

CURRICULUM FOR THREE YEAR  
(SIX SEMESTER)  
DIPLOMA COURSE IN

=====  
: GLASS AND CERAMIC ENGINEERING :  
: Effective from Session :  
=====

=====  
UNDER DEVELOPMENT  
=====

=====  
:Semester System :  
=====

Prepared By

=====  
: Curriculum Development Cell :  
=====

INSTITUTE OF RESEARCH DEVELOPMENT  
& TRAINING, U.P., KANPUR

APPROVED BY

=====  
: BOARD OF TECHNICAL EDUCATION :  
: U.P. LUCKNOW, :  
:CORRECTED AS SYLLABUS COMMITTEE OF:  
: B.T.E. MEETING HELD ON 19.04.2017:  
=====

Corrected and Approved By B.T.E. on dated 19.04.2017

STUDY AND EVALUATION SCHEME FOR  
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN GLASS & CERAMIC ENGINEERING.  
(Effective From Session )

I SEMESTER

Curriculum						Scheme of Examination											
Periods Per Week						S U B J E C T					Theory			Practical			Gr
Le	Tut	Dr	Lab	Work	Tot	S U B J E C T	Examination	Sess.	Total	Examination	Sess.	Total	Gr	nd			
c.	ori	aw	Shop	al	Dur.										Marks	Marks	Dur.
4	-	-	-	-	4	1.1 Foundational Communicaton	2.5	50	20	70	-	--	--	--	70		
3	1	-	-	-	4	1.2 Applied Mathematics-I(A)	2.5	50	20	70	-	-	-	-	70		
3	1	-	-	-	4	1.3 Applied Physics-I	2.5	50	20	70	-	--	--	--	70		
8	2	-	-	-	10	1.4 Introducation To Glass & Ceramic Engineering	2.5	50	20	70	-	-	-	-	70		
2	-	-	5	-	7	1.5 Introduction To Computer	--	--	--	--	3	60	30	90	90		
-	-	14	-	-	14	1.6 Engineering Drawing	3.0	50	20	70	-	-	-	-	70		
20	4	14	5	-	43	<-----TOTAL----->	--	250	100	350	--	60	30	90	440		
													Games/NCC/Social and Cultural Activity + Discipline (15 + 10)		25		
													Aggregate		465		

II SEMESTER

3	1	-	-	-	4	2.1 Applied Mathematics-I(B)	2.5	50	20	70	-	-	-	-	70
3	1	-	4	-	8	2.2 Applied Physics-II	2.5	50	20	70	3	40	20	60	130
5	1	-	2	-	8	2.3 Applied Mechanics	2.5	50	20	70	3	40	20	60	130
6	-	-	4	-	10	2.4 Applied Chemistry	2.5	50	20	70	3	40	20	60	130
-	-	-	-	14	14	2.5 Workshop Practice	--	--	--	--	4	60	30	90	90
-	-	-	-	-	-	2.6 Field Exposure-I (2 Weeks)	--	--	--	--	-	20	10	30	30
17	3	-	10	14	44	<-----TOTAL----->	--	200	80	280	--	200	100	300	580
													Games/NCC/Social and Cultural Activity + Discipline (15 + 10)		25
													Aggregate		605

- NOTE:-
- (1) Each period will be 50 minutes duration.
  - (2) Each session will be of 16 weeks.
  - (3) Effective teaching will be atleast 14 weeks.
  - (4) Remaining periods will be utilised for revision etc.
  - (5) 2 Weeks structured & Supervised branch specific task oriented industrial/field exposure to be organised during Semester break. The students will submit a report. This will be evaluated at institution level for 30 marks - 20 for Viva and 10 for report presented. See Anexure - I & III.
  - (6) For Community Development work see Annexure - IV .

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THREE YEARS(SIX SEMESTER) DIPLOMA COURSE IN GLASS & CERAMIC ENGINEERING.  
(Effective From Session )

III SEMESTER

Curriculum						Scheme of Examination										
Periods Per Week						T H E O R Y					P R A C T I C A L					G R A D E
Le	Tut	Dr	Lab	Work	Tot	Examination	Sess.	Total	Examination	Sess.	Total	Examination	Sess.	Total	Tot	
c.	ori	aw	Shop	al		Dur.	Marks	Marks	Dur.	Marks	Marks	Dur.	Marks	Marks	al	
al																
4	-	-	-	-	4	3.1 Applied Chemistry-II	2.5	50	20	70	-	-	-	-	70	
4	-	-	4	-	8	3.2 Elementary Electrical, Mech. & Civil Engineering	2.5	50	20	70	3	40	20	60	130	
4	-	-	-	-	4	3.3 Industrial Operations	2.5	50	20	70	-	-	-	-	70	
6	-	-	16	-	19	3.4 Pottery & Refractory	2.5	50	20	70	6	60	30	90	160	
-	-	-	10	-	10	3.5 Modelling & Mould Lab	-	-	-	-	3	40	20	60	60	
18	-	-	30	-	48	<-----TOTAL----->	-	200	80	280	-	140	70	210	490	
														Games/NCC/Social and Cultural Activity + Discipline (15 + 10)	25	
														Aggregate	515	

IV SEMESTER

4	-	-	-	-	4	4.1 Functional Communicaton	2.5	50	20	70	-	-	-	-	70
3	2	-	6	-	11	4.2 Glass & Enamel	2.5	50	20	70	6	60	30	90	160
-	-	10	-	-	10	4.3 Glass & Ceramic Engg. Draw-I	3.0	50	20	70	-	-	-	-	70
6	-	-	-	-	6	4.4 Industrial Calculation & Environmental Pollution	2.5	50	20	70	-	-	-	-	70
6	-	-	-	-	6	4.5 Fuels, Furnaces & Pyrometry	2.5	50	20	70	-	-	-	-	70
3	1	-	2	-	6	4.6 Element of Geology	2.5	50	20	70	3	40	20	60	130
-	-	-	-	-	-	4.7 Industrial Tour (2 Weeks)	-	-	-	-	4	40	20	60	60
3	-	-	2	-	5	4.8 Energy Conservation	2.5	50	20	70	3	20	10	30	100
25	3	10	10	-	48	<-----TOTAL----->	-	350	140	490	-	160	80	240	730
														Games/NCC/Social and Cultural Activity + Discipline (15 + 10)	25
														Aggregate	755

NOTE:-

- (1) Each period will be 50 minutes duration.
- (2) Each session will be of 16 weeks.
- (3) Effective teaching will be at least 14 weeks.
- (4) Remaining periods will be utilised for revision etc.
- (5) Visit to ceramic industries and related mines and mineral deposits
- (6) For Community Development work see Annexure - IV .
- (7) 2 Weeks structured & Supervised branch specific task oriented industrial/field exposure to be organised during summer vacation. See Anexure - I & III.

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STUDY AND EVALUATION SCHEME FOR  
THREE YEARS(SIX SEMESTER) DIPLOMA COURSE IN GLASS & CERAMIC ENGINEERING.  
(Effective From Session )

V SEMESTER

Curriculum						Scheme of Examination									
Periods Per Week						Theory					Practical			Gr-nd	
Le c.	Tut ori al	Dr aw al	Lab Shop	Work al	Tot al	Examination Dur.	Sess. Marks	Total Marks	Examination Dur.	Sess. Marks	Total Marks	Total Marks	Tot al		
-	-	-	4	-	4	5.1 Integrative Communicaton	--	--	--	--	3	40	20	60	60
6	2	-	-	-	8	5.2 Industrial Management and Enterprenurship Development	2.5	50	20	70	--	--	--	--	70
5	-	-	-	-	5	5.3 Pottery & Porcelain-I	2.5	50	20	70	-	-	-	-	70
5	-	-	-	-	5	5.4 Refractory Technology	2.5	50	20	70	-	-	-	-	70
5	-	-	-	-	5	5.5 Glass Technology-I	2.5	50	20	70	-	-	-	-	70
6	-	-	-	-	6	5.6 Modern Ceramics & Its Application	2.5	50	20	70	-	-	-	-	70
-	-	-	8	-	8	5.7 Pottery & Refractory Lab	-	-	-	-	6	60	30	90	90
-	-	-	7	-	7	5.8 Glass & Ceramic Workshop Practice (Glass, Enamel & Cement)	-	-	-	-	6	60	30	90	90
-	-	-	-	-	-	5.9 Industrial Training (4 Weeks)	--	--	--	--	Viva	30	10	40	40
27	2	-	19	-	48	<-----TOTAL----->	--	250	100	350	--	190	90	280	630
													Games/NCC/Social and Cultural Activity + Discipline ( 15 + 10)	25	
													Aggregate	655	

VI SEMESTER

4	-	-	-	-	4	6.1 Environmental Education * & Disaster management	2.5	50	--	--	-	--	--	--	--
6	-	-	-	-	6	6.2 Cement And Lime	2.5	50	20	70	-	-	-	-	70
6	-	-	-	-	6	6.3 Ceramic Machinery & furnace Design	2.5	50	20	70	-	-	-	-	70
-	-	8	-	-	8	6.4 Glass & Ceramic Engineering Drawing-II	2.5	50	20	70	-	-	-	-	70
6	-	-	-	-	6	6.5 Elective (Any One)	2.5	50	20	70	-	-	-	-	70
-	-	-	-	-	-	I. Glass Technology-II	-	-	-	-	-	-	-	-	--
-	-	-	-	-	-	II. Pottery & Porcelain-II	-	-	-	-	-	-	-	-	--
-	-	8	-	-	8	6.6 Silicate Analysis Lab	-	-	-	-	3	40	20	60	60
-	-	8	-	-	8	6.7 Physical Testing Lab	-	-	-	-	3	60	30	90	90
-	-	2	-	-	2	6.8 Project	-	-	-	-	Viva	80	40	120	120
-	-	-	-	-	-	6.9 Industrial Tour	--	--	--	--	--	-	30	30	30
22	-	8	18	-	48	<-----TOTAL----->	--	200	80	280	--	180	120	300	580
													Games/NCC/Social and Cultural Activity + Discipline ( 15 + 10)	25	
													Aggregate	605	

NOTE:-

(1) Each period will be 50 minutes duration.	30% of I & II Semester	330
(2) Each session will be of 16 weeks.	70% of III & IV Semester	889
(3) Effective teaching will be at least 14 weeks.	100% of V & VI Semester	1260
(4) Remaining periods will be utilised for revision etc.	Grand Total	2479

(5) 4 weeks structured & supervised branch specific task oriented industrial training to be organised during after exam of IV semester  
Students will submit a report. This will be evaluated for 30 marks by external examiner and 10 marks at institute level. (See Annexure II & III)

(6) For Community Development work see Annexure - IV .

(7) Industrial Tour : Students will go on industrial tour (various industries related to ceramics). Student will submit a report this will be evaluated at institute level for 30 marks.

(8) (\*) It is compulsory to appear & to pass in examination, But marks will not be included for division and percentage of obtained marks.

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MAIN FEATURES OF THE CURRICULUM

Title of the course	:	Diploma in Glass & Ceramic Engineering
Duration of the course	:	Three Years (Six Semester)
Pattern of the course	:	Semester System
Intake of the course	:	60
Type of the course	:	Full time Institutional
Entry qualification	:	Passed High School With 35% Marks
Mode of admission	:	Through Joint Entrance Examination

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## PROLOGUE TO REVISION

In the ever expanding universe of knowledge, the need for revision of a curriculum in any system of education, always exists. A revision is vital to accommodate new ideas, to systematise them and to make them suitable to need of the time. Material is the sole basis of present day science and technology, and its consumption is spiralling to the extent that there is a crisis for many materials in the present age. Besides this, with the advance of science and technology, new uses of the materials are also identified every day. For example ceramic materials about 30 years before, there have been a very limited use but now it is vast field where they find their new uses and ceramic itself is now a separate discipline of knowledge for scholars to study and research. Science and technology has gone to the extent where it is possible to develop the materials of our choice for intended use and this have happened in the field of ceramics too. A new group of materials known as composite material has come up. Ceramics has contributed too much to it and to its uses in the field of advance technological designs of three year diploma curriculum in ceramic Engg. has been felt imperative .

The aims and objects of the curriculum keeping the same as before, the changes required in the present curriculum, to make it suitable to present needs, has been carefully made. Care has been taken in choosing the topics for development of knowledge and skill wanted for jobs available to diploma holders. The continuity and consistency in the development of subject matter spreading over the period of three year span has been carefully assured.

Besides this, issues of present day obsessions of the society such as environment pollution, ecological imbalance and need of development of enterprenurship in the youth due to growing unemployment too has been duly introduced for the awareness of the students.

The present curriculum is the out come of up-shorts of the experts in the work shop organised for the purpose and thoughts obtained by personal contacts. A list of their names appears on the following page sufficient provision for practical experience has been made in the curriculum by providing a good number of labs/shops exposure to industry twice during the period of the course, first after first year exam for 2 weeks and second after second year exam for 4 weeks, will certainly give a extra impetus to sharpening of the students talent.

In addition to this all , the following changes can not remain concealed to any reviewer of the text. They are as envisaged below.

1. For the first time a provision for project work has been made in the final year of the course. It is just to give the students an opportunity to deal a practical problem in the light of the knowledge and skill they attained during the course of their studies. This will also help developing an enterprenurship attitude in them.
2. There is prolific growth of machanisation in every field of work from large industrial to cottage industry. With this

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view in mind, a concept of machanisation has been introduced for small unit works.

3. A product should have an aesthetic appeal in addition to its functional utility, with this view some concepts regarding aesthetic sense too has been given a due space. A new class of materials called ceramic composites has been given a due place and weightage in the course.
4. In Glass Technology-II paper ornamental glass introduced in place of Sealent Glass.
5. Preperation of Jigger & Profile has been deleted in the Final year.

During revision the subject matter has been carefully arranged according to developmental continuity to help teaching and comrehensiveness. The new ideas where-ever felt necessary have been added to enrich the course study. It is hoped now that the new form of the curriculum will certainly proove conducive to students employment in present enviorance of the industry.



#### NEED ANALYSIS

The utility of glass and ceramics is wellknown in the present civilisation. It has wide application in domestic, industrial and decorative utility articles. By now the personnel involved in these industries were using conventional methods for manufacture of glass and ceramics. Due to technological upgradation, new machines have been introduced in these industries. The operation and maintenance of these machines requires trained personnel in the respective fields. A diploma holder in ceramic and glass engineering is supposed to possess the adequate knowledge of raw material, manufacturing process, use of decorative designs and colour along with operation and maintenance of machines and tools used in these industries.

There is present and projected job potential in the field of glass and ceramics. The industry can no doubt flourish if diploma holders in glass and ceramic engineering are put to jobs in place of conventional untrained personnel engaged in the industries of this field.

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#### PROFILE DEVELOPMENT

The following procedure has been adopted in the revision of curriculum for diploma course in ceramic and glass engineering.

1. Personal contacts have been made with the industry people to assess job potential job activities and man power required in these industries.
  2. Activities have been analysed in the workshop by mutual interaction between experts from higher institutions, industry people and teachers of the polytechnic.
  3. Course objectives have been decided by activity analysis.
  4. Subjects of study and skill to be developed has been derived from course objectives.
  5. Horizontal and vertical organisation of subjects was carried out.
  6. Study and evaluation scheme was prepared.
  7. Detailed course contents were finalised in a workshop by mutual interaction among experts of the related field.
  8. List of equipments, space and staff required for implementing the curriculum was finalised by experts.
- It is hoped that this curriculum will be implemented in the right spirit for training competent diploma holders in ceramic and glass engineering.

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1. JOB OPPORTUNITIES
  - 1.1 Production Supervisor/Foreman in Glass and Ceramic Industry.
  - 1.2 Ceramic Engineer/Ceramic/Glass Technologist in small and medium industries.
  - 1.3 Quality Control and Inspection Supervisors.
  - 1.4 Inplant Laboratory Supervisor/R & D Supervisor.
  - 1.5 Stores Officer.
  - 1.6 Purchase Officer.
  - 1.7 Sales or Marketing Officer.
  - 1.8 Self employment.

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- 2. JOB ACTIVITIES
  - 2.A Production and Related Activities.
    - 2.1 Conducts tests on raw materials and ascertain their suitability.
    - 2.2 Supervises processing of raw materials.
    - 2.3 Supervises milling operations, glaze preparation, body preparation, shaping, drying and firing of ceramic goods.
    - 2.4 Selects appropriate processes and machines for manufacture of ceramic goods and glassware.
    - 2.5 Makes batch calculations.
    - 2.6 Plans men, materials and machines for achieving target production.
    - 2.7 Conducts quality control tests from raw materials and finished products.
    - 2.8 Detects common faults in processes, equipment and furnaces and suggests remedial measures.
    - 2.9 Organises labour, handles grievances and ensures safety.
    - 2.10 Make cost calculations of ceramic goods.
    - 2.11 Keep record of production.
    - 2.12 Manages stores.
    - 2.13 Conducts market survey and promotes sales.
  - 2.B Developmental Activities.
    - 2.14 Assist in testing laboratories.
    - 2.15 Assist in R & D laboratories.

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3. ACTIVITY ANALYSIS

Sl.No.	Activity	Knowledge	Skill
1	2	3	4
3.1	Conduct tests on raw materials and ascertain their suitability.	Raw materials, their properties, uses, testing and evaluation.	Laboratory and inplant training.
3.2	Makes batch calculations	Raw materials, their properties, uses, testing. chemical calculations.	
3.3	Supervises processing of raw materials	Raw materials, their properties and uses, testing and methods of processing.	Inplant training and practical lab. training in various unit operations.
3.4	Supervises milling operations, glaze preparation, body preparation, shaping, drying and firing of ceramic goods and malting of glass.	Raw materials, machine for crushing grinding/ milling; Machines for body preparation and shaping; Theory and Practice of Drying and Dryers; Theory and Practice of fuel combustion, Burners control & Kilns/ furnaces.	Operational experience of milling machine body preparation and shaping machine Dies. Burning of fuels and kiln/furnace operation.
3.5	Selects appropriate machines and process for manufacturing of ceramic goods and glassware.	Same as in 3.1 to 3.4 Plant Layout, different ceramic processes, properties and value of the finished product.	Same as above from 3.1 to 3.4 operational experience in different ceramic/glass making processes.
3.6	Plans men, materials and machines for achieving target production.	Same as in 3.1 to 3.5 AND Time work study, production, planning & control, Productivity of men, machine. industrial relations, human relations & principles of management.	Same as in 3.1 to 3.5

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1	2	3	4
3.7	Conducts quality control tests on raw materials and finished goods.	3.1 and methods testing of raw materials and finished goods, ISI & other International Specifications, Elementary statistics and quality control charts. common faults in finished goods, reasons and remedies.	Operational experience in testing and quality control of raw material and finished goods.
3.8	Detects common faults in processes, equipment and furnaces and suggests remedial measures.	Same as in 3.1 to 3.5	Same as in 3.1 to 3.5.
3.9	Makes cost calculations of ceramic and glass products.	Costing of various inputs, methods of costing and cost reduction.	--
3.10	Organises labour, handles grievances and ensures safety of men and machines.	Elementary idea of labour laws, communication, Human relations, Factory safety rules, First Aid Fire-fighting.	First Aid, Fire-fighting.
3.11	Keeps record of production	Bar charts histogram etc. Book-keeping.	--
3.12	Conduct market survey and promotes sales	Sales promotion and marketing management.	--
3.13	Manages Stores	Same as in 3.1 to 3.11 and Inventory control methods.	--
3.14	Assists in developmental activities.	Same as in 3.1 to 3.5.	Same as in 3.1 to 3.5.

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4. COURSE OBJECTIVES
1. Read and interpret mechanical engineering drawing.
  2. Plan, schedule, organise direct, control and coordinate men, materials and machines for the production of ceramic/glass products.
  3. Knowledge of physical, chemical and thermal properties of raw materials, additives and finished product.
  4. Select appropriate raw materials, processes, machines and make cost calculations for production of ceramic/glass products.
  5. Knowledge of work measurement and materials handling techniques.
  6. Detect faults in equipments/processes/product and suggest remedial measures.
  7. Undertake quality control tests on raw materials, materials in the process and finished products.
  8. Assist in developmental activities.
  9. Knowledge of marketing and sales promotion of ceramic/glass products.
  10. Ability to manage stores.
  11. Knowledge of labour laws, factory safety rules, and handling of labour problems.
  12. Establish and run a small enterprise.

