

STUDY AND EVALUATION SCHEME FOR
THREE YEARS DIPLOMA COURSE IN GLASS & CERAMIC ENGINEERING.
(Effective from session 2008 -2009)

I YEAR :

Curriculum						Scheme of Examination									
Periods Per Week						S U B J E C T	Theory			Practical			Grand Total		
Le. c.	Tut. ori al	Dr. aw	Lab	Work Shop	Tot al		Examination	Sess.	Total	Examination	Sess.	Total			
							Dur.	Marks	Marks	Marks	Dur.	Marks		Marks	Marks
3	-	-	2	-	5	1.1 Professional Communication	2.5	50	20	70	3	20	10	30	100
3	2/2	-	-	-	4	1.2 Applied Mathematics-I	2.5	50	20	70	-	-	-	-	70
3	2/2	-	2	-	6	1.3 Applied Physics	2.5	50	20	70	3	40	20	60	130
3	-	-	2	-	5	1.4 Applied Chemistry	2.5	50	20	70	3	40	20	60	130
-	-	8	-	-	8	1.5 Engineering Drawing	3.0	50	20	70	-	-	-	-	70
2	2/2	-	2/2	-	4	1.6 Applied Mechanics	2.5	50	20	70	3	40	20	60	130
3	2/2	-	-	-	4	1.7 Introduction To Glass & Ceramic Engineering	2.5	50	20	70	-	-	-	-	70
1	-	-	3	-	4	1.8 Computer Application For Engineering	-	-	-	-	3	60	30	90	90
-	-	-	-	8	8	1.9 Workshop Practice	--	--	--	--	4	60	30	90	90
-	-	-	-	-	-	1.10 Field Exposure-I(2 Weeks)	--	--	--	--	-	20	10	30	30
18	4	8	10	8	48	<-----TOTAL----->	--	350	140	490	--	280	140	420	910
Games/NCC/Social and Cultural Activities + Discipline (30 + 20)														50	
TOTAL														960	

- NOTE: (1) Each period will be of 50 minutes duration.
(2) Each session will be of 32 weeks.
(3) Effective teaching will be atleast 25 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 summer vacation. 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 Annexure - I & III.
(5) For Community Development work see Annexure - IV .

STUDY AND EVALUATION SCHEME FOR
THREE YEARS DIPLOMA COURSE IN GLASS & CERAMIC ENGINEERING.
(Effective from session 200 -200)

II YEAR :

Curriculum						S U B J E C T	Scheme of Examination								
Periods Per Week							Theory				Practical				Grand Total
Le	Tut	Dr	Lab	Work	Tot		Examination	Sess.	Total	Examination	Sess.	Total	Tot		
c.	ori	aw	Shop	al		Dur.	Marks	Marks	Dur.	Marks	Marks	al			
2	-	-	-	-	2	2.1 Applied Chemistry-II	2.5	50	20	70	-	-	-	70	
2	-	-	2	-	4	2.2 Elementry Electrical, Mech. & Civil Engineering	2.5	50	20	70	3	40	20	60	130
2	-	-	-	-	2	2.3 Industrial Operations	2.5	50	20	70	-	-	-	70	
3	-	-	8	-	11	2.4 Pottery & Refractory	2.5	50	20	70	6	60	30	90	160
3	2/2	-	4	-	8	2.5 Glass & Enamel	2.5	50	20	70	6	60	30	90	160
-	-	8	-	-	8	2.6 Glass & Ceramic Engg.Draw-I	3.0	50	20	70	-	-	-	70	
3	-	-	-	-	3	2.7 Industrial Calcuation & Environmental Pollution	2.5	50	20	70	-	-	-	70	
3	-	-	-	-	3	2.8 Fuels,Furnaces & Pyrometry	2.5	50	20	70	-	-	-	70	
2	2/2	-	2	-	5	2.9 Element of Geology	2.5	50	20	70	3	40	20	60	130
-	-	-	2	-	2	2.10 Modelling & Mould Lab	-	-	-	-	3	40	20	60	60
-	-	-	-	-	-	2.11 Industrial Tour (2 Weeks)	-	-	-	-	-	40	20	60	60
20	2	8	18	-	48	<-----TOTAL----->	-	450	180	630	-	280	140	420	1050
												Games/NCC/Social and Cultural Activities + Discipline (30 + 20)		50	
												TOTAL		1100	

- NOTE: (1) Each period will be of 50 minutes duration.
(2) Each session will be of 32 weeks.
(3) Effective teaching will be atleast 25 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.

STUDY AND EVALUATION SCHEME FOR
THREE YEARS DIPLOMA COURSE IN GLASS & CERAMIC ENGINEERING.
(Effective from session 200 -200)

III YEAR :

Curriculum						Scheme of Examination									
Periods Per Week						S U B J E C T	Theory				Practical				Grand Total
Le c.	Tut ori al	Dr aw	Lab	Work Shop	Tot al		Examination Dur.	Sess. Marks	Total Marks	Examination Dur.	Sess. Marks	Total Marks	Total Marks		
														Marks	
3	-	-	-	-	3	3.1 Pottery & Porcelain-I	2.5	50	20	70	-	-	-	-	70
3	-	-	-	-	3	3.2 Refractory Technology	2.5	50	20	70	-	-	-	-	70
3	-	-	-	-	3	3.3 Glass Technology-I	2.5	50	20	70	-	-	-	-	70
3	-	-	-	-	3	3.4 Cement And Lime	2.5	50	20	70	-	-	-	-	70
3	-	-	-	-	3	3.5 Modern Ceramics & Its Application	2.5	50	20	70	-	-	-	-	70
2	1	-	-	-	3	3.6 Industrial Management and Entrepreneurship Development	2.5	50	20	70	--	--	--	--	70
3	-	-	-	-	3	3.7 Ceramic Machinery & furnace Design	2.5	50	20	70	-	-	-	-	70
-	-	4	-	-	4	3.8 Glass & Ceramic Engineering Drawing-II	2.5	50	20	70	-	-	-	-	70
2	-	-	-	-	2	3.9 Environmental Education * & Disaster management	2.5	50	--	--	-	--	--	--	--
						3.10 Elective (Any One)									
3	-	-	-	-	3	I. Glass Technology-II	2.5	50	20	70	-	-	-	-	70
3	-	-	-	-	3	II. Pottery & Porcelain-II	2.5	50	20	70	-	-	-	-	70
-	-	-	3	-	3	3.11 Silicate Analysis Lab	-	-	-	-	3	40	20	60	60
-	-	-	4	-	4	3.12 Pottery & Refractory Lab	-	-	-	-	6	60	30	90	90
-	-	-	4	-	4	3.13 Glass & Ceramic Workshop Practice(Glass,Enamel & Cement)	-	-	-	-	6	60	30	90	90
-	-	-	4	-	4	3.14 Physical Testing Lab	-	-	-	-	3	60	30	90	90
-	-	-	3	-	3	3.15 Project	-	-	-	-	Viva	80	40	120	120
-	-	-	-	-	-	3.16 Industrial Tour	--	--	--	--	-	-	30	30	30
-	-	-	-	-	-	3.17 Industrial Traing (4 Weeks	--	--	--	--	Viva	30	10	40	40
28	1	4	18	-	48	<-----TOTAL----->	--	450	180	630	--	320	200	520	1150
														Games/NCC/Social and Cultural Activities + Discipline (30 + 20)	50
														TOTAL	1200

NOTE: (1) Each period will be of 50 minutes duration.

(2) Each session will be of 32 weeks.

(3) Effective teaching will be atleast 25 weeks.

(4) Remaining periods will be utilised for revision etc.

(5) 4 weeks structured & supervised branch specific task oriented industrial training to be organised during summer vacation after II year Exam. 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.

30% of I Yr.	288
70% of IIYr.	770
100% of IIIYr.	1200
TOTAL	2258

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MAIN FEATURES OF THE CURRICULUM

Title of the course	:	Diploma in Glass & Ceramic Engineering
Duration of the course	:	Three Years
Pattern of the course	:	Annual System
Intake of the course	:	60
Type of the course	:	Full time Institutional
Entry qualification	:	10+ with science II & maths II.
Mode of admission	:	Through Joint Entrance Examination

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 enterpreneurship 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 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 prove conducive to students employment in present enviorance of the industry.

LIST OF EXPERTS

The experts whose deliberation regarding revision of the curriculum has proved helpful on dated 05-12-2003 and 09-01-2004, at I.T. B. H. U., C.D.G.I., Firozabad and Central Glass and Ceramic Research Institute, Kurja respectively, are honourably named in the following list.

1. Dr. G. N. Agarwal
Professor & Head I.T.B.H.U., Varanasi
2. Dr. G. K. Singh
Professor I.T.B. H. U., Varanasi
3. Prof. V. C. Joshi
Retd. Professor I.T.B. H. U., Varanasi
4. Dr. Ram Pyare
Reader I.T.B. H. U., Varanasi
5. Prof. Om Prakesh
Professor I.T.B. H. U., Varanasi.
6. Dr. S. P. Singh
Reader I.T.B. H. U., Varanasi.
7. Dr. Davendra Kumar
Professor I.T.B. H. U., Varanasi
8. Dr. Anil Kumar
Lecturer I.T.B. H. U., Varanasi
9. Dr. Viney Kumar Singh
Lecturer (Ceramic) S. G. S. J. Poly, Kurja
10. Shri C. S. Prasad
Deputy Officer Incharge C. G. C. R.I., Khurja
11. Dr. V. P. Tiwari
Principal Chem. Lab. C. D. G. I., Firozabad
12. Shri K. C. Singh
Technical Officer C. G. C. R.I., Khurja
13. Shri Devendra Saha
Sr. Glass Technologist C. D. G. I., Firozabad
14. Shri A. K. Singh
Pollution Control Officer C. D. G. I., Firozabad
15. Shri S. Paul
Glass Technologist C. D. G. I., Firozabad
16. Shri Y. Singh
T. B. O. I. R. D. T., Kanpur

The experts whose deliberation regarding revision of the curriculum has proved helpful on dated 15-02-2008 and 25-03-2008 at Central Glass and Ceramic Research Institute, Khurja respectively, are honourably named in the following list.

1. L. K. Sharma
Scientist Incharge C.G.C.R.I., Khurja
2. Shri C. S. Prasad
Deputy Officer Incharge C. G. C. R.I., Khurja
3. Shri K. C. Singh
Technical Officer C. G. C. R.I., Khurja
4. Shri Yad Ram
Technical Officer C. G. C. R.I., Khurja
5. Shri J.S. Minhas
Industrialist Silico Chemica Industries, Khurja
6. Shri V. K. Vishneya
Asstt. Lecturer S. G. S.J. P., Khurja
7. Shri K. C. Sharma
Asstt. Lecturer S. G. S.J. P., Khurja
16. Shri Dhruv Narayan
Asstt. Professor I. R. D. T., Kanpur

NEED ANALYSIS

The utility of glass and ceramics is well known 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.

