CURRICULUM FOR THREE YEAR
(SIX SEMESTER)
DIPLOMA COURSE IN

CHEMICAL TECHNOLOGY(FERTILIZER)

Effective from Session

UNDER DEVELOPMENT

Semester System

Prepared By

Curriculum Development Cell

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

APPROVED BY

BOARD OF TECHNICAL EDUCATION
U.P. LUCKNOW,
CORRECTED AS SYLLABUS COMMITTEE OF:
B.T.E. MEETING HELD ON 27.05.2015

Corrected and Approved By B.T.E. on Dated 27.05.2015

STUDY AND EVALUATION SCHEME FOR
THREE YEAR (SIX SEMESTER) DIPLOMA COURSE IN CHEMICAL TECHNOLOGY (FERTILIZER TECHNOLOGY)
(Effective From Session)

I SEMESTER

Curriculum							Scheme of Examination								
Periods Per Week						S U B J E C T	Theory			Practical			Grand Total	
Lec.	Tutorial	Draw	Lab	Work Shop	Total		Examination Dur.	Examination Marks	Sess. Marks	Total Marks	Examination Dur.	Examination Marks	Sess. Marks	Total Marks	
5	-	-	3	-	8	1.1 Professional Communication	2.5	50	20	70	3	20	10	30	100
3	1	-	-	-	4	1.2 Applied Mathematics-I(A)	2.5	50	20	70	-	-	-	-	70
3	1	-	-	-	4	1.3 Applied Physics-I	2.5	50	20	70	-	--	--	--	70
6	-	-	4	-	10	1.4 Applied Chemistry	2.5	50	20	70	3	40	20	60	130
4	2	--	--	--	6	1.5 Measuring Instrument and Measurements	2.5	50	20	70	--	--	--	--	70
4	-	10	-	-	14	1.6 Engineering Drawing	3.0	50	20	70	-	-	-	-	70
25	4	10	7	-	46	<---------TOTAL---------->	--	300	120	420	--	60	30	90	510
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
														Aggregate	535

II SEMESTER

3	1	-	-	-	4	2.1 Applied Mathematics-I(B)	2.5	50	20	70	-	-	-	-	70
3	1	-	4	-	8	2.2 Applied Physics-II	2.5	50	20	70	3	40	20	60	130
5	1	-	2	-	8	2.3 Applied Mechanics	2.5	50	20	70	3	40	20	60	130
4	2	-	4	--	10	2.4 Mechanical Operation And Solid Handling	2.5	50	20	70	3	60	30	90	160
-	-	-	-	14	14	2.5 Workshop Practice	--	--	--	--	4	60	30	90	90
15	5	-	10	14	44	<---------TOTAL---------->	--	200	80	280	--	200	100	300	580
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
														Aggregate	605

NOTE:- (1) Each period will be 50 minutes duration.
(2) Each session will be of 16 weeks.
(3) Effective teaching will be at least 14 weeks.
(4) Remaining periods will be utilised for revision etc.
(5) Field visit and extension lectures are to be organised and managed well in advance at institute level as per need.

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(Effective From Session)

III SEMESTER

Curriculum						S U B J E C T	Scheme of Examination								
Periods Per Week							Theory			Practical			Grand Total
Lec.	Tutorial	Draw	Lab	Work Shop	Total		Examination Dur.	Sess. Marks	Total Marks	Examination Dur.	Sess. Marks	Total Marks	
5	2		--		7	3.1 Applied Mathematics-II	2.5	50	20	70	--	--	--	--	70
6	2		-		8	3.2 Chem. Engg. Thermodynamics	2.5	50	20	70	-	-	-	-	70
6	2		--		8	3.3 Material Energy Balances	2.5	50	20	70	--	--	--	--	70
5	2		4		11	3.4 Elect.Tech. & Electronics.	2.5	50	20	70	3	40	20	60	130
2	-		5		7	3.5 Introduction To Computer	---	--	--	--	3	60	30	90	90
24	8	-	9	-	41	<---------TOTAL---------->	--	200	80	280	--	100	50	150	430
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
													Aggregate		455