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5. DERIVING CURRICULUM AREAS FROM COURSE OBJECTIVES

Course Objectives	Curriculum Areas			
	Engg. Specialities	Engg. Sciences	Basic Skills	Humanities & basic sciences
1. Read & Interpret mechanical Engg. Drawing.			Engg. Drawing	
2. Plan, schedule, organise, direct, control and coordinate men, material and machine for production of ceramic/glass products.	Production technology for Pottery, Refractories glass, enamels.	Production/Industrial management.		App. Physics App. Chemistry App. Maths
3. Knowledge of physical, chemical and thermal properties of raw materials, additives and finished products.	Raw materials for glass, ceramics/refractory	Chemistry of materials Elements of Geology Applied Mechanics & Strength of materials.		Physics Chemistry
4. Select appropriate raw materials, processes machines and make cost calculations for production of Ceramic/glass products	Production Technology, Machines and furnaces	Elements of Civil, Elect., & Mech. Engg. Pyrometry, Fuel, furnace, Business & control.		-do-
5. Know work measurement & material handling techniques.	Material handling equipment		Basic work-shop Practice Engg. Maths	-do-
6. Detect fault in equipment, processes, product and suggest remedial measures.	-do-	-do-	--	-do-
7. Undertake quality control test on raw materials, materials in process and finished goods.	Quality control specially for testing and inspection & assessment. Analytical testing techniques.	Instrumental analysis		Mathematics (S.Q.C.) Physics Chemistry
8. Assists in developmental activities.	All the above areas S.No. 1 to 5			
9. Knowledge of marketing & sales promotion of ceramic/glass products.	Marketing & Sales management.	--	--	--
10. Knowledge of labour laws, factory safety rules & handling of labour problems.	Production management	Labour laws	--	Human Psychology Communication Technique
11. Ability to manage stores.	Stores management			
12. Establish and run a small enterprise	Entrepreneurship Project work			

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**1.1 FOUNDATIONAL COMMUNICATION  
SECTION "A" (ENGLISH)**

L    T    P  
4   -   -

**TOPIC WISE DISTRIBUTION OF PERIODS**

Sl.No.	Units	Coverage Time		
		L	T	P
<b>Section A English</b>				
1.	PARTS OF SPEECH	12	-	-
2.	VOCABULARY BUILDING	05	-	-
3.	Grammar	15	-	-
4.	DEVELOPMENT OF EXPRESSION (Composition)	12	-	-
<b>Section B Hindi</b>				
5.	Topic 5	2	-	-
6.	Topic 6	5	-	-
7.	Topic 7	5	-	-
		56	-	-

**DETAILED CONTENTS**

1. **PARTS OF SPEECH** :
  - a. Noun
  - b. The pronoun : Kinds and Usage
  - c. The adjective : Kinds and Degree
  - d. Determiner : Articles
  - e. The verb : Kinds
  - f. The Adverb : Kinds, Degree and Usage
  - g. Prepositions
  - h. Conjunctions
  - i. The Interjections
  - j. Subject: Verb Agreement (Concord)
  
2. **VOCABULARY BUILDING** :
  - a. Antonyms and Synonyms
  - b. Homophones
  - c. One word substitutions
  - d. Idioms and Phrases
  - e. Abbreviations
  
3. **Grammar**
  - a. Sentence & its types
  - a. Tenses
  - b. Punctuations
  - c. Active and Passive voice
  - d. Transformation of Sentences

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- e. Synthesis of Sentences
- f. Direct and Indirect Narrations

4. **DEVELOPMENT OF EXPRESSION (Composition) :**

- a. Paragraph Writing
- b. Essay Writing
- c. Proposal Writing
- d. Letter Writing (Formal, Informal, Business, official etc.)
- f. Report Writing
- g. Note Making
- h. News Making
- i. Application Writing
- j. Minute Writing
- k. Invitation Letter Writing

**SECTION "B" (Hindi)**

- 5- संज्ञा, सर्वनाम, विशेषण, क्रिया विशेषण, वर्ण समास, संधि, अलंकार, रस, उपसर्ग प्रत्यय।
- 6- पत्र लेखन, निविदा संविदा, दर आमंत्रण (कोटेशन) अपील, स्वतन्त्र अभिव्यक्ति, प्रतिवेदन लेखन, प्रेस विज्ञप्ति।
- 7- वाक्य/वाक्यांश के लिए शब्द, पर्यायवाची या समानार्थी शब्द, विलोम शब्द, अनेकार्थी शब्द, शब्दयुग्म या समुच्चारित शब्द समूह, वाक्य शुद्धि (शुद्ध अशुद्ध वाक्य), मुहावरे एवं लोकोक्तियाँ।

1.2 APPLIED MATHEMATICS I(A)  
[ Common to All Engineering Courses]

L    T    P  
3   2/2   -

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

S.N.	Units	Coverage Time		
		L	T	P
1.	Algebra- I	8	3	-
2.	Algebra- II	8	3	-
3.	Trigonometry	6	2	-
4.	Differential Calculus-I	10	3	-
5.	Differential Calculus-II	10	3	-
		42	14	-

DETAILED CONTENTS:

1. ALGEBRA-I : (10 Marks)
  - 1.1 Series : AP and GP; Sum, nth term, Mean
  - 1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.
  - 1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Cramer's rule
2. ALGEBRA-II:(10 Marks)
  - 2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.
  - 2.2 Complex number.
 

Complex numbers, Representation, Modulus and amplitud  
Demoivre theorem, its application in solving algebraic  
equations, Mod. function and its properties..
3. TRIGONOMETRY :(8 Marks)
  - 3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relation ship between sides and angle of a triangle.
  - 3.2 Inverse circular functions : Simple case only

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4. DIFFERENTIAL CALCULUS - I : (12 Marks)
  - 4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.
  - 4.2 Methods of finding derivative, - Function of a function, Logarithmic differentiation, Differentiation of implicit functions.
5. DIFFERENTIAL CALCULUS -II :(10 Marks)
  - 5.1 Higher order derivatives, Leibnitz theorem.
  - 5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.
  - 5.3 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

### 1.3 APPLIED PHYSICS-I

[ Common to All Engineering Courses]

L T P  
3 2/2 -

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject, teachers should make maximum use of demonstrations to make the subject interesting to the students.

#### TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Units & Dimensions	3	1	-
2.	Errors in Measurement	3	1	-
3.	Circular Motion	4	1	-
4.	Motion of Planets	4	1	-
5.	Dynamics of rigid body (Rotational Motion)	5	1	-
6.	Fluid Mechanics and Friction	4	1	-
7.	Friction	4	1	-
8.	Harmonic Motion	5	2	-
9.	Heat & Thermodynamics	6	4	-
10.	Acoustics	4	1	-
		42	14	-

#### DETAILED CONTENTS:

##### 1. Units and Dimensions (4 Marks)

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogeneity of dimensions and applications of homogeneity principle to:

- i) Checking the correctness of physical equations,
- ii) Deriving relations among various physical quantities,
- iii) Conversion of numerical values of physical quantities from one system of units into another. Limitations of dimensional analysis.

##### 2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measurements, accuracy and precision, random and systematic errors, estimation of probable errors in the results of measurement (Combination of errors in addition, subtraction, multiplication and powers). Significant figures, and order of accuracy in respect to instruments,

##### 3. Circular Motion (5 Marks)

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Central forces. Uniform Circular motion (Horizontal and Vertical cases), angular velocity, angular acceleration and centripetal acceleration. Relationship between linear and angular velocity and acceleration. Centripetal and centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

4. MOTION OF PLANETS AND SATELLITES : (5 Marks)

Gravitational force, Acceleration due to gravity and its variation w.r. to height and depth from earth, Kepler's Law, Escape and orbital velocity, Time period of satellite, Geostationary, Polar satellites (Concept Only)

5. Dynamics of Rigid Body (Rotational Motion) (6 Marks)

Rigid body, Rotational motion, Moment of inertia, Theorems (Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylindrical), Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane. Concept of Fly wheel.

6. Fluid Mechanics : (5 Marks)

Surface tension, Capillary action and determination of surface tension from capillary rise method, Equation of continuity ( $A_1V_1=A_2V_2$ ), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. Friction : (4 Marks)

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

8. Harmonic Motion (6 Marks)

Periodic Motion, characteristics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system. Simple pendulum. Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. Heat & Thermodynamics: (6 Marks)

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Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

10. Acoustics (5 Marks)  
Definition of pitch, loudness, quality and intensity of sound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Acoustics of building defects and remedy.

1.4 INTRODUCTION TO GLASS & CERAMIC ENGINEERING

L T P  
8 2 -

Rationale:

The study of the subject is required to introduce the students with the materials used in ceramic engineering i.e. glass, enamel, pottery, refractory & cement. The only elementary knowledge of the raw materials used in different fields of ceramic industry and their applications is kept in the subject.

Sl. No.	Units	L	T
1.	Glass	30	8
2.	Enamel	25	6
3.	Pottery	25	6
4.	Refractory	20	5
5.	Cement	12	3
		112	28

1. Glass

History, Elementary knowledge of raw materials, Types of glass - container, glass sheet and plate glass, bulbs, laboratory wares, Decoration of Glass.

2. Enamel

Elementary knowledge of raw materials .Types of enamels and their applications.

3. Pottery

Elementary knowledge of raw materials.Types of pottery wares- Porcelain, stone ware, earthen ware , terracotta sanitary wares. White wares

4. Refractory

Elementary knowledge of materials considered as refractories, types of refractory acid refractory , basic refractory, neutral refractory.

5. Cements

Elementary idea of types of cements, raw materials used in the manufacture of cement, applications.

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### 1.5 INTRODUCTION TO COMPUTER

[Common with Civil Engg., Civil (Spl. With Rural), Mechanical Engg., (Specialisation in Production, Automobile, Refrigeration and Air conditioning), Electronics Engg., Instrumentation and Control Engg., Dairy Engg., Leather Technology, Footwear and Leather Goods Tech., Ceramics, Chemical Engg. (Four year Sandwich), Chemical Tech. (Rubber & Plastic), Chemical Tech. (Fertilizer) ]

L T P  
2 - 5

#### Rationale:

Computers are being used for design and information processing in all branches of engineering. An exposure to fundamentals of computer programming is very essential for all diploma holders. This subject has been included to introduce students in the use and application of computers in engineering.

#### TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Introduction to Computer	4	-	-
2.	Introduction To Operating System (MS DOS/Windows)	3	-	-
3.	Word Processing	4	-	-
4.	Worksheet	4	-	-
5.	Presentation	4	-	-
6.	Data Base Operation	3	-	-
7.	Introduction to Internet	2	-	-
8.	Introduction to advance tools	4	-	-
		28	-	70

#### DETAILED CONTENTS

##### 1. Introduction to Computer:

- A. Block Diagram of Computer.
- B. Types Of Computer
- C. Types of Input and Output devices
- D. Memories Devices (Its Types and Basic).

##### 2. INTRODUCTION TO OPERATING SYSTEMS (MS-DOS/MS-WINDOWS:)

What is operating system, its significance, Commands of DOS, Features/Application of window.

##### 3. WORD PROCESSING:

File : Open, Close, Save, Save as, Search, Send to, Print

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Preview, Print and Page Setup  
Edit : Cut, Copy, Paste, Office Clipboard, Select All,  
Find, replace, Goto, etc.  
View : Normal/Web Layout/Print Layout; Tool Bars;  
Header/Footer; Zoom, etc.  
Insert: Break, Page Number, Date & Time, Symbol, Comment,  
Reference, etc.  
Format: Font, Paragraph, Bullets & Numbering, Borders &  
Shading, Column, Change case, Back ground, etc.  
Tools : Spelling & Grammer, Language, Word Count, Letters &  
Mailing, Options, Customize, etc.  
Table : Draw, Insert, Delete, Select, Auto Format, AutoFit,  
Convert, Sort, Formula, etc.  
Mail Merge

4. WORKSHEET:

Introduction, Use of Tools/Icons for preparing simple  
Mini Project.

5. PRESENTATION :

Introduction, Use of Tools/Icons for preparing simple  
presentation on Power Point.

6. DATABASE OPERATION :

Create database using MS Access, Create Table and Creating  
Reports.

7. Introduction to Internet:

What is Network, How to send & receive messages, Use of  
Search Engines, Surfing different web sites. Creating Mail  
ID, Use of Briefcase, Sending./replying emails.

8. INTRODUCTION TO ADVANCE TOOLS :

I. Steps requires to solving problems.

- A. Flow Chart
- B. Algroithm
- C. Programming

II. Use of advance Tools such as Skype, Teamviewer, Installation  
of Modem, use of WiFi, Etc.

## INTRODUCTION TO COMPUTER LAB

### List Of Practicals

1. Practice on utility commands in DOS.
2. Composing, Correcting, Formatting and Article (Letter/Essay/Report) on Word Processing tool Word and taking its print out.
3. Creating, editing, modifying tables in Database tool.
4. Creating labels, report, generation of simple forms in Database tool.
5. Creating simple spread sheet, using in built functions in Worksheet tool..
6. Creating simple presentation.
7. Creating mail ID, Checking mail box, sending/replying e-mails.
8. Surfing web sites, using search engines.

Note : In the final year, related students have to use the concept of MS Word/MS Excel/MS Access/ MS Power Point in their respective branch's project work such as creating project report through MS Word/Creation of statistical data in MS Excel/Creation of database in MS Excel/Demonstration of project through Power Point Presentation.

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### 1.6 ENGINEERING DRAWING

[ Common to Three years Diploma Course in Civil Engg.,  
Electrical Engg., Chemical Engg., Dairy, Ceramic, Textile  
Technology, Textile Chemistry]

[ Also Common to Four year Part-time Diploma Course in  
Electrical Engineering, Mechanical Engineering  
(Specialization in Production Engineering)]

[ Also common to First year Diploma Course in Chemical  
Technology : (1) Fertilizer Technology, (2) Rubber and  
Plastic Technology]

L T P  
4 - 10

#### Rationale

Drawing, which is known as the language of engineers, is a widely used means of communication among the designers, engineers, technicians, draftmen and craftsmen in the industry. The translation of ideas into practice without the use of this graphic language is really beyond imagination. Thus, for the effective and efficient communication among all those involved in an industrial system, it becomes necessary that the personnel working in different capacities acquire appropriate skills in the use of this graphic language in varying degrees of proficiency in accordance with their job requirements.

Generally speaking, an engineering technician working at the middle level of the threetier technical manpower spectrum, is required to read and interpret the designs and drawings, provided to him by technologists and subsequently to translate them to the craftsmen for actual execution of the job.

This course in Engineering Drawing has been designed, keeping in view, the above referred job functions of a technician in the industry. This preliminary course aims at building a foundation for the further courses in drawing and other allied subjects. The contents of the course have been selected as to form a core for the various diversified fields of engineering. It is expected that at the end of this session, the students acquire sufficient skill drafting and some ability in special visualization of simple objects.

Sl.N.	Units	Coverage Time		
		L	T	P
1.	Drawing Instruments and their use	5	-	4
2.	A. Lettering techniques	3	-	16
	B. Introduction to scales	2	-	8
3.	Conventional Presentation	5	-	8
4.	A. Principles of projections	3	-	12
	B. Point Line, Plane	2	-	28
5.	Orthographic projection of simple geometrical solids	5	-	12
6.	Section of Solids	5	-	20
7.	Isometric Projection	5	-	20
8.	Free Hand Sketching	5	-	8
9.	Development of surfaces	5	-	24
10.	Orthographics Projection of Machine Parts	5	-	12
11.	Practice on Auto Cad	6	-	24
		56	-	140

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## C O N T E N T S

- NOTE : Latest Indian Standards Code of Practice to be followed.
1. Drawing, instruments and their uses. 1 Sheet
    - 1.1 Introduction to various drawing, instruments.  
1
    - 1.2 Correct use and care of Instruments.
    - 1.3 Sizes of drawing sheets and their layouts.
  2. (a) Lettering Techniques 2 Sheet  
  
Printing of vertical and inclined, normal single stroke capital letters.  
  
Printing of vertical and inclined normal single stroke numbers.  
  
Stencils and their use.  
  
(b) Introduction to Scales 2 Sheet  
  
Necesssity and use, R F  
  
Types of scales used in general engineering drawing. Plane, diagonal and chord scales.
  3. Conventional Presentaion : 1 Sheet  
  
Thread (Internal and External), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts.
  4. (a) Principles of Projection 1 Sheet  
  
Orthographic, Pictorial and perspective.  
  
Concept of horizontal and vertical planes.  
  
Difference between I and III angle projections.  
  
Dimensconing techniques.  
  
(b) Projections of points, lines and planes. 1 Sheet
  5. (a) Orthographic Projections of Simple 2 Sheet  
  
Geometrical Solids  
  
Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with referance planes.  
  
(b) Orthographic views of simple composite solids from their isometric views.  
  
(c) Exercises on missing surfaces and views
  6. Section of Solids 2 Sheet

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Concept of sectioning

Cases involving cutting plane parallel to one of the reference planes and perpendicular to the others.

Cases involving cutting plane perpendicular to one of the reference planes and inclined to the others plane, true shape of the section

7. Isometric Projection. 2 Sheet
- Isometric scale
- Isometric projection of solids.
8. Free hand sketching 1 Sheet
- Use of squared paper
- Orthographic views of simple solids
- Isometric views of simple job like carpentary joints
9. Development of Surfaces 2 Sheet
- Parallel line and radial line methods of developments.
- Development of simple and truncated surfaces (Cube, prism, cylinder, cone and pyramid).
10. ORTHOGRAPHIC PROJECTION OF MACHINE PARTS: 2 Sheet
- Nut and Bolt, Locking device, Wall bracket
11. PRACTICE ON AUTO CAD : 2 Sheet
- Concept of AutoCAD, Tool bars in AutoCAD, Coordinate System, Snap, Grid and Ortho mode. Drawing Command - Point, Line, Arc, Circle, Ellipse. Editing Commands - Scale, Erase, Copy, Stretch, Lengthen and Explode. Dimensioning and Placing text in drawing area. Sectioning and hatching. Inquiry for different parameters of drawing.
- NOTE :
- A. The drawing should include dimension with tolerance wherever necessary, material list according to I.S. code. 25% of the drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle figure
- B. Practice on AutoCAD latest software is to be done in AutoCAD lab of Mechanical Engineering Department of the Institute.

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II Semester

2.1 APPLIED MATHEMATICS I (B)  
[ Common to All Engineering Courses]

L T P  
3 2/2 -

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

S.N.	Units	Coverage Time		
		L	T	P
1.	Integral Calculus-I	12	4	-
2.	Integral Calculus-II	12	4	-
3.	Coordinate Geometry (2 Dimensional)	10	3	-
4.	Coordinate Geometry (3 Dimensional)	8	3	-
		42	14	-

DETAILED CONTENTS:

1. INTEGRAL CALCULUS - I : (14 Marks)

Methods of Indefinite Integration :-

- 1.1 Integration by substitution.
- 1.2 Integration by rational function.
- 1.3 Integration by partial fraction.
- 1.4 Integration by parts.

2. INTEGRAL CALCULUS -II :(14 Marks)

- 2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.
- 2.2 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.
- 2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases.

3. CO-ORDINATE GEOMETRY (2 DIMENSION):(14 Marks)

3.1 CIRCLE :

Equation of circle in standard form. Centre - Radius form,

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Diameter form, Two intercept form.

3.2 Standard form and simple properties

Parabola  $x^2=4ay$ ,  $y^2=4ax$ ,

Ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

4. CO-ORDINATE GEOMETRY (3 DIMENSION): (8 Marks)

4.1 Straight lines and planes in space -

Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line and Plane ( Different Forms),

4.2 Sphere  $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz=d$  (Radius, Centre and General Equation)

2.2 APPLIED PHYSICS-II

[ Common to All Engineering Courses]

L T P  
3 2/2 4

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject, teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Optics	4	1	-
2.	Introduction To Fiber Optics	4	1	-
3.	Laser & its Application	4	1	-
4.	Electrostatics	4	1	-
5.	D.C. Circuits	4	1	-
6.	Magnetic Materials & Their Properties	4	1	-
7.	Semi Conductor Physics	4	1	-
8.	Introduction Diode & Transistors	4	2	-
9.	Introduction To Digital Electronics	4	2	-
10.	Non-conventional energy sources	6	3	-
		42	14	56

1. Optics (4 Marks)

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Destructive), Diffraction and Polarization (Concept Only), Law of Malus and Polaroids.

2. Introduction To Fibre Optics :(5 Marks)

Critical angle, Total internal reflection, Principle of fibre optics, Optical fibre, Pulse dispersion in step-index fibres, Graded index fibre, Single mode fibre, Optical sensor.

3. Lasers and its Applications (4 Marks)

Absorption and Emission of energy by atom, Spontaneous and Stimulated Emission, Population inversion, Main component of laser and types of laser- Ruby Laser, He-Ne laser and their applications. Introduction to MASER.

4. Electrostatics :(4 Marks)

Coulomb's Law, Electric field, Electric potential, Potential energy, Capacitor, Energy of a charged capacitor, Effect of

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dielectric on capacitors.

5. D.C. Circuits (5 Marks)

Ohm's Law, Kirchoff's Law and their simple application, Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

6. Magnetic Materials and Their Properties: (5 Marks)

Dia, Para and Ferro-magnetism, Ferrites, Magnatic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics (4 Marks)

Concept of Energy bands in soldis, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semi conductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

8. Junction Diode and Transister : (6 Marks)

Majority and Minority charge carriers, P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Base, emitter and collector currents and their relationship LED's.

9. Introduction To Digital Electronics : (6 Marks)

Concept of binary numbers, Interconversion from binary to decimal and decimal to binary. Concepts of Gates (AND, NOT, OR).

10. Non-conventional energy sources: (7 Marks)

- (a) Wind energy : Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill.
- (b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

PHYSICS LAB

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.
2. Determination of 'g' by plotting a graph  $T^2$  versus  $l$  and using the formula  $g = 4\pi^2 / \text{Slope of the graph line}$
3. Determine the force constant of combination of springs in case of 1. Series 2. Parallel.
4. To verify the series and parallel combination of Resistances with the help of meter bridge.
5. To determine the velocity of sound with the help of resonance tube.
6. Determination of viscosity coefficient of a lubricant by Stoke's law.
7. Determination of  $E_1/E_2$  of cells by potentiometer.
8. Determination of specific resistance by Carey Foster bridge.
9. Determination of resistivity by P.O.Box.
10. Verification of Kirchoff's Law.
11. To draw Characteristics of p-n Junction diode.
12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

NOTE :

Students should be asked to plot a graph in experiments (where possible) and graph should be used for calculation of results. Results should be given in significant figures only.

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## 2.3 APPLIED MECHANICS

[ Common to three years Diploma Course in Civil Engg., Agriculture, Dairy, Ceramic, Civil & Rural Engg., Chemical Engineering, Architecture Assistantship, Computer Science & Engineering]

[ Also Common to Mechanical Engineering (Spacialization In Production Engineering )

[ Also common to First year Diploma Course in Chemical Technology : (1) Fertilizer Technology, (2) Rubber and Plastic Technology ]

L T P  
5 1 2

### RATIONALE

The subject Applied Mechanics deals with fundamental concepts of mechanics which are useful for the students for further understanding of the second & final year subjects like S.O.M. and theory and design of steel & masonry structures as well as RCC designs. The subject enhances the method ability of the students.

### TOPIC WISE DISTRIBUTION OF PERIODS

SL.No.	Topic	L	T	P
1.	Introduction	4	1	
2.	System of Forces & General Condition of Equilibrium	18	4	
3.	Moment and Couple	8	1	
4.	Friction	8	1	
5.	Machines	8	1	
6.	Center of Gravity	8	2	
7.	Moment of Inertia	8	2	
8.	Beam & Trusses	8	2	
Total		70	14	28

### DETAILED CONTENTS

#### 1. Introduction:

Mechanics and its utility. Concept of scalar and vector quantities. Effect of a force. Tension & compression. Rigid body. Principle of physical independence of force. Principle of transmissibility of a force.

#### 2.A. System of Forces :

Concept of coplaner and non-coplaner forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple

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wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a particle, conditions of equilibrium of coplaner concurrent force system.

