

**Scheme of Teaching and Examination for
VI Semester DIPLOMA in CHEMICAL 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.	Mass Transfer Operation	14602	06	60	03	20	80	100	26	36
3.	Chemical Engineering Design & Drawing	14603	06	60	04	20	80	100	26	36
4.	Industrial Instrumentation and Control	14604	04	50	03	20	80	100	26	36
5.	Elective*		06	60	03	20	80	100	26	36
	Fertilizer Technology	14605A								
	Bio-Chemical Engineering	14605B								
	Petroleum Refining	14605C								
Total :-			28					500		

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION - SCHEME					
			Periods per Week	Periods in one Session (Year)	Hours of Exam.	Marks Internal Exam. (A)	Marks External Exam. (B)	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
6.	Industrial Instrumentation and Control	14606	06	60	03	10	40	50	16	21
Total :-			06					50		

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.	Chemical Engineering Design & Drawing	14608	04	50	20	30	50	25
9.	Chemical Plant Training	14609	--	--	40	60	100	50
Total :-			08				200	

Total Periods per Week	42	Total Marks = 750
-------------------------------	-----------	--------------------------

PROFESSIONAL STUDIES & ENTREPRENEURSHIP

Subject Code 601	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

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:

<u>01 – INTRODUCTION:</u>		[05]
01.01	Professional Ethics: Definition, Objective, Right & Wrong, Duty & Obligation	
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:

02 – INTRODUCTION:

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: [10]
 Meaning, Project Identification, Project Selection, Contents of a project Report, Techno-Economic Feasibility Report (TEFR), Market Survey.
- 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. |

MASS TRANSFER OPERATION

Subject Code 14602	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

Rationals & Objective : An elementary knowledge of mass transfer distillation, absorption, extraction, drying are quite essential to operate and maintain the plants.

The students will be able to learn these basic unit operations which are most common in chemical industries.

Sr. No.	Topics	-	Periods
1.	Mass transfer operation	-	06
2.	Distillation	-	15
3.	Absorption	-	15
4.	Extraction	-	12
5.	Drying	-	12
			60

CONTENTS

Topic: 01- Mass Transfer operation [06]

- 01.01 Introduction
- 01.02 Classification
- 01.03 Diffusion Theory
- 01.04 Molecular diffusion

Topic: 02- Distillation [15]

- 02.01 Vapor liquid equilibria.
- 02.02 Volatility concept.
- 02.03 Methods of distillation.
- 02.03.01 Flask Distillation.
- 02.03.02 Differential Distillation.
- 02.03.03 Rectification.
- 02.04 Material and Energy balance.
- 02.05 McCabe Theele Material Balance.
- 02.06 Reflux ratio and its effects on size of column.
- 02.07 Condenser duty, No of trays.
- 02.08 Plate efficiency

Topic: 03- Absorption [15]

- 03.01 Definition.
- 03.02 Equilibrium, Solubility of gas in liquid.
- 03.03 Equipment for gas liquid operation.
- 03.03.01 Gas dispersed equipments.
- 03.03.02 Liquid dispersed equipments.
- 03.04 Packed column.
- 03.05 Types of packing.
- 03.06 Characteristics of packing.
- 03.07 Solvent Selection for gas absorption.
- 03.08 Material Balance in Counter current phenomenon.

Topic: 04- Extraction [12]

- 04.01 Principle of Extraction.
- 04.02 Ternary Diagram.
- 04.03 Solvent liquid Extraction.
- 04.04 Liquid-liquid Extraction.
- 04.05 Types of Equipments.

Topic: 05- Drying

[12]

05.01	Principle
05.02	Various terms used.
05.03	Rate of drying Calculation.
05.04	Study of equipment used for drying.
05.04.01	Tray Dryer.
05.04.02	Rotary Dryer.
05.04.03	Spray Dryer.
05.04.04	Drum Dryer.
05.04.05	Fluidised bed dryer.

Books Recommended

- | | | |
|----|-----------------------------------|----------------------|
| 1. | Introduction to chemical Engg. by | Badger & Banchemo |
| 2. | Unit operation by | Mccabe & Smith |
| 3. | Chemical Engg. Vol- II by | Coulson & Richardson |
| 4. | Unit operation by | G.G. Brown |

CHEMICAL ENGINEERING DESIGN & DRAWING

Subject Code 14603	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

Rationals & Objective : A Chemical engg. diploma student should know the details of standard equipments in chemical industrials and should be conversant loith drawings and reading of these equipments.

