

**Scheme of Teaching and Examination for  
VI Semester DIPLOMA in CHEMICAL (CERAMICS) ENGINEERING  
THEORY**

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION - SCHEME						
			Periods per Week	Periods in one Session (Year)	Hours of Exam.	Terminal Exam. (A) Marks	Final Exam. (B) Marks	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject	
1.	Professional Studies & Entrepreneurship	00601	06	60	03	20	80	100	26	36	
2.	Glass Technology-II	30602	06	60	03	20	80	100	26	36	
3.	Modern & Electronics Ceramics	30603	06	50	03	20	80	100	26	36	
4.	Enamel Technology	30604	06	50	03	20	80	100	26	36	
5.	Elective*		06	60	03	20	80	100	26	36	
	Modern Refractory Technology	30605A									
	Modern Furnace Technology	30605B									
	Instrumentation and Automatics Process Control	30605C									
<b>Total :-</b>			<b>30</b>						<b>500</b>		

**PRACTICAL**

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION - SCHEME						
			Periods per Week	Periods in one Session (Year)	Hours of Exam.	Marks of Internal Exam (A)	Marks of External Exam (B)	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject	
6.	Ceramic Engineering Workshop Practice - IV (Glass & Enamel)	30606	04	60	04	10	40	50	16	21	
<b>Total :-</b>			<b>04</b>						<b>50</b>		

**SESSIONAL**

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION - SCHEME				
			Periods per Week	Periods in One Session (Year)	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	
7	Professional Studies & Entrepreneurship	00607	04	50	20	30	50	25	
8.	Elective Lab.	30608	04	50	20	30	50	25	
	Modern Refractory Technology	30608 A							
	Modern Furnace Technology	30608 B							
	Instrumentation and Automatic Process Control	30608 C							
9.	Project Work & Its Presentation in Seminar	30609	-		40	60	100	100	
<b>Total:-</b>			<b>08</b>					<b>200</b>	

<b>Total Periods per Week</b>	<b>42</b>	<b>Total Marks = 750</b>
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## PROFESSIONAL STUDIES & ENTREPRENEURSHIP

<b>Subject Code</b> <b>00601</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

### Rationale:

The paper has been introduced to achieve dual purpose for the students. Firstly, this course provides the basics of Professional management and secondly it also prepares the student to develop self reliance by becoming an entrepreneur.

This makes them conversant with their duties and responsibility to make them successful in their career building by developing profession expertise.

### Objectives:

With the input provided in this paper, the students will be able to :-

- Acquire basic knowledge of management.
- Understand the various area of management such as human resources, marketing, finance and commercial aspect, production & material management etc.
- Understand the benefit of becoming an entrepreneur.
- Handle a project efficiently and independently.
- To avail subsidies / grants / loan etc. from various of agencies.

### PART-I: PROFESSIONAL STUDIES

#### TOPIC:

<b><u>01 – INTRODUCTION:</u></b>		[05]
01.01	Professional Ethics: Definition, Objective, Right & Wrong, Duty & Obligation	[05]
01.02	Management: Definition, Function and Objectives.	[05]
01.03	Leadership: Definition, Types – Autocratic, Democratic and Laissez – faire, Functions and Characteristics of Leadership.	[05]
01.04	Motivation : Definition, Types and Importance / Benefits	[05]
01.05	Forms of Business organization: Sole proprietorship, Partnership, Joint Stock company and Co-operative Societies.	[05]
01.06	Supervisor’s/Technician’s role: Concept of supervisory management, career needs, Role of Technicians in an organization.	[05]

### PART-II: ENTREPRENEURSHIP

#### TOPIC:

<b><u>02 – INTRODUCTION:</u></b>		[10]
02.01	Entrepreneurship: Concept, Characteristics of a successful entrepreneurship, basic ingredients of entrepreneurship: 1. Finance 2. Technology 3. Sales and Marketing	[10]
02.02	Project Report: Meaning, Project Identification, Project Selection, Contents of a project Report, Techno-Economic Feasibility Report ( TEFRR), Market Survey.	[10]

02.03 Sources of Finance: [05]  
Government, Commercial Banks, Financial institutions:  
SIDBI – Small Industries development Bank of India  
SFC – State Financial Corporations  
IDBI – Industrial Development Bank of India  
IFCI – Industrial Finance Corporation of India  
ICICI – Industrial Credit Investment Corporation of India

02.04 Acts : [05]  
Indian factories Act 1948 ( Main Provision Only)  
Consumers Protection Act 1986 ( Main Provision Only)

**03 – PROJECT WORK:**

As elaborated in Sessional Paper (00607).