IV SEMESTER

6	2		8		16	4.1 Chemical Technology	2.5	50	20	70	3	60	30	90	160
5	2		--		7	4.2 Conventional & Non Conventional Source of Energy	2.5	50	20	70	--	--	--	--	70
4	2		4		10	4.3 Fluid Mechanics	2.5	50	20	70	3	100	50	150	220
4	2		--		6	4.4 Process Plant Utilities	2.5	50	20	70	--	--	--	--	70
19	8	-	12	--	39	<---------TOTAL---------->	--	200	80	280	--	160	80	240	520
						Games/NCC/Social and Culturl Activity + Discipline (15 + 10)									25
													Aggregate		545

NOTE:- (1) Each period will be 50 minutes duration.
(2) Each session will be of 16 weeks.
(3) Effective teaching will be at least 14 weeks.
(4) Remaining periods will be utilised for revision etc.
(5) Field visit and extension lectures are to be organised and managed well in advance at institute level as per need.
(6) 4 weeks structured and supervised, branch specific, task oriented Industrial/field exposure to be organised during summer vacation. Student will submit a report. There will be 150 marks for this exposure. These marks will be awarded by project examiner in the VI Sem. (Examination Marks : 100, Sessional Marks : 50). (See Annuxure-I)

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V SEMESTER

Curriculum							Scheme of Examination								
Periods Per Week						SUBJECT	Theory			Practical			Grand Total		
Lec.	Tutorial	Draw	Lab	Work Shop	Total		Examination Dur.	Sess. Marks	Total Marks	Examination Dur.	Sess. Marks	Total Marks			
6	2		--		8	5.1 Industrial Management and Enterprenurship Development	2.5	50	20	70	--	--	--	--	70
5	1		3		9	5.2 Heat Transfer Operations	2.5	70	30	100	4	100	50	150	250
5	1		3		9	5.3 Mass Transfer Operations	2.5	70	30	100					100
6	2		--		8	5.4 Pollution Control & Industrial Safety	2.5	70	30	100	--	--	--	--	100
5	2	-	-	-	4	5.5 Fertilizer Technology-I	2.5	70	30	100					
27	8	-	6	--	41	<---------TOTAL---------->	--	330	140	470	--	100	50	150	620
						Games/NCC/Social and Culturl Activity + Discipline (15 + 10)									25
													Aggregate		645

VI SEMESTER

5	1		--		6	6.1 Chemical Reaction Engineering	2.5	70	30	100	--	--	--	--	100
6	2		6		14	6.2 Automatic Process Control	2.5	70	30	100	4	100	50	150	250
4	2		--		6	6.3 Process Equipment Design	2.5	70	30	100	--	--	--	--	100
				10	10	6.4 Project									
						A- Equipment Design Project	-	-	-	-	-	100	50	150	150
						B- Field Exposure	-	-	-	-	-	80	40	120	120
5	1	-	4	-	10	6.5 Fertilizer Technology-II	2.5	70	30	100	3	80	40	120	220
20	6	--	10	10	46	<---------TOTAL---------->	--	280	120	400	--	360	180	540	940
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
													Aggregate		965

30% of I & II Semester	342
70% of III & IV Semester	700
100% of V & VI Semester	1610
Grand Total	2652

NOTE:-
(1) Each period will be 50 minutes duration.
(2) Each session will be of 16 weeks.
(3) Effective teaching will be at least 14 weeks.
(4) Remaining periods will be utilised for revision etc.
(5) Field visit and extension lectures at institute level as per need be organised.