The students should learn details of various equipments and their components various equipments and their drawings of the same.

Sr. No.	Topics	- Periods
1.	Fluid Flow	- 10
2.	Heat Transfer	- 20
3.	Mass Transfer	- 30
		60

CONTENTS:

<u>Topic: 01, Fluid Flow</u>		-	[10]
01.01	H.P. of pump		
01.02	Pipe line design		
<u>Topic: 02, Heat Transfer</u>		-	[20]
02.01	Double Pipe Heat Exchanger.		
02.02	Shell & Tube Type Heat Exchanger.		
02.03	Condensers		
02.04	Evaporators – Single & double effect		
<u>Topic: 03, Mass Transfer</u>		-	[30]
03.01	Distillation Coloumn.		
03.01.01	Height		
03.01.02	Diameter.		
03.01.03	No. of stages.		
03.01.04	Bubble Caps		
03.02	Absorption Coloumn.		
03.02.01	Height		
03.02.02	Diameter		
03.02.03	No of stages		
03.02.04	Thickness.		

Books Recommended

<ol style="list-style-type: none"> 1. Introduction to chemical Engg. by 2. Unit operations by 3. Chemical Engg. Handbook 		Badger & Banchra McCabe & Smith. Perry
---	--	--

INDUSTRIAL INSTRUMENTATION & CONTROL

Subject Code 14604	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

Rationals & Objective : Measurement of Various process parameters namely temperature, pressure, level and flow and properties of various materials like density, viscosity, conductivity, PH and composition of mixtures are fundamental requirement for quality control of products and stable operation of the plant. The study of various methods instruments for measurements and control and analysis is highly essential.

The student should learn the basic principles, constructions and looking of emtruments used for measurement and control of various parameters.

Sr. No.	Topics	- Periods
1.	Measurement	- 04
2.	Temperature	- 04
3.	Pressure	- 05
4.	Level	- 07
5.	Flow	- 10
6.	Instruments	- 08
7.	Control	- 12
		60

CONTENTS:

Topic: 01, Measurement - [04]

- 01.01 Temperature
- 01.02 Pressure
- 01.03 Level
- 01.04 Flow
- 01.05 Humidity
- 01.06 Specific gravity
- 01.07 Viscosity
- 01.08 Conductivity

- [04]

Topic: 02, Temperature

- 02.01 Temperature scales
- 02.02 Liquid and gas filled thermometers
- 02.03 Bimetallic Thermometers
- 02.04 Resistance Thermometers.
- 02.05 Pyrometers.

- [05]

Topic: 03, Pressure

- 03.01 Manometers.
- 03.02 Pressure Elements
- 03.02.01 Bourdan Tube Bellows
- 03.02.02 Helix
- 03.02.03 Capsule
- 03.03 Measurement of differential pressure.

- [07]

Topic: 04, Level

- 04.01 Direct level Measurement.
- 04.01.01 Boband tape.
- 04.01.02 Sight Glass, Floats etc.
- 04.02 Indirect Level Measurement
- 04.02.01 Liquid Head Pressure Type
- 04.02.02 Air trap type Bubbler type etc.
- 04.03 Measures of level based on use of radio active source, sound inaves, load cells etc.

Topic: 05, Flow - [10]

- 05.01 Differential pressure meters
- 05.01.01 Venturimeter
- 05.01.02 Orifice meter
- 05.02 Variable Head Meters
- 05.02.01 Rotameters
- 05.02.02 Valve types meter
- 05.03 Tested Flow Meters.
- 05.03.01 Positive Displacement meters.
- 05.03.02 Velocity meters
- 05.03.03 Integrators

Topic: 06, Instruments - [08]

- 06.01 For measuring specific gravity
- 06.02 For measuring specific viscosity
- 06.03 For measuring specific PH
- 06.04 For measuring specific Electirical & thermal conductivity

Topic: 07, Control - [12]

- 07.01 Linearisation of model equators
- 07.02 Laplace transforms
- 07.03 Transfer functions and input –output models
- 07.04 Dynamic response to step inputs of first and second order systems with and without time lags.
- 07.05 Feedback control and effect of proportional, integral and derivative control.