**Books Recommended:**

1. Essential of Management, Tata McGraw Hill, Publishing Company Ltd., New Delhi. - Herald Koonz & Cyril O' Donnel.
2. Business Organization and Management, S. C. Chand and Company (Pvt.) Ltd., Ram Nagar, New Delhi - M. C. Shukla.
3. Managerial Economics, Sultan Chand & Sons, New Delhi - R. L. Vashney & K. L. Maheshwari
4. Project Appraisal and Follow up, Govind Prakashan, Mumbai. - D. P. Sharda
5. Modern Marketing Management, Progressive Corporation Pvt. Ltd., P51, Mahatma Gandhi Road, Bombay-400 001 - Dr. Rustam S. Davar
6. A hand book for new entrepreneurs (with special reference to science and technology target group) - Entrepreneurship Development Institute of India, 83-A, Swastic Society Navrangpura, Ahmedabad, PIN-380 009.

**Reference Books:**

1. Leadership in Organisation - Published by I.S.T.E. Mysore
2. Motivation - Published by I.S.T.E. Mysore
3. Motivation - I.I.T. Kanpur - Published by I.S.T.E. Mysore
4. A Hand book on Project Appraisal and follow up, Govind Prakashan, 204, Saraswati Kunj, 90, S. V. Road, Goregoan, Bombay-400 062. - D. P. Sarda
5. Bihar Industrial Policy - Government of Bihar, Department of Industries.
6. Entrepreneurship Guide - Bihar State Financial Corporation, Fraser Road, Patna-800 001.

## GLASS TECHNOLOGY - II

<b>Subject Code 30602</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Layout of Modern Glass Plant.	
02	Properties & Testing	
03	Glass Forming Machine and Equipment	
04	Manufacture of Glass.	
05	Defects in Glass.	
06	Decoration of Glass.	
07	Special Glasses.	
<b>Total :</b>		<b>(60)</b>

### CONTENTS:

#### **TOPIC: 01 – LAYOUT OF MODERN GLASS PLANT:**

01.01 **Plant layout diagram indicating all the units of a glass manufacturing unit such as :-**

Storage, batch house, mixing, furnace, Fabrication machines, Sorting and Packing Section, Warehouse.

#### **TOPIC: 02 – PROPERTIES & TESTING:**

02.01 Sieve analysis, Purity, Density, Chemical durability, Viscosity, Thermal expansion, Thermal Stress and Strain, Strength of glass, Annealing of glass, Devitrification, Softening Points, Bursting Pressure and Thermal Shock Resistance.

#### **TOPIC: 03 – GLASS FORMING MACHINE AND EQUIPMENT:**

03.01 Hand Operation, Fore hearth and Feeder, Machines for Blown Ware, Press machines, Moulds, Float glass making equipment

#### **TOPIC: 04 – MANUFACTURE OF GLASS:**

04.01 Glass-bottles, Rods, Tubes, Bangles, Sheet glass, Plate glass, Rolled glass, Float Glass, wired glass.

#### **TOPIC: 05 – DEFECTS IN GLASS: (Their Causes and Remedies)**

05.01 Seeds and Blisters, Cords, Striae, Strain, Stones, Causes and Remedies.

#### **TOPIC: 06 – DECORATION OF GLASS:**

06.01 Etching, Sand Blasting, Selvering, Straining,

#### **TOPIC: 07 – SPECIAL GLASSES:**

07.01 Heat resistant glass, Fibre glass, Glass-ceramics, Optical Glass, Ophthalmic glass, Glass Wool, Toughened glass, Laminated Safety glass, Glasses for Electrical and Electronic Industries, Glass insulators.

### **Books Recommended:**

- |   |                 |
|---|-----------------|
| 1. Hand Book of Glass Technology.                 | - R. Charan.    |
| 2. Properties of Glass.                           | - W. Morey.     |
| 3. Glass Engineering Hand Book.                   | - E. B. Shand.  |
| 4. Hand Book of Glass Manufacture, Vol.-I and II. | - F. V. Tooley. |

## MODERN AND ELECTRONIC CERAMICS

<b>Subject Code 30603</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>		<b>:</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>		<b>:</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>		<b>:</b>
					<b>100</b>	
					<b>80</b>	
					<b>20</b>	

### Rationale :

Present century is moving towards a technologically advanced arena where electronics is playing a major role and electronics and modern ceramics are playing a big and critical role in the advancement and achievement of competitive and durable products. Electronics and modern ceramics has been selected as a theory paper to deal with various modern and contemporary components and products used in the development key sectors such as communications, power, Nuclear etc. The students will lay their hands on the developing technology to copy up with the changes and needs of the world in the field of High technology.

