONAL STATEMENTS AND LOOPS:**
04.01 Decision making within a program
04.02 Conditions, Relational Operators, Logical Perator.
04.03 If statement, it-else statement.
04.04 Loop statements
04.05 Break, Continue, Switch, Goto and Labels.

**TOPIC: 05 – ARRAYS:**
What is an Array?; Declaring an Array, Initializing an Array.
One dimensional arrays: Array manipulation: Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Representation sparse matrices.

**TOPIC: 06 – FUNCTIONS:**
Top-down approach of problem solving. Modular programming and functions, Definition of Functions Recursion, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference; call by value, Recursive Functions, arrays as function arguments.

**TOPIC: 07 – STRUCTURES AND UNIONS:**

**TOPIC: 08 – POINTERS:**
Concept of Pointers, Address operators, pointer type declaration, pointer assignment, pointer initialization pointer arithmetic, Indirection Operator, Pointers to Pointers, functions and pointers, Arrays and Pointers, pointer arrays.
TOPIC: 09 – SELF REFERENTIAL STRUCTURES AND LINKED LISTS: [03]
Creation of a singly linked list, Traversing a linked list, Insertion into a link list, Deletion from a linked list.

TOPIC: 10 – FILE PROCESSING: [03]
Concept of Files, File operation in various modes and closing of a file, Reading from file, Writing onto a file.

Book Recommended:


SCHEME OF EXAMINATION FOR FINAL EXAMINATION
F.M : 80
CHEMISTRY FOR CERAMICS ENGINEERING

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S.No. Topics Periods

01 Physical Chemistry
02 Preparation, Properties and uses of the compounds used in Ceramic Industry

CONTENTS:

TOpic: 01 – Physical Chemistry:
Elementary knowledge of phase rule – phase, component, degree of freedom, one component system, two component system, SO2-Al2O3 system, elementary knowledge of pH Value
Preliminary idea of law of mass action, viscosity and surface tension.

TOpic: 02 – Preparation, Properties and Uses of the Compounds Used in Ceramic Industry:
Preparation, Properties and uses of the following compounds used in ceramic industry:-
Sodium Carbonate, Sodium Silicate, Sodium Sulphate, Barium Carbonate, Calcium Carbonate, Calcium Sulphate, Plaster of Paris and Gypsum Magnese Oxide, Zinc Oxide, Lead Oxides, Antimony Oxide, Chromic Oxide, Tin Oxide, Potassium Chromate and Dichromate, Magnesium Oxide, Selenium Metal, Borax, Copper Sulphate, Cuprous and Cupric Oxide, Alumina, Ferrous and Ferric Oxides, Cobalt Oxide.

Books Recommended:
1. Physical Chemistry - Puri and Sharma
2. Physical Chemistry - Bahl and Tuli
3. Inorganics Chemistry - Puri and Sharma

Scheme of Examination for Final Examination

F.M. : 80
### CHEMICAL ENGINEERING

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S.No.  Topics  Periods
01  Crushing and Grinding  0
02  Size Separation  0
03  Conveying  0
04  Mixing  0
05  Filtration  0
06  Drying  0
07  Heat Transfer  0

### CONTENTS:

**TOPIC: 01 – CRUSHING AND GRINDING:**
Rettinger’s Law of Crushing, Jaw Crusher, Gyratory Crusher, Crushing rolls, Hammer mill, Ball mill, Tube mill.

**TOPIC: 02 – SIZE SEPARATION:**
Screens, Grizzlies, Trommels, Shaking Screens, Vibrating Screens.

**TOPIC: 03 – CONVEYING:**
Belt conveyors, Screw Conveyor, Elevator, Chain Conveyors.

**TOPIC: 04 – MIXING:**
Paddle stirrer, Propeller, Kneader, Dry mixers, Muller mixer.

**TOPIC: 05 – FILTRATION:**
Plate and Frame Filter Press, Screen and Leaf Filter Press.

**TOPIC: 06 – DRYING:**
Compartmental Dryer, Tunnel Dryer, Rotary Dryer, Drum Dryer.

**TOPIC: 07 – HEAT TRANSFER:**
Conduction, Heat flow through composite wall, convection, radiation, double pipe heat exchanger.