B. General Condition of Equilibrium:

General condition of equilibrium of a rigid body under the action of coplaner forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.

3. Moment & couple:

Concept of Varignon's theorem. Generalised theorem of moments. Application to simple problems on levers-Bell crank lever, compound lever, steel yard, beams and wheels, lever safety valve, wireless mast, moment of a couple; Properties of a couple ; Simple applied problems such as pulley and shaft.

4. Friction:

Types of friction:statical,limiting and dynamical friction, statement of laws of sliding friction, Coefficient of friction, angle of friction; problems on equilibrium of a body resting on a rough inclined plane, simple problems on friction. Conditions of sliding and toppling.

5. Machines:

Definition of a machine. Mechanical advantage, velocity ratio, input, output, mechanical efficiency and relation between them for ideal and actual machines. Law of a machine Lifting machines such as levers, single pulley, three system of pulleys. Weston differential pulley, simple wheel and axle, differential wheel and axle. Simple screw jack, differential screw jack, simple worm and worm wheel.

6. Centre of Gravity:

Concept, definition of centroid of plain figures and center of gravity of symmetrical solid bodies. Determination of centroid of plain and composite lamina using moment method only, Centroid of bodies with removed portion. Determination of center of 'gravity' of solid bodies - cone, cylinder, hemisphere and sphere, composite bodies and bodies with portion removed.

7. Moment of Inertia:

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Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical section : rectangle, triangle, circle (without derivations). Second moment of area for L, T, I and channel section, section of modulus.

8. Beams & Trusses:

Definition of statically determinate and indeterminate trusses. Types of supports. Concept of tie & strut, Bow's notation, space diagram, polar diagram, funicular polygon; calculation of reaction at the support of cantilever and simply supported beams and trusses graphically and analytically; graphical solution of simple determinate trusses with reference to force diagram for determining the magnitude and nature of forces in its various members. Analytical methods: method of joints and method of sections. (simple problems only)

Applied Mechanics Lab : Practicals

1. To verify the law of Polygon of forces.
2. To verify the law of parallelogram and triangle of forces.
3. To verify the law of principle of moments.
4. To find the coefficient of friction between wood, steel, copper and glass.
5. To find the reaction at supports of a simply supported beam carrying point loads only.
6. To find the forces in the jib & tie of a jib crane
7. To find the forces in the members of a loaded roof truss.  
(King / Queen post truss)
8. To find the mechanical advantage, velocity ratio and efficiency of any three of the following machines:
  - (i) Simple wheel & axle
  - (ii) Differential wheel & axle

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(iii) Differential pulley block

(iv) Simple Screw jack

(v) Simple Worm & worm wheel

(vi) System of Pulleys (any type).

9. To find out center of gravity of regular lamina.

10. To find out center of gravity of irregular lamina.

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## 2.4 APPLIED CHEMISTRY

[ Common to All Engineering Courses]

L T P  
6 - 4

Rationale:

Engineering Chemistry has profound and deep relationship with the industrial and environmental technology. This curriculum intends to impart technical knowledge alongwith productive practice to the students of the diploma engineering. The teachers are expected to guide the students in the classroom and the laboratories according to the curriculum by demonstrations and by showing relevant materials and equipments to inculcate interests in learning among students.

### TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Atomic Structure	4	-	-
2.	Chemical Bonding	6	-	-
3.	Classification of Elements	4	-	-
4.	Electro Chemistry-I	7	-	-
5.	Electro Chemistry-II	8	-	-
6.	Chemical Kinetics	4	-	-
7.	Catalysis	4	-	-
8.	Solid State	4	-	-
9.	Fuels	4	-	-
10.	Water Treatment	6	-	-
11.	Colloidal State	4	-	-
12.	Lubricants	4	-	-
13.	Hydrocarbons	7	-	-
14.	Organic Reactions & Mechanism	8	-	-
15.	Polymers	4	-	-
16.	Synthetic Materials	6	-	-
-----		84	-	56
-----				

### DETAILED CONTENTS:

1. ATOMIC STRUCTURE : (3 MARKS)

Basic concept of atomic structure, Matter wave concept, Quantum number, Haisenberg's Uncertainty Principle, Shaples of orbitals.

2. CHEMICAL BONDING : (4 MARKS)

Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.

3. CLASSIFICATION OF ELEMENTS : (3 MARKS)

Modern classification of elements (s,p,d and f blcok elements), Periodic properties : Ionisation potential

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electro negativity, Electron affinity.

4. ELECTRO CHEMISTRY-I:(3 MARKS)

Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,

5. ELECTRO CHEMISTRY-II:(3 MARKS)

Redox reactions, Electrode potential(Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electro chemical series and its application. Chemical and Electrochemical theory of corrosion, Galvenic Series. Prevention of corrosion by various method.

6. CHEMICAL KINETICS :(3 MARKS)

Law of mass action, order and molecularity of rection. Activation energy, rate constants, Ist order reactions and 2nd order reactions.

7. CATALYSIS :(2 MARKS)

Definition Characteristics of catalytic reactions, Catalytic promoters and poison , Autocatalysis and Negative catalysis, Theory of catalysis, Application.

8. SOLID STATE :(2 MARKS)

Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

9. FUELS :(3 MARKS)

Definition, its classification, high & low Calorific value.Determination of calorific value of solid and liquid fuels by Bomb calorimeter.

Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Disel and Petrol), Benzol and Power alchol. Knocking, Anti-knocking agents, Octane number and Cetane number.

Cracking and its type, Gasoling from hydrogenation of coal (Bergius process and Fischer tropsch's process)

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Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG.

Numerical Problems based on topics

10. WATER TREATMENT :(3 MARKS)

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Soda lime, Zeolite and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embrittlement, priming and foaming in boilers.

Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorination, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. COLLOIDAL STATE OF MATTER :(3 MARKS)

Concept of colloidal and its types, Different system of colloids, Dispersed phase and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electrodialysis. Properties of colloidal solution with special reference to absorption, Brownian Movement, Tyndal effect, Electro phoresis and coagulation. relative stability of hydrophilic and hydrophobic colloids. Protection and protective colloids. Emulsion, Types, preparation, properties and uses. Application of colloids chemistry in different industries.

12. LUBRICANTS :(3 MARKS)

Definition, classification, Necessity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compounds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. HYDROCARBONS:(4 MARKS)

A. Classification and IUPAC nomenclature of organic compounds homologous series (Functional Group)

B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.

14. ORGANIC REACTIONS & MECHANISM:(4 MARKS)

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1. Fundamental aspects -
  - A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion
  - B. Inductive effect, Mesomeric effect, Electromeric effect.
- 2.A. Mechanism of addition reaction (Markonikov's Rule, Cyanohydrin and Peroxide effect),
- B. Mechanism of Substitution reactions; (Nucleophilic) hydrolysis of alkyl halide, electrophilic substitution halogenation, Sulphonation, Nitration and Friedel-Craft reaction.
- C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehydrohalogenation of primary alkyl halide.
15. POLYMERS : (3 MARKS)
  1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)
  2. Thermosetting and Thermoplastic resins -
    - A. Addition polymers and their industrial application - Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.
    - B. Condensation polymer and their industrial application : Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.
  3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers (Silicon)
16. SYNTHETIC MATERIALS : (4 MARKS)
  - A. Introduction - Fats and Oils
  - B. Saponification of fats and oils, Manufacturing of soap.
  - C. Synthetic detergents, types of detergents and its manufacturing.
  3. EXPLOSIVES: TNT, RDX, Dynamite.
  4. Paint and Varnish

#### LIST OF PRACTICALS

1. To analyse inorganic mixture for two acid and basic radicals from following radicals

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A. Basic Radicals :

$\text{NH}_4^+$ ,  $\text{Pb}^{++}$ ,  $\text{Cu}^{++}$ ,  $\text{Bi}^{+++}$ ,  $\text{Cd}^{++}$ ,  $\text{As}^{+++}$ ,  $\text{Sb}^{+++}$ ,  
 $\text{Sn}^{++}$ ,  $\text{Al}^{+++}$ ,  $\text{Fe}^{+++}$ ,  $\text{Cr}^{+++}$ ,  $\text{Mn}^{++}$ ,  $\text{Zn}^{++}$ ,  $\text{Co}^{++}$   
 $\text{Ni}^{++}$ ,  $\text{Ba}^{++}$ ,  $\text{Sr}^{++}$ ,  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$

B. Acid Radicals :

$\text{CO}_3^{--}$ ,  $\text{S}^{--}$ ,  $\text{SO}_3^{--}$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{NO}_2^-$ ,  
 $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{SO}_4^{--}$

2. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.
3. To determine the total hardness of water sample in terms of  $\text{CaCO}_3$  by EDTA titration method using Eriochroma black-T indicator.
4. To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalein as indicator.
5. To determine the Chloride content in supplied water sample by using Mohr's methods.
6. Determination of temporary hardness of water sample by O-Henry's method.

## 2.5 WORKSHOP PRACTICE

[Common with Civil Engg., Civil Engg. (sp. in Rural Engg.), Electrical, Ceramic, Dairy, Agriculture, Chemical Technology (Rubber & Plastic), Chemical Technology (fertilizer), Four year chemical Engg.]

[Four year Past time Mechanical Engg. (sp. in Production Engg.)]

L T P  
- - 14

### Rationale

A diploma holder in any branch of engineering has to work in between a skilled workman and an Engineer. In order to have effective control over skilled workmen it is necessary that the supervisory staff must have adequate knowledge and skill. For development of skills workshop practice is very essential.

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Carpentry shop	-	-	20
2.	Painting & polishing shop	-	-	16
3.	Sheet metal and soldering shop	-	-	56
4.	Fitting shop, Plumbing & Fastening Shop	-	-	24
5.	Foundry shop	-	-	20
6.	Smithy shop	-	-	24
7.	Welding shop	-	-	20
8.	Machine shop	-	-	16
		-	-	196

### DETAILED CONTENTS

1. **Carpentry Shop :**
  - EX-1 Introduction & demonstration of tools used in carpentry shop and different types of joints, types of wood, seasoning and preservation of wood
  - EX-2 Planing and sawing practice
  - EX-3 Making of lap joint
  - EX-4 Making of mortise and tenon joint
  - Ex-5 Making of any one utility article such as wooden-picture frame, hanger, peg, name plate, etc.
  
2. **Painting and Polishing Shop:**
  - EX-1 Introduction of paints, varnishes, Reason for surface preparation, Advantage of painting, other method of surface coating i.e. electroplating etc.
  - EX-2 To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.
  - Ex-3 To prepare metal surface for painting, apply primer

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and paint the same.  
EX-4 To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

\* The sequence of polishing will be as below:

- i) Abrasive cutting by leather wheel.
- ii) Polishing with hard cotton wheel and with polishing material.
- iii) Buffing with cotton wheel or buff wheel.

3. Sheet Metal and Soldering Shop :

EX-1 Introduction and Types of sheets, measuring of sheets  
EX-2 Study and sketch of various types of stakes/anvil.  
EX-3 Introduction & demonstration of tools used in Sheet metal working shop.

EX-4 Cutting, shearing and bending of sheet.

EX-5 To prepare a soap case by the metal sheet.

EX-6 To make a funnel with thin sheet and to solder the seam of the same.

EX-7 To make a cylinder and to solder the same.

EX-8 Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired

joints.

EX-9 To braze small tube/conduit joints.

4. Fitting Shop, Plumbing Shop & Fastening Shop:

EX-1 Study of materials, limits, fits and tolerances.

EX-2 Introduction & demonstration of tools used in Fitting Shop.

EX-3 Hacksawing and chipping of M.S. flat. Filing and squaring of chipped M.S. job. Filing on square or rectangular M.S. piece.

EX-4 Making bolt & nut by tap and die set and make its joints

EX-5 To drill a hole in M.S. Plate and tapping the same to create threads as per need.

EX-6 Utility article-to prepare double open mouth spanner for 18" hexagonal head of a bolt.

EX-7 Cutting and threading practice for using socket, elbow and tee etc. and to fit it on wooden practice board.

EX-8 Study of-bib cock, cistern or stop cock, wheel valve and gate valve etc.

EX-9 Practice of bolted joints

EX-10 To prepare a rivetted joint

EX-11 To make a pipe joint

EX-12 To make a threaded joint

EX-13 Practice of sleeve joint

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5. Foundry Work
  - Ex-1 Study of metal and non metals
  - Ex-2 Study & sketch of the foundry tools.
  - Ex-3 Study & sketch of cupula & pit furnace.
  - Ex-4 To prepare the green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould)
  - Ex-5 Casting of non ferrous (lead or aluminium) as per exercise 3.
  
6. Smithy Shop :
  - EX-1 Study & Sketch of Tools used in smithy shop.
  - EX-2 To prepare square or rectangular piece by the M.S. rod.
  - EX-3 To make a ring with hook for wooden doors.
  - EX-4 Utility article-to preapre a ceiling fan hook.
  
7. Welding Shop :
  - EX-1 Introduction to welding, classinfication of welding, types of weld joints.
  - EX-2 Welding practice-gas and electric.
  - EX-3 Welding for lap joint after preparing the edge.
  - EX-4 Welding of Butt joint after preparation of the edge.
  - EX-5 'T' joint welding after preparation of edge.
  - EX-6 Spot welding, by spot welding machine.
  
8. Machine Shop
  - EX-1 Study & sketch of lathe machine.
  - EX-1 Study & sketch of grinders, milling M/c, Drilling M/c and CNC Machines
  - Ex-2 Plain and step turning & knurling practice.
  - Ex-3 Study and sketch of planning/Shaping machine and to plane a Ractangle of cast iron.

## 2.6 FIELD EXPOSURE

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L	T	P
4	-	-

## RATIONALE:

Chemistry has intricate and profound relationship with technology. This curriculum includes those topics of chemistry which enable a technician for better application of technology. Metals and compounds related to ceramic & glass technology are included in the subject to give better understanding of the technology.

## A. TOPICWISE DISTRIBUTION OF PERIODS:

NO.	TOPIC	LECT.	TUTO.	P
1.	Unit-I	8	-	-
2.	Unit-II	8	-	-
3.	Unit-III	8	-	-
4.	Unit-IV	8	-	-
5.	Unit-V	8	-	-
6.	Unit-VI	8	-	-
7.	Unit-VII	8	-	-
TOTAL		56	-	-

## B. Syllabus:

- I. Compounds of:-
  - (a) Li, Na, K, Cu, Ag, Au.
  - (b) Mg, Ca, Sr, Ba, Pb, Cd, Zn.
 (With special reference to their oxides, nitrates, halides, sulphates). their properties and application in ceramic industry.
- II. Compound of Al and B with special reference to aluminates and Borates and oxides.
- III. Compounds of:-
  - (a) Ti, V, Cr, Mn, Fe, Co, Ni.
  - (b) Si, Ti, Zn.
 (With special reference to their oxides and other compounds related to ceramic industry) Colour Produce by these compounds in glass and enamel
- IV. Oxides of As and Sb.
- V. Selenium and sulphur and their compounds used in ceramic industry.
- VI. Compound of Ce, Nd and Pr.
- VII. Phase rule, one component system ( $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{ZrO}_2$ ), two component systems ( $\text{Al}_2\text{O}_3$ - $\text{SiO}_2$ ,  $\text{Na}_2\text{O}$ - $\text{SiO}_2$ ,  $\text{CaO}$ - $\text{SiO}_2$ ,  $\text{CaO}$ - $\text{Al}_2\text{O}_3$ )

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3.2 ELEMENTARY ELECTRICAL, MECHANICAL & CIVIL ENGG.

L T P  
4 - 4

RATIONALE

Ceramic & Glass Engineering Diploma holder has to interact with engineering and technicians in the Field of mechanical, electrical & civil engineering. This subject has been kept in the curriculum to provide a general introduction to mechanical, electrical & civil engineering elements. Teachers should lay more emphasis on basic concept while teaching the subject.

A. TOPICWISE DISTRIBUTION OF PERIODS

SL.NO.	TOPIC	L	T	P
Electrical Engineering				
1.	D.C. Machines	3		
2.	Fundamentals of A.C.	9		
3.	Transformer	2		
4.	A.C. Machines	9		
5.	Electrical Measuring Instruments	9		
Mechanical engineering				
1.	Unit-I	6		
2.	Unit-II	3		
3.	Unit-III	3		
Civil Engineering				
1.	Unit-I	12		
TOTAL		56	-	56

B. Syllabus:

Electrical Engineering:

1. D.C. Machines

Working, Principle, types and applications.

2. Fundamentals of A.C.

Definition of Alternating current: Instantaneous value, maximum value, time periods, frequency, R.M.S. value, average value, phase and phase difference, leading and lagging power factor. Concept of 3-phase system: KVA, KVAR, KW, calculation of power consumed in single phase and three phase circuits. Star and delta connection (Line voltage, Line current, phase voltage and phase current only).

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3. Transformers

Working principle of a single phase transformer and its applications.

4. A.C. Machines:

Motors: Brief idea about construction, starting methods and applications (excluding winding details of single phase induction motors), three phase induction motors (squirrel cage & slip ring type).

5. Electrical Measuring Instruments:

Ammeter, voltmeter, wattmeters and induction type energy meters (single phase only), meggers, multimeters. Temperature measuring thermo couple, Resistance thermometer, Furnace Electrification.

Mechanical Engineering:

Internal combustion engines, classification of I.C. engines, mechanism of I.C. engine. Classification of control systems: mechanical, hydraulic, pneumatic and electrical, working and uses of simple machines- loaders and lift trucks, conveyors, Excavators, mixing and placing equipments. Combustion table in MM and Inch.

II. Bearing & Lubricants:

Types of Bearings, lubrication of Machines, types of lubricants, basic rules of lubrication. Properties of a good lubricant.

III. Safety and Accident Prevention:

Safety organization, prevention of accidents due to mechanical causes, safety in operation of electrical equipments, fire precaution of storage of lubricants.

Civil Engineering

Selection of site for location of a factory, orientation of a factory building, nature of soils and bearing capacity, Improving bearing capacities, Foundation materials for the construction of furnaces and kilns. Construction of kilns and furnace walls. Arches and domes etc. Estimation for construction of kilns and furnaces. Sketches showing the different views of kilns. Machine foundation.

C.

PRACTICALS  
(Elementary Elect. & Mech. Engg.)

NOTE: Do any eight. Atleast four from each section.

Sec. A. Electrical

1. To study the constructional details of a DC machine.
2. To measure power & calculate powerfactor of single phase load using ammeter, voltmeter and wattmeter.
3. To start a 3 phase induction motor with the help of star-delta starter.
4. To study the constructional details of (a) Moving iron (b) Moving coil measuring instruments.
5. Connect ammeter, voltmeter, wattmeter and energy meter to a single phase load and measure current voltage, power and energy for a given time.
6. Simple C.T.S. wiring up to 2 points only.

Sec. B. Mechanical

1. To study the various types of lubrication system used in machines.
2. To study and sketch different types of bearings.
3. To study and sketch 4-stroke and 2-stroke engines.
4. Calibrate pressure gauge by using dead weight tester.
5. To study the working of "on-off" level controller and plot the time response chart and calculate time constant.
6. To draw the characteristics curve of proportional temperature control.
7. To study closed loop automatic control setup and draw its block or circuit diagram.

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### 3.3 INDUSTRIAL OPERATIONS

L T P  
4 - -

#### A. TOPICWISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Introduction	8		
2.	Size reduction	16		
3.	Handling of solids & slurry	16		
4.	Mechanical Operations	16		
TOTAL		56	-	-

#### B. Syllabus:

##### 1. Introduction:

Concept and rule of unit operation in process industries and House Keeping.

##### 2. Size reduction:

Theory of crushing, Rittinger's law and Kicks law, crushing and grinding machines, classification and their general discription, jaw crushers, gyratory crushers, roll crushers, hammer mills, ball mills, tube mills, vibrating mills, Raymod mill, operation of machinery, open circuit and closed circuit operations, field control, mill discharges. To decide optimum speed of ball mill for best grinding and Introduction of types of Lining of ball mill. Determination

of

Ball size, ball mill size and determination surface area of materials

##### 3. Handling of Solids & Slurries:

Screening and grinding of solid particles. Standard screening equipments and standard sieves. Conveying equipments, classification, their general construction, industrial application and operation, belt conveyors, chain conveyors, screw conveyors, bucket conveyors, pneumatic conveying system, pumping and transportation of slurry and their flow control.

##### 4. Mechanical Operation:

Type of filtration apparatus their general construction, application and operation of filter press and rotary, filters, filter aids centrifugal filteration. Types of mixing equipments used in ceramic industry. Introduction for

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moderization of ceramic machineries

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3.4 POTTERY & REFRACTORY

L T P  
6 - 16

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
SEC. A - POTTERY				
1.	Introduction	4		
2.	Raw Material	12		
3.	Body Preparation	12		
4.	Mould Materials	6		
5.	Firing	6		
6.	Quality Control Checks	6		
SEC. B - REFRACTORY				
1.	Raw Materials	8		
2.	Making of Refrectory Bricks	12		
3.	Manufacturing of crucible & saggars	12		
4.	Quality Control Checks	6		
TOTAL		84	-	224

B. SYLLABUS

SEC. A - POTTERY

1. Introduction:

2. Raw Materials:

Origin of clay, Principle of formation and classification. Primary and secondary clays, washing methods of clays. Winning and mining of clays. Behaviour, functions and physical properties of the important pottery raw materials - china clay, ball clay, fire clay, Red burning clay, quartz, felspar, nepheline syenite, whitening, talc, pyrphylite, silimanite group minerals and bone ash, places of occurrence of important raw materials in India.

3. Body Preparation & Shaping:

Unloading and storage, batch claculations, batching, blunging, ball milling, screening, dewatering clay slips, casting slip, plastc forming, dry press bodies.

Jiggering, i.e. Jigger and rotary Table type jiggering the casting process, different types of casting- 1. Ordinary or Natch casting 2. Bench casting 3. Battery casting 4 Capillary casting, extrusion, dry pressing different

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types of dry pressing finishing, drying.

4. Mould Materials:

Mould materials and their properties. (Different Types of dies and mould), Process of mould making using POP.

5. Firing:

Firing of pottery wares, kiln furnitures and placing of wares in kiln and firing schedules.