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MAIN FEATURES OF THE CURRICULUM

1.	Title of the Course	:	Diploma in Chemical Engineering (Fertilizer)
2.	Duration of the Course	:	Three Years Duration (Six Semester)
3.	Type of the Course	:	Full Time Institutional
4.	Pattern of the Course	:	Semester System
5.	Intake	:	60
6.	Entry Qualification	:	Passed High School with 35% Marks
7.	Admission Criteria	:	State Joint Entrance Examination

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LIST OF EXPERTS

List of experts whose deliberation helped the development of curriculum in Semester System for three year(Six Semester) diploma course in Chemical Engg. (Fertilizer) at I.R.D.T. U.P., Kanpur on 30.03.15 are honourably named below -

1.	Sri F. R. Khan	Principal	G.P., Kanpur
2.	Shri D. D. Singh	H.O.D. (Chem. Engg.)	Govt. Polytechnic Badaun
3.	Shri A. K. Agarwal	Head Chem. Engg. Deptt.	Govt. Polytechnic Sutavali(J.P.Nagar)
4.	Shri R. K. Gangwar	Head	Govt. Polytechnic Mankeda(Agra)
5.	Shri A. K. Mishra	Head	Govt. Polytechnic, Kanpur
6.	Sri Durgesh Chandra	Lecturer	Govt. Poly.,Firojhabad
7.	Shri Lal Ji Patel	T.B.O.	I. R. D. T.,

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NEED ANALYSIS

Learning in general goes on with life informally but in Education systems there are always some patterns to partake knowledge to desirous ones in definite period and systematic manners, developing their knowledge and skill both. The world of knowledge is evergrowing and there always remains something to aid to make the students update, so it is inperative to make relevant changes in the curriculum in the form and content both. Chemical Engg. Diploma curriculum in the state was a four year course since long and it was felt that it should be consolidated to fit in the frame of three year span without damaging its meaningful features and including all that is important in the present scenario of Industries today. Reducing the time span was due to make it uniform like many other diploma courses running in the state polytechnics, also it is to releive the parents from the burdens of expensive training of their wards not only this, the feed back from the Institution too suggested this, with all these considerations in the view, a number of formal and informal workshops were held in this Institute itself and other institution also for this purpose and upshots of these workshops have been properly arranged to systematise classroom teaching.

The important features of the presently proposed curriculum are as given below -

1. It has been made more skillful oriented, emphasizing more practical auspects the list of practicals have been thoroughly revised and enriched with additional important practicals, like other courses here too. Industrial training has been given due weightage.

2. In Second year level, the paper Fuel & Matrial Technology has been renamed as " Conventional and Non Conventional Source of Energy ".

With all these changes, it is hoped that the new proposed course will prove conducive to students for employment point of view.

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V- PROFILE DEVELOPMENT

A tool in form of a questionnaire was designed and sent to various organisations, industries, higher technological institutes and polytechnics for getting informations about job opportuntities, man power requirements and job activities of diploma holders in chemical engineering.

Feed back was taken from experts through questionnaire, personal interviews and workshops was analysed and a draft structure of curriculum was prepared in the workshop held at I.R.D.T., U.P., Kanpur adopting the following procedure.

1. Listing job potential and job activities.
2. Analysing activities into knowledge and skill.
3. Deriving the course objectives.
4. Deriving subject areas from course objectives.
5. Planning horizontal and vertical organisation of subjects.
6. Developing study and evaluation scheme.
7. Developing detailed course contents and coverage time keeping in view the knowledge and skill requirement.
8. Determining resource input in terms of human and information resources, space & equipments etc.

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VI-JOB POTENTIAL/JOB OPPORTUNITIES :

(A) The diploma pass outs can seek the job opportunities in following type of organisations

S.NO	DEPARTMENT/ORGANISATION	POSITION/DESIGNATION
1.	O.N.G.C.	Supervisor
2.	Oil Refineries	Supervisor
3.	Pharmacentical	Technician
4.	Fertilizer Factories	Shift Engineer
5.	Process Industries	Foreman
6.	Chemical Industries	Senior Operator
7.	Petro Chemical Industries	Foreman
8.	GAIL India Limited	Jr. Engg./Operator
9.	Indian Oil Corporation	Production - Jr. Engg./Operator
10.	Research Organisationsing Chemical Engineering	Technician

(B) Names of specific industries where diploma pass outs were empolyed.