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.

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.

- 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.

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 implant 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.	Implant 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

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.	Sames 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.

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.

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			

I YEAR

1.1 PROFESSIONAL COMMUNICATION

[Common to All Engineering/Non Engineering Courses]

L T P
3 - 2

Rationale:

Communication forms an important activity of diploma holder. It is essential that he/she should be in a position to communicate in writing and orally with superiors, equals and subordinates. This subject aims at providing working knowledge of languages like Hindi and English so as to train the students in the art of communication. It is suggested that maximum attention should be given in developing Communication abilities in the students while imparting instructions by giving maximum emphasis on practice.

Sr.No.	Units	Coverage time		
		L	T	P
1.	Introduction to communication methods meaning, channels & media written and verbal.	5	-	-
2.	Development of comprehension of English & Hindi through study of text material & language exercises.	20	-	-
3.	Development of expression through			
	A. Letters (English & Hindi)	10	-	-
	B. Report writing (English) Note making and minutes writing	10	-	-
4.	Composition	10	-	-
5.	Grammar	20	-	-
		75	-	50

1. PART I : COMMUNICATION IN ENGLISH

1.1 Concept of communication, importance of effective communication, types of communication, formal, informal, verbal and nonverbal, spoken and written. Techniques of communication, Listening, reading, writing and speaking, Barriers in communication, Modern tools of communication- Fax, e-mail, Telephone, telegram, etc.

1.2 Development of comprehension and knowledge of English through the study of text material and language exercises based on the prescribed text book of English.

1.3 Development of expression through:

1.3.1 Letters :

Kinds of letters:-

Official, demi-offical, unofficial , for reply or in reply, quotation, tender and order giving letters. Application for a job.

1.3.2 Report writing and Note making and minutes writing.

1.4 Grammer : Transformation of sentences, Preposition, Articles, Idioms and Phrases, One word substitution, Abbreviations.

1.5 Composition on narrative, descriptive, imaginative, argumentative, discussion and factual topics.

2. PART II : COMMUNICATION IN HINDI

2.1 Development of comprehension and knowledge of Hindi usage through rapid reading and language exercises based on prescribed text material developed by IRDT.

2.2 Development of expression through ;

Letter writing in Hindi:

Kinds of letters:-

Official, demi-offical, unofficial , for reply or in reply, quotation, tender and order giving letters, Application for a job.

- (1) Paper should be in two parts, part I - English and part II Hindi.

COMMUNICATION AND PRESENTATION PRACTICES

1.A. Phonetic transcription

B. Stress and intonation :

(At least 10 word for writting and 10 word for pronunciation)

2. ASSIGNMENT : (Written Communication)

Two assignment of approximately 400 word each decided by the teachers.

SUGGESTED ASSIGNMENTS :

1. a picture/photograph
2. an opening sentence or phrase
3. a newspaper/magzine clipping or report
4. factual writting which should be informative or argumentative.

3. Oral Conversation:

1. Short speeches/declamation : Bid farewell, Felicitate somebody, Celebrate a public event, Offer condolences
2. Debate on current problems/topics
3. MockInterview : Preparation, Unfolding of personality and Expressing ideas effectively
4. Group discussion on current topics/problems
5. Role Play/ general conversation : Making polite enquiries at Railway Station, Post Office, Banks and other Public places, Replying to such enquiries, enquiring about various goods sold in the market and discussing their prices. Complaining about service at Hotel, restaurant, Offering apologies in reply to such complaints, complain to a company about a defective product you have brought, reply to such complaints.
6. Presentation skill, Use of OHP and LCD.

4. Aural :

Listening to conversation/talk/reading of short passage and then writing down the relevant or main points in the specified number of words and answering the given questions

The assignments/project work are to be evaluated by the internal/ external examiner. The distribution of 30 marks e.g.

10 marks for assignment (Given by subject teacher as sessional marks)

10 marks for conversation and viva-voce

10 marks for phonetic transcription

STRUCTURE OF COMMUNICATION TECHNIQUE PAPER

Distribution of Marks

Theory Paper : 50 Marks

Sessional : 20 Marks

Practices : 30 Marks

- Q1. Question based on the topics prescribed text material will be set to test the candidates ability to understand the content, explain words and phrases, making sentence of given words and ability to summarise will be included. All questions will have to be answered.

A. from English Text Book 10 Marks

B. from Hindi Text Book 5 Marks

- Q2. Candidates will be required to write one letter (English) and one letter in (Hindi) from a choice of two -

A. English Letters 5 Marks

B. Hindi Letters 5 Marks

- Q3. Report Writing on given outlines 5 Marks

Q4. There will be a number of short answer questions to test the candidates knowledge of functional grammar, structure and usage of the language. All the items in this question will be compulsory. The grammar questions has four parts -

(Total Part: A For 5 Marks, B For 3 Marks, C For 3 Marks and D For 4 Marks)

A. This part of the question has to do with the transformation of sentences. English uses several patterns of sentence formation and the same meaning can be expressed by several patterns e.g. Active to Passive voice and vice versa, Direct to Indirect and vice versa, Reframing sentences by changing part of speech e.g. Noun to Adjective, Interchanging degree of comparison.

Interchanging Moods - Affirmative to Negative, Assertive to Interrogative or to exclamatory

B. The second part usually requires blanks in a sentence to be filled in with a suitable preposition and articles.

C. The third part is usually an exercise on tenses.

D. The fourth part concerns with one word substitution and abbreviation, uses of idioms and Phrases.

Q5. COMPOSITION : (About 300 Words) (5 marks)

Candidates will be required to select one composition topic from a choice of five. The choice will normally include narrative descriptive, argumentative, discussion and factual topics. The main criteria by which the composition will be marked are as follows

A. the quality of the language employed, the range and appropriateness of vocabulary and sentence structure the correctness of grammatical construction, punctuation and spelling.

B. The degrees to which candidate have been successfully in organising both the composition as a whole and the individual paragraphs.

1.2 APPLIED MATHEMATICS I

[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	18	6	-
2.	Trigonometry	7	2	-
3.	Coordinate Geometry	15	5	-
4.	Differential Calculus-I	15	5	-
5.	Integral Calculus-I	20	7	-
		75	25	-

DETAILED CONTENTS:

1. ALGEBRA-I :
 - 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
 - 1.4 Vector algebra : Dot and Cross product, Scaler and vector triple product. Application to work done, Moment of a force, Plane geometry.
2. TRIGONOMETRY :
 - 2.1 Relation between sides and angles of a triangle : Statement of various formulae showing relation ship between sides and angle of a triangle.
 - 2.2 Complex number.

Complex numbers, Representation, Modulus and amplitud
Demoivre theorem, its application in solving algebraic
equations, Mod. function and its properties..
3. CO-ORDINATE GEOMETRY :
 - 3.1 Standard form of curves and their simple properties -

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

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

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

Tangent and normals

3.2 Straight lines, planes and spheres in space -

Distance between two points in space, direction crossing and direction ratios, Finding equation of a straight line, and shortest distance between two lines

Under different conditions equation of a plane $lx+my+nz=c$, relation between lines and planes, sphere $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz=d$

4. DIFFERENTIAL CALCULUS - I :

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, Higher order derivatives, Leibnitz theorem.

4.3 Special functions (Exponential, Logarithmic, Hyperbolic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.

4.4 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, sketching of some simple curves (without assumptions, question, not to be asked in the examination), Rate, Measure, velocity, Acceleration, Errors and approximation.

5. INTEGRAL CALCULUS - I :

5.1 Methods of Indefinite Integration :- Integration by substitution, Partial fraction and by parts, Integration of special function of 4.3.

5.2 Meaning and properties of definite integrals, Evaluation of definite integrals.

5.3 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.

5.4 Simpsons and Trapezoidal Rule : their application in simple cases, Concept of error for simple function.

1.3 APPLIED PHYSICS

[Common to All Engineering Courses]

L T P
3 2/2 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.	Measurement	4	1	-
2.	Vector	3	1	-
3.	Force and Motion	4	1	-
4.	Dynamics of rigid body (Rotational Motion)	4	1	-
5.	Fluid Mechanics and Friction	4	1	-
6.	Work, Power and Energy	4	2	-
7.	Elasticity	2	1	-
8.	Simple Harmonic Motion	4	1	-
9.	Heat Transfer & Radiation	4	2	-
10.	Application of Sound Waves, Acoustics and Ultrasonics	6	2	-
11.	A. Optics	4	1	-
	B. Fiber Optics	4	1	-
12.	D.C. Circuits	4	1	-
13.	Dielectrics	4	2	-
14.	Magnetic Fields and Materials	4	2	-
15.	Semi Conductor Physics	5	1	-
16.	Nuclear Physics	4	2	-
17.	Laser & its Application	4	1	-
18.	Non-conventional energy sources	3	1	-
		75	25	50

DETAILED CONTENTS:

1. Measurement

a) Units and Dimensions

Fundamental and derived units :

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.
- b. 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, Standard deviation, Variance.
2. Vector :
- Scalar and vector quantities; Addition, Subtraction, Resolution of vector- Cartesian components of vector, Scalar and vector product of two vector.
3. Force and Motion
- Parabolic motion, projectiles thrown horizontally and at an angle. Problems on time of flight, horizontal range, and maximum horizontal range. Central forces. Circular motion, 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. Gravitational force, Motion of satellites, Kepler's laws, Escape velocity, Geostationary satellite, Concept of Black holes, Jet propulsion theory, Motion of Multi-stage Rocket, SLV, PSLV and GSLV Rockets.
4. Dynamics of Rigid Body (Rotational Motion)
- Rigid body, Rotational motion, Moment of inertia, Theorems (Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies, Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling down the slant planes.
5. Fluid Mechanics & Friction
- Surface tension, Capillaries, Equation of continuity ($A_1V_1=A_2V_2$), Bernoulli's theorem, stream line and Turbulent flow, Reynold's number.
- Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Static and dynamic frictional forces. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

6. Work, Power and Energy

Work done by force on bodies moving on horizontal and inclined planes in the presence of frictional forces, Concept of power and its units. Calculation of power (simple cases). Concept of kinetic and potential energy, various forms of energy, Conservation of energy. Force constant of spring, potential energy of a stretched spring.