### Objective:

The students will be able to :-

- (i) Understand electronic & modern ceramic components and products.
- (ii) Understand various key topics dealt while dealing with the subject.
- (iii) Understand high temperature ceramics, cermets, Ceramics components, Nuclear & magnetic ceramics etc.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Introduction.	
02	Electronic Ceramic.	
03	Modern Ceramic.	
<b>Total :</b>		<b>(50)</b>

### CONTENTS:

#### TOPIC: 01 – INTRODUCTION:

01.01 Introduction and concept of electronics & modern ceramics.

#### TOPIC: 02 – ELECTRONIC CERAMIC:

- 02.01 Carbon film resistors, ceramic capacitors, optical fiber, sol gel derived optical materials, TV tube, cermets. Quartz crystal
- 02.02 Other Components : Piezo Electric, Quartz Crystal, Ferrites etc.
- 02.03 **Other Components** : Piezo Electric, Ferroelectrics, Ferrites,

#### TOPIC: 03 – MODERN CERAMIC:

- 03.01 High Temperature Ceramics:  
**Oxides** : Beryl ia, Magnesia, Titania, Thoria, Uranium etc.  
**Non-Oxides** : Carbon, Carbides, Nitrides, Slicides, Borides etc.
- 03.02 Other Ceramics:  
 Sic troughs, Abrsives & grinding wheels. Ceramic cutting tools, Spark plug, Ceramic Engines, Steatite and Cordierite bodies, Ceramic coatings, Ceramic bones

### Books Recommended:

- |  |                                       |
|--|---------------------------------------|
| 1. Special Ceramics, Hey Wood & Company Ltd., London.  | - P. Popper.                          |
| 2. Cermets, Reinhold Publishing Corporation, New York. | - J. R. Tinklepaugh & W. B. Crandall. |
| 3. Ceramics, Butter Warths, London.                    | - H. Salmang.                         |
| 4. Industrial Ceramics, Chapman & Hall, London.        | - F. Singer & S. S. Singer.           |
| 5. Hand book of Ceramics- Volume -IV                   | - S.Kumar                             |
| 6. Advanced Ceramic Technology- Volume-I               | - Dr. S.K. Banargjee                  |

## ENAMEL TECHNOLOGY - II

<b>Subject Code 30604</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>			
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>		<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>		<b>:</b>	<b>80</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>		<b>:</b>	<b>20</b>

### Rationale:

Enamel Technology is an important organ of Ceramics Engineering. Not only this branch dominated in the area of utensils, decorative pieces etc. in olden days, but it also has shown its relevance in modern technology. Enamelling is carried out in electrical and electronic products. Since it is mainly a glassy layer applied over a base material, it produces all the properties of glass and thus acquires top usefulness in domestic as well as industrial uses. For Diploma students it is designed to impart modern technological aspects of Enamel suiting to the present time.

### Objective:

The objective in general is to achieve:-

- (i) Understanding the subject thoroughly.
- (ii) Understanding its deeper impact in Electrical & Electronic product making.
- (iii) R & D efforts knowledge base for future development.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Introduction.	
02	Properties and Testing	
03	Theory of Adherence and Pickling.	
04	Special Processes and Control.	
05	Equipments for Enameling & Decorations.	
06	Enameling Furnaces and Effects of Furnace Atmosphere.	
07	Enamel Calculations.	
<b>Total :</b>		<b>(50)</b>

### CONTENTS:

#### TOPIC: 01 – INTRODUCTION:

- 01.01 Enamel, Low fusing glasses.
- 01.02 Various uses of Enamel.

#### TOPIC: 02 – PROPERTIES AND TESTING:

- 02.01 Thermal Properties.
- 02.02 Optical Properties.
- 02.03 Physical and Mechanical Properties.
- 02.04 Chemical and Electrical Properties.

#### TOPIC: 03 – THEORY OF ADHERENCE AND PICKLING:

- 03.01 Theory of Adherence.
- 03.02 Theory of Pickling.
- 03.03 Methods and materials used for pickling.

**TOPIC: 04 – SPECIAL PROCESSES AND CONTROL:**

- 04.01        **Special Processes :**  
Nickel Dip.  
Pickling Accelerators.  
Nickel Reduction process.  
Pre Namel Process.  
Nickel Oxide Spray Process.  
The Hydrogen Treating Process.
- 04.02        **Control :**  
Theory.  
Cleaner Control.  
Neutraliser solution and Pickle Acid Control.

**TOPIC: 05 – EQUIPMENTS FOR ENAMELLING & DECORATIONS:**

- 05.01        **Equipments for:**
- ◆ Preparation of raw materials.
  - ◆ Applications.
  - ◆ Drying and Brushing.
  - ◆ Decoration.
  - ◆ Screen printing.
  - ◆ Blasting.