11.	Bharat Petroleum Corporation Ltd.	Jr. Engg./Operator
12.	Indian Glysol Ltd, Kashipur	Trainee Operator Shift Engineer
13.	Pashupati Acrilon Ltd., Kashipur	------Do--------
14.	Prakash Pipe Tubes, Kashipur	Chemist In Laboratory.
15.	Dynora T. V., Kashipur	Chemist
16.	Flow More Ltd., Kashipur	Operator
17.	Nepa, Pulp Paper Industry, Aliganj,Kashipur	Chemist/Operator
18.	Paper Industry, Lalkuawan(Pantnagar)	Chemist/Operator
19.	Heavy Electrical Ltd., Haridwar	Chemist
20.	IFFCO, Aonla, Bareilly	Tranee Operator
21.	Bhaba Atomic Research Centre Bombay	Shift Chemist/ Supervisor
22.	Bhaba Atomic Research Centre Kota, Rajasthan	Shift Chemist/ Supervisor
23.	Indo Gulf Fertilizer Ltd. Jagdishpur	Supervisor/Shift Engineer
24.	Hindustan Salt Ltd., Ram Nagar	Supervisor
25.	J. K. Synthetic, Kota	Supervisor
26.	Cement Corporation of India	Supervisor
27.	Hindustan Insecticides Ltd Delhi.	Supervisor
28.	Sri Ram Fertilizer & Chemicals New Delhi.	Supervisor
29.	Easter India Ltd., Khatima (Nainital)	Supervisor
30.	Sumaia Chemicals, Barabanki	Supervisor
31.	Mohan Mekien Distilleries Ltd., Ghaziabad	Operator
32.	Steel Authority of India Ltd.	Supervisor
33.	Bharat Electronics, Ghaziabad	Supervisor
34.	Vam Organic Gajrola Moradabad	Supervisor
35.	Atomic Power Project, Naraura	Operator