7. Elasticity

Elasticity, stress and strain. Hooke's law, elastic limit. Yielding point and breaking point. Modulus of elasticity Young's modulus, bulk modulus and modulus of rigidity, Poisson ratio, Resilience.

8. Simple Harmonic Motion

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 their periodic time. Energy conservation in S.H.M. Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. Heat Transfer and Radiation

Modes of heat transfer, coefficient of thermal conductivity and its determination by (i) Searle's method for good conductors, and (ii) Lee's method for poor conductors. Conduction of heat through compound media, Conduction and convection, Radial flow of heat, Blackbody radiation, Stefan's law, Wien's displacement and Rayleigh-Jeans laws, Planck's Law.

10. Application of Sound Waves

Acoustics

Standing waves, Closed and Open organ pipes, Resonance, End-correction. Definition of pitch, loudness, quality and intensity of sound waves. Echo and reverberation and reverberation time. Sabine's formula. Control of reverberation time (problems on reverberation time). Acoustics of building defects and remedy.

Ultra-Sonic :

Generation, Magnetostriction, Piezoelectric effect, Application in new technology

11.A Optics

Quantum nature of light, Coherence (Spatial and temporal), Duality of wave and particle, Concept of Interference, Biprism, Fraunhofer single and N-slit diffraction, Grating,

Resolving and dispersive power, Elementary concept of polarisation.

B. Fibre Optics :

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.

12. D.C. Circuits

Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); potentiometer, Kirchoff's Law and their simple application. Principle of Carey-Foster's bridge. Electric potential, potential energy, Energy of a charged capacitor. Fleming left hand rule, torque on a current loop, Moving coil, Galvano meter. Charging/discharging of capacitors, Ballistic galvanometer, its charge sensitivity and Current sensitivity.

13. Dielectrics :

Electric dipole; effect of electric field on dielectrics, polarisation.

14. Magnetic Fields & Materials :

Dia, Para and Ferro-magnetism, Ferrites, Hysteresis, Methods of plotting, Hysteresis curve of a ferro magnetic materials and their uses, Magnetic circuits, Energy stored in magnetic fields, Basic idea of super conductivity, Meissner's effect, Applications.

15. Semiconductor Physics

Energy bands in solids, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semiconductors, Electrons and holes as charge carriers in semiconductors, Effect of temperature in conduction in semiconductors, P-type and N-type semiconductors, P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Majority and Minority charge carriers, Base, emitter and collector currents and their relationship LED's, Photoelectric effect and photo devices.

16. Nuclear physics

Radioactivity, Nuclear stability, Radioactive emission, radiation damage, Nuclear fission and fusion, Nuclear reactors (PHWR-type and fast breeder) and their application, Mass-energy relation, Atomic mass unit, Mass defect and

binding energy.

17. Lasers and its Applications

Absorbtion and Emission of energy by atom, Spontaneous and Stimulated Emission, Einstein's co-efficients, Poluation inversion, Main component of laser and types of laser- Ruby Laser, He-Ne and Semi-conductor laser and their applications. Principles of Holography, Introduction to MASER.

18. Non-conventional energy sources:

- (a) Wind energy : Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill, Indian wind energy programme.
- (b) Solar energy: Solar radiation and potentiality of solar radiation in India, unit of solar radiation, Solar constant measurement of solar radiation by pyrometer, and by Insolation meter (suryamapi) uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector, Solar PV plants in India, Modern applications in technology.

PHYSICS LAB

Note: Any ten experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.
2. Determination of 'Y' (Young's Modulus) by Searle's Method.
3. Determination of 'g' by plotting a graph T^2 versus l and using the formula $g = 4\pi^2 / \text{Slope of the graph line}$
4. Determination of Spring constant.
5. Determination of viscosity coefficient of a lubricant by Stoke's law.
6. Determination of 'k' for good conductor (Searle's Method).
7. Determination of frequency of AC mains by melde's methods (Transverse and Longitudinal Mode)
8. Determination of velocity of sound by resonance tube.
9. Determination of E_1/E_2 by potentiometer.
10. Determination of specific resistance by Carry Foster bridge.
11. Determination of resistivity by P.O.Box.
12. Verification of Kirchoff's Law.
13. To observe Characteristics of p-n Junction diode on oscilloscope.
14. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.
15. To measure solar intensity (determine solar constant) with the help of Insolation meter (Suryamapi).
16. Demonstration of He-Ne laser (Interferometer)
17. Determination of internal resistance by potentiometer.

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.

1.4 APPLIED CHEMISTRY

[Common to All Engineering Courses]

L T P
3 - 2

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	3	-	-
4.	Instrumental Methods	4	-	-
5.	Electro Chemistry	6	-	-
6.	Chemical Kinetics	4	-	-
7.	Catalysis	3	-	-
8.	Solid State	3	-	-
9.	Colloids	3	-	-
10.	Lubricants	3	-	-
11.	Environmental Pollution and Control	3	-	-
12.	Water Treatment	5	-	-
13.	Corrosion	3	-	-
14.	Fuels	3	-	-
15.	Glass and Ceramics	3	-	-
16.	Streochemistry of Organic Compounds	4	-	-
17.	Organic Reactions	6	-	-
18.	Organic Materials	9	-	-
		75	-	50

DETAILED CONTENTS:

1. ATOMIC STRUCTURE :

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

2. CHEMICAL BONDING :

Overview of basic concept, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital

theory, Co-ordination bond, Crystal field theory for tetrahedral carbon.

3. CLASSIFICATION OF ELEMENTS :

Modern classification of elements (s,p,d and f block elements), Periodic properties : Ionisation potential, electro negativity, Electron affinity, Born-Haber cycle.

4. INSTRUMENTAL METHODS :

UV-visible, IR and NMR spectroscopy, Basic principles, Beer-Lamberts Law and Application of spectroscopy.

5. ELECTRO CHEMISTRY :

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 its measurement by pH meter. Buffer solutions, Indicators, Solubility product, Common ion effect with their application, 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.

Concentration cells, reference electrodes (Hydrogen electrode) cells - Primary, Secondary and Fuel cell, Laclanche's or dry cell, Acid storage cell (Lead accumulator) and Alkali storage cell (Edison accumulator), Fuel cell, Solar cell (Photovoltaic cell), Numerical problems based on topics.

6. CHEMICAL KINETICS :

Introduction, order and molecularity of reaction. Activation energy, Rate law, rate constants, 1st order reactions and 2nd order reactions.

7. CATALYSIS :

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

8. SOLID STATE :

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. COLLOIDAL STATE OF MATTER :

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

10. LUBRICANTS :

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

11. ENVIRONMENTAL POLLUTION AND ITS CONTROL :

Concept and various types of environmental pollution with special reference to air pollution and water pollution. General measures to control environmental pollution. depletion of Ozone layer, Green house effect, Acid rain, Smog formation, Chemical and photochemical reaction, Various species in atmosphere. Specific industrial pollution like Euro-I and Euro-II.

12. WATER TREATMENT :

Concept of hard and soft water, Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Sods lime, Zeolote and Ion exchange resin process). Disadvantage of hard water in different industries, Boiler feed water boiler scale formation, Corrosion, Caustic embrittlement, primming and foarming.

Characteristics imparted by various impurities or contaminants such as colour, odour, taste and sediments and their analysis.

Analysis of Water :

- A. Estimation of chlorides in water.
- B. Determination of dissolved oxygen.

Disinfecting of Water :

By Chloramic, Ozone and Chlorination with its mechemism, Advantage and disadvantage of chlorinational, Break point chlorination (Free residual chlorination). Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Recycling of water-Theory and Process. Numerical problems based on topics.

13. CORROSION :

Concept of metallic corrosion, Types of corrosion and factors affecting the corrosion rate, Chemical and electrochemical theory of corrosion, Oxide film formation and its characteristics, tarnishing fogging and rusting, Prevention of corrosion by various methods.

14. FUELS :

Definition of fuel, its classification and their composition, Calorific value and determination of calorific value of solid and liquid fuels by Bomb calorimeter by Dulong's formula.

Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Diesel and Petrol), Benzol and Power alcohol.

Knocking, Anti-knocking agents, Octane number and Cetane number.

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

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

Numerical Problems based on topics

15. GLASS AND CERAMICS :

Concept of glass and its constituents, Classification and uses of different glass, Elementary idea of manufacturing process of glass. Introduction to ceramics materials, Its constituent. Industrial application of glass and ceramic.

16. STEREOCHEMISTRY OF ORGANIC COMPOUND:

- Isomerism
- Types of isomerism
 1. Structural isomerism
 2. Stereoisomerism (a) Geometrical (b) Optical
- Definition of chiral, achiral stereogenic centre, plane of symmetry.
- Types of stereoisomers-
 1. Conformers or Rotamers (Only ethanes)
 2. Configurational isomers
 - a. Enantiomers
 - b. Diastereoisomers

17. ORGANIC REACTIONS :

1. Fundamental aspects -

- A. Regents electrophiles and nucleophiles
- B. Reaction Intermediates
 - i. Free radical
 - ii. Carbocation
 - iii. Carbanion
- C. Various effects of substituents - Inductive, Mesomeric, Electromeric.

2.A. Mechanism of addition reaction (Markonico'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.

18. ORGANIC MATERIALS :

A. POLYMERS :

1. Introduction to basic terms used in polymer chemistry and technology. Monomers, Average degree of polymerisation, Average molecular weight, Polymers, Polymerisation.

2. Characteristics of Polymers and their classification

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. Free radical polymerisation (Mechanism)

4. General idea of Bio polymers

5. Brief idea of bio degradable polymers.

6. Inorganic polymers - Silicones

B. SOAPS AND DETERGENTS :

1. Introduction - A. Lipids, B. Fats and Oils

2. Saponification of fats and oils, Manufacturing of soap.

3. Synthetic detergents, types of detergents and its manufacturing.

C. EXPLOSIVES: TNT, RDX, Dynamite.

E. Paint and Varnish

F. Adhesives

LIST OF PRACTICAL

1. To analyse inorganic mixture for two acid and basic radicals from following radicals
 - A. Basic Radicals :
NH₄⁺, Pb⁺⁺, Cu⁺⁺, Bi⁺⁺⁺, Cd⁺⁺, As⁺⁺⁺, Sb⁺⁺⁺,
Sn⁺⁺, Al⁺⁺⁺, Fe⁺⁺⁺, Cr⁺⁺⁺, Mn⁺⁺, Zn⁺⁺, Co⁺⁺
Ni⁺⁺, Ba⁺⁺, Sr⁺⁺, Ca⁺⁺, Mg⁺⁺
 - B. Acid Radicals :
CO₃⁻⁻, S⁻⁻, SO₃⁻⁻, CH₃COO⁻, NO₂⁻,
NO₃⁻, Cl⁻, Br⁻, I⁻, SO₄⁻⁻
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 CaCO₃ by EDTA titration method using E Br indicator.
4. To determine the strength of given HCl solution by NaOH solution using pH meter
5. To determine the Chloride content in supplied water sample by using Mohr's methods.
6. Determination method of temporary hard ness of water sample by O-hener's method.