**TOPIC: 06 – ENAMELLING FURNACES AND EFFECTS OF FURNACE ATMOSPHERE:**

- 06.01        Enameling furnaces
- ◆ Box type Furnaces.
  - ◆ Continuous Enameling Furnaces.
  - ◆ Frit making smelter.
- 06.02        Effects of Furnaces Atmospheres.

**TOPIC: 07 – ENAMEL CALCULATIONS:**

- 07.01        Various calculations adopted in Enamel Industries.

**Books Recommended:**

1. Porcelain Enamels, The Garrard Press Publishers, Champaign, Illinois.        - A. I. Andrerros.
2. Technology of Enamel.        - V. V. Vargin.
3. Elements of Ceramics, Addison-Wesley Press Inc., Cambridge 42, Mass.        - F. H. Norton.

## MODERN REFRACTORY TECHNOLOGY

<b>Subject Code 30605A</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

### Rationale:

This subject has been kept as an elective subject for Part-III Diploma students of Ceramic Engineering mainly to converse them with the new development taking place in the field of refractories. With R & D as the base, the refractory industries have gone to a significant change in its technology cope up with the changing needs of the industry. Nearly 60% of the raw materials used in steel plant are only refractories and so even 1 to 5 % savings in refractories speak a lot on the profitability. This in fact has put the focus on ceramic engineers to work hard and contribute towards new development with a view to bring high profitability highly competitive global market.

### Objective:

This course will facilitate in :-

- (i) Understanding refractories of 21<sup>st</sup> century.
- (ii) Developing the professionals to thrive on challenges pored by user industries.
- (iii) Understand new type of refractories developed for various user.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Introduction.	
02	Status and Future Prospects.	
03	R & D Activities in the country.	
04	Recent Trends in Refractory Applications and Technology.	
05	Technology Upgradation.	
06	Project Work and Seminar.	
<b>Total :</b>		<b>(60)</b>

### CONTENTS:

#### TOPIC: 01 – INTRODUCTION:

- 01.01 General.
- 01.02 Classification of Refractories.
- 01.03 Raw materials-Availability & uses.
- 01.04 Plant and machinery.
- 01.05 Production Places.
- 01.06 User industries.

#### TOPIC: 02 – STATUS AND FUTURE PROSPECTS:

- 02.01 History of development.
- 02.02 Various units, Regional distribution.
- 02.03 Government Policies.
- 02.04 Installed Capacity & Production.
- 02.05 Futures Prospects.



**TOPIC: 03 – R & D ACTIVITIES IN THE COUNTRY:**

- 03.01 C G C R I.
- 03.02 N M L.
- 03.03 Steel Plant Laboratories.
- 03.04 Refractory Plant Laboratories.
- 03.05 Ceramic Engineering Colleges

**TOPIC: 04 – RECENT TRENDS IN REFRACTORY APPLICATIONS AND TECHNOLOGY:**

- 04.01 Steel Plant.
- 04.02 Non ferrous industries.
- 04.03 Chemical and Petrochemical industries.
- 04.04 Ceramic Industries.
- 04.05 Other Industries.
- 04.06 World Trends.
- 04.07 Emerging Trends in India.
- 04.08 Factors effecting selection and application of Refractories emphasising techno-economic aspect.

**TOPIC: 05 – TECHNOLOGY UPGRADATION:**

- 05.01 In raw material processing.
- 05.02 Plant and Machinery.
- 05.03 Research and Development.
- 05.04 Quality Control.
- 05.05 Standardisation.
- 05.06 Skill Development.

**TOPIC: 06 – PROJECT WORK AND SEMINAR:**

- 06.01 Feasibility report preparation and plant layout.

**Books Recommended:**

- |  |                       |
|--|-----------------------|
| 1. Refractories, Smt. Lakshmi Devi, Jamshedpur.                      | - M. L. Mishra        |
| 2. Refractories, McGraw Hill Book Co. Inc., New York                 | - F. H. Norton        |
| 3. Ceramic Fabrication Process, M. I. T., Mass, U. S. A.             | - W. D. Kingrey.      |
| 4. Technology of Ceramics & Refractories, , M. I. T., Mass, U. S. A. | - P. P. Budhikov.     |
| 5. <b>Journals :-</b>  | -                     |
| Indian Ceramic Society.  | - C G C R I, Calcutta |
| Indian Refractory Manufactories Association.                         | - I R M A, Calcutta   |
| American Ceramic Society.  | - U. S. A             |
| British Ceramic Society.   | - U. K.               |

## MODERN FURNACE TECHNOLOGY

<b>Subject Code 30605B</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

### Rationale :

The subject has been taken as an elective considering the very importance of Furnaces used in Ceramic and other industries. The subject deals with entire aspects of Furnaces such as its construction, combustion, Heat transfer in the furnace, Fuel used in the furnace, Fuel economy, Strength & durability of the furnace, Heat releasing equipments, Furnace using Industries, Heat exchanges, material of construction used in a furnace etc. The subject has been designed to provide all the necessary knowledge required to the students about furnaces, which become an important organ of any industry.