Books Recommended

- 1. Industrial Instrumentation by Eckman Donald
- 2. Instruments by Kirk & Rimboi

Subject Code 14605 A	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks		
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

Rationals & Objective

Sl. No.	Topics	-	No. of lectures
1.	Importance	-	03
2.	Nitrogenous Fertilizer	-	11
3.	Phosphetic Fertilizer	-	11
4.	Potash Fertilizer	-	06
5.	Mixed Fertilizer	-	11
6.	Micronutrients	-	06
7.	Organic Fertilizers	-	13
			60

CONTENTS:

	- [03]
<u>Topic: 01- Importance</u>	
01.01	Importance of Fertilizer in agriculture
01.02	Sell Fertilizer Interaction
- [11]	
<u>Topic: 02- Nitrogenous Fertilizer</u>	
02.01	Food stock for synthesis gas production
02.02	Process for production of ammonia,
02.03	Urea and other nitrogenous fertilizers,
02.04	Integrated ammonia-urea plant,
02.05	Ammonium Nitrate and other nitrate fertilizer.
- [10]	
<u>Topic: 03- Phosphitic Fertilizers</u>	
03.01	Single super phosphate.
03.02	Treple super phosphate.
03.03	Manufacture.
- [06]	
<u>Topic: 04- Potash Fertilizers</u>	
04.01	Source
04.02	Production
- [11]	
<u>Topic: 05- Mixed Fertilizer</u>	
05.01	Mixed N P K fertilizers.
05.02	Granulate fertilizers.
05.03	Production & application.
- [06]	
<u>Topic: 06-Micro Nutrcents.</u>	
06.01	Production.
06.02	Applications.
- [13]	
<u>Topic: 07-Organic fertilizers.</u>	
07.01	Compost and other bio – fertilizers.
07.02	Comparative study with synthetic fertilizers.
07.03	Intensive agricultural practices ecological effects.

BIO – CHEMICAL ENGINEERING (ELECTIVE – III)

Subject Code 14605 B	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

Rational & Objective

Sr. No.	Topics	-	No. of lectures
1.	Scope and importance of bio-chemical engineering & bio- technology.	-	03
2.	Micro organisms	-	17
3.	Enzymes	-	18
4.	Fermentation	-	12
5.	Bio Reactors	-	10
			60

CONTENTS:

Topic :01- Scope & importance of bio –chemical engineering & bio-technology [03]

- 01.01 Scope
- 01.02 Importance of bio-chemical Engg.
- 01.03 Importance of bio-technology.

Topic :02- Micro organisms [17]

- 02.01 Structures.
- 02.02 Composition and activities.
- 02.03 Kinetics of cell growth – monod Equation
- 02.04 Metabolic pathways and bio-energetivs.

Topic :03- Enzymes [18]

- 03.01 Bio Catalysts
- 03.02 Immobilized enayme
- 03.03 Enzyme kinctics
- 03.03.01 Michel’s Menten Equation
- 03.03.02 Sequential enzyme reactions
- 03.03.03 Regulation of enzyme activity
- 03.03.04 Transport phenemena in micro bial systems

Topic :04- Fermentation [12]

- 04.01 Process parameters.
- 04.02 Sterilization
- 04.03 Process control.

Topic :05- Bio – reactors [10]

- 05.01 Different types.
- 05.02 Principles of bio-reactor design and scale up.
- 05.03 Cellular manipulation.
- 05.04 Genetic manipulation.
- 05.05 Principles of recombinant
- 05.06 DIM technology.
- 05.07 Important bio – chemical products and processes.

PETROLEUM REFINING (ELECTIVE)

Subject Code 14605 C	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

Rationals & Objective : The petroleum industry is one of the world's most important industries and one to which serious attention may well be given a set provides scope for a wide Variety of attainments in many fields of endeavour.

The objective of the Course is to attain all a round informations regarding Petroleum refining. The students would learn basic principles and operations in related field.

Sr. No.	Topics	-	No. of lectures
1.	Origin of Petroleum	-	06
2.	History of the oil Industry	-	04
3.	Properties of Crude oils	-	04
4.	Main Petroleum Product	-	08
5.	Refining Processes	-	33
6.	Location of Refinery	-	05
			60

CONTENTS:

Topic: 01, Origin of Petroleum	[06]
01.01 Hypotheses	
01.02 Formation of oil	
01.03 Physical Properties.	
Topic: 02, History of the oil Industry	[04]
02.01 Natural gas.	
02.02 Transport of oil	
Topic: 03, Properties of Crude oil	[04]
03.01 Constituents	
03.02 Configuration	
Topic: 04, Main Petroleum Products	[08]
04.01 Liquefied Petroleum Gas	
04.02 Gasoline	
04.03 Kerosene	
04.04 Gas oil	
04.05 Diesel Fuel	
04.06 Heavy oils & Residuals	
04.07 Asphalts or Bitumens	
04.09 Lubricants & Greases	