1.5 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
- - 8

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 acquires sufficient skill drafting and some ability in spetial visualization of simple objects.

Sl.N.	Units	Coverage Time		
		L	T	P
1.	Drawing Instruents and their use	-	-	4
2.	A. Lettering techniques	-	-	8
	B. Introduction to scales	-	-	8
3.	Conventional Presentation	-	-	8
4.	Principles of projections	-	-	16
5.	Orthographic projection of simple geometrical solids	-	-	24
6.	Section of Solids	-	-	20
7.	Isomatic Projection	-	-	20
8.	Free Hand Sketching	-	-	16
9.	Development of surfaces	-	-	24
10.	Assembly and disassembly drawing	-	-	24
11.	Orthographics Projection of Machine Parts	-	-	12

12.	Practice on Auto Cad	- - 16
		- - 200

C O N T E N T S

NOTE : Latest Indian Standards Code of Practice to be followed.

- 1
1. Drawing, instruments and their uses.
 - 1.1 Introduction to various drawing, instruments.
 - 1.2 Correct use and care of Instruments.
 - 1.3 Sizes of drawing sheets and their layouts.
 2. (a) Lettering Techniques 1 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 1 Sheet

Necesssity and use, R F

Types of scales used in general engineering drawing. Plane, diagonal and chord scales.
 3. Conventional Presentaion : 2 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 3 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 reference planes.

- (b) Orthographic views of simple composite solids from their isometric views.
- (c) Exercises on missing surfaces and views
6. Section of Solids 1 Sheet
- 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 1 Sheet
- Parallel line and radial line methods of developments.
- Development of simple and truncated surfaces (Cube, prism, cylinder, cone and pyramid).
10. Assembly and Disassembly Drawings 2 Sheet
- Plummer block
- Footstep bearings
- Couplings etc.
- Rivetted & Welded Joints
- Screw and form of screw thread
11. ORTHOGRAPHIC PROJECTION OF MACHINE PARTS: 2 Sheet

Nut and Bolt, Locking device, Wall bracket

12. PRACTICE ON AUTO CAD :

To draw geometrical figures using line, circle, arc, polygon, ellipse, rectangle - erase and other editing commands and osnap commands (two dimensional drawing only)

NOTE :

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

1.6 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
2 2/2 2/2

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	2		
2.	Force Analysis	8	4	
3.	Moment and Couple	4	2	
4.	General condition of equilibrium	4	3	
5.	Friction	6	3	
6.	Machines	6	3	
7.	Stress & Strain	8	4	
8.	Beam & Trusses	6	3	
9.	Thin cylindrical & spherical shells	6	3	
Total		50	25	25

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. 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 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.

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. 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.

5. 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.

6. 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.

7. Stresses and strains:

Concept of stress and strain. Concept of various types of stresses and strains. Definitions of tension, compression shear, bending, torsion. Concept of volumetric and lateral strains, Poisson's ratio. Changes in dimensions and volume of a bar under direct load (axial and along all the three axes). Ultimate stress, working stress. Elasticity, Hook's law, load deformation diagram for mild steel and cast iron. Definition of modulus of elasticity, yield point, modulus of rigidity and bulk Modulus. Stresses and strains for homogeneous materials and composite sections.

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)

9. Thin cylindrical and spherical shells:

Differentiation between thick and thin shells, cylindrical and spherical shells, thin spherical and cylindrical shells subjected to internal pressure, longitudinal stresses, circumferential or hoop stresses. longitudinal, circumferential and volumetric strains. Changes in the dimensions and volume of a thin shell subjected to internal fluid pressure.

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
 - (iii) Differential pulley block
 - (iv) Simple Screw jack
 - (v) Simple Worm & worm wheel
 - (vi) System of Pulleys (any type).

1.7 INTRODUCTION TO GLASS & CERAMIC ENGINEERING

L T P
3 2/2 -

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	10	3
2.	Glass Ceramic	10	3
3.	Enamel	12	3
4.	Pottery	11	4
5.	Refractory	10	4
6.	Cement	10	4
7.	Electronics Ceramic	6	2
6.	Composites	6	2
		75	25

1. Glass

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

2. Glass Ceramic :

Crystallization of glass, low thermal expansion glass of ceramics

3. Enamel

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

4. Pottery

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

5. Refractory

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

refractory,neutral refractory.

6. Cements

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

7. Electronic Ceramics :

Ceramic capicators, Ceramic magnets, Piezo Electric Ceramic.

8. Composites

Introduction to ceramic composites.

1.8 COMPUTER APPLICATION FOR ENGINEERING

[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
1 - 3

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	5	-	-
2.	Introduction To Operating System MS DOS/Windows	3	-	-
3.	Ms-Word	4	-	-
4.	Ms-Excel	3	-	-
5.	Ms-Power Point	3	-	-
6.	Ms-Access	3	-	-
7.	Introduction to Internet	2	-	-
8.	Concept of Programming	2	-	-
		25	-	75

DETAILED CONTENTS

1. Introduction to Computer:

Block Diagram of Computer, Types Of Computer Central Processing unit (Control unit, A.L.U.) & memory Unit. Types of Input and Output devices and memories. Visual Display Unit, Keyboard, Floppy disk drive, Hard disk drive, CD-ROM Drive, Magnetic & Tape Drive

Number system(Conversion) Binary, Octal, Hexa decimal number system, Conversion from Decimal to Other System and vice-versa Bit, Byte and Word.

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

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

3. MS WORD:

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

4. MS EXCEL:

Introduction, Use of Tools/Icons for preparing simple applications.

5. MS POWER POINT :

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

6. MS ACCESS :

Introduction, Use of Tools/Icons for preparing simple applications.

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. Concept of Programming :

Flowcharting, Algorithm techniques, etc.

List Of Practicals

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

1.9 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
-	-	8

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	-	-	24
2.	Painting & polishing shop	-	-	16
3.	Sheet metal and sodering shop	-	-	24
4.	Fitting shop	-	-	24
5 A.	Plumbing shop	-	-	16
5 B.	Foundry shop	-	-	20
6.	Smithy shop	-	-	24
7.	Welding shop	-	-	20
8.	Machine shop	-	-	16
9.	Fastening Shop	-	-	12
		-	-	200

DETAILED CONTENTS

1. **Carpentry Shop :**
 - EX-1 Introduction & demonstration of tools used in carpentry shop
 - EX-2 Planing and sawing practice
 - EX-3 Making of lap joint
 - EX-4 Making of mortise and tenon joint
 - Ex-5 Making of briddle joint
 - EX-6 Making of dovetail joint
 - Ex-7 Making of any one utility article such as wooden-picture frame, hanger, peg, name plate, etc.

2. **Painting and Polishing Shop:**
 - EX-1 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-2 To prepare metal surface for painting, apply primer and paint the same.
- EX-3 To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.
- * EX-4 Buffing and abrasive polishing of brass job.
- Ex-5 Zinc coating by electroplating method.
- Ex-6 To prepare any utility job.
- * 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 Working and Soldering Shop :
- EX-1 Introduction & demonstration of tools used in Sheet metal working shop.
- EX-2 Cutting, shearing and bending of sheet.
- EX-3 To prepare a soap case by the metal sheet.
- EX-4 To make a funnel with thin sheet and to solder the seam of the same.
- EX-5 To make a cylinder and to solder the same.
- EX-6 Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.
- EX-7 Study and sketch of various types of stakes/anvil.
- EX-8 To braze small tube/conduit joints.
4. Fitting Shop :
- EX-1 Introduction & demonstration of tools used in Fitting Shop.
- EX-2 Hacksawing and chipping of M.S. flat.
- EX-3 Filing and squaring of chipped M.S. job.
- EX-4 Filing on square or rectangular M.S. piece.
- EX-5 Making bolt & nut by tap and die set.
- Ex-6 To drill a hole in M.S. Plate and tapping the same to create threads as per need.
- EX-7 Utility article-to prepare a screw driver or paper weight, double open mouth spanner for 18" hexagonal head of a bolt.
- 5 A. Plumbing Shop :
- EX-1 Cutting and threading practice for using socket, elbow and tee etc. and to fit it on wooden practice board.
- EX-2 Study of-bib cock, cistern or stop cock, wheel valve and gate valve etc.
- 5 B. Foundry Work
- Ex-1 Study & sketch of the foundry tools.
- Ex-2 Study & sketch of cupola & pit furnace.
- Ex-3 To prepare the green moulding sand and to prepare moulds (single piece and double piece pattern sweep

- mould)
- Ex-4 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-1 To prepare square or rectangular piece by the M.S. rod.
- EX-2 To braze M.S. Flats/Tipped tools on M.S. shank.
- EX-3 To make a screw driver with metallic handle.
- EX-4 To make a square or hexogonahed bolt.
- EX-5 To make a ring with hook for wooden doors.
- EX-6 Utility article-to preapre a ceiling fan hook.
7. Welding Shop :
- EX-1 Welding practice-gas and electric.
- EX-2 Welding for lap joint after preparing the edge.
- EX-3 Welding of Butt joint after preparation of the edge.
- EX-4 'T' joint welding after preparation of edge.
- EX-5 Spot welding, by spot welding machine.
- EX-6 Welding of plastic pieces by hot strip method.
- EX-7 Welding practice by CO2 gas welding
8. Machine Shop
- EX-1 Study & sketch of lathe machine.
- 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.
9. Fastening Shop
- EX-1 Practice of bolted joints
- EX-2 To prepare a rivetted joint
- EX-3 To make a pipe joint
- EX-4 To make a threaded joint
- EX-5 Practice of sleeve joint

II YEAR

2.1 APPLIED CHEMISTRY - II

L	T	P
2	-	-

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	6	-	-
3.	Unit-III	8	-	-
4.	Unit-IV	6	-	-
5.	Unit-V	8	-	-
6.	Unit-VI	6	-	-
7.	Unit-VII	8	-	-
TOTAL		50	-	-

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, helides, sulphats). their propoerties 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)
- IV. Oxides of As and Sb.
- V. Selenium and sulpher and their compounds used in ceramic industry.
- VI. Compound of Ce, Nd and Pr.
- VII. Phase rule, one component system (SiO₂, Al₂O₃, ZrO₂),two component systems (Al₂O₃-SiO₂, Na₂O-SiO₂, CaO-SiO₂, CaO-Al₂O₃)

2.2 ELEMENTARY ELECTRICAL, MECHANICAL & CIVIL ENGG.

L T P
2 - 2

RATIONALE

Ceremic & 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 curriculam to provide a general introduction to mechanical, electircal & 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.	Transfomer	2		
4.	A.C. Machines	6		
5.	Electrical Measuring Instruments	6		
Mechanical engineering				
1.	Unit-I	6		
2.	Unit-II	3		
3.	Unit-III	3		
Civil Engineering				
1.	Unit-I	12		
TOTAL		50	-	50

B. Syllabus:

Electrical Engineering:

1. D.C. Machines

Principle, type and application.