### Objective:

The objective in general to achieve will be to :-

- (i) Understand the furnace with its role and use.
- (ii) Understand the basic principle of operation.
- (iii) Understand fuel economy in furnace operation which is very important.
- (iv) Understand the use of refractories to achieve economy.
- (v) Understand various type of furnaces used in industries.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Introduction.	
02	Classification of Furnaces.	
03	Combustion.	
04	Heat Transfer.	
05	Gas Flow and Process Balance Sheets.	
06	Solution of Heat Transfer.	
07	Fuel and Fuel Economy.	
08	Heat Exchanger.	
09	Furnace Construction.	
10	Control of Furnace Temperature and Atmosphere.	
11	Diagnostic Study of a Furnace.	
12	Safety Measures.	
13	Project Work and Seminar.	
<b>Total :</b>		<b>(60)</b>

### CONTENTS:

#### TOPIC: 01 – INTRODUCTION:

- 01.01 Definition of a furnace and general description.
- 01.02 Function of a furnace.

**TOPIC: 02 – CLASSIFICATION OF FURNACES:**

**02.01 Furnaces used in Ceramic Industries:**

Pottery, Glass, Enamel, Refractory, Electronic Ceramics, Cement & Lime etc.

**02.02 Furnaces used in other Industries :**

Steel, Non ferrous, Chemical, Power, Petrochemical.

**TOPIC: 03 – COMBUSTION:**

03.01 Heat of Combustion.

03.02 Specific heat and sensible heat.

03.03 Control of Combustion.

03.04 Available Heat.

03.05 Flue Gas analysis.

03.06 Flames & flame temperature.

03.07 Characteristics of Industrial Fuels.

**TOPIC: 04 – HEAT TRANSFER:**

04.01 Conduction.

04.02 Convection.

04.03 Radiation from Surfaces.

04.04 Heat loss.

04.05 Gas Radiation.

04.06 Heat Flow.

**TOPIC: 05 – GAS FLOW AND PROCESS BALANCE SHEETS:**

05.01 Introduction.

05.02 Gas Laws, nomograms.

05.03 Streamline and Turbulent Flow.

05.04 Energy of Gases, Energy loss.

05.05 Buoyancy, Draught, Gas Leakage.

**TOPIC: 06 – SOLUTION OF HEAT TRANSFER:**

**06.01 Heat transfer through a Wall :**

Standard brick equivalent.

06.02 Heat loss by gas leakage.

06.03 Unsteady Heat Flow- Heat Storage.

06.04 Heat loss in Foundation, Water Cooling, through Openings, in complete Combustion.

06.05 Heat Transfer to stock.

**TOPIC: 07 – FUEL AND FUEL ECONOMY:**

07.01 **Types of Fuel used in a Furnace :**

Solid, Liquid, Gaseous, Atomic or Special.

07.02 Furnace Efficiency and Distribution of Heat.

07.03 Effective fuel economy in various furnaces.

**TOPIC: 08 – HEAT EXCHANGER:**

08.01 Recuperators.

08.02 Regenerators.

**TOPIC: 09 – FURNACE CONSTRUCTION:**

09.01 Elements of Furnace Construction.

09.02 **Material of Construction :**

Steel, Cast Iron, Refractories, Cement, Brick etc.

09.03 Principle of Wall, Crown Construction and internal Walls.

09.04 Brick & Expansion joints in Construction and other measures taken during construction.

**TOPIC: 10 – CONTROL OF FURNACE TEMPERATURE AND ATMOSPHERE:**

10.01 Means of maintaining a given temperature.

10.02 Devices used in measuring temperature.

10.03 Control of Furnace Atmosphere and Pressure.

10.04 Effects of Furnace Atmosphere.

10.05 Instrumentation and process control equipments

**TOPIC: 11 REFRACTORY MATERIALS:**

11.01 Type of refractories used, expansion joints, properties & applications.

**TOPIC: 12 – SAFETY MEASURES:**

12.01 General idea on safety measures adopted, for preventing explosion, Pilot flames, Safety Shutoff valves,

**TOPIC: 13 – PROJECT WORK AND SEMINAR:**

13.01 Project report on a furnace and layout.

**Books Recommended:**

**Text Books:**

1. Modern Furnace Technology, Charles Griffin & Co. Ltd., 42 - H. Etherington &  
Drury Lane, London, WC2, U. K. G. Etherington

**Reference Books:**

1. Industrial Furnaces, Vol.- I & Vol.-II, John Wiley, U. S. A. - W. Trinks &  
M. H. Mawhinnery
2. The Science of Flames and Furnaces, Chapman & Hall, U. K. - M. W. Thring.