SEC. B - REFRACTORIES

1. Raw Materials:

Classification of refractory materials, clay minerals, alumina silica, magnesite, dolomite, chromite, and other refractory oxides. Synthetic raw materials - Fused alumina, sintered alumina.

2. Making of Refractory Bricks:

Moulding methods, drying, effect of heat on clay, Manufacture and properties of silica and semi-silica refractories, fire clay and other alumino silicate refractories, application of phase diagrams related to the manufacture of above refractories.

3. Manufacturing of Crucibles & Saggars:

A detailed study of the manufacture of crucibles, furnace blocks, refractory block for furnace, saggars and muffles used in different industries.

## POTTERY & REFRACTORY LAB

Emphasis should be given to Testing and quality Control wherever applicable.

### A. POTTERY PRACTICALS:

- (a) Model and mould making.
- (b) Preparation of different bodies and their glazes. Fabrication of test specimens by different process
- (c) Bisuciting and ghost firing of test peices.
- (d) Moisture content in china clay/given sample.
- (e) Determination of dry and fired shrinkage of china clay/ test specimen of body.
- (f) Water of plasticity of clays and particle size distribution.
- (g) Determination of setting time of plaster of paris.
- (h) Density of casting slip.
- (i) Water of plasticity determination of body for jiggering.
- (j) Flow and rolling limit of clay bodies.
- (k) Prepration of plaster models moulds, free hand drawings and stencilling.
- (l) Fired characteristics of test specimens (such as colour, W.A., Applied porosity, B.D., Thermal expansion and MOR (Strength)).

### B. REFRACTORY PRACTICALS:

1. Particle size determination of refractory raw materials by sieve analysis.
2. Density and specific gravity of refractory raw materials by vacuum treatment.
3. Porosity of fired test specimen.
4. Preparation of refractory sample by dry press.
5. Firing of sample at appropriate temperature.
6. Determination of properties by water absorption test:
  - a. Apparant porosity
  - b. Bulk density and packing density
  - c. Apparant specific gravity
  - d. Percentage of water absorption.

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e. Flexural strength (MOR)  
Note :- Those practicals which are not possible at institute level, can be demonstrated/performed in Industrial Training/field exposure.

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### 3.5 MODELLING AND MOULD LAB

L T P  
- - 10

Basic principles of Design- study of forms through nature, ornamentation in design. Designing of ceramic products. Stencelling & screen printing designs.

Methods of making various regular and irregular ceramic models by clay modelling, preparation of various types of moulds with plaster of paris.

Note :- 1. Students should get a complete idea about the operations involved in transferring the design of paper to the actual ceramic product, while preparing the job.

2. Emphasis should be made on demonstration of actual shapes of ceramic products.

IV Semester

4.1 Functional Communication

L T P  
4 - -

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
<b>Section A English</b>				
1.	On Communication	04	-	-
2.	Exploring Space	04	-	-
3.	Sir C.V. Raman	04	-	-
4.	Professional Development	04	-	-
5.	Buying a Second Hand Bicycle	04	-	-
6.	Leadership and Supervision	04	-	-
7.	First Aid	03	-	-
8.	The Romanance of Reading	03	-	-
9.	No Escape from Computers	03	-	-
10.	Bureau of Indian Standards	03	-	-
<b>Section B Hindi</b>				
1.	Topic 1	02	-	-
2.	Topic 2	02	-	-
3.	Topic 3	02	-	-
4.	Topic 4	02	-	-
5.	Topic 5	02	-	-
6.	Topic 6	02	-	-
7.	Topic 7	02	-	-
8.	Topic 8	01	-	-
9.	Topic 9	02	-	-
10.	Topic 10	02	-	-
11.	Topic 11	01	-	-
		56	-	-

Section "A" (English)

Text Lessons

- Unit I. On Communication
- Unit.II Exploring Space
- Unit.III Sir C.V. Raman
- Unit.IV Professional Development of Technicians
- Unit.V Buying a Second Hand Bicycle
- Unit.VI Leadership and Supervision
- Unit.VII First Aid
- Unit.VIII The Romanance of Reading
- Unit.IX No Escape from Computers
- Unit.X Bureau of Indian Standards

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Section "B" Hindi

- 1- स्वरोजगार
- 2- भारतीय वैज्ञानिकों एवं तकनीकियों का भारत के विकास में योगदान
- 3- ग्राम्य विकास
- 4- परिवार नियोजन
- 5- सामाजिक संस्थायें
- 6- नियोजन और जन कल्याण
- 7- भारत में प्रौद्योगिकी के विकास का इतिहास
- 8- हरित क्रान्ति
- 9- पर्यावरण एवं मानव प्रदूषण
- 10- श्रमिक कल्याण
- 11- भारत में श्रमिक आन्दोलन

## 4.2 GLASS AND ENAMELS

L	T	P
3	2	6

## A. TOPIC WISE DISTRIBUTION OF PERIODS.

SL.NO.	TOPIC	L	T	P
SEC. A GLASS				
1.	Raw Materials	6	2	
2.	Batch Calculation	6	2	
3.	Typical Commercial Glasses	4	2	
4.	Melting & Refining	4	2	
5.	Decoration	2	1	
6.	Quality & Control Test	4	2	
SEC. B ENAMELS				
1.	Unit I	14	3	
2.	Unit II	4	1	
TOTAL		42	14	84

## B. SYLLABUS

## SECTION A - GLASS

## 1. Raw Materials:

Chemical and Physical Characteristics of principal glass making batch materials, their storage, mixing and conveying, minor ingredients and their function, factor influencing choice of batch materials..

## 2. Batch Calculation:

Calculation of glass batch oxide composition to raw material And raw material composition to oxide composition.

## 3. Typical Commercial Glasses:

Types of glass and their chemical composition, container glass, sheet and plate glass, scientific laboratory glass.

## 4. Melting and Refining:

Essential requirements of glass melting, mechanisation of melting, thermal currents, production of homogeneous liquid, refining, shaping and moulding.

## 5. Decoration:

Different Methods of Decoration.

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6. Quality Control & Test:  
Quality control/methods of testing.

SEC. B - ENAMEL

1. Unit I -

History of enamelling, raw materials for enamels, metal and metal preparation, preparation of enamel frit milling and mill addition, application and control, firing, decoration, defects, their causes and remedies.

2. Unit II -

Quality Control and Testing.

GLASS AND ENMAL LAB

- A. GLASS PRACTICALS:

- (a) Compounding of glass batches.

- (b) Melting of simple coloured glasses.

- (c) Simple decoration processes e.g. etching, silvering staining, sand-blasting, lustering, cutting and polishing.

- (d) Sieve analysis of glass sand.

- (e) Density of glass by float and sink method.

- B. ENAMEL PRACTICALS:

- (a) Cleaning and pickling of small mild steel plates for enamelling.

- (b) Preparation of frit and its application for making sign plates.

- (c) Firing and fusion of applied enamel.

- (d) Density of enamel frit using specific gravity bottle.

- (e) Fineness test of enamel slip.

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4.3 GLASS & CERAMIC ENGINEERING DRAWING-I

L T P  
- - 14

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	LAB/DRG.	NO. OF PLATES
1.	UNIT I - a	16	1
	- b	12	1
	- c	12	1
2.	Unit II	48	2
3.	Unit III	32	2
4.	Unit IV	32	2
5.	Unit V	44	4
TOTAL		196	13

B. SYLLABUS

Unit I

- (a) Detail use of abvriviation in electrial drawing symbols for simple equipment used in circuit, lamp, switches, condenser, resistance, reactors, transformer and motor.  
Sheet 1
- (b) Simple domestic wiring circuit diagram.  
Sheet 1
- (c) Wiring diagrams of simple switch board(lab), general electrical layout for substation.  
Sheet 1

Unit II

Types of pulleys, bush bearing, foot step bearing, plumber block, wall brackets.  
Sheet 2

Unit III

Sectional views of cotter-joint, knuckle joint, Jib and cotter joint, flange coupling.  
Sheets 2

Unit IV

Pictorial views of the following ceramic machinery.

- (a) Ball Mill )  
(b) Edge runner mill )  
(c) Jaw Crusher ) Sheets 2  
(d) Plunger )  
(e) Filter press )

Unit V - CAD

4

1. To Study the basis of Auto Cad  
2. To draw 2 D ceramic drawing of block diagram, plot layout, machine and lilne

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3. To draw simple 3 D ceramic Product (i) Procelain Insulator  
(ii) Refractory Product

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#### 4.4 INDUSTRIAL CALCULATION & ENVIRONMENTAL POLLUTION

L    T    P  
6    -    -

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL NO.	TOPIC	L	T	P
1.	Introduction	5		
2.	Dimension, Units	6		
3.	Stoichiometric relationship	12		
4.	(a) Ideal gas, PVT	12		
	(b) Dalton and Anagat's Law	4		
5.	Humidity and saturation	6		
6.	Material Balance	12		
7.	Combustion process	12		
8.	Environmental Pollution	15		
TOTAL		84	-	-

B. SYLLABUS:

1. UNIT I

Introduction for material and Energy Balances.

2. Unit II

Dimensions, units and their conversion factors, S.I Units.

3. Unit III

Stoichiometric and composition relationships - conservation of mass, mass and volume relationships in chemical reactions, concept of gram-mole and gram-atom, mass and volume relationship for gaseous substance, use of molal units, choice of basis of calculation.

4. Unit IV

Behaviour of ideal gases - P & T relationship, standard condition, gauge pressure, Dalton and Amagat's laws, average molecular weight of a gaseous mixture.

5. Unit V

6. Unit VI

Material Balance- Drying and firing problems.

7. Unit VII

Combustion processes, analysis of the products of combustion.

8. Unit VIII Ceramic industry and its influence on the environment. How to make it environment friendly. Major pollutants and their remedies. Industrial waste disposal.

Wasteminimization and recycling. Reduction of GHS (Green House

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Gases), Control of combustion by improved process (Reduction  
in fuel consumption)

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4.5 FUELS, FURNACES AND PYROMETRY

L T P  
6 - -

A. TOPIC WISE DISTRIBUTION OF PERIODS.

SL.NO.	TOPIC	L	T	P
1.	Fuels			
	a- Solid Fuels	8		
	b- Liquid Fuels	8		
	c- Gaseous Fuels	8		
2.	Furnaces	12		
3.	Continuous Kilns	10		
4.	Tank Furnaces	10		
5.	Other Equipments	15		
6.	Pyrometry	15		
TOTAL		84	-	-

B. SYLLABUS

FUEL

1. Solid Fuel:

Coal and its formation, theories of formation of coal, nature and occurrence, impurities in coal, grading of coal, coal washing, hardness and grindability of coal, agglomeration and swelling of coal, calorific value of coal, coal ash and clinkering. Spontaneous combustion, its causes and remedy.

2. Liquid Fuels:

Nature of oil, its origin and composition, refining process for the production of liquid petroleum products - petrol, kerosene, fuel oil and coke (brief outlines) storage and handling practices in industry.

3. Gaseous Fuels:

Producer gas; design and description of producer gas plant, chemical reactions, composition and calorific value in relation to operating conditions and quality of coal. Water Gas, Carburetted water gas. Coke oven Gas; low and high temperature carbonisation, Tar and Gas and their nature. Blast Furnace Gas, Refinery Gases, Natural Gas-Composition and calorific value.

2. Furnaces

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Definition, classification of furnaces- periodic kilns, scove kiln - setting and firing, updraft kiln - flues, wall, crown, bag wall, vents, stack. Down Draft Kilns: Round and rectangular down draft kiln, foundation and flue construction, wall-crown-bag wall, dampers, stack, crown, wedge and scow blocks, fire boxes, kiln bandages. muffle furnaces, chamber kiln - construction and working. Muffle kilns: Muffle tunnel kiln, principle of working, Dressler Treft Muffle kiln and other muffle kilns, advantages of muffle type tunnel kiln. Modern muffle kilns for enamel industries.

3. Continuous Kilns:

Fundamentals of continuous kilns - construction, working and firing circuits of tunnel kiln, roller kiln, shaft kiln rotary kiln, chamber kiln. Methods of setting in continuous kilns.

4. Tank Furnaces:

Day tank, continuous tank, bridge wall tank, super structure, refractories used in different parts of tank furnaces, up takes and chimney construction, draught pressure and chimney draught.

5. Other Equipments

Design and operation of Burners, Burner efficiency, blowers And measurement of air flow heater regenerator, recuperator etc.

6. Pyrometry

Definition, classification of pyrometers, Deniel's pyrometer, seger cones - classification of cones, Behaviour of cones etc. Thermo electric pyrometers - general principle, Material used for thermal junction - chromel - Alomel, Platinum - Rhodium etc., Indicators, recorders, Advantage of thermo electric method of measuring temperature. Optical pyrometers: General Principle, Lien's law of Ferry's optical pyrometer, Le -Chateleir's optical pyrometer, colour extinction pyrometer. Resistance Pyrometers, Radiation Pyrometers: Ferry's mirror pyrometer, Ferry's spiral radiation pyrometer, indicators for radiation pyrometers.

#### 4.6 ELEMENTS OF GEOLOGY

L T P  
3 1 2

##### RATIONALE:

The knowledge of geology is essential for the students of ceramic and glass engineering with related to the raw materials used in the industry. It will help them to understand the industrial map of industry in the country and sources of raw materials used in the industry.

##### A. TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	L	T	P
1.	Chapter I	15	5	-
2.	Chapter II	12	4	-
3.	Chapter III	15	5	-
		42	14	28

1. Utility of geology specially for ceramic industries. Elementary and general idea of rocks and minerals, classification of rocks, industrial minerals. Occurrence of ceramic raw materials in India.

II Economic geology with reference to ceramic raw materials distribution of ceramic industry in India.

III Petrological microscope, study of physical and optical properties with special reference to the following minerals- Quartz, china clay, ball clay, felspar, mica, basalt, calcite, lime stone, gypsum, corundum.

##### GEOLOGY PRACTICALS

1. Identification of hand specimen of the following rocks and minerals-

Graphite, Basalt, Sand Stone, Kaolinite, Quartz, Felspar, Calcite, Baryte, Bauxite, Lime stone, Hematite, Magnetite and Magnesite.

2. Determination of specific gravity of minerals

3. Hardness test of minerals by Moh's scales.

4. Microscopic identification of minerals.

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4.7 INDUSTRIAL TRAINING  
(SEE ANNEXURE)

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## 4.8 ENERGY CONSERVATION

L T P  
3 - 2

### RATIONALE

The requirement of energy has increased manifold in last two decades due to rapid urbanization and growth in industrial/service sector. It has become a challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as an additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

### DETAILED CONTENTS

1. **Basics of Energy**
  - 1.1 Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.
  - 1.2 Global fuel reserve
  - 1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)
  - 1.4 Impact of energy usage on climate
2. **Energy Conservation and EC Act 2001**
  - 2.1 Introduction to energy management, energy conservation, energy efficiency and its need
  - 2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.
  - 2.3 Standards and Labeling
    - 2.3.1 Concept of star rating and its importance
    - 2.3.2 Types of product available for star rating
3. **Electrical Supply System and Motors**
  - 3.1 Types of electrical supply system
  - 3.2 Single line diagram
  - 3.3 Losses in electrical power distribution system
  - 3.4 Understanding Electricity Bill
    - 3.4.1 Transformers Tariff structure
    - 3.4.2 Components of power (kW, kVA and kVAR) and power factor, improvement of power factor
    - 3.4.3 Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)
  - 3.5 Transformers
    - 3.5.1 Introduction
    - 3.5.2 Losses in transformer
    - 3.5.3 Transformer Loading

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3.5.4 Tips for energy savings in transformers

3.6 Electric Motors

- 3.6.1 Types of motors
- 3.6.2 Losses in induction motors
- 3.6.3 Features and characteristics of energy efficient motors
- 3.6.4 Estimation of motor loading
- 3.6.5 Variation in efficiency and power factor with loading
- 3.6.6 Tips for energy savings in motors

**4. Energy Efficiency in Electrical Utilities**

4.1 Pumps

- 4.1.1 Introduction to pump and its applications
- 4.1.2 Efficient pumping system operation
- 4.1.3 Energy efficiency in agriculture pumps
- 4.1.4 Tips for energy saving in pumps

4.2 Compressed Air System

- 4.2.1 Types of air compressor and its applications
- 4.2.2 Leakage test
- 4.2.3 Energy saving opportunities in compressors.

4.3 Energy Conservation in HVAC and Refrigeration System

- 4.3.1 Introduction
- 4.3.2 Concept of Energy Efficiency Ratio (EER)
- 4.3.3 Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

**5 Lighting and DG Systems**

5.1 Lighting Systems

- 5.1.1 Basic definitions- Lux, lumen and efficacy
- 5.1.2 Types of different lamps and their features
- 5.1.3 Energy efficient practices in lighting

5.2 DG Systems

- 5.2.1 Introduction
- 5.2.2 Energy efficiency opportunities in DG systems
- 5.2.3 Loading estimation

**6 Energy Efficiency in Thermal Utilities**

6.1 Thermal Basics

- 6.1.1 Types of fuels
- 6.1.2 Thermal energy
- 6.1.3 Energy content in fuels
- 6.1.4 Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)

6.2 Energy Conservation in boilers and furnaces

- 6.2.1 Introduction and types of boilers
- 6.2.2 Energy performance assessment of boilers
- 6.2.3 Concept of stoichiometric air and excess air for combustion
- 6.2.4 Energy conservation in boilers and furnaces
- 6.2.5 Do's and Don'ts for efficient use of boilers and furnaces

6.3 Cooling Towers

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- 6.3.1 Basic concept of cooling towers
- 6.3.2 Tips for energy savings in cooling towers

#### 6.4 Efficient Steam Utilization

### 7 Energy Conservation Building Code (ECBC)

- 7.1 ECBC and its salient features
- 7.2 Tips for energy savings in buildings
  - 7.2.1 New Buildings
  - 7.2.2 Existing Buildings

### 8 Waste Heat Recovery and Co-Generation

- 8.1 Concept, classification and benefits of waste heat recovery
- 8.2 Concept and types of co-generation system

### 9 General Energy Saving Tips

Energy saving tips in:

- 9.1 Lighting
- 9.2 Room Air Conditioner
- 9.3 Refrigerator
- 9.4 Water Heater
- 9.5 Computer
- 9.6 Fan, Heater, Blower and Washing Machine
- 9.7 Colour Television
- 9.8 Water Pump
- 9.9 Cooking
- 9.10 Transport

### 10 Energy Audit

- 10.1 Types and methodology
- 10.2 Energy audit instruments
- 10.3 Energy auditing reporting format

## PRACTICAL EXERCISES

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD ) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

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## 5.1 INTEGRATIVE COMMUNICATION

L	T	P
-	-	4

## TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Introduction to Personality Development	-	-	02
2.	Factors Influencing / Shaping Personality	-	-	02
3.	Self Awareness - 1	-	-	03
4.	Self Awareness - 2	-	-	02
5.	Self Awareness - 3	-	-	02
6.	Change Your Mind Set	-	-	02
7.	Interpersonal Relationship and Communication	-	-	03
8.	Non-Verbal communication Communication Skills	-	-	02
9 .	Communication Skills ACTIVITIES	-	-	06
10.	Body Language skills	-	-	03
11.	Leadership Traits & Skills	-	-	03
12.	Attitude	-	-	03
13.	Analyzing & Solving a Problem skills	-	-	02
14.	Time Management skills	-	-	03
15.	Stress Management Skills	-	-	02
16.	Interview Skills	-	-	04
17.	Conflict Motives	-	-	02
18.	Negotiation / Influencing Skills	-	-	02
19.	Sociability	-	-	03
20.	Importance of Group	-	-	03
21.	Values / Code of Ethics	-	-	02
		-	-	56

## PERSONALITY DEVELOPMENT

**1 Introduction to Personality Development**

AIM, Skills, Types of Skills, LIFE SKILLS VS OTHER SKILLS, Concept of Life Skills. Ten core Life Skills identified by

WHO

**2. Factors Influencing / Shaping Personality :**

Introduction, Physical and Social Factors Influencing / Shaping

Personality (Hereditary, Self-Development, Environment, Education, Life-situations ) Psychological AND Philosophical Factors Influencing / Shaping Personality ( Past Experiences, Dreams and Ambitions, Self-Image, Values)

**3. Self Awareness - 1**

DIMENSIONS OF SELF AWARENESS ( Self Realization, Self Knowledge or Self Exploration, Self Confidence, Self Talk, Self

Motivation, Self Esteem, Self Image, Self Control, Self Purpose, Individuality and Uniqueness, Personality, Values, Attitude, Character ), SELF REALIZATION AND SELF EXPLORATION

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THROUGH SWOT ANALYSIS AND JOHARI WINDOW,

4. **Self Awareness - 2**

SYMPATHY VS EMPATHY AND ALTRUISM,  
Importance of Empathizing with Others,

5. **Self Awareness - 3**

Self-Awareness through Activity, Body Image ( What is Body Image, What Decides our Body Image, What is Poor Body Image, What are the Harmful Effects of Poor Body Image ), Tackling Poor Body Image( Enhance Self-Esteem, Build Up Critical Thinking, Build up Positive Qualities, Understand Cultural Variation, Dispel Myths, Utilize Life Skills )

6. **Change Your Mind Set**

What is Mindset, HOW TO CHANGE YOUR MINDSET ( Get the Best Information Only, Make the best people your Role Model, Examine Your Current Beliefs, Shape Your Mindset with Vision and Goals, Find Your Voice, Protect Your Mindset, Let Go of Comparisons, Put An End To Perfectionism, Look At The Evidence, Redefine What Failure Means, Stop Worrying About What "People" Think)

**INTERPERSONAL SKILLS**

7. **Interpersonal Relationship and Communication**

INTERPERSONAL RELATIONSHIP , Forms of Interpersonal Relationship, Must Have in an Interpersonal Relationship, Interpersonal Relationship between a Man and a Woman ( Passion, Intimacy, Commitment), Relationship Between Friends, ROLE OF COMMUNICATION IN INTERPERSONAL RELATIONSHIP ( Take Care Of Your Tone And Pitch, Choice of Words is Important in Relationships, Interact Regularly, Be Polite, Try To Understand The Other Person's Point Of View As Well, Individuals Can Also Communicate Through Emails,