2. Fundamentals of A.C.

Definition of Alternating current. Instantaneous value, maximum value, timeperiods, frequency, R.M.S. value, average value, phase and phase differeance, leading and laging power factor, concept of 3-phase system. KVA, KVAR, KW, calculation of power consumed in single phase and three phase circuit. Star and delta connection (Line voltage, Line

current, phase voltage and phase current only).

3. Transformers

Working principle of a single phase transformer and its application.

4. A.C. Machines:

Motors: Brief idea about construction, starting, methods & 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.

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.

2.3 INDUSTRIAL OPERATIONS

L	T	P
2	-	-

A. TOPICWISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Introduction	4		
2.	Size reduction	16		
3.	Handling of solids & slurry	14		
4.	Mechanical Operations	16		
TOTAL		50	-	-

B. Syllabus:

1. Introduction:

Concept and rule of unit operation in process industries.

2. Size reduction:

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

3. Handling of Solids & Slurries:

Screening and grinding of solid particles. Standard screening equipments. 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 filtration. Types of mixing equipments used in ceramic industry.

2.4 POTTERY & REFRACTORY

L T P
3 - 8

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
SEC. A - POTTERY				
1.	Introduction	2		
2.	Raw Material	12		
3.	Body Preparation	12		
4.	Mould Materials	6		
5.	Firing	4		
6.	Quality Control Checks	6		
SEC. B - REFRACTORY				
1.	Raw Materials	8		
2.	Making of Refractory Bricks	13		
3.	Manufacturing of crucible & saggars	8		
4.	Quality Control Checks	4		
TOTAL		75	-	200

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:

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

Jiggering, i.e. Jigger and rotary Table type jiggering the casting process, different types of casting, extrusion, dry pressing different 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 furnace and placing of wares in furnace and firing schedules.

6. Quality Control Checks:

Quality checks/control methods at various stages.

SEC. B - REFRACTORIES

1. Raw Materials:

Classification of refractory materials, clay minerals, high alumina, alumina silica minerals, magnesite, dolomite, chromite, and other refractory oxides. The mining and primary treatment of raw materials.

2. Making of Refractory Bricks:

Moulding methods, drying, effect of heat on clay, Manufacture and properties of silica and semisilica 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, glass house pots, furnace blocks, saggars and muffles used in different industries.

4. Quality Control Checks:

Quality Checks/Control methods at various stages.

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 speciman 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.
 - e. Flexural strength (MOR)

Note :- Those practicals which are not possible at institute level, can be demostrated/performed in Industrial Training/field exposure.

2.5 GLASS AND ENAMELS

L	T	P
3	2/2	4

A. TOPIC WISE DISTRIBUTION OF PERIODS.

SL.NO.	TOPIC	L	T	P
SEC. A GLASS				
1.	Raw Materials	12	4	
2.	Batch Calculation	10	3	
3.	Typical Commercial Glasses	4	1	
4.	Melting & Refining	8	2	
5.	Decoration	2	1	
6.	Quality & Control Test	8	2	
SEC. B ENAMELS				
1.	Unit I	24	10	
2.	Unit II	7	2	
TOTAL		75	25	100

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 batch from glass composition and vice versa typical commercial glasses.

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.

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 ENAMEL 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.

2.6 GLASS & CERAMIC ENGINEERING DRAWING-I

L T P
- - 8

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	LAB/DRG.	NO. OF PLATES
1.	UNIT I - a	16	1
	- b	16	1
	- c	12	1
2.	Unit II	48	2
3.	Unit III	44	3
4.	Unit IV	64	4
TOTAL		200	12

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 3

Unit IV

Pictorial views of the following ceramic machinary.

- (a) Ball Mill)
 (b) Edge runner mill)
 (c) Jaw Crusher) Sheets 4
 (d) Plunger)
 (e) Filter press)

2.7 INDUSTRIAL CALCULATION & ENVIRONMENTAL POLLUTION

L	T	P
3	-	-

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL NO.	TOPIC	L	T	P
1.	Introduction	2		
2.	Dimension, Units	6		
3.	Stoichiometric relationship	12		
4.	(a) Ideal gas, PVT	10		
	(b) Dalton and Anagat's Law	2		
5.	Humidity and saturation	4		
6.	Material Balance	12		
7.	Combustion process	12		
8.	Environmental Pollution	15		
TOTAL		75	-	-

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

Humidity and saturation-simple problem using chart.

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. Pollution control Acts and Legislation.

2.8 FUELS, FURNACES AND PYROMETRY

L	T	P
3	-	-

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	8		
4.	Tank Furnaces	6		
5.	Other Furnaces	8		
6.	Other Equipments	7		
7.	Pyrometry	10		
TOTAL		75	-	-

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

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. Horizontal draft kiln, 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 - Hoffman's Kiln, 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 Furnaces:

Description and operation of shuttle kiln, tophat kiln, chamber kiln, Hoffman's/Belgian/Zig-Zag kiln, Pushar kiln, decoration kiln, fast firing kiln, box type furnaces.

6. Other Equipments

Design and operation of Burners, Burner efficiency, blowers, heater regenerator, recuperator etc.

7. 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 - Rhodiun 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.

2.9 ELEMENTS OF GEOLOGY

L T P
2 2/2 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	20	10	-
2.	Chapter II	10	5	-
3.	Chapter III	20	10	-
		50	25	50

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, andalusite sillimanite, kaolinite, olivine, bauxite, pyrophyllit, zircon, mica, basalt, graphite, calcite, magnasite, dolomite, lime stone, gypsum, gypsite, corondum.

GEOLOGY PRACTICALS

1. Blow pipe analysis of common minerals e.g. hematite, magnetite gypsum, calcite, baryte etc.

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

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

3. Determination of specific gravity of minerals

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

5. Microscopic identification of minerals.

2.10 MODELLING AND MOULDING

L	T	P
-	-	2

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.

III YEAR

3.1 POTTERY AND PORCELAIN-I

L T P
3 - -

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL. NO.	TOPIC	L	T	P
1.	Chapter I	12		
2.	Chapter II	16		
3.	Chapter III	12		
4.	Chapter IV	9		
5.	Chapter V	10		
6.	Chapter VI	4		
7.	Chapter VII	4		
8.	Chapter VIII	4		
9.	Chapter IX	4		
TOTAL		75	-	-

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.
 - IV. Ceramic glazes - Different 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.
 - VIII. Machenisation in pottry works - Introduction to simple hand tools, equipments & Machines.
 - IX. Quality Control & Testing
- A. Residue on different sieve range and particle size

distribution below 25 micron.

- B. Green and dry properties of body mixes such as shrinkage, bulk density, strength.
- C. Fired characteristics such as fired shrinkage, fired strength (MOR and Compressive strength), water absorption, apparent porosity, bulk density, fired colour at different temperatures.
- D. Pressing effect on the fired and green bodies.
- E. Thermal expansion of body and glass.

3.2 REFRACTORY TECHNOLOGY

L	T	P
3	-	-

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	15		
TOTAL		75	-	-

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 Refractory
- 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. Thermal Mechanical: Refractoriness under load (RUL). Hot modulus of rupture (MOR), Hot crushing strength.
 - d. Thermochemical - corrosion.
- III. Refractoriness : Refractoriness under load, role of vitrification, change in volume sensitiveness to sudden change in temperature, crushing strength, porosity-apparent porosity, specific gravity, permeability, resistance to corrosion and abrasion. Resistance to weather and frost conductivity.
- IV. Application of Refractories : Blast furnace, basic and acid open hearth furnace and bessemer converters, electric furnace for steel melting. Refractories in aluminium furnace.
- V. Testing and Quality control of refractory articles : Chemical analysis micropetrological examination.

3.3 GLASS TECHNOLOGY-I

L	T	P
3	-	-

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Chapter I	10		
2.	Chapter II	10		
3.	Chapter III	8		
4.	Chapter IV	8		
5.	Chapter V	6		
6.	Chapter VI	6		
7.	Chapter VII	6		
8.	Chapter VIII	12		
9.	Chapter IX	9		
TOTAL		75	-	-

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.
- V. Decolourising : Theory of decolorisation, decolorising agents.
- 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, quality control measures.

3.4 CEMENT AND LIME

L T P
3 - -

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	3		
8.	Chapter VIII	3		
9.	Chapter IX	9		
10.	Chapter X	18		
11.	Chapter XI	24		
TOTAL		75	-	-

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.

3.5 MODERN CERAMICS & ITS APPLICATIONS

L	T	P
3	-	-

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	12		
5.	Chapter V	12		
6.	Chapter VI	6		
7.	Chapter VII	8		
TOTAL		75	-	-

B. SYLLABUS:

- I. 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. High permittivity ceramics: Electrical condensers, advantage of ceramic condensers, rutile bodies, Titanates ceramics. Ferro electric and Piezo electric ceramics
- III. Magnetic ceramics: Soft spinel ferrites and hard hexagonal ferrites.
- IV. Special Ceramics: High temperature ceramics, Berillia, Magnesia, alumina and zirconia, Non oxides : Silicon nitride, Boron nitride Boron carbide, Silicon Carbide and calcium carbide. Sialonse, ceramic super conductors.
- V. Ceramic Composites & their applications :
 - (a) Types : Agglomerated materials; Reinforcement and dispersion strengthening: Theoretical principles of strengthening.
 - (b) Fiber and Whiskers : Methods of production; Strength and characteristic properties of ceramic fibres; Carbon and boron fibres; Glass fibres and Whiskers-alumina, graphite etc.
 - (c) Fibre Reinforced Composites: Methods of production, properties and applications.

- (d) Cermets: Types, methods of production, properties and applications.
 - (e) Metal Coatings Vapour deposition; Electroplating; D.C. and R.F. sputtering and true printing; Ceramic metal seals.
 - (f) Transformation toughened Ceramics Cutting tools; Wear resistant ceramics; Grinding media and ceramic engine parts.
- VI. Newer Techniques in ceramics: Density reduction & increasing strength.
- VII. Recent developments in the field of ceramics (lectures to be delivered by eminent ceramic engineers)

3.6 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

L T P
2 1 -

Rationale:

The knowledge of this subject is required for all engineering technicians, but it becomes more important for those technicians who wish to choose industry as their career. This course is designed to develop understanding of various functions of management, role of workers, and engineers, industrial safety, trade unions, wages and incentives, marketing, entrepreneurship, inventory control and industrial legislation.