# INSTRUMENTATION AND AUTOMATIC PROCESS CONTROL

<b>Subject Code 30605C</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>06</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Instruments.	
02	Automatic Process Control.	
03	Project Work and Seminar.	

**Total : (60)**

## CONTENTS:

### TOPIC: 01 – INSTRUMENTS:

- 01.01 General Principle of industrial instruments.
- 01.02 **Measurements :**
  - ◆ Fluidity.
  - ◆ Mass/Weight.
  - ◆ Temperature.
  - ◆ Pyro meters.
  - ◆ Pressure.
  - ◆ Flow.
  - ◆ Velocity.
  - ◆ DTA, RUL, PCE, Thermal Shock.
  - ◆ CCS, Modulus of rupture

### TOPIC: 02 – AUTOMATIC PROCESS CONTROL:

- 02.01 Type of Automatic Process Control System.
- 02.02 **Automatic Controls on :**  
Mechanical, Hydraulic, Pneumatic, Electricals, Electronics System.
- 02.03 Flow measurements. Temperature control on automatic system
- 02.04 On-off, Proportional and integral control system.

### TOPIC: 03 – PROJECT WORK AND SEMINAR:

- 03.01 Project report on an instrument and layout

### **Books Recommended:**

1. Instrument Technology, Vol.-I, Scientific Publications. - E. B. Jones Buttle Worth.
2. Principles of Industrial Process Control, John Wiley & Sons, New York. - D. P. Eekman
3. Flow measurement & meters, E & F N Spon Ltd. - A. Linford.

**CERAMIC ENGINEERING WORKSHOP PRACTICE – IV  
(GLASS AND ENAMEL)**

<b>Subject Code 30606</b>	<b>Practical</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>40</b>
	<b>-</b>	<b>-</b>	<b>03</b>	<b>Internal Exam.</b>	<b>:</b>	<b>10</b>

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
<b>Glass</b>		
01	Preparation of coloured glass batches.	
02	Melting of Glass batches.	
03	Forming of different glass wares by blowing and pressing.	
04	Polishing of glasses.	
05	<b>Decoration of Glass wares :</b>	
	(a) Etching on a glass plate.	
	(b) Silvering for mirror making.	
	(c) Staining on glass plate.	
	(d) Sand Blasting.	
<b>Enamel</b>		
06	Compounding of different Enamel batch.	
07	Fritting and Milling in ball mill.	
08	Cleaning and Nickel lining of Metal surface.	
09	Application of Enamel using brushing, dipping, spraying, screen printing.	
10	Firing of Enamel Wares in electric furnace.	
11	Study of Enamel defects.	
<b>Total:-</b>		<b>(60)</b>

## PROFESSIONAL STUDIES & ENTREPRENEURSHIP

<b>Subject Code</b> <b>00607</b>	<b>Sessional</b>			<b>No of Period in one session : 50</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>30</b>
	-	-	<b>04</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

### Rationale:

The paper has been introduced to achieve dual purpose for the students.

Firstly, this course provides the basics of Professional management and secondly it also prepares the student to undertake independent venture by becoming an entrepreneur.

This makes them conversant with their duties and responsibility to make them successful in their career building.

### Objectives:

With the input provided in this paper, the students will be able to :-

- Acquire basic knowledge of management.
- Understand the area of management such as human resources, marketing, finance and commercial aspect.
- Understand the benefit of becoming an entrepreneur.
- Handle a project efficiently and in dependently.

**To prepare a Project Report on any of the followings:**

<u>S.No.</u>	<u>Topics</u>
01	Project Identification and formulation Report.
02	Project Profile/Pre-feasibility Report.
03	Techno-economical Feasibility Report (TEFR).
04	Market Survey Report.

### CONTENTS

<u>S.NO.</u>	<u>TOPICS</u>
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#### TOPIC – 01 : PROJECT IDENTIFICATION AND FORMULATION REPORT:

- ◆ Introduction.
- ◆ Collection of Data.
- ◆ Compilation of Data.
- ◆ Analysis and Assimilation of Data.
- ◆ Product Selection.
- ◆ Report Finalisation and Report Writing.