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S.NO	DEPARTMENT/ORGANISATION	POSITION/DESIGNATION
36.	Synthetics & Chemical, Bareilly	Supervisor
37.	U. P. Straw & Agro Products, Agvanpur (Moradabad)	Supervisor
38.	Camphor & Allied Products, Bareilly	Supervisor
39.	Khaitan Fertilizer, Rampur	Supervisor
40.	Rampur Distillaries & Chemicals Rampur.	Chemical Analyst
41.	Modi Zerox, Rampur	Supervisor
42.	Modi Olivetti (Computer), Rampur	Supervisor
43.	Modi Rubber & Chemical Industries Modi Nagar.	Supervisor
44.	Modi Pon, Modi Nagar	Supervisor
45.	Modi distilleries, Modi Nagar	Supervisor
46.	Bajpur Distillery. Bajpur	Supervisor
47.	Dauralla Distillery & Chemicals Dauralla, Meerut	Supervisor
48.	U. P. Tiwiga Fibre Glass Ltd. Secundrabad (Ghaziabad)	Supervisor
49.	Dewan Rubber Industries, Meerut	Supervisor
50.	Dewan Tyres Ltd., Meerut	Supervisor
51.	Kanoria Chemicals Ltd., Mirzapur	Supervisor
52.	Indian Petrochemicals & Complex Ltd., Baroda	Operator
53.	Mathura Refinery, Mathura	Operator
54.	National Organics & Chemicals Ltd., Bombay	Operator
55.	Indian Drugs & Pharmaceuticals Ltd., Rishikesh.	Operator
56.	Ramganga Fertilizer Ltd, Gajrola (Moradabad)	Supervisor
57.	Shree Chemicals & Industries Ltd., Gajrola (Moradabad)	Supervisor
58.	Steel Authroithy India Ltd.,Delhi	Supervisor
59.	Dunkan Industries Ltd. Panki Kanpur	Supervisor/Operator
60.	Lohia Group	Supervisor/Operator
	A- Injectoplast Ltd.,Panki	Supervisor/Operator
	B- Startinger Ltd.,Panki	Supervisor/Operator
	C- Machinery Manufacture Ltd. Chaubepur Kanpur Dehat.	Supervisor/Operator
61.	Pepsico, Kanpur Dehat	Supervisor/Operator
62.	Goodlass Merolac Paints Ltd.,Jainpur,UPSIDC, Industrial Area, Kanpur Dehat.	Supervisor/Operator
63.	M.L.A. Group of Industries, Harsh Nagar, Kanpur	Supervisor/Operator
64.	Scooter India Ltd. Paints Shop, Sarojini Nagar Lucknow.	Supervisor/Operator
65.	L.M.L., Ltd., Paints shop, Panki.	Supervisor/Operator
66.	India Polyfibre Ltd., Barabanki	Supervisor/Operator
67.	Somaiya Organics Ltd., Barabanki.	Supervisor/Operator
68.	Superhouse Leather Ltd.Unnao.	Supervisor/Operator
69.	Raymonds Synthetics Ltd.,Karchhena,Allahabad	Supervisor/Operator
70.	Oswal Fertilizers & Chemicals Ltd, Fertilizer Div., Babrala, Shahjahanpur	Supervisor/Operator
71.	Tata Chemicals Ltd., Badayun	Supervisor/Operator
72.	U.P. Asbertos Ltd. Lucknow	Supervisor/Operator
73.	Hindustan Lever Ltd., Orai	Supervisor/Operator
74.	Hindustan Lever Ltd., Hamirpur	Supervisor/Operator
75.	Vegipro Ltd., Orai	Supervisor/Operator
76.	Larsan & Toubro, Bombay	Supervisor/Operator

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77.	KTI, Ltd., Delhi	Supervisor/Operator
78.	Mc Dowell Industries, Ltd, Banglore	Supervisor/Operator
79.	IPCL, Baroda	Supervisor/Operator
80.	Panjab Tractor, Bhewani	Supervisor/Operator
81.	Hindalco Ltd., Renukut, Mirzapur	Supervisor/Operator
82.	Hindustan Lever Ltd., Banglore (Research Division)	Supervisor/Operator
83.	Indian oil Corporation Ltd.	Supervisor/Operator
84.	GAIL India Limited	Supervisor/Operator
85.	Reliance Industries Ltd., Bombay	Supervisor/Operator
86.	Reliance Petrochemical Ltd.(Refinery) Jamnagar	Supervisor/Operator
87.	MRPL, Mangalore	Supervisor/Operator
88.	ESSAR Refinery Ltd. Jamnagar	Supervisor/Operator
89.	Chambal Fertilizers Ltd., Kola Rajasthan	Supervisor/Operator
90.	Nagarjuna Fretilizers, Andhra Pradesh	Supervisor/Operator
91.	R.C.F.(Rashtriya Chemical & Fertilizers Bombay)	Supervisor/Operator
92.	Insilco , Gujralla, Moradabad	Supervisor/Operator
93.	Malvika Steel Industries, Jagdishpur, Sultanpur	Supervisor/Operator
94.	K.M. Sugar Mills & Distillary Div.,Masoudha	Supervisor/Operator
95.	Yash Paper Mills, Faizabad	Supervisor/Operator
96.	H.P.C.L.(Hindustan Petroleum Co. Ltd.) Bombay	Supervisor/Operator
97.	Balrampur Chinee Mill & Distillery Div. Balrampur	Supervisor/Operator
98.	Oil Refinery India, Ltd., Digboi (Assam)	Supervisor/Operator
99.	NALCO, Orissa	Supervisor/Operator
100.	BALCO, Korba (M.P.)	Supervisor/Operator
101.	NALCO Chemicals, Bombay	Supervisor/Operator

(C) SELF EMPOLYMENT:

A diploma pass out in Chemical Engineering can start his enterprenurial activities in the following small scale industries.