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Principles of Management	10	4	-
2.	Human Resource Management	3	2	-
3.	Human and Industrial Relations	4	3	-
4.	Personnel Management	6	3	-
5.	Financial Management	6	3	-
6.	Material Management	4	3	-
7.	Labour, Industrial and Tax Laws	4	2	-
8.	Entrepreneurship Development	8	4	-
9.	Intellectual Property Rights	5	1	-
		50	25	-

DETAILED CONTENTS

1. PRINCIPLES OF MANAGEMENT :

Definition of management, Administration organisation, Functions management, Planning, Organizing, Co-ordination and control, Structure and function of industrial organisations, Leadership- Need for leadership, Factors to be considered for accomplishing effective leadership, Communication -Importance, Processes, Barriers to communication, Making communication, Effective, formal and informal communication, Motivation - Factors determining motivation, Positive and negative motivation, Methods for improving motivation, Incentives, Pay promotion and rewards, Controlling - Just in time, Total quality management, Quality circle, Zero defect concept. Concept of Stress Management

2. HUMAN RESOURCE DEVELOPMENT :

Introduction, Staff development and career development, Training strategies and methods.

3. HUMAN AND INDUSTRIAL RELATIONS :

Human relations and performance in organisation, Understand

self and others for effective behaviour, Industrial relations and disputes, Characteristics of group behaviour and Trade unionism, Mob psychology, Labour welfare, Workers participation in management.

4. PERSONNEL MANAGEMENT :

Responsibilities of human resource management - Policies and functions, Selection - Mode of selection - Procedure - training of workers, Job evaluation and Merit rating - Objectives and importance wage and salary administration - Classification of wage, Payment schemes, Components of wage, Wage fixation.

5. FINANCIAL MANAGEMENT :

Fixed and working capital - resource of capital, Shares, types preference and equity shares, Debenture types, Public deposits, Factory costing, Direct cost, Indirect cost, Factory over head, Fixation of selling price of product, Depreciation- Causes, Methods.

6. MATERIAL MANAGEMENT :

Objective of a good stock control system - ABC analysis of inventory, Procurement and consumption cycle, Reorder level, Lead time, Economic order quantity, Purchasing procedure, Stock keeping, Bin card.

7. LABOUR, INDUSTRIAL AND TAX LAWS :

Importance and necessity of industrial legislation, Types of labour laws and dispute, Factory Act 1948, Payment of Wages Act 1947, Employee State Insurance Act 1948, Various types of taxes - Production Tax, Local Tax, Trade tax, Excise duty, Income Tax.

8. ENTREPRENEURSHIP DEVELOPMENT :

Concept of entrepreneurship, need of entrepreneurship in context of prevailing employment conditions of the country. Successful entrepreneurship and training for entrepreneurship development. Idea of project report preparation.

9. INTELLECTUAL PROPERTY RIGHTS :

Introduction to IPR (Patents, Copy Right, Trade Mark), Protection of undisclosed information, Concept and history of patents, Indian and International Patents Acts and Rules, Patentable and Nonpatentable invention including product versus Process.

NOTE : Entrepreneurship Awareness camp to be organised at a stretch for Two or Three days. Lectures will be delivered on Entrepreneurship by industries experts at institute level.

3.7 CERAMIC MACHINERY & FURNACE DESIGN

L	T	P
3	-	-

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	9		
5.	Chapter V	9		
6.	Chapter VI	9		
7.	Chapter VII	5		
8.	Chapter VIII	12		
TOTAL		75	-	-

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.
- VII. Furnace capacity, fuel efficiency and firing efficiency.
- VIII. Elementery idea of design, construction and thermal calculation of at least one of the above mentioned furnaces.

3.8 GLASS & CERAMIC ENGINEERING DRAWING-II

L T P
- - 4

A. TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Unit I (12 Plates)			84
2.	Unit II (4 Plates)			23
3.	Unit III (1 Plate)			8
TOTAL				100

B. SYLLABUS

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

- | | |
|------------------|--|
| 1. Ballmill | 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 |
| 15. Frit furnace | 16. Chimneys for glass and pottery furnace |

II. Layouts of ceramic plant:

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

III. Dimensioned drawing of Insulator.

3.9 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

L T P
2 - -

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	3		
2.1	Water Pollution	8		
2.2	Air Pollution	8		
2.3	Noise Pollution	3		
2.4	Radio Active Pollution	4		
2.5	Solid Waste Management	5		
3.	Legislations	3		
4.	Environmental Impact Assessment	4		
5.	Disaster Management	6		
TOTAL		50	-	-

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 :

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, CO₂, NH₃, 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.

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 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.

ELECTIVE

3.10 I. GLASS TECHNOLOGY-II

L	T	P
3	-	-

TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Topic 1	10	-	-
2.	Topic 2	15	-	-
3.	Topic 3	10	-	-
4.	Topic 4	8	-	-
5.	Topic 5	10	-	-
6.	Topic 6	10	-	-
7.	Topic 7	12	-	-
TOTAL		75	-	-

1. GLASS CERAMICS :

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. T.V. PICTURE TUBE :

Manufacturing of screen and funnel and their joining, Coating on screen, Construction of electron gun in picture tube.

4. FLOAT GLASS :

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

5. OPTHELMIC GLASSES :

Refractive and dispersion in glass, Design of glass lens.

6. 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.

7. GLASS DECORATION :

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

3.10 II. POTTERY & PORCELAIN-II

L T P
3 - -

TOPIC WISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L	T	P
1.	Topic 1	15	-	-
2.	Topic 2	10	-	-
3.	Topic 3	10	-	-
4.	Topic 4	10	-	-
5.	Topic 5	10	-	-
6.	Topic 6	10	-	-
7.	Topic 7	5	-	-
8.	Topic 8	5	-	-
TOTAL		75	-	-

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

3.11 SILICATE ANALYSIS LAB

L	T	P
-	-	3

- 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.

3.12 POTTERY & REFRACTORY LAB

L	T	P
-	-	4

(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).

3.13 GLASS & CERAMIC WORKSHOP PRACTICE

L	T	P
-	-	4

(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

3.14 PHYSICAL TESTING LAB

L	T	P
-	-	4

(A) POTTERY:

1. Particle size determination of ceramic raw materials by sedimentation e.g. Anderencen pippete, sedimentation balance.
2. Strenght 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. Spolling 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 strenght.
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. Inpact Resistance Test
32. Water Resistance Test
33. Metal Gauge and Dimension

(E) FUEL AND PYROMETRY :

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

3.15 PROJECT

L	T	P
-	-	3

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:

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

DIPLOMA IN GLASS & CERAMIC ENGINEERING
STAFF STRUCTURE

Intake of the course	60	
Pattern of the course	3yrs	
1. Principal	1	
2. H.O.D.	1	
3. Lecturer Ceramic.Engg.	3	
4. Lecturer Maths	1	Part time or common with other discipline if the intake is more than 180.
5. Lecturer Physics	1	
6. Lecturer Chemistry	1	
7. Lecturer Language	1	
8. Lecturer Computer	1	
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
<p>Note: Labs of physics, Chemistry and computer science will be common for all disciplines in the institute.</p>			
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	

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.	Amt.in Rs.
1.	Brass ball with hook 2 cm. dia	2	20	40
2.	Stop clock least count 0.1 Sec	2	500	1000
3.	Wall bracket with clamping arrangement	2	50	100
4.	Meter scale	5	20	100
5.	Convex lenses of focal length 10 cm., 20 cm., 50 cm. and 100 cm. 2 nos. of each	8	10	80
6.	Optical bench steel with pin and lens holders	2	500	1000
7.	Astronomical telescope	1	500	500
8.	Searl's conductivity apparatus with copper & steel rods 25 X 4 cm. diameter with all accessories	1 set	1000	1000
9.	Lee's conductivity app. complete with all accessories	1 set	1000	1000
10.	Constant water flow arrangement	2	400	800
11.	Boiler made of copper 2 lt. cap.	4	200	800
12.	Platinum resistance thermometer	2	800	1600
13.	Potentiometer - 10 wires with jockey	1	500	500
14.	Meter bridge complete	1	250	250
15.	Lead accumulator 2.2 V. and 20 amp. hour capacity	2	250	500
16.	Moving coil galvanometer	3	200	600
17.	Moving coil ammeter 0-1 amp., 0-5 amp., 0-10 amp., 1 no of each	3	250	750
18.	Moving coil voltmeter 0-1 V. 0-5 V., 0-10 V. 1 No of each	3	250	750
19.	Leclanchi cell complete	3	100	300
20.	Resonance col. of steel tube with tuning forks and other accessories	1	500	500
21.	Tuning forks set of different frequencies	1 set	1000	1000

S.No.	Name of Equipment	No.	@ Rs.	Amt. in Rs.
22.	App. for determining coefficient of friction on a horizontal plane	1 set	1000	1000
23.	Apparatus for determining characteristics of P-N junction diode complete with all accessories	1 set	1500	1500
24.	Post office box dial type	1	1200	1200
25.	Resistance box 0-10 ohm., 0-100 ohm. 2 nos. each	4	400	1600
26.	Rheostat of different ohm.capacity	8	250	2000
27.	Physical balance with weight box	2	800	1600
28.	Set of fractional weights	10	20	200
29.	Fortin's barometer with mercury	1	2500	2500
30.	Battery eliminator 6 V. & 3 amp.	1	250	250
31.	Lab tables	3	8000	24000
32.	Lab stools	10	100	1000
33.	Anemometer cup type	1	1000	1000
34.	Anemometer hand held	1	1000	1000
35.	Suryamapi	1	1500	1500
36.	Insolation meter	1	1500	1500
	Misc.	LS		5000