#### TOPIC - 02 : PROJECT PROFILE/PRE-FEASIBILITY REPORT :

- ◆ Introduction of the product.
- ◆ Market.
- ◆ Man Power (Personnel Required).
- ◆ Manufacturing Process.
- ◆ Plant and Machinery.
- ◆ Cost of Project.

- ◆ Means of Finance.
- ◆ Cost of Production.
- ◆ Annual Turnover.
- ◆ Profit.
- ◆ Profit on Investment.

**TOPIC – 03: TECHNO-ECONOMICAL FEASIBILITY REPORT (TEFR).**

- ◆ Introduction on product.
- ◆ Market Prospects and Marketing.
- ◆ Location.
- ◆ Manufacturing Programme and Annual Turnover.
- ◆ Manufacturing Process.
- ◆ Cost of Project.
- ◆ Means of Finance.
- ◆ Requirement of Raw materials, Consumables, Utilities and Working Capital.
- ◆ Organisational Structure, Management and Man Power.
- ◆ Project Implementation Schedule.
- ◆ Profitability and Cash Flow.

**TOPIC - 04 : MARKET SURVEY REPORT:**

- ◆ Data Collection & Processing through Primary & Secondary Sources- Questionnaire method, e-mail, by post, by phone.
- ◆ Present Status.
- ◆ Growth of the Industry.
- ◆ Import and Export.
- ◆ Present market Demand.
- ◆ Forecast.
- ◆ Future Prospect/Scope.
- ◆ Market Segmentation.

**Books Recommended:**

1. Essential of Management, Tata McGraw Hill, - Herald Koonz & Cyril O' Donnel. Publishing Company Ltd., New Delhi.
2. Business Organisation and Management, S. C. Chand - M. C. Shukla and Company (Pvt.) Ltd., Ram Nagar, New Delhi
3. Managerial Economics, Sultan Chand & Sons, New - R. L. Vashney & K. L. Maheshwari Delhi
4. Project Appraisal and Follow up, Govind Prakashan, - D. P. Sharda Mumbai.
5. Modern Marketing Management, Progressive - Dr. Rustam S. Davar Corporation Pvt. Ltd., P51, Mahatma Gandhi Road, Bombay-400 001



6. A hand book for new entrepreneurs (with special reference to science and technology target group) - Entrepreneurship Development Institute of India, 83-A, Swastic Society Navrangpura, Ahmedabad, PIN-380 009.
7. Student discipline - Published by I.S.T.E. Mysore
8. Communication Skill - Published by I.S.T.E. Mysore
9. Decision Making - Published by I.S.T.E. Mysore
10. Pollution Control in Industry - Published by I.S.T.E. Mysore
11. S.S.M. in Environmental Engineering - Published by I.S.T.E. Mysore
12. Leadership in Organisation - Published by I.S.T.E. Mysore
13. Small Enterprise Management - Published by I.S.T.E. Mysore
14. Motivation - Published by I.S.T.E. Mysore
15. Fundamentals of Environmental Pollution - Krishnan and Kannan
16. Enviromental Engineering, T.T.T.I., Madras - Tata Mcgraw Hill
17. Motivation I.I.T. Kanpur - Published by I.S.T.E. Mysore
18. Mine Management - V.N. Singh, Bangle Prining Press Ranchi
19. Hand book on Project Appraisal and follow up, Govind Prakashan, 204, Saraswati Kunj, 90, S. V. Road, Goregoan, Bombay-400 062. - D. P. Sarda
20. Bihar Industrial Policy - Government of Bihar, Department of Industries.
21. Entrepreneurship Guide - Bihar State Financial Corporation, Fraser Road, Patna-800 001.
22. Management Economics, S. Chand & Sons, 4792/23, Dariaganj, New Delhi-110 002. - R. L. Varshney & G. L. Maheshwari
23. Management Principles & Practices, S. Chand & Sons, 4792/23, Dariaganj, New Delhi-110002. - L. Prasad & S. S. Gulshan

# MODERN REFRACTORY TECHNOLOGY

<b>Subject Code</b> <b>30608 A</b>	<b>Sessional</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>30</b>
	<b>-</b>	<b>-</b>	<b>03</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

## **Rationale:**

This subject has been kept as an elective subject for Part-III Diploma students of Ceramic Engineering mainly to converse them with the new development taking place in the field of refractories. With R & D as the base, the refractory industries have gone to a significant change in its technology cope up with the changing needs of the industry. Nearly 60% of the raw materials used in steel plant are only refractories and so even 1 to 5 % savings in refractories speak a lot on the profitability. This in fact has put the focus on ceramic engineers to work hard and contribute towards new development with a view to bring high profitability highly competitive global market.

## **Objective:**

This course will facilitate in:-

- (i) Understanding refractory of 21<sup>st</sup> century.
- (ii) Developing the professionals to thrive on challenges pored by user industries.
- (iii) Understand new type of refractory developed for various user.