Topic: 05, Refining Processes**[33]**

- 05.01 Simplified refining flowsheet
- 05.02 Diagrammatic representation of Crude oil distillation.
- 05.03 Power Requirements
- 05.04 Crude distillation Units.
- 05.05 Solvent Extraction Processes.
- 05.06 Thermal Cracking.
- 05.07 Thermal Reforming.
- 05.08 Alkylation.
- 05.09 Catalytic Cracking

Topic: 06, Location of Refinery**[05]**

- 06.01 Different factors affecting plant site Location.
- 06.02 Different refineries in India.

Books Recommended

- | | |
|--|------------------------|
| 1. Petroleum Refining by | Nelson |
| 2. Petroleum by | V.Sokolov |
| 3. Handbook of the Petroleum Industry by | G. Sell & H.A. Dossett |

INDUSTRIAL INSTRUMENTATION & CONTROL LAB

Subject Code 14606	Practical			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	-	-	2	Internal Exam.	:	20

Rationals & Objective: Measurement of Various process parameters and properties of various materials are fundamental requirements for quality Control of produced and stable operation of the plant. The study of Various meth instruments for measurements, control and analysis are highly essential.

List of the experiments

(At least eight experiments to be performed)

Sr. No.	Name
1.	Measurement & Caliberation of thermocouple
2.	Study of bimetallic thermometer & its use
3.	Study of pressure gauge and its testing with dead weight tester.
4.	Measurement of level by air purge method.
5.	Study of Control valve.
6.	Caliberation of flow integrator.
7.	Study of on-line working of conductivity anoter.
8.	Study of on line working of p H meter.
9.	Study of online working of pH meter
10.	Study of online working of pH meter

List of the equipments for Industrial Instrumentation and Control lab

Sr. No.	Name of the equipments	No.	Specifications
1.	Thermocouples	2	Range
2.	Bimetallic Thermometer	2	Rang 0-500c
3.	Pressure Gauge	2	0-30 ps
4.	Dead weight tester	1	
5.	Air purge apparatus	1	Storage tank of suitable size with T shaped tube inserted in it and this tube is connected to air compressor.
6.	Control value	1	Inlet & outlet y2" connection
7.	Diaphragm value	2	Suitable size
8.	Flow integrator	2	Taylor model of different.
9.	Conductivity meter	1	0 to 20 mha/cm
		1	0 to 100 mha/cm
10.	PH meter	2	0 to 14
11.	Selica Analyser	1	0 to 0.2 ppm
			0 to 30ppm

PROFESSIONAL STUDIES & ENTREPRENEURSHIP

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

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>
--------------	---------------

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, Publishing Company Ltd., New Delhi. | - | Herald Koonz & Cyril O' Donnel. |
| 2. | Business Organisation 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. |
| 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 |

CHEMICAL ENGINEERING DESIGN & DRAWING

Subject Code 14608	Sessional			No of Period in one session : 75		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

Rationale & Objective:

Same as that of chemical Engg. Design and Drawing (Theory), subject code-

Sr.No.	Topic	-	No. of periods
1.	Flow of fluid	-	20
2.	Heat Transfer	-	20
3.	Mass Transfer	-	35
			<hr/>
			75

CONTENTS:

Same as that of Elementary chemical Engg design & drawing (Theory),Subject code--

Books Recommended

[1]	Introduction to chemical Engg. by	Badger & Banchro
[2]	Unit Operation by	Mccabe & Smith
[3]	Heat Transfer by	D.Q. Kern
[4]	Chemical Engg. Handbook by	J.H. Perry.

CHEMICAL PLANT TRAINING

Subject Code 14609	Sessional			No of Period in one session :		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	-	-	-	Internal Exam.	:	20

Rationale & Objective:

It is quite essential for technical students to get exposed to industrial environments to acquire, practical and professional experiences which improved their understandings all around.

The duration of training & visit to works will be four weeks in local large scale and small scale industries. The programme will be decided by the officer incharge (Training) of the organization. The training will be imparted to students after end of academic session. After completion of training the students will submit training report and final evaluation will be done by a committee consisting of two members, one of them should be from industry preferably. There will be no division of marks between external and external examiners.

One faculty from the institute will monitor the training programmes and he will maintain liaison with training incharge of the organization.