### Books Recommended:

1. Introduction to Chemical Engineering - Bedger and Banchero
2. Unit Operation - McCabe and Smith

### SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
POTTERY AND PORCELAIN TECHNOLOGY - I

Subject Code
03206

Theory

No of Periods Per Week
Full Marks
L T P/S Annual Exam.
02 00 00 Internal Exam.

No of Period in one session : 50
Full Marks : 100
Annual Exam. : 80
Internal Exam. : 20

S.No. Topics
01 Introduction and Classification
02 Raw Materials
03 Batch Calculation
04 Plaster of Paris
05 Glazes
06 Manufacturing Process

CONTENTS:

TOPIC: 01 – INTRODUCTION AND CLASSIFICATIONS:
Division and brief history, scope and division of: Pottery, Terra Cotta, Earthenware, Stoneware and Porcelainware.

TOPIC: 02 – RAW MATERIALS:
Geological Formation, occurrence and properties of raw materials such as Clays, Quartz, Felspar, Whitings, Talc, Pyrophyllite, Nepheline, Syenite, Bone Ash, Kyanite and Sillimanite.

TOPIC: 03 – BATCH CALCULATION:
Batch calculation, batching.

TOPIC: 04 – PLASTER OF PARIS:
Use of Plaster of Paris in Pottery Industries, Manufacture of Plaster of Paris and Properties.

TOPIC: 05 – GLAZES:
General idea of glazes, role of glaze on pottery body. Colouring ingredient, application of glaze, firing and defects of glazes.

TOPIC: 06 – MANUFACTURING PROCESS:
Body preparation such as clay preparation, blunging, ball milling, screening, dewatering of clay slip, casting slip, plastic forming, dry pressing, slip casting, mould making, drying, firing, inspection, packing and despatch.

Books Recommended:
1. Elements of Ceramics - F.H. Norton
2. Ceramic Fabrication Process - W.D. Kingrey

SCHEME OF EXAMINATION FOR FINAL EXAMINATION
F.M. : 80
REFRACTORY TECHNOLOGY - I

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<tr>
<td>02</td>
<td>Raw Materials</td>
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<tr>
<td>03</td>
<td>Machinery and Equipments used for manufacturing of refractories</td>
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<tr>
<td>04</td>
<td>Kilns and Kilns Furniture</td>
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<td>05</td>
<td>Dryer</td>
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<td>06</td>
<td>Manufacturing Processes</td>
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<tr>
<td>07</td>
<td>Manufacture</td>
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<tr>
<td>08</td>
<td>Concept of Quality Control</td>
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</table>

CONTENTS:

TOPIC: 01 – INTRODUCTION AND CLASSIFICATIONS:
Introduction of refractories, classification of refractories such as acid, basic, neutral and special refractories.

TOPIC: 02 – RAW MATERIALS:
Refractories raw material such as Fire Clay, Sillimanite, Kyanite, Andalusite, Bauxite, Quartzite, Magnesite, Chronite, Dolomite, Forsterite, Zircon – their properties, uses and occurrences.

TOPIC: 03 – MACHINERIES AND EQUIPMENTS USED FOR MANUFACTURING OF REFRACTORIES:

TOPIC: 04 – KILNS AND KILNS FURNITURE:
Various types of kilns used in Refractory Industries such as Down-draft kiln, Tunnel kiln, Rotary kiln, Shaft kiln.

TOPIC: 05 – DRYER:
Tunnel Dryer.

TOPIC: 06 – MANUFACTURING PROCESS:
Raw material treatment, moulding, drying, firing.

TOPIC: 07 – MANUFACTURE:
Crucible, Glass Pots, Saggars, Furnace blocks, Muffles, Saggar cones.

TOPIC: 08 – CONCEPT OF QUALITY CONTROL:
Concept of Quality Control, Introduction of I.S. Codes.