8. **NON-VERBAL COMMUNICATION Communication Skills**

Non-Verbal Communication,  
We Communicate with Our Eyes, Communication with Facial Expression, A Good Gesture, Appearance, Posture and Gait, Proximity and Touch ), IMPORTANCE OF LISTENING,  
Characteristics of Good and Effective Listener( Is Attentive,

Do

Not Assume, Listen for Feelings and Facts, Concentrate on the Other Speakers Kindly and Generously, Opportunities)

9. **Communication Skills ACTIVITIES -**

Activities in Making Collages, Making Advertisements, PPT Preparation &

Presentation, Speaking -Seminars, Group Discussions, Debates, Extempore Speeches, Listening to an audio clip and telling

its

gist, Answering a telephone call, Making enquiries, General

tips-

Pronunciation, Tone, Pitch, Pace, Volume, relevance, brief, simple Reading Newspaper, Magazines ( Current Affairs,

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Economic magazines, Technical magazines), How to read a report, article, Writing- Resume Writing, Writing joining report,  
Notice writing, Report making, Proposal writing, Advertisement,  
Notice for tender, Minutes writing, E-Mail writing, Listening News, Listening to audio clips. (Lecture, poetry, speech, songs),

#### **10. Body Language skills**

Introduction, What is Body Language , Body Language Parts, Personal Space Distances (Intimate Distance, Personal Distance, Social Distance, Public Distance), IMPORTANT BODY LANGUAGE SIGNS AND THEIR MEANING

#### **UNDERSTANDING OTHERS**

#### **11. Leadership Traits & Skills :**

Introduction, Important Leadership Traits (Alertness, Bearing, Courage, Decisiveness, Dependability, Endurance, Enthusiasm, Initiative, Integrity, Judgment, Justice, Knowledge, Loyalty, Sense of Humour), Other Useful traits (Truthfulness, Esprit-de-corps, Unselfishness, Humility and sympathy, Tact without loss of moral courage, Patience and a sense of urgency as appropriate, Selfconfidence, Maturity, Mental including emotional stability)

#### **12. Attitude**

Types of Attitude, Components of Attitudes (Cognitive Component, Affective Component, Behavioral Component ), Types of Attitudes (Positive Attitude, Negative Attitude, Neutral Attitude, Rebellious Attitude, Rational and Irrational Attitudes, Individual and Social Attitudes), Kinds of Attitude, ASSERTIVENESS, How to Develop Assertiveness (Experiment and Try New Things, Extend Your Social Circle, Learn to Make Decisions for Yourself, Indulge in Knowledge, Admire Yourself & Others), Negotiation (Be Sensitive to The Needs Others, Be Willing To Compromise, Develop Your Problem-Solving Skills, Learn to Welcome Conflict, Practice Patience, Increase Your Tolerance For Stress, Improve Your Listening Skills, Learn To Identify Bottom-Line Issues Quickly, Be Assertive, Not Aggressive)

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**13. Analyzing & Solving a Problem skills**

Critical Thinking, Creative Thinking, Decision Making, Goal Setting & Planning, Problem Solving

**14. Time Management skills**

Need of Time Management, TIME WASTERS (Telephone, Visitors , Paper work, Lack of Planning & Fire Fighting , Socializing , Indecision , TV , Procrastination ), PRINCIPLES

OF

TIME MANAGEMENT - Develop a Personal Sense of Time (Time Log , value of other people's time ), Identify Long-Term Goals ,

Concentrate on High Return Activities , Weekly & Daily Planning

(The Mechanics of Weekly Planning , Daily Planning ), Make the

Best Use of Your Best Time , Organize Office Work

(Controlling

Interruptions , Organizing Paper Work ), Manage Meetings, Delegate Effectively, Make Use of Committed Time, Manage Your Health,

**15. Stress Management Skills**

INTRODUCTION, Understanding Stress and its Impact, Expected Responses (Physical, Emotional, Behavioral), stress signals(thoughts, feelings, behaviors and physical), STRESS MANAGEMENT TECHNIQUES (Take Deep Breath, Talk It Out, Take A Break, Create a Quiet Place in Your Mind, Pay

Attention

to Physical Comfort, Move, Take Care of Your Body, Laugh, Manage Your Time, Know Your Limits, Do You Have To Be Right Always, Have A Good Cry, Look for the Good Things Around You, Talk Less, Listen More), UNDERSTANDING EMOTIONS AND FEELINGS-through Activity

**16. Interview Skills ( 2 sessions from Industry Expert is Compulsory)**

Curriculum Vitae (When Should a CV be Used, What Information Should a CV Include, personal profile, Covering Letter, What Makes a Good CV, How Long Should a CV Be, Tips on Presentation), Different Types of CV (Chronological, Skills-Based ), BEFORE THE INTERVIEW , CONDUCTING YOURSELF DURING THE INTERVIEW , FOLLOWING THROUGH AFTER THE INTERVIEW , Interview Questions To Think About , MOCK INTERVIEW - Activity (MOCK INTERVIEW EVALUATION - NON-VERBAL BEHAVIORS, VERBAL BEHAVIORS, General Etiquettes to face the Board , Telephonic interview

**17. Conflict Motives -Resolution**

Motives of Conflict( Competition for Limited Resources, The Generation Gap and Personality Clashes, Aggressive Personalities, Culturally Diverse Teams, Competing Work and Family Demands, Gender Based Harassment), Merits and

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Demerits of Conflict , Levels of Conflict (Interpersonal Conflict, Role Conflict, Inter-group Conflict, Multi-Party Conflict, International Conflict ), Methods of Conflict Resolution (The Win-Lose Approach, The Lose-Lose Strategy, The Win-Win Approach), Techniques for Resolving Conflicts (Confrontation and Problem Solving Leading to Win-Win, Disarm the Opposition, Cognitive Restructuring, Appeal to Third Party, The Grievance Procedure)

#### **18. Negotiation / Influencing Skills**

Why Influencing, What Is Influencing, TYPES OF INFLUENCING SKILLS (Probing And Listening, Building Rapport, Sign Posting, Pacing, Selling, Assertiveness), LAWS AND PRINCIPLES OF INFLUENCE, The Six Laws of Influence (The Law of Scarcity, The Law of Reciprocity, The Law of Authority, The Law of Liking, The Law of Social Proof, The Law of Commitment and Consistency), Influencing Principles (Making a Start, Buy Yourself Thinking Time, Dealing With Disagreement, Difficult And Sensitive Situations)

#### **19. Sociability : Etiquettes And Mannerism & Social Skills**

Need for Etiquette , Types of Etiquettes (Social Etiquette, Bathroom Etiquette, Corporate Etiquette, Wedding Etiquette, Meeting Etiquette, Telephone Etiquette, Eating Etiquette, Business Etiquette, E-Mail Etiquettes, ), MANNERISMS, HOW TO IMPROVE YOUR SOCIAL SKILLS (Be Yourself, Be Responsible, Be Open & Approachable, Be Attentive, Be Polite, Be Aware, Be Cautious)

#### **20. Importance of Group / Cross Cultural Teams / Team Work skills**

Introduction, Types and Characteristics of Groups (Definition of a Group, Classification / Types of Groups, Friendship Group, Task Group, Formal Groups, Informal Group, Effective Group), Importance of a Group, Characteristics of a Mature Group, TYPES AND CHARACTERISTICS OF A TEAM ( Definition of a Team, Types of Teams, Functional Teams, Problem Solving Teams, Cross - Functional Teams, Self - Managed Teams), Importance of a Team, Characteristics of a Team

#### **21. VALUES / CODE OF ETHICS**

Meaning, A FEW IMPORTANT VALUES (Honesty, Integrity, Purity, Discipline, Selflessness, Loyalty, Fairness, Equality, Trust, Support, Respect, etc)

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Note : One Orientation module for the faculty is must.  
Involvement of Industry Experts is necessary for  
Interview Skills

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5.2 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

**L T P**  
**6 2 -**

**RATIONALE**

The knowledge of this subject is required for all engineers/technicians who wish to choose industry/field as their career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about industrial and tax laws.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Principles of Management	8	-	-
2.	Human Resource Development	10	-	-
3.	Wages and Incentives	4	-	-
4.	Human and Industrial Relations	6	-	-
5.	Professional Ethics	2	-	-
6.	Sales and Marketing management	10	-	-
7.	Labour Legislation Act	10	-	-
8.	Material Management	8	-	-
9.	Financial Management	8	-	-
10.	Entrepreneurship Development	8	-	-
11.	Fundamental of Economics	5	-	-
12.	Accidents and Safety	5	-	-
		84	-	-

**DETAILED CONTENTS**

1. **Principles of Management**
  - 1.1 Management, Different Functions: Planning, Organising, Leading, Controlling.
  - 1.2 Organizational Structure, Types, Functions of different departments.
  - 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment.
  - 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work.
2. **Human Resource Development**
  - 2.1 Introduction, objectives and functions of human resource development (HRD) department.
  - 2.2 Recruitment, methods of selection, training strategies and career development.
  - 2.3 Responsibilities of human resource management - policies and functions, selection - Mode of selection - Procedure - training of workers, Job evaluation and Merit rating.
3. **Wages and Incentives**
  - 3.1 Definition and factors affecting wages, methods of wage payment.
  - 3.2 Wage incentive - type of incentive, difference in wage, incentive and bonus; incentives of supervisor.

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- 3.3 Job evaluation and merit rating.
- 4. **Human and Industrial Relations**
  - 4.1 Industrial relations and disputes.
  - 4.2 Relations with subordinates, peers and superiors.
  - 4.3 Characteristics of group behaviour and trade unionism.
  - 4.4 Mob psychology.
  - 4.5 Grievance, Handling of grievances.
  - 4.6 Agitations, strikes, Lockouts, Picketing and Gherao.
  - 4.7 Labour welfare schemes.
  - 4.8 Workers' participation in management.
- 5. **Professional Ethics**
  - 5.1 Concept of professional ethics.
  - 5.2 Need for code of professional ethics.
  - 5.3 Professional bodies and their role.
- 6. **Sales and Marketing management**
  - 6.1 Functions and duties of sales department.
  - 6.2 Sales forecasting, sales promotion, advertisement and after sale services.
  - 6.3 Concept of marketing.
  - 6.4 Problems of marketing.
  - 6.5 Pricing policy, break even analysis.
  - 6.6 Distribution channels and methods of marketing.
- 7. **Labour Legislation Act (as amended on date)**
  - 7.1 Factory Act 1948.
  - 7.2 Workmen's Compensation Act 1923.
  - 7.3 Apprentices Act 1961.
  - 7.4 PF Act, ESI Act.
  - 7.5 Industrial Dispute Act 1947.
  - 7.6 Employers State Insurance Act 1948.
  - 7.7 Payment of Wages Act, 1936.
  - 7.8 Intellectual Property Rights Act
- 8. **Material Management**
  - 8.1 Inventory control models.
  - 8.2 ABC Analysis, Safety stock, Economic ordering quantity.
  - 8.3 Stores equipment, Stores records, purchasing procedures, Bin card, Cardex.
  - 8.4 Material handling techniques.
- 9. **Financial Management**
  - 9.1 Importance of ledger and cash book.
  - 9.2 Profit and loss Account, Balance sheet.
  - 9.3 Interpretation of Statements, Project financing, Project appraisal, return on investments.
- 10. **Entrepreneurship Development**
  - 10.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.
  - 10.2 Distinction between an entrepreneur and a manager.
  - 10.3 Project identification and selection.
  - 10.4 Project formulation.
  - 10.5 Project appraisal.
  - 10.6 Facilities and incentives to an entrepreneur.
- 11. **Fundamental of Economics**

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- 11.1 Micro economics.
- 11.2 Macro economics.
- 12. **Accidents and Safety**
  - 12.1 Classification of accidents based on nature of injuries, event and place.
  - 12.2 Causes and effects of accidents.
  - 12.3 Accident-prone workers.
  - 12.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.
  - 12.5 Safety consciousness and publicity.
  - 12.6 Safety procedures.
  - 12.7 Safety measures - Do's and Don'ts and god housing keeping.

5.3 POTTERY AND PORCELAIN-I

L T P  
5 - -

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL. NO.	TOPIC	L	T	P
1.	Chapter I	12		
2.	Chapter II	12		
3.	Chapter III	12		
4.	Chapter IV	9		
5.	Chapter V	10		
6.	Chapter VI	2		
7.	Chapter VII	3		
8.	Chapter VIII	4		
9.	Chapter IX	6		
TOTAL		70	-	-

B. SYLLABUS:

NOTE: Recapitulation of main topics from II year.

- I. A study of the various ceramic fabrication process (for manufacture of bodies).
- II. A detailed study of the manufacture of floor and wall tiles, sanitary ware, table ware, parian art ware, semi-vitreous bone china, chemical stone ware, chemical porcelain, refractory porcelain.
- III. High and low tension insulators : High voltage low frequency application Procilain Insulator, Low voltage high frequency application, Steatile, Magnusium titanate, co-ordierite, Porcelain.
- IV. Ceramic glazes - Diffrent types of glazes, their composition preparation and application.
- V. Ceramic Stains - Their composition, preparation, application & use.  
Decoration with stains.
- VI. Ceramic Transfer - Their preparation, application and firing.
- VII. Lithography :
  - (A) Lithium Compunds

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- (B) Prepare and Design For making Lithograph transfer.
- VIII. Machenisation in pottery works - Introduction to simple hand tools, equipments & Machines.
- IX. Quality Control & Testing
- A. Green and dry properties of body mixes such as shrinkage, bulk density, strength.
  - B. Fired charactertics such as fired shrinkage, fired strength (MOR and Compressive strength), water absorption, apparent porosity, bulk density, fired colour at different temperatures.
  - C. Pressing effect on the fired and green bodies.
  - D. Thermal expansion of body and slage.
  - E. Testing - Physical testing : thermal behaviour, MOR, Porosity, Density, Craging, etc.

5.4 REFRACTORY TECHNOLOGY

L T P  
5 - -

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO	TOPIC	L	T	P
1.	Chapter I	9		
2.	Chapter II	9		
3.	Chapter III	9		
4.	Chapter IV	9		
5.	Chapter V	9		
6.	Chapter VI	5		
7.	Chapter VII	5		
8.	Chapter VIII	5		
9.	Chapter IX	10		
TOTAL		70	-	-

B. SYLLABUS:

NOTE: Recapitulation of main topics from II year.

- I. Manufacture of :  
Silica, Alumino silicate, alumina, Magnesite, Dolomite, Kyanite, Sillimanite, chrome and chrome-magnesite, insulation refractories & carbon refractories. Super refractories, Refractory castables, Synthetic raw materials, Cordierite refractory, Monolithic, Cordierite Milline Refectory
- II. Properties :
  - a. Physical : Porosity, bulk density, permeability, cold crushing strength, modulus of rupture, abrasion.
  - b. Thermal : Pyrometric Cone Equivalent (PCE), expansion, thermal conductivity.
  - c. Mechanical : Cold crushing strength
  - d. Thermal Mechanical: Refractoriness under load (RUL). Hot modulus of rupture (MOR), Hot crushing strength.
  - e. Thermochemical - corrosion.
- III. Refractoriness : Refractoriness under load, role of vitrification, change in volume sensitiveness to sudden change in temperature, crushing strength, porosity-apparant porosity, specific gravity, permeability, resistance to corrosion and abrasion. Resistance to weather and frost conductivity.

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- IV. Application of Refractories : Blast furnace, basic and acid open hearth furnace and bessemer converters, electric furnace for steel melting. Refractories in aluminium furnace, Nozzle, Stoppers and Sleeves.
- V. Testing and Quality control of refractory articles : Chemical analysis micropetrological examination.
- VI. Crucibles, Muffles, Saggars adn Glass Pots.
- VII. Refractory cement and Mortars
- VIII. Monolithic Refractries - Castables, Plastic masses, Ramming, Gunning, Spraying, Patching Masses.

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5.5 GLASS TECHNOLOGY-I

L T P  
5 - -

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Chapter I	6		
2.	Chapter II	6		
3.	Chapter III	8		
4.	Chapter IV	8		
5.	Chapter V	6		
6.	Chapter VI	9		
7.	Chapter VII	9		
8.	Chapter VIII	9		
9.	Chapter IX	9		
TOTAL		70	-	-

B. SYLLABUS:

NOTE: Recapitulation of main topics from II year.

- I. Storage of raw materials, batch house, melting furnace, fabrication-machines, annealing lehr, sorting and packaging section, ware house.
- II. Properties of glass : Origin of thermal stresses, generation and release of stresses, strain viewer. Chemical durability of glass measurement of chemical durability by A.S.T.M & I.S.I Method, effect of glass composition and its significance in glass processes & its measurements.
- III. Viscosity, variation with temperature and composition, transformation range.
- IV. Defects in glass, their causes and remedies. Types of defects : Cords, Blister, Seeds and Bad colours, etc.
- V. Colouring and Decolourising : Theory and agent
- VI. Refining: Refining mechanism, refining agents, factors affecting refining.
- VII. Manufacture of glass bottles and other hollow wares by fully automatic machine.
- VIII. Manufacture of sheet, plate and rolled glass, toughened glass, laminated safety glass.
- IX. Optical Glass- Composition, manufacture of optical glass,

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quality control measures.

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5.6 MODERN CERAMICS & ITS APPLICATIONS

L T P  
6 - -

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Chapter I	15		
2.	Chapter II	15		
3.	Chapter III	15		
4.	Chapter IV	15		
5.	Chapter V	12		
6.	Chapter VI	12		
TOTAL		84	-	-

B. SYLLABUS:

- I. Introduction To Low loss ceramics: The importance of low dielectric losses in high frequency work, steatite and cordierite bodies and their composition, manufacturing methods, properties and uses.
- II. Introduction To High permittivity ceramics: Electrical condensers, advantage of ceramic condensers, rutile bodies, Titanates ceramics. Ferro electric and Piezo electric ceramics
- III. Introduction To Magnetic ceramics: Soft spinel ferrites and hard hexagonal ferrites.
- IV. Special Ceramics: High temperature ceramics, Berillia, Magnesia, alumina and zirconia.
- V. Recent developments in the field of ceramics (lectures to be delivered by eminent ceramic engineers) in kilns, materials, energy efficiency. Elementary idea of non-oxide ceramic and fuel cells.
- VI. Ceramic raw materials, Chemical analysis and Physical Testing, Investigations of Clay firing properties, Glaze and Process control.

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5.7 POTTERY & REFRACTORY LAB

L T P  
- - 10

(A) POTTERY PRACTICALS:

1. Shaping of pottery wares by different processes e.g. throwing. Jigger & Jolleying, pressing and slip castings etc.
2. Preparation of different types of glazes and strains.
3. Preparation of different types of colours and strains.
4. Decoration of wares e.g. glazing, printing, painting spraying etc.
5. Drying finishing and firing of pottery wares and furnace control.
6. To prepare verification curve of a ceramic body mixture.

(B) REFRACTORY PRACTICALS :

1. Shaping of refractories by :
  - a. Slip casting
  - b. Extrusion
  - c. Pressing
2. Firing of refractory sample at different temperature and determination of its fired properties (B.D., Shrinkage, Applied Porosity, Warpage, MOR, Thermal expansion).

5.8 GLASS & CERAMIC WORKSHOP PRACTICE

L T P  
- - 9

(A) GLASS PRACTICALS :

1. Compounding of glass batches.
2. Melting of special glasses, ruby glass, opaque glass, aventury glasses such as chromium, copper.
3. Grinding, polishing and powering of lenses.
4. Decoration of Glass by different processes such as screen painting, spraying, brush painting.

(B) ENAMEL PRACTICALS:

1. Compounding of different enamel batches.
2. Printing and Milling.
3. Cleaning and pickling of metal sheets.
4. Application and fusion of enamels on cast iron, steel and coppers.
5. Stencil cutting.
6. Decoration.
7. Furnace control.

(C) CEMENT PRACTICALS :

1. Setting time test of cements.
  - a. Initial setting
  - b. final setting
2. C.C.S.
3. Tensile strength
4. Workability

5.9 INDUSTRIAL TRAINING (4 WEEKS)

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VI SEMESTER

6.1 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

L T P  
4 - -

RATIONALE:

A diploma student must have the knowledge of different types of pollution caused due to industrialisation and construction activities, so as he may help in balancing of eco-system and control pollution by providing controlling measures. They should be also aware of the environmental laws for effectively controlling the pollution of environment. The topics are to be taught in light of legislation Para-3.

TOPIC WISE DISTRIBUTION OF PERIODS:

SL. NO.	TOPIC	L	T	P
1.	Introduction	6		
2.	Pollution	4		
2.1	Water Pollution	8		
2.2	Air Pollution	8		
2.3	Noise Pollution	4		
2.4	Radio Active Pollution	6		
2.5	Solid Waste Management	6		
3.	Legislations	4		
4.	Environmental Impact Assessment	4		
5.	Disaster Management	6		
TOTAL		56	-	-

DETAILED CONTENTS

1. INTRODUCTION :

- Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on ecology and eco system, Mining and deforestation and their effects.
- Lowering of water level , Urbanization.
- Biodegradation and Biodegradability, composting, bio remediation, Microbes .Use of biopesticides and biofungicides.
- Global warning concerns, Ozone layer depletion, Green house effect, Acid rain,etc.

2. POLLUTION :

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Sources of pollution, natural and man made, their effects on living environments and related legislation.

#### 2.1 WATER POLLUTION :

- Factors contributing water pollution and their effect.
- Domestic waste water and industrial waste water. Heavy metals, microbes and leaching metal.
- Physical, Chemical and Biological Characteristics of waste water.
- Indian Standards for quality of drinking water.
- Indian Standards for quality of treated waste water.
- Treatment methods of effluent (domestic waste water and industrial/ mining waste water), its reuse/safe disposal.

#### 2.2 AIR POLLUTION :

Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, CO, CO<sub>2</sub>, NH<sub>3</sub>, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.
  - A. Settling chambers
  - B. Cyclones
  - C. Scrubbers (Dry and Wet)
  - D. Multi Clones
  - E. Electro Static Precipitations
  - F. Bog Fillers.
- Ambient air quality measurement and their standards.
- Process and domestic emission control
- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.

#### 2.3 NOISE POLLUTION :

Sources of noise pollution, its effect and control.