II. APPLIED CHEMISTRY LAB

S.No.	Name of Equipment	No.	@ Rs.	Amt. in Rs.
1.	Test tube stand	15	10	150
2.	Funnel stand	15	10	150
3.	Burette stand	15	30	450
4.	Pipette stand	15	10	150
5.	Chemical balances with analytical weights 1gm -200gms	5	1500	7500
6.	Fractional weights set with rider	5sets	25	125
7.	Kipp's apparatus 1000 ml. polythen	2	500	1000
8.	Reagents bottles			
	250ml	120	10	1200
	500ml	5	15	75
	1000ml	5	25	125
9.	Wide mouth bottle 250 ml	15	15	225
10.	Winchester bottle 2.5 litre	15	30	450
11.	Test tubes 1/4" x 6"	75	1	75
12.	Boiling tube 1" x 6" hard glass	24	10	240
13.	Pestle and mortar 10 cms	2	30	60
14.	Watch glass 7.5 cms	15	5	75
15.	Beakers			
	100 ml.	10	15	150
	250 ml.	24	20	480
	400 ml.	12	25	300
	1000 ml.	5	30	150
16.	Weighing bottle 10 ml with lid	15	10	150
17.	Wash bottles	15	15	225
18.	Conical flask 250 ml.	15	30	450
19.	Flat bottom flask 500 ml.	6	40	240
20.	Flat bottom flask 250 ml.	15	25	375

S.No.	Name of Equipment	No.	@ Rs.	Amt. in Rs.
21.	Burette 50 ml.	15	60	900
22.	Pipette 25 ml.	15	20	300
23.	Measuring flask 250 ml. with stopper	15	50	750
24.	Measuring cylinder of various sizes (250 ml, 500 ml, 1000 ml) 3 no. of each	9	LS	250
25.	Bunsen's burner of brass	15	50	750
26.	Gas plant petrol 10 to 20 burners automatic	1	5000	5000
27.	Spirit lamp	15	30	450
28.	Tripod stand	15	10	150
29.	Wire gauge 15 X 15 cm. with asbestos	15	15	225
30.	Test tube holder	15	10	150
31.	Porcelain plates	15	20	300
32.	Funnel 15 cm.	15	16	240
33.	Blow pipe & work tools with electric blower for glass blowing	1 set	10000	10000
34.	Cork borers with sharpn	2 set	100	200
35.	Cork pressure	1 set	250	250
36.	Glass cutting knife	1	75	75
37.	Spatula hard & nickel/steel	2 each	50	100
38.	Water tapes with gooseneek	6	200	1200
39.	Gas taps two way	10	150	1500
40.	Pinch cock & screw	15	20	300
41.	Distilled water units (electrical)	1	5000	5000
42.	Distilled water units (solar)	1	5000	5000
43.	Open balance 1000 gms./10 mg.	1	600	600
44.	Platinum wire	5	25	125
45.	Brush for cleaning various type	40	10	400
46.	Jars 20 Lit. for keeping distilled water	5	100	500
47.	Lab table 2 m. x 1.2 m. x 1 m. height with central sink and cup boards (Teak wood) with drawers and two built in almira on each side with reagent racks, better tile top	4	8000	32000
48.	Exhaust fans 18"	4	2000	8000
49.	Side racks and selves for bench reagents made of teak wood for 24 bottles each set	4	2000	8000
50.	Digital balance electronic	1	10000	10000
51.	Hot plates 7-1/2", 3" dia controled 2000 watts	1	1000	1000
52.	Hot air oven thermostatically controled with selves and rotary switches 350 x 350 x 25 high	1	8000	8000
53.	pH Meter	1	1000	1000
54.	Glass Electrode	2		
55.	Reference Electro	2		
	Miscellaneous	LS		10000

APPLIED MECHANICS LAB

Sl.No.	Name of Equipment	No.	Rate	Amount
1.	Polygon of Forces Apparatus	1	700	700
2.	Universal Force Table	1	1500	1500
3.	Principle of Moment Apparatus			
	Bell Crank lever	1	500	500
4.	Combined Inclined plane & Friction apparatus	1	900	900
5.	Simple wheel and axle	1	800	800
6.	Differential wheel and axle	1	1200	1200
7.	Double sleeve Pulley Block	1	400	400
8.	Simple Screw Jack	1	200	200
9.	System of pulleys (Any I,II,III)	1	1200	1200
10.	Worm & Worm wheel	1	1200	1200
11.	Apparatus for Reaction at support	1	1000	1000
12.	Jib Crane	1	500	500
13.	Jointed Roof Truss Apparatus	1	500	500
	Misc.	Lum Sum		2000

III. WORKSHOP PRACTICE

CARPENTRY SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	60 cm.rule	10	15	150
2.	Flexible steel rule 2 metre	2	20	40
3.	T square 23 cm. steel	10	20	200
4.	Bevel square 23 cm. steel	2	30	60
5.	Marking knife 25 cm. steel	10	30	300
6.	Marking gauge wooden & brass 25 cm.	10	30	300
7.	Mortise gauge wooden & brass 25 cm.	10	50	500
8.	Caliper inside, steel 20 cm.	2	50	100
9.	Caliper outside , steel 20 cm.	2	50	100
10.	Compass steel 20cm.	2	40	80
11.	Devider steel 20 cm.	2	40	80
12.	Plumb	2	20	40
13.	Wooden bench vice steel 20 cm.	10	200	2000
14.	Bench hold fast steel 30 cm.	10	40	400
15.	Bar clamp 2 m.	2	300	600
16.	G clamp of flat spring steel 20x30 cm.	4	60	240
17.	Rip saw 40-45 cm.	10	80	800
18.	Cross cut saw 40-45 cm.	2	80	160
19.	Tennon saw 30-35 cm.	10	50	500
20.	Dovetail saw 30-35 cm.	2	60	120
21.	Compass saw 35 cm.	4	60	240
22.	Key hole saw or pad saw 30-35 cm.	2	25	50
23.	Bow saw	2	25	50

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
24.	Frame saw	2	25	50
25.	Chisel fish brand 1" to 1/8" firmer	3 set	100	300
	Dovetail	3 set	100	300
	Mortise	3 set	100	300
26.	Gauge or Golchi 1" to 1/8"	3 set	150	450
27.	Wooden jack plane complete	10	100	1000
28.	Wooden smoothing plane	10	80	800
29.	Iron jack plane complete	10	200	2000
30.	Iron rebate plane complete	3	80	240
31.	Iron grooving plane complete	3	120	360
32.	Iron compass plane complete	3	200	600
33.	Wooden moulding plane complete	3	200	600
34.	Bradawl	3	150	450
35.	Gimlet drills set	1 set	150	150
36.	Center bit	2	120	240
37.	Twist bit	2	80	160
38.	Auger bit	2	40	80
39.	Dovetail bit	2	15	30
40.	Counter shank bit	2	20	40
41.	Ratchet brace machine	2	175	350
42.	Grand drill machine 1/4"	2	200	400
43.	Wooden hand drill burmi	5	200	1000
44.	Wooden mallet	10	25	250
45.	Claw hammer	3	30	90
46.	Carpenters hammer	10	30	300
47.	Cutting tool for Universal wood working machine	3 set	800	2400
48.	Screw driver 18" & 15"	6	50	300
49.	Adze 500 gm.	10	50	500
50.	Pincer 175 mm.	6	75	750
51.	Plier 150 mm.	4	90	360
52.	Oil stone 8"	4	75	300
53.	Rasp file 12"	4	100	400
54.	Half round file 12"	4	80	320
55.	Round file 12"	4	80	320
56.	Triangular file 5", 4"	8	60	480
57.	Water stone	4	20	80
58.	Carpentry work benches	4	2000	8000
59.	Band saw machine complete	1	30000	30000
60.	Circular saw machine	1	15000	15000
61.	Double Ended Electric Bench grinder	1	6000	6000
62.	Universal wood working machine	1	15000	15000
	misc. for foundation of machines	LS		10000
SMITHY SHOP				
1.	Anvil 150 Kg. with stand	5	2500	12500
2.	Swage block 50x30x8cm.&45x45x10cm.	2	1250	2500
3.	Hammers			
	Ball peen 0.8 Kg. (Approx.)	10	150	1500
	Cross peen 0.8 Kg. (Approx.)	10	150	1500

4.	Beak iron	25 Kg.	1	500	500
5.	Swages different types		6	40	240
6.	Fullers different types		6	30	180
7.	Leg vice 15 cms. opening		1	150	150
8.	Electric blower with motor		1	5000	5000
9.	Furnace chimney with exhaust pipe		5	5000	25000
10.	Sledge hammer - 5 Kg.		2	200	400
	Misc. tools			LS	2500

SHEET METAL, SOLDERING & BRAZING

1.	Dividers - 15cm.		5	60	300
2.	Trammel 1 m.		1		
3.	Angle protector		5	60	300
4.	Try square 30 cm.		5	40	200
5.	Centre punch		5	20	100
6.	Steel rule 30 cm. , 60 cm.,		5	25	125
7.	Sheet metal gauge		1	120	120
8.	Straight snips 30 cm.		2	250	500
9.	Curved snips 30 cm.		2	300	600
10.	Bench shear cutter 40 cm.		1	5000	5000
11.	Chisel 10 cm.		5	100	500
12.	Hammer		5	150	750
13.	Bench vice 13 cm.		5	1000	5000
14.	Plier		5	50	250
15.	Nose plier		5	60	300
16.	Sheet metal anvil/stakes		5	2000	10000
17.	Shearing machine 120 cm.		1	2500	2500
18.	Solder electric		2	500	1000
19.	Solder furnace type		2	250	500
20.	Brazing equipments and accessories		1	5000	5000
21.	Blow lamp		2	250	500
22.	Sheet bending machine		1	10000	10000
	Misc.			LS	5000

FITTING SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Bench vice jaw 10 cm.	10	300	3600
2.	Surface plate 45x45 cm.	2	2000	4000
3.	V. Block 10x7x4 cm.	5	350	1650
4.	Try square	10	40	400
5.	Bevel protractor 30 cm.	1	2100	2100
6.	Combination set	1	2500	2500
7.	Divider	5	60	300
8.	Centre punch	5	20	100
9.	Calipers (Different sizes)	12	20	240
10.	Vernier calipers 30 cm.	2	600	1200
11.	Micrometer 0-25, 25-50 m.m.	4	500	2000
12.	Vernier depth gauge	1	350	350
13.	Feeler gauge--15 blades	1	30	30
14.	Radius gauge	1	100	100
15.	Angle gauge	1	100	100
16.	Thread gauge	1	100	100
17.	Bench drilling machine 13 mm.	1	5000	5000
18.	Double ended electric grinder	1	4000	4000
19.	Drill set	1set	1000	1000
20.	Reamer set	1set	2000	2000
21.	Tap set	1set	2000	2000
22.	Adjustable wrenches (15 cm., 20cm. 30 cm.)	1set	500	500
23.	Allen key set	1set	350	350
24.	Spanners	6	60	360
25.	Work benches	6	2000	12000
26.	Power hacksaw	1	4000	4000
	Misc. Files, Dieset, Hexa frames etc.		LS	10000