Books Recommended:
1. Refractories and Their Manufacture, Properties and Uses - M.L. Mishra
2. Handbook on Refractories - D.N. Nandi
3. Refractories - F.H. Nortan
4. Technology of Ceramic and Refractories - P.P. Budnikov

SCHEME OF EXAMINATION FOR FINAL EXAMINATION
F.M. : 80
GLASS TECHNOLOGY - I

Subject Code
03208

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S.No. | Topics                      | Periods
--- | --------------------------- | -------
01   | Introduction and Classification |                     
02   | Raw Materials               |                     
03   | Colourants of Glass         |                     
04   | Principles of Glass Making  |                     
05   | Glass Furnaces              |                     

CONTENTS:

**TOPIC: 01 – INTRODUCTION AND CLASSIFICATIONS:**
Introduction of glass classification of glass such as Soda lime glass, Potash lime glass, Potash lead glass, Borosilicate glass, Phosphate Silicate glass, white and coloured glass, safety glass, compound glass, sandwich glass, Triplex or threeply glass, strained glass.

**TOPIC: 02 – RAW MATERIALS:**
Raw material such as Silica, Boric Oxide, Phosphoric Oxide, Sodium Oxide, Potassium Oxide, Lithium Oxide, Calcium Oxide, Barium Oxide, Lead Oxide, Aluminium Oxide, Titanium Oxide, Zinc Oxide, Magnesium Oxide – their properties and origin.

**TOPIC: 03 – COLOURANTS OF GLASS:**
Chromium, Vanadium, Nickel, Cobalt, Copper, Magnese, Iron, Sulphur, Carbon, Silver, Gold, Selenium, Decolourisation of glass.

**TOPIC: 04 – PRINCIPLES OF GLASS MAKING:**
Storage and mixing of raw materials, batch calculation with different type of problem solution, cullet, fluxes, oxidising and reducing agents, fining and annealing of glass.

**TOPIC: 05 – GLASS FURNACES:**
Study of common types of furnace used in glass-melting. Glass Tank furnace, Pot furnace, Annealing Lehrs.

Books Recommended:
1. Hand Book of Glass Technology - Dr. R. Charan
2. Modern Glass Practice - S.R. Scholes
4. Glass Melting Tank Furnace - R. Gunther
5. Coloured Glasses - W.A. Weyl

SCHEME OF EXAMINATION FOR FINAL EXAMINATION
F.M : 80
GEOLOGY FOR CERAMICS ENGINEERING

<table>
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S.No. Topics
01 Introduction
02 General Idea of Rocks and Minerals
03 Physical Properties
04 Economic Geology with reference to Ceramic
05 Optical Mineralogy

CONTENTS:

TOPIC: 01 – INTRODUCTION:
Introduction of Geology, Utility of geology in Ceramic Industries, Branches of Geology, Brief knowledge of origin and age of earth.

TOPIC: 02 – GENERAL IDEA OF ROCKS AND MATERIALS:
Rocks - Definition, Classification of rocks, Characteristics of rocks.
Minerals – Definition, Classification of Minerals, Crystal systems.

TOPIC: 03 – PHYSICAL PROPERTIES:
Physical properties of minerals used in ceramic industries such as Kaolin, Fireclay, Ball clay, Felspar, Tale, Sillimanite, Kyanite, Andalusite, Bauxite, Topaz, Garnet, Calcium Carbonate, Magnesite, Dolomite, Olivine, Zircon, Mica, Silica, Steatite.

TOPIC: 04 – ECONOMIC GEOLOGY WITH REFERENCE TO CERAMIC:
Economic use of ceramic raw materials such as Clay, Silica, Felspar, Tale, Limestone, Dolomite, Gypsum, Magnesite, Chromite, Bauxite, Sillimanite, Kyanite and Andalusite, Zircon, Mica, Calcite, Pyrophilite.

TOPIC: 05 – OPTICAL MINERALOGY:
Introduction, Petrological Microscope, Properties of Light, Refraction, Double Refraction, Polarised light, Observation of minerals, Procedure for the identification of minerals in section.