## **CONTENTS:**

1. Preparation of Project Report on a Refractory manufacturing unit.
2. Presentation of the project report in a seminar.

# MODERN FURNACE TECHNOLOGY

<b>Subject Code</b> <b>30608B</b>	<b>Sessional</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>30</b>
	<b>-</b>	<b>-</b>	<b>03</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

## **Rationale:**

The subject has been taken as an elective considering the very importance of Furnaces used in Ceramic and other industries. The subject deals with entire aspects of Furnaces such as its construction, combustion, Heat transfer in the furnace, Fuel used in the furnace, Fuel economy, Strength & durability of the furnace, Heat releasing equipments, Furnace using Industries, Heat exchanges, material of construction used in a furnace etc. The subject has been designed to provide all the necessary knowledge required to the students about furnaces, which become an important organ of any industry.

## **Objective:**

The objective in general to achieve will be to:-

- (i) Understand the furnace with its role and use.
- (ii) Understand the basic principle of operation.
- (iii) Understand fuel economy in furnace operation which is very important.
- (iv) Understand the use of refractories to achieve economy.
- (v) Understand various type of furnaces used in industries.

## **CONTENTS:**

1. Preparation of Project Report on a Furnace.
2. Presentation of the project report in a seminar.

# INSTRUMENTATION AND AUTOMATIC PROCESS CONTROL

<b>Subject Code</b> <b>30608C</b>	<b>Sessional</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>30</b>
	<b>-</b>	<b>-</b>	<b>03</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

## CONTENTS:

1. Preparation of Project Report on an instrument or a control unit.
2. Presentation of the project report in a seminar.

# PROJECT WORKS & ITS PRESENTATION IN SEMINAR

<b>Subject Code</b> <b>30609</b>	<b>Sessional</b>			<b>No of Period in one session :</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>60</b>
	<b>-</b>	<b>-</b>	<b>-</b>	<b>Internal Exam.</b>	<b>:</b>	<b>40</b>

**Rationale:**

Project work and its presentation in seminar has been kept in the curriculum to provide an opportunity to the final year students to develop skill in preparing project work and be eligible to give its presentation in a seminar with full and extensive understanding of the subject. This exercise not only develop communication skill, but it also generates confidence to the students in presenting the project to the audience. It provides an opportunity to discuss the project with an open mind with an intention to improve upon quality of the project. Technique to produce a quality report is also develop.

**Objective:**

The objective is to achieve:

- Trained professionals for handling a project.
- Knowledge to build a strong data base for the project.
- Skill of quality documentation.
- Interaction skill.
- Skill to give good and impressive presentation.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Selection of a Project.	
02	Preparation of Data base.	
03	Draft Report Writing	
04	Presentation in Seminar.	
05	Final Report.	

**CONTENTS**

**TOPIC: 01 –SELECTION OF A PROJECT:**

01.01 This exercise should be carried out in association with the Professor concerned, and a suitable Project should be selected related to that particular branch of Engineering.  
Allotment of Project Work should be done preferably in the beginning of the session to the students to give them ample time for its formation.

**TOPIC: 02 – PREPARATION OF DATA BASE:**

- Visit to Project, if required.
- Collection of datas.
- Compilation of datas.
- Analysis and Assimilation of Data.

**TOPIC: 03 –DRAFT REPORT WRITING:**

One draft report will be prepared either on new project or on existing project.

### 03.01 **New Project**

This should include :

- Introduction.
- Market prospects and marketing.
- Location.
- Manufacturing programme and annual turnover.
- Manufacturing process.
- Cost of Project.
- Means of finance.
- Requirement of raw materials, consumables, utilities and working capital.
- Organisational structure, Management and manpower.
- Project implementation schedule.
- Profitability and cashflow.

### 03.02 **Existing Project**

This will be deal with problem related areas in any one of the following :

- Technical.
- Human Relation.
- Welfare.
- Safety.

Any other.

Report should include :

- Introduction.
- Problem details (identified for the project).
- Details of plant/works/institution towards :
  - ◆ Technical.
  - ◆ Management.
  - ◆ Marketing.
  - ◆ Financial & Commercial.
  - ◆ Profitability (Profit/Loss).
- Reason for selecting the problem.
- Analysis and Remedy.
- Conclusion.

### **TOPIC: 04 – PRESENTATION IN SEMINAR:**

- Presentation of Draft, Project Report.
- Discussion on Project.
- Record of useful suggestions for incorporation in the report.

### **TOPIC: 05 – FINAL REPORT:**

- Report Finalisation after incorporating changes.
- Preparation of Final Report and submission.