WELDING SHOP

1.	Ellectric welding set oil cooled	1	10000	10000
2.	Industrial regulator type oil cooled arc welder	1	12000	12000
3.	Air cooled spot welder 7.5 KVA	1	15000	15000
4.	General accssories for air cooled spot welder of 7.5 KVA			8000
5.	Gas welding set with gas cutting torch and complete with all accessories	1	15000	15000
6.	Misc. work benches		LS	20000

PAINTING & POLISHING SHOP

1.	Air compressor complete with 2 HP motor	1set	12000	12000
2.	Spray gun with hose pipe	1	1000	1000
3.	Stoving oven	1	3000	3000
4.	Buffing machine with leather and cotton wheels	1	4000	4000
5.	Electroplating Equipment for cromium Nikle plating.	1	10000	10000
	Misc.		LS	2000

PLUMBING SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Pipe vice 5 cm.	4	250	1000
2.	Chain wrenches	5	250	1250
3.	Ring spanner Set	5	125	625
4.	Wheel pipe cutter	2	300	600
5.	Water pump plier	4	50	200
6.	Pipe die set 2" set	2 set	600	1200
7.	Pipe bending device	1	5000	5000
8.	Work benches	4	4000	16000
9.	Set of various types of plumbing fittings e.g. Bib cock, Cistern, Stop cock, Wheel volve, Gat volve etc.		LS	2000
10.	Misc. Hacksaw frame and others		LS	2000

FOUNDRY SHOP

1.	Moulding boxes	25		6000
2.	Laddles	5		1000
3.	Tool kits	10 sets		2500
4.	Quenching tanks water or oil	2		1000
5.	Permiability tester	1		1000
6.	Mould hardness tester	1		6000
7.	Sand tensile testing equipment	1		7500
8.	Portable grinders	1		3000
9.	Temperature recorders/controllers	LS		5000
10.	Pit furnace with Blower	1		5000

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.	2	25000	50000
2.	Shaper machine 12 inch stroke with 2 H.P. motor 440 volts push button starter with vice 6 inch (Swivel base)	1	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

LIST OF EQUIPMENT
Pottery & Refractory Lab

Sl.No.	Item	Qty.	Price	Total Cost
1	2	3	4	
1.	Edge Runner Mill	1	250000	250000
2.	Ball Mill capacity 3 Cwt.	1	40000	40000
3.	Ball Mill for glaze 51 bs.	1	22000	22000
4.	Pot Mill rotatary	1	8000	8000
5.	Screw Plunger	1	22000	22000
6.	Wooden Plunger	1	5000	5000
7.	Vibrating	1	3000	3000
8.	Filter Press	1	30000	30000
9.	Jigger Jolleys	6	2000	2000
10.	Universal Jigger Jolleys	2	5000	10000
11.	Toygle Press	1	10000	10000
12.	Down draft furnace	1	30000	30000
13.	Press for refractory Bricks	1	15000	15000
14.	Hot air oven	2	5000	10000
15.	Disintegrator	1	20000	20000
16.	Kanthal Furnace upto 10000c	2	18000	36000
17.	Thermal Expansion apparatus	1	50000	50000
18.	Permeability test apparatus upto 1600o c.	1	10000	10000
19.	High temperature furnace horizontal type upto 1500 c.	1	200000	200000
20.	Ph meter	2	5000	10000
21.	Metallic frame for cone set	1	2000	2000
22.	Schoeme's Elutriator	1	5000	5000
23.	Physical Balance 250 cms.	2	1500	3000
24.	Rotory Viscosity meter	1	40000	40000
25.	Test Sieves set	2	1000	2000
26.	Adherence test Aparatus.	1	5000	5000
27.	Vernier Callipers	5	500	2500
28.	Nicholson's Hydrometer	2	1000	2000
29.	Vicats Needle. app.	5	500	2500
30.	Maduce pump	1	10000	10000
31.	Co-efficient of linear expansion app. for ref.	1	80000	80000
32.	Annealing testing app. for Glass.	1	80000	80000
33.	Softening Testing Appt. for Glass.	1	10000	10000
34.	Thermal Expansion Testing App. for Glass.	1	20000	20000
35.	Density Comparator Testing App.	1	3000	3000
36.	Permeability App.	1	6000	6000
37.	Optical Microscope	3	20000	60000
38.	Optical Microscope (Ord.)	5	800	4000
39.	Ball mill size 2"X2.5" with high alumina lining and high alumina pebbles as grinding media.	1	200000	200000
40.	Vibro finishing mill (with rubber lining and polishing media)	1	350000	350000
41.	Hydraulic press (100 MT Capacity)	1	300000	300000
42.	Copying Machine	1	80000	80000
43.	Polishing and Grinding Machine	1	100000	100000

44.	Diamond Cutter with variable dia of blade (8",10" & 12")	1	300000	300000
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GLASS & 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	1	250000	250000
5.	Lens Grinding & Polishing m/c.	2	25000	50000
6.	Sand blasting m/c.	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.	Pressure Testing M/c. for Bottels	1	60000	60000
13.	Tickness Viewer	1	10000	10000
14.	Suction & Blowing M/c.	1	10000	10000
15.	Glass melting Furnace (Gas fired)	1	80000	80000
16.	Pit Furnace coal fired	2	25000	50000
17.	Blow Lamp System For Glass Beeds Making	1		
18.	LPG Gas Fired Glass Beeds Making Kiln Size (1.25Feet X 2 Feet X 1.25 Feet)	1	20000	20000
19.	Ultra Voilet Glass Viewer	1	25000	25000
20.	Glass Fusing Furnace For Glass Pendants and other decorative items making	1	60000	60000
21.	Screw Hot Press Size	2	50000	50000
22.	Round Shape Glass Beeds Making Plant	1	1000000	1000000
	- Cut of machine			
	- Breaking Device			
	- Vibro Polisher			
	- Assorting Machnie			
	- Misc. Tools			
23.	Crystal Glass Beeds Making Plant	1	2000000	2000000
	- Grinding Machine			
	- Polishing Machine			
	- Fixing Machine			
	- Transfer Machine			
	- Brushing Machine			
	- Moulding Machine			
	- Multiple Stau Bearers			

SILICATE LAB.

1.	Platinum Crushible with lid 25 ml.	5	40000	200000
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.	Hot air Oven	1	20000	20000
6.	Mataler Balance	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.	Chemical Balance	1	5000	5000
11.	Hot air oven 14"x14"x14"	1	20000	20000
12.	Flame Photometer	1	40000	40000
13.	Water Bath	3	45000	45000
14.	Water De-ioniser Plant	1	250000	250000
15.	Platinum Grushible with lid	3	300000	300000
16.	Platonum Disc	3	400000	400000

POTTERY & REFRACTORY WORKSHOP

1.	Jaw Crusher Capacity 1/4 to 1/2 ton per hour	1	40000	40000
2.	Double Roller crusher 10"x8" Roller size.	1	20000	20000
3.	Permanent Magnet for casting slip	1	5000	5000
4.	De-airing pug mill	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	1	3000	3000
10.	Optical pyrometer	1	20000	20000
11.	P.C.E. Furnace	1	500000	500000
12.	Under load furnace	1	300000	300000
13.	Thermo couples upto 1500oc	1	10000	10000
14.	Potentiometer	1	10000	10000
15.	Travelling Microscope	1	22000	22000
16.	Horizontal High Temp. furnace	2	150000	300000
17.	Ultrasonic Drilling Machine	1	50000	50000
18.	3D Facating Machine	1	50000	50000
19.	Concave Machine	1	50000	50000
20.	Convex Facating Machine	1	50000	50000
21.	Gas Fired gold Decoratio Furnace (1000oc)	1	100000	100000
22.	Gas Fired Raku Kiln (1200oc)	1	200000	200000
23.	Gas Fired Bench Busher	1	20000	20000
24.	Graphite Paddles For Glass Beeds Making	1	50000	50000
25.	Ploter with Computer	1	700000	700000
26.	Optic Moulds for millefiori Glass rods	10	100000	100000

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

COMPUTER APPLICATION FOR ENGINEERING (Common to all Trades)

COMPUTER CENTRE

S.No.	DESCRIPTION	QTY.	APPROX. COST (in Rs.)
1	PENTIUM-IV 2.4 Ghz or latest RAM-256 MB or latest HDD-80 GB latest MONITOR COLOUR 17" AGP 16 MB 52X MM KIT(52x CD Drive, Speaker, sound card) FDD - 1.44 MB Key Board - 107 Keys Multimedia Mouse - Optical Fibre Mouse 32 Bit PCI ETHERNET CARD(10/100) Mbps Pre loaded Windows XP OR WINDOWS 2000 Pre loaded Norton Anti Virus with licence media and manual	16 (15+1Server)	8,000,00=00

OR

Computer of latest Specification

Software :

i.	Noval Netware/NT Latest Version	01	55000
ii	WINDOWS - XP/WINDOWS 2000 /Windows NT	01	6000
iii.	MS OFFICE XP	01	17000
iv.	Dos latest version.	01	5,000
v.	FoxPro 2.5 or Latest Version	01	
vi.*	Mechanical DeskTop Power Pack (*->Only For Mechanical Engg.)	01	70000

3. Hardware

i.	Internal Modem 56 kbps		
ii.	Hubs-16 port, all accessories related to Networking.		
iii.	Scanner- A4	01	10,000
4.	132 Column 600 CPS or faster 9 Pin dot matrix printer with 500 million character head life	01	15,000
5.	Laser Jet	01	20,000
6.	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.	01	1,75000
7.	Window Air Conditioner 1.5 tones capctity with ISI mark alongwith electronic voltage stablizer with over voltage and time delay circuit	04	30,000(EACH)
8.	Room preparation and furniture		LS

7. LEARNING RESOURCE MATERIALS

1.	Overhead Projector with screen	1	--	20000
2.	35 m.m. Slide cum Film Projector	1	--	50000
3.	Audio Cassette Recorder	1	--	15000
4.	V.C.R. with Monitor & Accessories	1	--	35000
5.	Photography Camera for Production of slide and film strips, 35 mm still camera dark room equipment.	1		100000
6.	Mathematical Typewriter	1	--	50000
7.	Cutting, Binding & Stitching equipment.	1	--	30000

ANNEXURE - I

FIELD EXPOSURE

Ceramic Engg. students will undergo a two week Industrial Exposure, (in small scale units atleast) after II semester during summer vacation arranged and supervised by the institute 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)

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.

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

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.

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 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.Importent 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 -----%
- 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.
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:-

Dhurve Narayan
Assistant Professor
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)

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

1. DISCIPLINE : CERAMIC ENGINEERING

Sl.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		
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