Books Recommended:

4. Optical Mineralogy - A.F. Rogers and P.F. Kerr

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
ENAMEL TECHNOLOGY - I

Subject Code 03210

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CONTENTS:

**TOPIC: 01**
Introduction

**TOPIC: 02**

**TOPIC: 03**
Preparation – Frit Making, Milling and mill additions, electrolytes

**TOPIC: 04**
Preparation and control of slip

**TOPIC: 05**
Preparation of metal surface for enamelling – steel, cast iron.

**TOPIC: 06**
Composition of enamel

**TOPIC: 07**
Application of slip

**TOPIC: 08**
Enamelling Furnaces

**TOPIC: 09**
Firing

**TOPIC: 10**
Common defect, their causes and remedies – pinhole, peeling, cracks, chipping, fish scaling, blistering, hair lining, jumping-off, reboiling, rusting, speckling, tearing, warping.

Books Recommended:

1. Porcelain Enamels - A.I. Andrew
2. Technology of Enamel - V.V. Vargin

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

| F.M. : 80 |
Rationale & Objectives:
The Engineering Mechanics Laboratory is a subject which will help technicians to understand the application of theory that he has studied in practice by performing experiments and verifying results.

Besides the above the objective of the curriculum with effective skill will be developed in them to observe experimental data, and to analyses the results.

These topics of this curriculum will certainly build their confidence in performing the utilization of principle of mechanics in Civil Engineering works.

CONTENTS:
Eight experiments to be performed in the laboratory:

1. Determination of elongation of wire under external load.
2. Tensile Test on mild steel specimen.
3. Tensile Test on high tensile specimen.
4. Compression Test on metal.
5. Compression Test on bricks.
7. Determination of reaction at the support of beam.
8. Determination of bending moment of a simply supported beam.
9. Determination of reaction at the support of roof truss.
10. Determination of deflection of beams.
12. Determination of bending moment of a over hanging beam.
13. Verification of Polygon Law of forces.
14. Verification of Triangle Law of forces.
15. To find moment of inertia of fly wheel.
16. Compression Test on metal.
17. Tensile Test on M.S.specimen.
18. Determination of co-efficient of friction on inclined plane.

Books Recommended:

Text Books

5. *Stronger of Materials* - Bininder Singh

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 40
CONTENTS:

List of Practicals:
1. Programming exercise on executing a C program.
2. Programming exercise on editing C program.
3. Programming exercise on defining variables and assigning values to variable.
4. Programming exercise on arithmetic and relational operations.
5. Programming exercise on arithmetic expressions and their evaluation
6. Programming on infix, postfix, transformation using stack.
7. Programs on insertion, deletion on link list.

Books Recommended:

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 40
WORKSHOP PRACTICE

Subject Code
03213

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Rationale & Objective:
A Diploma holder technician should get more opportunity to know about machines, equipments & its operations which will help to be more confident & practical.

S. No. | Topics | Periods
---|---|---
A | Machine Shop |  
B | Welding Shop |  
C | Foundry Shop |  
D | Fitting Shop |  

CONTENTS:

**TOPIC:A – MACHINE SHOP:**
A.01 Safety precautions, Machine cleaning, checking, making ready for operation. Selection of tools, preparing it in ready condition (tool sharpening)
A.02 Lathe:
Setting of job on three jaw, four jaw check, centering, tool/tools fitting, adjustment of tail stocks (if required).
Practice of operations: Turning, facing, taper turning on sample jobs. Job configuration checking.
Preparing a job by above processes (Sessional Preparation)
A.03 Shaper:
Study of quick return mechanism.
Repair of faults (minor) in machines.
Tool setting on Ram.
Practice of feed depth of cut, no. of pass on sample job.
Preparation of V block on a sample job.
A.04 Drilling:
Checking of drill bit.
Making of sample blind hole.
Making hole in a tapered job/V block.

**TOPIC:B – WELDING SHOP:**
B.01 Safety precautions, handling of tools & equipment.
B.02 Gas welding: Flame adjustment, practical on welding, soldering & brazing on two parts (sample job).
B.03 Electric welding:
(i) Flame adjustment, use of electrodes on jobs (T-shape, L-shape), Course & fire welding.
(ii) Preparation of chair & grill.