#### 2.4 RADISACTIVE POLLUTION :

Sources and its effect on human, animal, plant and material, means to control and preventive measures.

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2.5 SOLID WASTE MANAGEMENT :

Municipal solid waste, Biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATION :

Preliminary knowledge of the following Acts and rules made thereunder-

- The Water (Prevention and Control of Pollution) Act - 1974.
- The Air (Prevention and Control of Pollution) Act - 1981.
- The Environmental Protection (Prevention and Control of Pollution) Act -1986. Rules notified under EP Act - 1986 Viz.
  - # The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000
  - # The Hazardous Wastes (Management and Handling ) Amendment Rules, 2003.
  - # Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
  - # The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002.
  - # Municipal Solid Wastes (Management and Handling) Rules, 2000.
  - # The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003.

4. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) :

- Basic concepts, objective and methodology of EIA.
- Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

5. DISASTER MANAGEMENT :

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State

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Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan.

Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

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## 6.2 CEMENT AND LIME

L	T	P
6	-	-

## A. TOPICWISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Chapter I	3		
2.	Chapter II	3		
3.	Chapter III	3		
4.	Chapter IV	3		
5.	Chapter V	3		
6.	Chapter VI	3		
7.	Chapter VII	6		
8.	Chapter VIII	6		
9.	Chapter IX	12		
10.	Chapter X	18		
11.	Chapter XI	12		
12.	Chapter XII	12		
TOTAL		84	-	-

## B. SYLLABUS:

## LIME.

- I. Origin of lime stones.
- II. Varieties of lime stones, chemical composition of lime stone.
- III. Burning of lime stone.
- IV. Type of lime kilns.
- V. Composition of commercial limes, lime slaking.
- VI. Effect of the presence of magnesia and use of lime mortar.
- VII. Preparation of hydrated lime, grinding the quick lime, mixing with water.
- VIII. Test of hydrated lime.
- IX. Building limes, classification of building lime, hydraulic and fat lime, lime saturation factor and lime standards.

## CEMENT:

- X. Chemistry of anhydrous and hydrated cement compounds. The constitution of portland cement. Method of manufacture of port land cement, and testing. Action of acid and sulphate water on port land cement, the physical and chemical properties of port land cement, defects causes and remedies.
- XI. Different types of cements, e.g. quick setting cement, pozzolanas and pozzolanic cement, high alumina cement, water proof cement, oil well cement, hydrophobic cement, masonry cement, white cement, coloured cement, rapid hardening cement, castable refractories, low and ultra low cement castables.  
Additives - accelerators, retarders, waterproofers, pigments, dispersing agents.
- XII. Testing of Cement : Consistency of cement, Initial and final setting of cement, Expansion of cement, Compressive and

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tensile strength, Particle of cement, Impurities in cement,  
Specific gravity of cement, Chemical analysis of cement

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6.3 CERAMIC MACHINERY & FURNACE DESIGN

L T P  
6 - -

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Chapter I	12		
2.	Chapter II	15		
3.	Chapter III	4		
4.	Chapter IV	12		
5.	Chapter V	12		
6.	Chapter VI	12		
7.	Chapter VII	5		
8.	Chapter VIII	12		
TOTAL		84	-	-

B. SYLLABUS:

- I. Plant design, plant location, layout of the factory building, selection, operation and maintenance of ceramic machinery and equipment (for pottery, refractory, glass, enamel and cement).
- II. Furnace Design: study of common types of furnaces in use in ceramic industries i.e. glass melting tank furnaces including unit melters, tunnel kiln, chamber kiln and down draft kiln, rotary cement kiln, muffle kiln and annealing lehrs. Environment friendly gas fired Kiln for glass beads making.
- III. Chimney and chimney calculation.
- IV. Essential operations of a furnace i.e. firing, charging, melting and reversal etc.
- V. Preheating of air, gas, fuel and oil, Flame-system, preheating of batch.
- VI. Furnace life and selection of refractories, Heating up and cooling down of a furnace. Combustion calculation, Solid and Liquid Fuel, gaseous Mixture.
- VII. Furnace capacity, fuel efficiency and firing efficiency.
- VIII. Elementary idea of design, construction and thermal calculation of at least one of the above mentioned furnaces.

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6.4 GLASS & CERAMIC ENGINEERING DRAWING-II

L T P  
- - 8

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Unit I (12 Plates)			75
2.	Unit II (4 Plates)			25
3.	Unit III (1 Plate)			12
TOTAL				112

B. SYLLABUS

I. Sectional views of the following ceramic machinery  
(Assembly and disassembly where possible)

- |                        |   |
|------------------------|---|
| 1. Ballmill, Tube Mill | 2. Edge runner mill                             |
| 3. Jaw crusher         | 4. Plunger                                      |
| 5. Filter press        | 6. Vibrating screen                             |
| 7. Sieve shaker        | 8. Muffle furnace                               |
| 9. Jigger jolley       | 10. Down draft furnace                          |
| 11. Hand press         | 12. Pugmill                                     |
| 13. Pc furnace         | 14. Glass melting furnace, Tank and Pot Furnace |
| 15. Frit furnace       | 16. Chimneys for glass and pottery furnace      |
| 17. Rotary Kiln        |   |

II. Layouts of ceramic plant:

- a. Pottery
- b. Refractory
- c. Glass
- d. Enamel
- e. Cement

III. Dimensioned drawing of Insulator.

ELECTIVE

6.5 I. GLASS TECHNOLOGY-II

L T P  
6 - -

TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Topic 1	10	-	-
2.	Topic 2	15	-	-
3.	Topic 3	15	-	-
4.	Topic 4	12	-	-
5.	Topic 5	10	-	-
6.	Topic 6	10	-	-
7.	Topic 7	12	-	-
TOTAL		84	-	-

1. GLASS CERAMICS :

Introduction on Nucleation and crystallization in glasses, Controlled heat treatment for crystallization, Ultra low thermal expansion glass ceramics, Machinable glass ceramics.

2. ORNAMENTAL GLASS:

Raw materials of ornamental glass i.e. Soda Lime, Silica Glass, Borosilicate Glass. Types of ornamental products i.e. Glass beads, Glass Pendants, Different techniques of decoration i.e. Silvering, Fuming, Lustering, Feathering, Dating, Banding, Dichroic, Millefiori, Different techniques of glass beads making. History of glass beads making. Tools and apparatuses for glass beads making.

3. FLOAT GLASS :

Theory of float process, construction of float tank, Control of glass ribbon thickness.

4. OPTHELMIC GLASSES :

Refractive and dispersion in glass, Design of glass lens.

5. GLASS AND REFECTORY TECHNOLOGY :

Different types of refractories used in glass industry, Properties, Behaviour, Conditions in the different zones of glass. Melting furnace and selection of refractory accordingly.

6. GLASS DECORATION :

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Different methods of decoration- Cutting and polishing, Sand blasting, Engraving, Screen printing, Hand painting and Stained glasses.

6. GRAIN SIZE DETERMINATION :  
Size grading and its determination by different metal

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## 6.5 II. POTTERY &amp; PORCELAIN-II

L T P  
6 - -

## TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Topic 1	15	-	-
2.	Topic 2	15	-	-
3.	Topic 3	10	-	-
4.	Topic 4	10	-	-
5.	Topic 5	10	-	-
6.	Topic 6	10	-	-
7.	Topic 7	9	-	-
8.	Topic 8	5	-	-
TOTAL		84	-	-

1. Raw material for whitewares. Thermal effect, high temperature reactions in raw materials and their chemical change. Properties effect on ceramic whitewares, Texture and other physical properties. Influence of size and shape of particles. Particles size of ceramic materials and their determination. Changes in volume factors which influence the change. Defects in whiteware bodies caused by thermal expansion effects. Factors which influence changes in porosity and water absorption. Factors involved in the strength of whiteware bodies. Factor affecting colour. Processing of the grain growth. sintering and vitrification. Microstructure of whitewares.
2. Triaxial and other whitewares and compositions with their calculations.
3. Mechanism of firing and control : Modern trends in firing of whitewares.
4. Strength of porcelain insulators. Factors effecting breakdown of high and low voltage insulators.
5. Whitewares bodies : bone china, chemical procelain, sanitary wares, electrical procelain manufacture, properties and uses.
6. Ceramic glazes and their properties and uses.
7. Ceramic colours and decoration.
8. Recent development and control techniques ad applied to the whitewares processes- Kilns, Roller Head Jigger, Digital Printing.

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6.6 SILICATE ANALYSIS LAB

L T P  
- - 8

- i. Determination of purity of chemicals used in Ceramic industry.
- ii. Analysis of ceramic raw materials and glass raw materials such as lime, glass-sand, felspar, clay and quartz.
- iii. Colorimetric estimation of iron in China clay, glass sand and quartz.
- iv. Analysis of Soda-lime glass.
- v. Determination of alkali by conventional method and by flame photometer.

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6.7 PHYSICAL TESTING LAB

L T P  
- - 8

(A) POTTERY:

1. Particle size determination of ceramic raw materials by sedimentation e.g. Anderencen pipette, sedimentation balance.
2. Strength of green and fired bodies.
3. pH-measurement of casting slip.
4. Viscosity of slurry.
5. Thickness of weight, per unit area of glaze applied.
6. P.C.E. test for clays.

(B) REFRACTORY :

7. P.C.E. test for refractories.
8. Refractoriness under load test.
9. Spalling test. (upto 1000 C.)
10. Thermal expansion test (upto 1000 C.)
11. Thermal conductivity (upto 1000 C.)
12. Slag or glass resistance test (corrosion test)
13. Permanent linear change.
14. Permeability test.
15. Cold crushing strength.
16. Packing Density
17. Grading of Grog
18. Warpage of Refractory Slab

(C) GLASS :

19. Softening point by Littinton methods.
20. Low temperature viscosity.
21. Chemical durability by
  - a. I.S.I. method
  - b. ASTM Method
22. Thermal expansion test upto 1000 C.
23. Thermal Shock test
24. Annealing test by strain viewer.
25. Wall thickness test
26. Light absorption of coloured glass at different wave length by spectro photometer.

(D) ENAMEL:

28. Fusion test.
29. Alkali Resistance Test
30. Acid Resistance Test
31. Impact Resistance Test
32. Water Resistance Test
33. Metal Gauge and Dimension

(E) FUEL AND PYROMETRY :

34. Proximate analysis of coal.
35. Gas analysis.

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36. Viscosity of fuel oil.
37. Flash point of fuel oil.
38. sulphur determination of coal.
39. Study of different types of pyrometers and Thermocouples.
40. Calorific value of coal by Bomb calorimeter.

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## 6.8 PROJECT

L T P  
- - 2

In the final year of the course, student can be divided in groups of 3 to 5 to take up a project for setting up a small scale industry to produce glass wares, white wares, electrical insulating items, refractory bricks etc.

The project report will include selection of site, market survey, list of equipments & machinery, raw materials, power, human resources, and investment involved. These things be rationally determined by the basis of actual data collected during survey. They are expected to visit existing industry for the purpose.

The project will also clearly mention amount of raw material wanted for 3 months working and yearly turn over and expected profit.

Prepare at least a few samples of the product, intended for manufacture, at institute level for producing before the examiner.

The project should have a table of the results of test and quality control of the product.

There should be a brief consideration of environment pollution due to this unit and measures to achieve & maintain the minimum permissible level of pollution.

The project will be evaluated by an external examiner for 120 marks whose breakup is as follows:

Presentation on given project in 10 - 15 slides

- |   |   |          |
|---|---|----------|
| (i) Documentation of the project report | - | 30 marks |
| (ii) Viva Voce                          | - | 50 marks |
| (iii) Sessional                         | - | 40 marks |

## 6.9 INDUSTRIAL TOUR

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DIPLOMA IN GLASS & CERAMIC ENGINEERING  
STAFF STRUCTURE

Intake of the course	60
Pattern of the course	3yrs(Six Semester)
1. Principal	1
2. H.O.D.	1
3. Lecturer Ceramic.Engg.	6
4. Lecturer Maths	1   Part time or
5. Lecturer Physics	1   common with
6. Lecturer Chemistry	1   other discipline
7. Lecturer Language	1   if the intake is
8. Lecturer Computer	1   more than 180.
9. Steno typist	1
10. Accountant/Cashier	1
11. Student/Library Clerk	1
12. Store Keeper	1
13. Class IV	6
14. Sweeper	Part time as per requirement.

The posts of Choukidar and Mali will be sanctioned according to the justification of institution. Services for existing staff in other disciplines of the institute may be utilised if possible.

The posts at serial number 4,5,6,7,8,9,10 and 11 are minimum common staff in the institute.

The qualifications of the staff will be as given in the service rules.

SPACE REQUIREMENT

A. Total Land Area	No	M2
B. Administrative Block		
1. Principals Room	1	30
2. Steno Room	1	6
3. Confidential Room	1	10
4. Office room	1	80
5. Library (Common with other disciplines)	1	150
6. Common Room	1	80
7. Class Rooms	2	150
8. Store	1	100
9. Model Room	1	90
C. Laboratories/Workshops		
1. Computer Lab	1	30
2. Applied mechanics Lab	1	60
3. Drawing Hall	1	120
4. Ceramic Engg.Lab.	1	120
5. Ceramic Lab	1	120
6. Modelling & Moulding Lab.	1	120
7. Silicate Analysis Lab	1	60
Note: Labs of physics, Chemistry and computer science will be common for all disciplines in the institute.		
D. Common Facilities		
1. Dispensary	1	40
2. Canteen & Tuck shop	1	50
3. Parking space/cycle stand with Garrage	1	200% student 50% student
4. N.C.C. Block	1	70
5. Guest Room	1	30
E. Residential Facilities		
1. Hostel for Students	1	for 40% student
2. Staff Quarters		
Principle	1	Type IV
HOD/Warden	2	Type IV
Sr. Lect./Lect.	2	Type IV
Technical/Ministerial staff	2	Type II
Class IV	6	Type I
3. Play Ground	1	

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LIST OF EQUIPMENTS

Only those of the equipments given below which are essentially required for the conduction of practicals mentioned in the curriculum are to be procured by the institutions.

"Machine/Equipments/Instruments of old BTE list which are not included below are to be retained in the Lab/Shop for Demonstration purpose but not to be demanded fresh for purchase."

NOTE : Equipment for different shop and lab of latest version should be purchased.

I. APPLIED PHYSICS LAB

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
1.	Brass ball with hook dia 1.8 Cm to 2 Cm diameter	2	50	100
2.	Stop watch least count Least Count 0.1 Sec. (non-magnetic) 0.01 sec to 0.001 sec (Electronic Desirable)	4	750	3000
3.	Wall bracket with clamping arrangement 8" to 10" length	2	50	100
4.	Meter scale Least count 0.1cm, wooden 1meter	5	40	200
5.	Meter scale Least count 0.1cm, wooden 50 Cm	5	40	200
6.	Searl's conductivity apparatus with copper & steel rods 25 cm length 4 cm. diameter with all accessories	2 set	1500	3000
7.	Constant Level Water Flow Container of one liter capacity vertical stand & rubber tubing	2	250	500
8.	Thermometer 0-110°C (Least count 0.1°C desirable)	4	100	400
9.	Potentiometer - 10 wires (1 meter length of each wire) with jockey, sunmoical top	4	750	3000
10.	Moving coil galvanometer 30-0-30 with moving mounting	5	300	1500
11.	Rheostat 50 ohm., 100 Ohm., 150 Ohm. 16 capacity	16	300	4800
12.	Lead Accumulator 2V, 6V (1 No. Each)	2	250	500
13.	Meterbridge 1 meter length, sunmica top copper strips fitted with scale	2	300	600
14.	Resistance Coil (Standard) 1 ohm. to 10 ohm.	10	50	500
15.	Moving coil ammeter 0-1 amp., 0-2 amp., 0-5 amp. with mounting	8	250	2000
16.	Moving coil voltmeter 0-1 V., 0-2V 0-5 V., 0-10 V. with mounting	8	250	2000
17.	Denial cell with complete accessories	2	250	500

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S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
18.	Leclanche Cell with complete accessories	2	250	500
19.	Standard Cadmium Cell with complete accessories	2	250	500
20.	Battery Charger with complete accessories	1set	1800	1800
21.	Battery Eliminator Multi range	2set	750	1500
22.	Multimeter(Digital)	1set	800	800
23.	Carey Foster Bridge (With all accessories)	2set	4500	9000
24.	Resistance Box (2 No. Each) 0-1 Ohm, 0-100 Ohm.	4	850	3400
25.	Fractional Resistance Box 0-1 Ohm.	2	1200	2400
26.	Post office box Key type	2	1200	2400
27.	Post office box Dial type	2	1200	2400
28.	Resistance Wire(100 Gm.) (Constanton/Maganin)	1 lacchi	100	100
29.	Connecting Wire Copper(1/2 Kg.) (Cotton Insulated)	1 lacchi	700	700
30.	Screw gauge L.c 1/100 mm	5set	150	750
31.	Vernier Callipers L.c. 1/10 mm	5set	100	500
32.	Appratus for determining character- stics of P-N junction diode complete with all accessories	2 set	1500	3000
33.	Resonance Column of steel One Meter length and 3-4 Cm diameter fitted with scale & water level arrangement	2	1600	3200
34.	App. for determining coefficient of friction on a horrizontal plane (Complete with all accessories)	2 set	700	1400
35.	Tuning Fork's Sets Set of different frequency (with rubber pad)	3set	350	1050
36.	Physical balance with weight box Complete with Fractional weight	2	800	1600
37.	Anemometer with counter cup type	1	1000	1000
38.	Spring Force Constant Apparatus with graduated mirror & pointer, weight set with hanger	2	1200	2400
39.	Viscosity Apparatus (Stock law) with steel balls and viscous liquid & timer	2set	1600	3200
40.	Thermometer of different range Mercury thermometer 0-50oC to 0-110oC	10set	100	1000
41.	Wall Thermometer Alcohol Filled 0-50oC	2set	20	40
42.	Sprit Level Technical Type	1set	60	60
43.	Drilling Machine Electric with different size bits	1set	800	800
44.	LPG Gas Burner with Cylinder	1set	800	800
45.	Tool Kit with different tools Complete	1set	800	800
46.	Lab stools	30		

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S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
47.	Lab tables	8		
48.	Plug Keys One Way	5	50	250
49.	Plug Keys Two Way	5	100	500
50	Helical Springs - Soft, 10 cm each	6	100	600

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II. APPLIED CHEMISTRY LAB

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
1.	Test tube stand (Plastic/Tafflon)	30	20	600
2.	Funnel stand (Plastic/Tafflon)	30	20	600
3.	Burette stand Stainless Steel/Wooden/Iron	30	50	1500
4.	Pipette stand Stainless Steel/Wooden/Plastic	30	20	600
5.	Chemical balances with analytical weights 1gm -200gms	5	1500	7500
6.	Fractional weights set with rider 10 mg to 500 mg with rider	5sets	25	125
7.	Kipp's apparatus 1000 ml. Plastic/ Tafflon	2	500	1000
8.	Reagents bottles			
	250ml	120	20	2400
	500ml	25	25	625
	1000ml	5	30	150
9.	Wide mouth bottle 250 ml Glass	50	15	750
10.	Winchester bottle 2.5 litre Plastic/Tafflon	15	30	450
11.	Test tubes 1/4" x 6"			
	i. Corning or Borosil	200	9	1800
	ii. Glass	200	2	400
12.	Boiling tube 1" x 6"			
	i. Corning or Borosil	100	16	1600
	ii. Glass	100	5	500
13.	Pestle and mortar Dia 10 cms 15 cms (Ceramics)	2	30	60
14.	Watch glass 5.0 cms, 7.5 cms glass	15	5	75
15.	Beakers (Glass/Brosil/Corning Plastic)			
	250 ml.	50	20	1000
	500 ml.	50	20	1000
16.	Weighing Tube 10 ml with lid (Plastic)	30	10	300
17.	Wash bottles (Plastic/Tafflon)	30	15	450
18.	Conical flask 250 ml. Glass (Brosil/Corning/Plastic) Transparnt	100	30	3000
19.	Flat bottom flask 500 ml. Glass	15	40	600
20.	Flat bottom flask 250 ml. Glass	15	25	375
21.	Burette 50 ml. (Plastic/Tafflon)	30	60	1800
22.	Pipette 25 ml. (Plastic/Tafflon)	30	20	600
23.	Measuring flask 250 ml. with stopper	30	50	1500
24.	Measring cylinder of various sizes (100 ml, 250 ml, 500 ml, 1000 ml) 3 no. of each	12	30	360
25.	Bunsen's burner of brass	30	50	1500
26.	Gas plant petrol/LPG 10 to 20 burners automatic	1	5000	5000
27.	Spirit lamp (Brass)	30	30	900
28.	Tripod stand (Steel/Iron) Large/Medium	30	30	900
29.	Wire gauge 15 X 15 cm. with asbestos	30	15	450
30.	Test tube holder wodden	50	10	500

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S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
31.	Porcelain plates Ceramic	30	20	600
32.	Funnel 15 cm. Glass Borosil Corning/Plastic	60	16	960
33.	Spatula hard & nickel/steel	2 each	50	100
34.	Distilled water units (electrical)	1	10000	10000
35.	Distilled water units (solar)	1	5000	5000
36.	Open balance 1000 gms./10 mg.	1	600	600
37.	Brush for cleaning Hydro Fiber Acid & Alkali Resistant	100	10	1000
38.	Jars 20 Lit. for keeping distilled water	5	100	500
39.	Lab table 2 m. x 1.2 m. x 1 m. hight with central sink and cup boards (Teak wood) with drawers and two built in almirah on each side with reagent racks, better tile top	4	8000	32000
40.	Exhaust fans 18" (GEC make/Crompton)	4	2000	8000
41.	Side racks and selves for bench reagents made of teak wood for 24 bottels each set	4	2000	8000
42.	Digital balance electronic Electronics upto 2 decimal places	1	10000	10000
43.	Hot plates 7-1/2", 3" dia controled 2000 watts	1	1000	1000
44.	Hot air oven thermostatically controled with selves and rotary switches 350 x 350 x 25 high	1	8000	8000
45.	pH Meter (Digital)	1	1000	1000
46.	Glass Electrode	2	850	1700
47.	Reference Electro	2	850	1700
48.	Weight Box 1gm, 2gmX2, 5gm, 10 gm 20gmX2, 50gm, 100gm with for cep Miscellaneous	LS		15000

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III. APPLIED MECHANICS LAB

Sl.No.	Name of Equipment	No.	Rate	Amount
1.	Polygon of Forces Apparatus	4	1500	60000
2.	Universal Force Table	2	2500	5000
3.	Principle of Moment Apparatus Bell Crank lever	4	1500	60000
4.	Combined Inclined plane & Friction apparatus	4	1500	60000
5.	Simple wheel and axle	2	2500	5000
6.	Differential wheel and axle	2	3500	7000
7.	Double sleeve Pulley Block	1	800	800
8.	Simple Screw Jack	4	3000	12000
9.	System of pulleys (Any I,II,III)	2Set Each	4000	8000
10.	Worm & Worm wheel	2Set Each	5000	10000
11.	Simply Support Beam with different weights (2 Sets)	2	3000	6000
12.	Jib Crane	2	2500	5000
13.	Jointed Roof Truss Apparatus	2	2500	5000
	Misc.	Lum Sum		5000

Note :

1. S. No. 1,2 Acrylic/Wood material/Aluminium Cast
2. S.No. 3,4,5,8,9 working model of Acrylic/Aluminium/Cast
3. Above items are for 2 batches of 15 students each.