**TOPIC:C – FOUNDRY SHOP:**
(Pattern, Moulding & Cutting)
C.01 Tools, cope, drag. Different types of pattern – introduction & use.
C.02 Preparation of foundry sand.
C.03 Demonstration & handling of mould (A sample mould should be prepared by teacher/Institute)
C.04 Preparation of different types of moulds using single piece, spit or any available pattern – at least 3 moulds should be prepared by each student.
C.05 Taking photographs of different moulds prepared by students.
C.06 Non-Fe Casting of one of the above.

**TOPIC:D – FITTING SHOP:**
D.01 Tools – Introduction & its use.
D.02 Different processes (Sawing, filing, drilling, tapping, dieing, scraping, reaming etc.)
D.03 Different types of fitting – Round fitting, Square fitting, Triangular fitting etc.
D.04 Use of above D. 02 & D.03 on sample jobs, L-shape, T-shape etc.
D.05 Practical Use of fitting.
D.06 Preparation of threads in pipes using tap & die – sessional preparation.

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

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15
WORKSHOP PRACTICE – 1 (GLASS AND ENAMEL)

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CONTENTS:

GLASS

TOPIC: 01
Preparation of raw material

TOPIC: 02
Batch formation

TOPIC: 03
Mixing of the batch ingredients.

TOPIC: 04
Melting of simple glass

TOPIC: 05
- Blowing of glass shapes:
  - Glowing
  - Pressing

TOPIC: 06
Decoration of Glass

ENAMEL

TOPIC: 01
- Metal surface preparation:
  - Cleaning
  - Pickling
  - Nickel Dip
  - Neutralisation

TOPIC: 02
Formation of frits

TOPIC: 03
Melting of frits

TOPIC: 04
Compounding of receipt of enamel slip with frit

TOPIC: 05
- Application of enamel:
  - Dipping
  - Spraying
  - Stencil Making
  - Screen-Printing
  - Hand Printing

TOPIC: 06
Firing of Enamel Wares

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 40
WORKSHOP PRACTICE – II (POTTERY AND REFRACTORY)

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CONTENTS:

POTTERY

TOPIC: 01
Raw materials preparation

TOPIC: 02
Making of slip

TOPIC: 03
Making of Plaster of Paris

TOPIC: 04
Making of mould

TOPIC: 05
- Shaping of Articles:
  - Hand Moulding
  - Slip Casting

TOPIC: 06
Preparation of Frit and Glaze

REFRACTORY

TOPIC: 01
Processing of Refractory Raw materials

TOPIC: 02
- Shaping of Refractory bricks:
  - Hand moulding
  - Slip casting
  - Pressing

TOPIC: 03
Making of saggars by hand moulding

TOPIC: 04
Making of muffles by hand moulding

TOPIC: 05
Drying of Refractory Wares

TOPIC: 06
Firing of Refractory wares

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 40
# CERAMIC ENGINEERING LAB. - I

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## CONTENTS:

1. To study the physical properties of clay  
2. Determination of water content in clay  
3. Determination of shrinkage of clay  
4. Determination of Plasticity of clay  
5. Determination of Bulk density of Refractory brick  
6. Determination of True Specific Gravity of Refractory brick  
7. Determination of Apparent Porosity of Refractory brick  
8. Sieve Analysis of Glass sand  
9. Determination of Density of glass by Float and Sink method  
10. Determination of thermal Endurance of glass

## SCHEME OF EXAMINATION FOR FINAL EXAMINATION

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CONTENTS:
1. Identification of hand specimens such as graphite, Basalt, Sand Stone, Kaoline, Quartz, Felsapar, Calcite, Beryl, Bauxite, Lime Stone, Hematite & Magnesite.
2. Determination of specific gravity of mineral by Steel yard balance of Feldspar, Calcite, Bauxite, Quartz, Lime Stone, Magnesite, Hematite.
3. Study of the Petrological Microscope with respect to:
   - Parts component & their function,
   - Working Principle
4. Blow pipe analysis of common minerals such as :- Hematite, Magnesite, Gypsum, Calcite, Beryl etc.

Books Recommended:
- Introduction of Physical Geology - A. K. Datta
- Optical Mineralogy - A. F. Rogers & P. F. Kerr

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

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## WORKSHOP PRACTICE – 1 (GLASS AND ENAMEL)

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