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V. WORKSHOP PRACTICE

CARPENTRY SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	60 cm.rule	10	50	500
2.	Flexible steel rule 2 metre	2	75	150
3.	T square 23 cm. steel	10	50	500
4.	Bevel square 23 cm. steel	2	100	200
5.	Marking knife 25 cm. steel	10	100	1000
6.	Marking gauge wooden & brass 25 cm.	10	150	1500
7.	Mortise gauge wooden & brass 25 cm.	10	150	1500
8.	Caliper inside, steel 20 cm.	2	200	400
9.	Caliper outside , steel 20 cm.	2	200	400
10.	Compass steel 20cm.	2	100	200
11.	Devicer steel 20 cm.	2	100	200
12.	Plumb	2	75	150
13.	Wooden bench vice steel 20 cm.	10	500	5000
14.	Bench hold fast steel 30 cm.	10	300	3000
15.	Bar clamp 2 m.	2	500	1000
16.	G clamp of flat spring steel 20x30 cm.	4	150	600
17.	Rip saw 40-45 cm.	10	200	2000
18.	Cross cut saw 40-45 cm.	2	200	400
19.	Tennon saw 30-35 cm.	10	200	2000
20.	Dovetail saw 30-35 cm.	2	150	300
21.	Compass saw 35 cm.	4	150	600
22.	Key hole saw or pad saw 30-35 cm.	2	150	300
23.	Bow saw	2	200	400
24.	Frame saw	2	200	400
25.	Chisel fish brand 1" to 1/8"			
	firmer	3 set	250	750
	Dovetail	3 set	250	750
	Mortise	3 set	250	750
26.	Gauge or Golchi 1" to 1/8"	3 set	300	900
27.	Wooden jack plane complete	10	100	1000
28.	Wooden smoothing plane	10	250	2500
29.	Iron jack plane complete	10	200	2000
30.	Iron rebate plane complete	3	200	600
31.	Iron grooving plane complete	3	300	900
32.	Iron compass plane complete	3	350	1050
33.	Wooden moulding plane complete	3	500	1500
34.	Bradawl	3	350	1050
35.	Gimlet drills set	1 set	300	300
36.	Center bit	2	250	500
37.	Twist bit	2	200	400
38.	Auger bit	2	200	400
39.	Dovetail bit	2	200	400
40.	Counter shank bit	2	200	400
41.	Ratchet brace machine	2	300	600
42.	Grand drill machine 1/4"	2	600	1200
43.	Wooden hand drill burmi	5	700	3500
44.	Wooden mallet	10	100	1000
45.	Claw hammer	3	100	300
46.	Carpenters hammer	10	100	1000
47.	Cutting tool for Universal wood working machine	3 set	1500	4500
48.	Screw driver 18" & 15"	6	100	600

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
49.	Adze 500 gm.	10	100	1000
50.	Pincer 175 mm.	6	250	1500
51.	Plier 150 mm.	4	200	800
52.	Oil stone 8"	4	180	720
53.	Rasp file 12"	4	200	800
54.	Half round file 12"	4	200	800
55.	Round file 12"	4	200	800
56.	Triangular file 5", 4"	8	200	1600
57.	Water stone	4	80	320
58.	Carpentry work benches	4	4000	16000
59.	Band saw machine complete	1	60000	60000
60.	Circular saw machine	1	35000	35000
61.	Double Ended Electric Bench grinder	1	15000	15000
62.	Universal wood working machine	1	30000	30000
	misc. for foundation of machines	LS		20000
SMITHY SHOP				
1.	Anvil 150 Kg. with stand	5	5500	25500
2.	Swage block 50x30x8cm.&45x45x10cm.	2	3000	6000
3.	Hammers			
	Ball peen 0.8 Kg. (Approx.)	10	350	3500
	Cross peen 0.8 Kg. (Approx.)	10	350	3500
4.	Beak iron 25 Kg.	1	1000	1000
5.	Swages different types	6	100	600
6.	Fullers different types	6	100	600
7.	Leg vice 15 cms. opening	1	300	300
8.	Electric blower with motor	1	10000	10000
9.	Furnace chmney with exhaust pipe	5	10000	50000
10.	Sledge hammer - 5 Kg.	2	400	800
	Misc. tools		LS	5000
SHEET METAL, SOLDERING & BRAZING				
1.	Dividers - 15cm.	5	100	500
2.	Trammel 1 m.	1	80	80
3.	Angle protector	5	100	500
4.	Try square 30 cm.	5	80	400
5.	Centre punch	5	50	250
6.	Steel rule 30 cm. , 60 cm.,	5	25	125
7.	Sheet metal gauge	1	250	250
8.	Straight snips 30 cm.	2	500	1000
9.	Curved snips 30 cm.	2	600	1200
10.	Bench shear cutter 40 cm.	1	10000	10000
11.	Chisel 10 cm.	5	200	1000
12.	Hammer	5	300	1500
13.	Bench vice 13 cm.	5	2000	10000
14.	Plier	5	100	500
15.	Nose plier	5	120	600
16.	Sheet metal anvil/stakes	5	3500	17500
17.	Shearing machine 120 cm.	1	5000	5000
18.	Solder electric	2	1000	2000
19.	Solder furnace type	2	500	1000
20.	Brazing equipments and accessories	1	10000	10000
21.	Blow lamp	2	400	800
22.	Sheet bending machine	1	20000	20000
	Misc.		LS	10000
FITTING SHOP				

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Bench vice jaw 10 cm.	10	600	6000
2.	Surface plate 45x45 cm.	2	4500	9000
3.	V. Block 10x7x4 cm.	5	700	3500
4.	Try square	10	100	1000
5.	Bevel protractor 30 cm.	1	250	250
6.	Combination set	1	3000	3000
7.	Divider	5	100	500
8.	Centre punch	5	80	400
9.	Calipers (Different sizes)	12	100	1200
10.	Vernier calipers 30 cm.	2	1500	3000
11.	Micrometer 0-25, 25-50 m.m.	4	1500	6000
12.	Vernier depth gauge	1	700	700
13.	Feeler gauge--15 blades	1	100	100
14.	Radius gauge	1	200	200
15.	Angle gauge	1	200	200
16.	Thread gauge	1	200	200
17.	Bench drilling machine 13 mm.	1	10000	10000
18.	Double ended electric grinder	1	8000	8000
19.	Drill set	1set	2000	2000
20.	Reamer set	1set	3500	3500
21.	Tap set	1set	3500	3500
22.	Adjustable wrenches (15 cm., 20cm. 30 cm.)	1set	1200	1200
23.	Allen key set	1set	700	700
24.	Spanners	6	100	600
25.	Work benches	6	4500	27500
26.	Power hacksaw	1	8000	8000
	Misc. Files, Dieset, Hexa frames etc.		LS	20000

#### WELDING SHOP

1.	Ellectric welding set oil cooled	1	20000	20000
2.	Industrial regulator type oil cooled arc welder	1	25000	25000
3.	Air cooled spot welder 7.5 KVA	1	30000	30000
4.	General accssories for air cooled spot welder of 7.5 KVA			15000
5.	Gas welding set with gas cutting torch and complete with all accessories	1	30000	30000
6.	Misc. work benches		LS	35000

#### PAINTING & POLISHING SHOP

1.	Air compressor complete with 2 HP motor	1set	25000	25000
2.	Spray gun with hose pipe	1	1500	1500
3.	Stoving oven	1	6000	6000
4.	Buffing machine with leather and cotton wheels	1	8000	8000
5.	Electroplating Equipment for cromium Nikle plating.	1	20000	20000
	Misc.		LS	5000

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PLUMBING SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Pipe vice 5 cm.	4	500	2000
2.	Chain wrenches	5	500	2500
3.	Ring spanner Set	5	250	1250
4.	Wheel pipe cutter	2	600	1200
5.	Water pump plier	4	100	400
6.	Pipe die set 2" set	2 set	1200	2400
7.	Pipe bending device	1	5000	5000
8.	Work benches	4	6500	26000
9.	Set of various types of plumbing fittings e.g. Bib cock, Cistern, Stop cock, Wheel volve, Gat volve etc.		LS	4000
10.	Misc. Hacksaw frame and others		LS	4000

FOUNDRY SHOP

1.	Moulding boxes	25		12000
2.	Laddles	5		2000
3.	Tool kits	10 sets		5000
4.	Quenching tanks water or oil	2		2000
5.	Permiability tester	1		2000
6.	Mould hardness tester	1		12000
7.	Sand tensile testing equipment	1		15000
8.	Portable grinders	1		6000
9.	Temperature recorders/controllers	LS		10000
10.	Pit furnace with Blower	1		10000

MACHINE SHOP

1.	Lathe machine 4.5 feet "V" bed. Height of centres 8.5 inch. Dog chuck 8 inch complete 1 H.P. motor 440v, push button starter with coolent pump, tray and with standard accessories.	4		50000
2.	Shaper machine 12 inch stroke with 2 H.P. motor 440 volts push button starter with vice 6 inch (Swivel base)	2	20000	200000

NOTE:-

- The institutes running mechanical engg. course need not purchase these two items sepreately because they will have one complete machine shop for the course
- Above items are for 2 batches of 15 students each.  
(Additional Equipments For Second Year Mechanical Engg. Only)

1.	Crucibles (10-20 Kg.)	1	5000	5000
2.	Core Boxes	1 Set	8000	8000
3.	Plate form Weighing M/C (100 Kg. Capacity)	1	15000	15000
4.	Drying Oven	1	30000	30000
5.	Sand Sieves	1 Set	1000	1000
6.	Optical Pyrometer	1	10000	10000
7.	Electrical Discharge M/C (EDM)	1	50000	50000
8.	Misc.	LS		5000

Note:

- Above items are for 2 batches of 15 students each.

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INTRODUCTION TO COMPUTER (Common to all Trades)

COMPUTER CENTRE

S.No.	DESCRIPTION	QTY.	APPROX. COST (in Rs.)
1.	Core-2 Quad Processor, 4GB RAM 1 GB SATA HDD, 19" TFT Monitor/ Server of Latest Specification OS-Windows 2007/2008/Latest Version	02 Server	1,20,000=00
2.	General Desktop Computer-Intel i5 60 node or Higher(with latest Specification Pre loaded latest Anti Virus with Life time Subscription, Licence Media and Manual with UPS 660 VA with latest window OS Including licence OR Computer of latest Specification With latest window os including licence		36,00,000=00
3.	Software :((Latest Version)		
	i. MS OFFICE 2010/Latest Version		LS LS
	ii. COMPILER 'C', C++, JAVA-7		LS LS
4.	Hardware		4,50,000.00 LS
	i. Switch-32 Port		02
	ii. Router		02
	iii. Hub		04(8 Port)
	iv. Ext. Modem		02
	v. Wireless N/W Adaptor		02
	vi. Series Access Point		02
	vii.LAN Cable Meter		05
	viii. LAN Cable Analyzer		05
	ix. Crimping Tool		15
	and all other accessories related to Networking		
5.	Scanner- Flat Bed A4/Auto Lighter (Bit depth 48)		02 20,000
6.	132 Column 600 CPS or faster 9 Pin dot matrix printer with 500 million character head life		02 50,000
7.	Laser Jet-A4 All In one 20 page per min (2 Each)		04 50,000
8.	Desk Jet-A4 Photo Smart (2 Each)		04 40,000
9.	5 KVA on line UPS with minimum 30 minute battery backup along with sealed maintenance free batteries. Provision for connecting external batteries with network connectivity.(For 2 Labs)		04 8,00000

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10.	Split Air Conditioner 1.5 tones capacity with ISI mark along with electronic voltage stabilizer with over voltage and time delay circuit	08	35,0000
11.	Room preparation and furniture	LS	
12.	19" rack, 24-port switch. connector RJ-45 Cat-6 cabling for network	LS	10,0000
13.	2 KVA Inverter Cum UPS	02	6,0000
14.	Fire Extinguisher (2 Kg.)	04	15000
15.	Fire Extinguisher (5 Kg.)	04	25000
16.	Vacuum Cleaner	02	25000
17.	LCD Projector 3000 Lumen with all Accessories	02	350000
18.	Pen Drive 16 GB	10	10000
19.	DVD Writer External	02	10000
20.	HDD External 500 GB	02	15000
21.	PAD (Latest Configuration)	02	15000
22.	Broadband For Internet (Speed Min. 8mbps)	04	LS
23.	USB Modem	02	8000
24.	Generator 15 KVA Water Coolant	01	450000

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LIST OF EQUIPMENT  
Pottery & Refractory Lab

Sl.No.	Item	Qty.	Price	Total Cost
1	2	3	4	
1.	Ball Mill capacity Lab Size	1	40000	40000
2.	Pot Mill rotatary	1	8000	8000
3.	Screw Plunger Lab Size	1	22000	22000
4.	Wooden Plunger Lab Size	1	5000	5000
5.	Vibrating	1	3000	3000
6.	Filter Press Lab Size with Diaphram Pump	1	30000	30000
7.	Universal Jigger Jolleys	2	5000	10000
8.	Toygle Press Lab Size	1	10000	10000
9.	Down Draft Furnace Display Model	1	30000	30000
10.	Hand Screw Press (No. 1)	1	15000	15000
11.	Hot air oven	2	5000	10000
12.	Disintegrator	1	20000	20000
13.	Kanthal Furnace upto 10000c	2	18000	36000
14.	High temparature furnace horizontal type upto 1500 c.	1	200000	200000
15.	Ph meter	2	5000	10000
16.	Metallic frame for cone set	1	2000	2000
17.	Schoeme's Elutriator	1	5000	5000
18.	Physical Balance 250 cms.	2	1500	3000
19.	Rotory Viscosity meter	1	40000	40000
20.	Test Sieves set	2	1000	2000
21.	Adherence test Aparatus.	1	5000	5000
22.	Vernier Callipers	5	500	2500
23.	Vicats Needle. app.	5	500	2500
24.	Maduce pump	1	10000	10000
25.	Co-efficient of linear expansion app. for ref.	1	80000	80000
26.	Annealing testing app. for Glass.	1	80000	80000
27.	Softening Testing Appt. for Glass.	1	10000	10000
28.	Thermal Expansion Testing App. for Glass.	1	20000	20000
29.	Density Comparator Testing App.	1	3000	3000
30.	Permeability App.	1	6000	6000
31.	Optical Microscope	3	20000	60000
32.	Optical Microscope (Ord.)	5	800	4000
33.	Vibro finishing mill (with rubber lining and polishing media)	1	350000	350000
34.	Hydraulic press (25-50 MT Capacity) Lab Size	1	300000	300000
35.	Diamond Cutter with variable dia of blade (8",10" & 12")	1	300000	300000

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## GLASS &amp; ENAMEL WORKSHOP

Sl.No.	Item	Qty.	Price	Total Cost
1	2	3	4	
1.	Strain Viewer	2	7500	15000
2.	Auto clave	1	15000	15000
3.	Thermal baths for thermal shack	1	15000	15000
4.	High Temp. furnace 1400°C	1	250000	250000
5.	Lens Grinding & Polishing m/c. Small Size	2	25000	50000
6.	Sand blasting m/c. Small Size with Compressor	1	15000	15000
7.	Electric Furnace Small size 1000oc	1	20000	20000
8.	Electric furnace 30x30x30cm.Temp.1000oc	1	25000	25000
9.	Enamel slip Spray gun	2	1500	3000
10.	Hot plate 2 KW.	3	1000	3000
11.	Worker's tool and Moulds for glass set	15	1500	22500
12.	Tickness Viewer	1	10000	10000
13.	Glass melting Furnace (Gas fired)	1	80000	80000
14.	Blow Lamp System For Glass Beeds Making	1		
15.	Ultra Violet Glass Viewer	1	25000	25000

## SILICATE LAB.

1.	Platinum Crushible with lid 25 ml.	5	10000	50000
2.	Platinum dish with lid 10 cm dia	5	35000	165000
3.	Hydro Flourication Ohamber	2	10000	20000
4.	Chemical Balance	2	5000	10000
5.	Mataler Balance/Electronic Balance (0.0001)	1	150000	150000
7.	Calorimeter for determination of Iron titanium content in clay	1	60000	60000
8.	Lovibond comporotor with test tube.	1	500	500
9.	Speedy moisture test for direct reading	1	25000	25000
10.	Hot air oven 14"x14"x14"	1	20000	20000
11.	Flame Photometer	1	40000	40000
12.	Water Bath	3	45000	45000
13.	Water De-ioniser Plant	1	250000	250000
14.	Platinum Grushible with lid	3	300000	300000
15.	Platonum Disc	3	400000	400000

## POTTERY &amp; REFRACTORY WORKSHOP

1.	Jaw Crusher Capacity 1/4 to 1/2 ton per hour Lab Size	1	40000	40000
2.	Double Roller crusher 10"x8" Roller size.Lab Size	1	20000	20000
3.	Permanent Magnet for casting slip	1	5000	5000
4.	De-airing pug mill Lab Size	1	350000	350000
5.	Painters Wheel	6	1000	6000
6.	Screw Cutting M/c.	1	10000	10000
7.	Muffle furnace	1	25000	25000
8.	Extrusion mill for Pipes	1	80000	80000
9.	Hot Plate 2KW	1	3000	3000
10.	Optical pyrometer	1	20000	20000
11.	Thermo couples upto 1500oc With Digital Indicator	1	10000	10000
12.	Potentiometer	1	10000	10000
13.	Travelling Microscope	1	22000	22000
14.	Ultrasonic Drilling Machine	1	50000	50000
15.	3D Facating Machine	1	50000	50000

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16.	Gas Fired gold Decoratio Furnace (1000oc)	1	100000	100000
17.	Graphite Paddles For Glass Beeds Making	1	50000	50000
18.	Ploter with Computer	1	700000	700000
19.	Optic Moulds for millefiori Glass rods	10	100000	100000
20.	Planetary Ball Mill with PM 100 -01-100000-100000 complete accessories			

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CERAMIC ENGG. LAB.

Sl.No.	Item	Qty.	Price	Total Cost
1	2	3	4	
1.	Physical Balance 250 cms.	1	20000	20000
2.	Apparatus for testing c.c.e. of refractory	1	40000	40000
3.	Stop watches	2	5000	10000
4.	Ofset apparatus for Gas Analysis	1	25000	25000
5.	Bomb calorimeter	1	50000	50000
6.	Viscometer for full	1	25000	25000
7.	Flash point Apparatus	1		
8.	Tensile strenth testing machine	1	40000	40000
9.	Piling resistance test apparatus	1	100000	100000
10.	Radiation Pyrometer	1	80000	80000
11.	Softening point apparatus			
	i. Vertical tubler furnace upto 1000o c.	1	10000	10000
	ii. Thermocouple	1	3000	3000
	iii. Temperature indicator	1	5000	5000
	iv. Vertical Graduated Telescope	1	40000	40000
12.	Low temperature viscosity appratus			
	i. Tubler furnace upto 1000o C.	1	25000	25000
	ii. Termocouple			
	iii. Temperature indicator	1	3000	3000
	iv. Vertical graduated telescope	1	10000	10000
	v. 1/2 kg. weight	1	100	100
13.	Thermal Expansion Apparatus upto 1000 C.	1	100000	100000
14.	Spectrophotometer 300-900 mu	1	350000	350000
15.	Halfman Scratch hardness tester (Imported)	1	15000	15000
16.	Thickness Tester (Imported)	1	15000	15000
17.	Dimond wheel cutting M/c.	1	60000	60000
18.	Mending Strength Testing Machine			
	(a) Green Sample	1	450000	450000
	(b) Fired Sample	1	550000	550000
19.	Electronic Digital Physical Balance	2	200000	200000
20.	High Temperature Furnace (1400oc)	1	400000	400000
21.	Moisture Balance	2	80000	80000
22.	Non Contact Thermometer upto 1400oc	1	200000	200000
23.	Refractometer & Glossy Meter	1	350000	350000
24.	Red Wood Viscometer	2	50000	50000

GEOLOGY LAB.

1.	Mineralogical Microscope	6	20000	120000
2.	Steel Books Shelves	2	6000	12000
3.	Steel Yard balance	3	1500	4500
4.	Moh's Scale for hardness	10	500	5000
5.	Rockwel Hardness Tester with computer Programming	1	1200000	1200000
6.	Grinding & Polishing Machines for sample preparation	1	300000	300000

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**LIST OF LABORATORY EQUIPMENT(Energy Conservation)**

<b>Sr. No</b>	<b>Particulars</b>	<b>Qty</b>	<b>Estimated Cost (Rs)</b>
1.	Multimeter	1	17,000
2.	Power Analyzer	1	20,000
3.	Luxmeter	1	5,000
4.	Black Box (for checking lamp efficacy including stand and luxmeter)	1	25,000
5.	Centrifugal pump, 1 kW	1	15,000
6.	Variable Frequency drive	2	50,000
7.	Water Flow meter	1	10,000
8.	Pressure Gauge	1	2,000
9.	Experimental Set up for Valve Throttling vs VFD	1	50,000
10.	Compressor, 20 cfm, single-stage	1	50,000
11.	Air leakage meter	1	18,000
12.	Blower (2 HP)	1	8,000

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7.	LEARNING RESOURCE MATERIALS			
1.	LCD Projector with Screen	1	--	20000
2.	Handicam	1	--	30000
3.	Cutting, Binding & Stitching equipment.	1	--	30000
4.	Desk Top Computer with Internet Core i5/i7- 760, Processor, Genuine Windiw 7, Professional 18 inch HD, Flat Panel Monitor Optical Mouse, Key Board & all related media or latest version	1	--	40000
5.	Home Theater Support Disc type CD. CDR/CDRW DVDR/DVDRW, VCD Supported with USB Port Support-DIVX/JPEG/MP3	1	--	25000
6.	Commerical P A System 16 W-220W output, AC & 24V DC Operated, 5 Mic. & 2 Auxilary input, Speaker output 4 Ohm, 8 Ohm, 17 V & 100 V	1	--	20000
7.	Interactive Board	1	--	50000

Note :

1. This center will be only one at the institute level irrespective of all branches.

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ANNEXURE - I

FIELD EXPOSURE

Ceramic Engg. students will undergo a two week Industrial Exposure, (in small scale units atleast) after II semester arranged and supervised by the iunstitute staff. They may try their hands on simple tools and machines and will incorporate following points in their reports.

1. Name & Address of the unit
2. Date of
  - i. Joining.
  - ii. Leaving.
3. Nature of Industry
  - i. Product.
  - ii. Services.
  - iii. Working Hrs.
4.
  - i. Names of the sections of the unit visited.
  - ii. Number of person engaged.
  - iii. Activities in the section.
  - iv. Name of tools/machines/instruments used.  
simple sketch of tools & instruments.
  - v. Source of power.
5.
  - i. What is learnt. (Give on separate field)
  - ii. What interested him most. (Give details)

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ANNEXURE - II  
INDUSTRIAL TRAINING

After IV semester exam. in the summer vacation students of ceramic Engg. will have a four week Industrial Training in units not less than small scale industries. It should preferably be arranged in manufacturing (producing ceramic products e.g. white wares, Refractory bricks, Glass wares etc.). They will work and focus their attention there on following points to incorporate them in their reports.

1. Name & Address of the unit
2. Date of
  - i. Joining.
  - ii. Leaving.
3. Nature of Industry
  - i. Product.
  - ii. Services.
  - iii. Working Hrs.
4. Sections of the unit visited and activities there in.
5. Details of machines/Tools & instruments used in working in the section of the unit visited.
6. Work procedure in the section visited.
7. Specifications of the product of the section and materials used.
8. Work of repair and maintenance cell.
9. Details of the shops (welding, Foundary, Machines shop etc) related to repair and maintenance work.
10. Name of checking and Inspecting Instruments and their details. Quality controls measures taken.
11. Details of hadraulics/pneumatic/thermal units or appliances used if any.
12. Discription of any breakdown and its restoring.
13. Use of computer - if any.
14. Visit of units store, Manner of keeping store items, Their receiving & distribution.
15. Safety measures on work place & working conditions in general - comfortable, convenient & hygeinic.

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ANNEXURE - III  
TRAINEES ASSESSMENT

This Institution invites the comments on the training of its students (work & behaviour) from their immediate supervisors on the following points.

1. Name of the trainee
2. Date of
  - i. Joining.
  - ii. Leaving.
3.
  - i. Regularity & Punctuality
  - ii. Sense of responsibility
  - iii. Readiness to work/learn
  - iv. Obedience
  - v. Skill aquired
4. Name of the sections of the unit he attended during his stay.  
His activities/worth of being there.
5. Any thing specific

Sinnature of the Assessor

Date :-

Designation

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#### COMMUNITY DEVELOPMENT WORK

For Community Development work two 15 days camps shall be organised during the session in the identified villages. The students shall stay in the camps and under the supervision of the concerned faculty members shall undertake/execute the assigned works in the following fields.

1. To launch and sustain functional literacy programmes.
2. To train the rural youth in different trades/skills.
3. Training by innovating and improving the efficiency of household gadgets.
4. To control and reduce pollution affecting the social fabric of rural life i.e.
  - Construction of Soak Pits and Sanitary Latrines, Tree Plantation, Social Forestry, Installation of Smokeless Chulhas.
5. To disseminate information on sources of non conventional energy. Installation and maintenance of Solar Street Lights, Solar Photovoltaic Pumps, Wind Mills, Bio Gas Plants etc shall be undertaken.
6. Transfer of appropriate Technology/Demonstration of cheap houses by use of locally available material, treatment of mud walls innovation of mud floor, treatment of thatch roofs etc shall be taken with provisions for training to the villagers.
7. Training and demonstration of new agricultural implements, household gadgets and appliances of non conventional energy.
8. To help the rural youth in preparing project reports to set up industrial units and entrepreneurial development.
9. All community polytechnics shall render, repair and maintain agricultural implements, appliances of non conventional energy, household gadgets, etc. and train the rural youth in such skills.

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## STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

1. Presentations of Case Studies
2. Debate competitions
3. Poster competitions
4. Industrial visits
5. Visual Aids

## COURSE OUTCOMES

After studying this course, a student will be able to co-relate and apply fundamental key concepts of energy conservation and energy management in industry, commercial and residential areas. A student will be able to:

- Define principles and objectives of energy management and energy audit.
- Understand Energy Conservation Act 2001 and its features.
- Understand various forms & elements of energy.
- Identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.
- Identify areas of energy conservation and adopt conservation methods in various systems.
- Evaluate the techno economic feasibility of the energy conservation technique adopted.

## INSTRUCTIONAL STRATEGY

Teachers are expected to lay considerable stress on understanding the basic concepts in energy conservation, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject must be supplemented by demonstrations and practical work in the laboratory. Visits to industries must be carried out. Expert from industry must be invited to deliver talks on energy conservation to students and faculty.

## REFERENCE BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
4. Handbook on Energy Audit & Environmental Management by Y P Abbi&Shashank Jain published by TERI. Latest Edition
5. **Important Links:**
  - (i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. [www.beeindia.gov.in](http://www.beeindia.gov.in).
  - (ii) Ministry of New and Renewable Energy (MNRE), Government of India. [www.mnre.gov.in](http://www.mnre.gov.in).
  - (iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. [www.upneda.org.in](http://www.upneda.org.in).
  - (iv) **Central Pollution Control Board (CPCB)**, Ministry of Environment, Forest and Climate Change, Government of India. [www.cpcb.nic.in](http://www.cpcb.nic.in).
  - (v) **Energy Efficiency Services Limited (EESL)**. [www.eeslindia.org](http://www.eeslindia.org).
  - (vi) Electrical India, Magazine on power and electrical products industry. [www.electricalindia.in](http://www.electricalindia.in).

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ANNEXURE V-QUESTIONNAIRE

INSTITUTE OF RESEARCH, DEVELOPMENT AND TRAINING U.P. KANPUR -208024

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holder in Glass & Ceramic Engg.

PURPOSE: To design and develop Three Year (Six Semester) diploma curriculum in Glass & Ceramic Engg.

NOTE: 1. Please answer the questions to the points given in the questionnaire.  
2. Any other point or suggestion not covered in this questionnaire may be written on a separate paper and enclosed with the questionnaire.

1. Name of the organisation: \_\_\_\_\_  
\_\_\_\_\_

2. Name & Designation of the officer filling the questionnaire \_\_\_\_\_  
\_\_\_\_\_

3. Name of the department/section/shop \_\_\_\_\_  
\_\_\_\_\_

4. Important functions of the department/section/shop \_\_\_\_\_  
\_\_\_\_\_

5. Number of diploma holder employees under your charge in the area of Glass & Ceramic Engg. \_\_\_\_\_

6. Please give names of modern equipments/machines handled by a diploma holder in Glass & Ceramic Engg.

- |    |    |    |
|----|----|----|
| 1. | 2. | 3. |
| 4. | 5. | 6. |

7. What proficiencies are expected from a diploma holder in Glass & Ceramic Engg.

- |    |    |    |
|----|----|----|
| 1. | 2. | 3. |
| 4. | 5. | 6. |

8. Mention the approximate percentage of the following desired in Diploma teaching.

- |                          |        |
|--------------------------|--------|
| 1. Theoretical knowledge | -----% |
| 2. Practical knowledge   | -----% |

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3. Skill Development -----%

9. Do you think " on the job training" / Industrial training should form a part of curriculum. ( Yes/ No) if yes then

- (a) Duration of training -----  
(b) Mode of training
1. Spread over different semesters
  2. After completion of course
  3. Any other mode

10. What mode of recruitment is followed by your organisation.

1. Academic merit
2. Written test
3. Group discussion
4. Interview
5. On the job test.

11. Mention the capabilities/ Qualities looked for while recruiting diploma holder in Glass & Ceramic Engg.

- (a) Technical knowledge -----  
(b) Practical skill -----  
(c) Etiquettes and behaviour -----  
(d) Aptitude -----  
(e) Health habit and social background -----  
(f) Institution where trained -----

12. Does your organisation have any system for the survey of Home articles of different countries/States. Yes/No

13. Does your organisation conduct field survey to know users views regarding. Yes/No

1. Home Articles for different age groups and sex.
  2. Effect of climatic conditions
  3. Any other
- If yes ; Please give brief account of each.

14. Which type of assignment do you suggest for an entrepreneur in Glass & Ceramic Engg.

15. In which types of organisations can a diploma holder in Glass & Ceramic Engg.

- |   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |

16. Job prospects for the diploma holder in Chemical Engg. the next ten years in the state / country.

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17. In your opinion what should be the subjects to be taught to a diploma student in Glass & Ceramic Engg.
- |        |           |
|--------|-----------|
| Theory | Practical |
|--------|-----------|
18. Kindly mention particulars regarding topics/areas which should be given more emphasis in the curriculum .
- |        |           |
|--------|-----------|
| Theory | Practical |
|--------|-----------|
19. Kindly state whether your organisation can contribute towards improvement of curriculum in above field. Yes/ No  
If yes : Please give names of experts in your organisation to whom contact.
20. Kindly give your valuable suggestions for being considered at the time of finalisation of curriculum.
21. What changes in technologies are to be incorporated in the development of curriculum in Glass & Ceramic Engg.

( Signature )

Kindly mail the above questionnaire duly filled to:-

Manisha Asthana  
Head (Pharmacy)  
Institute of Research, Development & Training, U.P.  
Govt. Polytechnic Campus  
Kanpur-208024

( Please note that all information in this survey is confidential for the use of curriculum design only )

Corrected and Approved By B.T.E. on dated 19.04.2017

## SUGGESTED BOOKS

## 1. DISCIPLINE : APPLIED PHYSICS

Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	ANUPRAYUKT BHAUTKI	GUPTA & GUPTA	HINDI	1995	75.00	ASIAN PUBLISHERS, 85-C NAI MANDI, MUZAFFAR NAGAR
2.	ENGINEERING BHAUTKI	Dr. BHARGAVA	HINDI	1995	60.00	DHANPAT RAI & SONS
3.	ANUPRAYUKT BHAUTKI	KUMAR & TYAGI	HINDI	1995	75.00	NAV BHARAT PRAKASHAN, BEGUM BRIDGE ROAD, MEERUT
4.	ANUPRAYUKT BHAUTKI	Dr. R.C.PANDEY	HINDI	1994	75.00	NAV BHARAT PRAKASHAN, BEGUM BRIDGE ROAD, MEERUT
5.	APPLIED PHYSICS-I (Vol - I)	Dr. H.H.LAL	ENGLISH	1993	45.00	TATA McGRAW HILL
6.	APPLIED PHYSICS-II (Vol - II)	Dr. H.H.LAL	ENGLISH	1993	54.00	TATA McGRAW HILL
7.	MODERN COLLEGE PHYSICS	WHITE	ENGLISH	1995	110.00	C. B. S.
8.	PHYSICS Vol - I & II	HOLLIDAY AND RESNIC	ENGLISH	1993	100.00	WILEY EASTERN

## 1. DISCIPLINE : APPLIED MATHEMATICS

Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	APPLIED MATHEMATICS (Math-I & Math-II)	KAPOOR & TARAMAN	HINDI	1994	75.00	NAV BHARAT PRAKASHAN, MEERUT
2.	APPLIED MATHEMATICS (Math-I & Math-II)	Dr KAILASH SINHA	HINDI	1994	60.00	BHARAT BHARATI PRAKASHAN, MEERUT
3.	APPLIED MATHEMATICS (I & II)	LUTHERA	HINDI	1994	65.00	B. Tec. PRAKASHAN, LUCKNOW
4.	APPLIED MATHEMATICS (I & II)	P. GUPTA	HINDI	1994	65.00	ASIAN PUBLISHERS, MUZAFFAR NAGAR
5.	ADVANCE Engg. MATHS	H. K. DAS	ENGLISH	1994	125.00	S. CHAND & Co., RAM NAGAR NEW DELHI

## 1. DISCIPLINE : PROFESSIONAL COMMUNICATION

Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	ENGLISH FOR COMMUNICATION	V. SHASHIKUMAR M. N. K. BOSE	ENGLISH	1987	21.00	I. R. D. T. U. P., KANPUR
2.	SAMPRESHAN TAKNIK	Prof. R. PAL Dr. Smt NEERAJ SHUKLA Dr. SUBHASH GARG	HINDI	1989	15.00	I. R. D. T. U. P., KANPUR

## 1. DISCIPLINE : APPLIED CHEMISTRY

Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	ANUPRAYUKT RASAYAN	KHANNA & KHANNA & BOUNTRA	HINDI	1994	60.00	BHARAT BAARTI PRAKASHAN, MEERUT
2.	PRAYUKT RASAYAN	MAHENDRA AND SRIVASTAVA	HINDI	1994	58.00	B. TECH. PUBLISHERS, AMMINABAD LUCKNOW
3.	PRAYUKT RASAYAN SHASTRA	S. CHANDRA	HINDI	1994	60.00	NAV BHARAT PRAKASHAN, BEGUM BRIDGE ROAD, MEERUT
4.	APPLIED CHEMISTRY	V. P. MEHITA	HINDI	1993	60.00	ASIAN PUBLISHERS, 85-C NAI MANDI, MUZAFFAR NAGAR
5.	ENGINEERING RASAYAN	Dr. LALIT	HINDI	1994	45.00	DHANPAT RAI & SONS, 1682 NAI SARAK, DELHI
6.	ENGINEERING CHEMISTRY	P. C. JAIN	ENGLISH	1994	100.00	DHANPAT RAI & SONS, 1682 NAI SARAK, DELHI

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1. DISCIPLINE : CERAMIC ENGINEERING

S1.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	ELEMENTS OF CERAMICS VOL. I & II	Dr. S. KUMAR	ENGLISH	LATEST		INDIAN INSTITUTE OF CERAMIC C/O CENTRAL GLASS & CERAMIC RESEARCH INSTITUTE, CALCUTTA
2.	CEMENT INDUSTRY IN INDIA VOLUME I & II	V. PODDERMAR	ENGLISH	LATEST		
3.	CEMENT ENGINEERS HAND BOOK	OTTO LEBACHER	ENGLISH	LATEST		
4.	PORTLAND CEMENT TECHNOLOGY	J. C. WITT	ENGLISH	LATEST		
5.	CHEMISTRY OF CEMENT & CONCRETE	F. M. LEE	ENGLISH	LATEST		
6.	CHEMISTRY OF CEMENTS	H.F. W. TAYLER	ENGLISH	LATEST		
7.	ELEMENTS OF CEMENT & CONCRETE	S. N. GHOSH	ENGLISH	LATEST		
8.	REFRACTORIES	M. L. MISHRA	ENGLISH	LATEST		LAXMI PRAKASHAN
9.	HAND BOOK OF REFRACTORIES	D. N. NANDI	ENGLISH	LATEST		TATA Mc GRAW HILL
10.	REFRACTORIES	NORTON	ENGLISH	LATEST		Mc GRAW HILL
11.	HEAT PROCESSES OF SILICATES	ADHHA AND I. BULAVIN	ENGLISH	LATEST		MIR PUBLICATION, MOSCOW
12.	MODERN CERAMICS	HOVA J. E.	ENGLISH	LATEST	250.00	DINTER SCIENCE PUB.
13.	GLASS SCIENCE & TECHNOLOGY VOLUME I TO VI	D. R. UHLMANN	ENGLISH	LATEST		
14.	HAND BOOK OF CRUSHING AND GRAINDING	C. L. PRASHER	ENGLISH	LATEST		
15.	CERAMICS VOL. I TO VI	E.P.Mc NAMARA	ENGLISH	LATEST		
16.	ELEMENT OF CERAMICS	F. H. NORTON	ENGLISH	LATEST		
17.	CERAMIC GLAZES	KOEHIG	ENGLISH	LATEST		INDUSTRIAL PUBLICATION Inc.
18.	HAND BOOK OF GLASS MANUFACTURE VOLUME I	F. V. TOLLEY	ENGLISH	LATEST		Mc GRAW HILL
19.	HAND BOOK OF GLASS MANUFACTURE VOLUME II	F. V. TOLLEY	ENGLISH	LATEST		Mc GRAW HILL
20.	GLASS ENGINEERING HAND BOOK	E. B. SHAND	ENGLISH	LATEST		
21.	DEFECTS IN GLASS	C. J. PADDLE	ENGLISH	LATEST		
22.	COLOURED GLASSES	W. A. WEYL	ENGLISH	LATEST		
23.	KANCH UDYOG	R. CHARAN	ENGLISH	LATEST		
24.	A TEXT BOOK OF POTTERY	H. N. BOSE	ENGLISH	LATEST		CERAMIC PUB. HOUSE
25.	MODERN POTTERY MANUFACTURER	H. N. BOSE	ENGLISH	LATEST		CERAMIC PUB. HOUSE
26.	MRITRKA UDYOG POTTERY	H. N. BOSE	HINDI	LATEST		CERAMIC PUB. HOUSE
27.	INTRODUCTION TO CERAMICS	KINGERY W. D.	ENGLISH	LATEST		
28.	INDUSTRIAL FURNACES VOL I & II	W. TRINKD	ENGLISH	LATEST		
29.	A TEXT BOOK GEOLOGY	P. SINGH	ENGLISH	LATEST		S. K. KATARIA & SONS
30.	PROPERTIES OF GLASS	G. W. MOREY	ENGLISH	LATEST		
31.	ENAMELS	A. I. ANDREWS	ENGLISH	LATEST		
32.	TECHNOLOGY OF ENAMELS	V. I. VARGIN	ENGLISH	LATEST		
33.	GLASS MELTING TANK FURNACES	GUNTHER	ENGLISH	LATEST		
34.	GLASS- CERAMICS	M. C. MILLAN	ENGLISH	LATEST		
35.	GLASS CERAMICS AND PHOTO SITALLS	A. I. BREZHNOI	ENGLISH	LATEST		
36.	ADVANCED CERAMICS	E. C. SUBBARAO	ENGLISH	LATEST		
37.	PHASE DIAGRAMS FOR CERAMICS	LEVIN	ENGLISH	LATEST		AMERICAN CERAMIC SOCIETY, NEW YORK
38.	SPECIAL CERAMIC	POPPER P.	ENGLISH	LATEST	200.00	ACADEMIC
39.	DOWN DRAFT BHATIYON ME USHMA SAN RA KHSHAN	K. S. MATHEE	ENGLISH	LATEST	50.00	C.G.C.R.I. KHURJA
40.	POTTERY MANAGEMENT	BOSE H. N.	ENGLISH	LATEST	55.00	CERMAIC PUB. HOUSE
41.	GLASS MELTING TANK FURNACES	GUNTHER	ENGLISH	LATEST		

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Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
42.	CERAMIC WHITEWARE	REPORT NEW COMBTRI	ENGLISH	LATEST		PITMAN
43.	INDUSTRIAL CERAMICS	SINGAL & SINGH	ENGLISH	LATEST		
44.	ENGINEERING APPLICATORS OF CERAMIC MATERIALS	SCHWELTZ M. M.	ENGLISH	LATEST		M. C. GRAWHILLS
45.	SET OF CERAMIC NOTE FOR AIII CERAMIC		ENGLISH	LATEST		INSTITUTE OF CERAMIC C/O C.G.C.R.I., JADAVPUR UNI., CALCUTTA
45.	CERAMIC SCIENCE VOL-I & II		ENGLISH	LATEST		KUMAR & ASSOCIATE, 20 B DOVER PLACE, CALCUTTA
46.	POTTERY VIGYAN PARICHAY		HINDI	LATEST		C. G. C. R. I., KHURJA
47.	CHEMICAL ANALYSIS OF CERAMIC RAW MATERIAL & ALLIED PRODUCT		ENGLISH	LATEST		INSTITUTE OF CERAMIC C/O C.G.C.R.I., JADAVPUR UNI., CALCUTTA
48.	GATE WAY TO CERAMIC	S. MATIRA & A.K. BANDOPADHYA	ENGLISH	LATEST		S.M.D. VOLYOG, 9/4A/1Q SOUTH SINTHEE ROAD, CALCUTTA
49.	PROPERTIES OF GLASSES	G.W. MOOREY	ENGLISH	LATEST		REINHOLD PUBLISHING CO.
50.	CHEMISTRY OF GLASSES	AMAL PAUL	ENGLISH	LATEST		CHAPMAN HALL
51.	GLASS	G.O. JONES	ENGLISH	LATEST		
52.	MODERN GLASS PRACTICE	S.R. SCHOLZE	ENGLISH	LATEST		
53.	ELEMENTS OF MINEROLOGY	H.H. READ	ENGLISH	LATEST		
54.	GLASS	R.P. CHARAN	ENGLISH	LATEST		
55.	REFRACTORY	M.L. MISRA	ENGLISH	LATEST		
56.	ELEMENTS OF CERAMICS	S. KUMAR	ENGLISH	LATEST		
57.	POTTERY	H.N. BOSE	ENGLISH	LATEST		
58.	STEEL, PLANT & REFRACTORY	CHASTER	ENGLISH	LATEST		
59.	REFRACTORY	F.H. NORTON	ENGLISH	LATEST		
60.	ELEMENTS OF CERAMICS	F.H. NORTON	ENGLISH	LATEST		
61.	FUEL FURNESS & PYROMETRY	GILLCHRIST	ENGLISH	LATEST		

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