(i) Manufacturing of Paints & Varnishes.
(ii) Manufacturing of Plastic & rubber Articles.
(iii) Manufacturing of domestic utility articles such as Soap, Detergent, Edible oils, Hair oils etc.
(iv) Small scale packing industries.

VII. JOB ACTVITIES :

(A) GENERAL:

1. OPERATION OF CHEMICAL PLANT:

1.1 Supervises the operation of chemical plants.

1.2 Supervise the process control

1.3 Training of crafts man

1.4 Manages labour materials and utilities

1.5 Safety of workers and equipments

2. CHEMICAL ANALYSIS :

2.1 Analysis of sample

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2.2 Interpretation of results of analysis

3. ERECTION AND COMMISSIONING OF CHEMICAL PLANT :

3.1 Reading and inter-preting the sketches, drawings

3.2 Preparing inventory control and costing.

4. INSPECTION AND TESTING OF CHEMICAL EQUIPMENT :

4.1 Inspection and testing performance of individual equipment.

4.2 Fault finding or trouble shooting and its rectification.

5. MARKETING :

5.1 Explaining the salient features and performance of the product and comparison with regard to other such available equipments in the market.

5.2 Preparing estimates and contract documents

5.3 Booking of orders and making relevent documents and correspondence.

5.4 Servicing of equipments and instruments.

5.5 Inventory control and determination of material requirement.

5.6 Preparation of tender documents and investing tenders.

5.7 Placing orders and receiving the supplies.

6. PROJECT PREPARATION AND EVALUATION :

6.1 To scrutinise the project reports for Chemical plants from the point of view of feasibility and finances involved.

7. TEACHING, RESEARCH AND TRAINING :

7.1 To assist the teachers in imparting instructions to students.

7.2 To set up laboratory equipments for experimental work.

7.3 Preparation of specifications of various equipments and instruments.

7.4 Preparing of tender.

7.5 Receipt of supplies and their inspection and testing according to specifications.

7.6 Maintains the equipments and instruments in

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the laboratory.

(B)SELF EMPLOYMENT:

(a) Setting up of small scale chemical industry

(b) Setting up an ancillary industry for big chemical plants.

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ACTVITY ANALYSIS:

S.No.	Activity	Knowledge Required	Skill Required
GENERAL:			
1.1	Supervisors / Technicians / Sr. Operators in Chemical and allied industries :		
1.1.1	Supervises the Operation of Chemical Plants.	Knowledge of : - Inorganic and organic chemistry and part of physical chemistry. - Unit operations such as fluid flow heat transfer, mass transfer, mechanical operation etc. - Unit process of inorganic and organic industries. - Process testing instrument- their principle of operation, working and constructional details.	Skill in operation of individual chemical equipment and related instrument.
1.1.2	Supervises the process control.	- Knowledge of : - Unit process of inorganic and organic chemical industries. - Instruments used in process control, their principle of operation, working and constructional details. - Various types of break downs their causes and rectification. Effect of break down on the working of industry.	Skill in the use of instruments. Skill in attending the break downs.
1.1.3	Training of Crafts man	- Knowledge of subject matter of chemical plants i.e. equipments and processes. - Collection of feed data and effective communication methods.	Skill in planning and supervising of training, communication techniques.

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S.No.	Activity	Knowledge Required	Skill Required
1.1.4	Manages labour materials and utilities.	- Modern methods of labour management, labour welfare activities. - Labour laws and acts, workman compensation act, strikes and lock-outs etc. - Principles of material management. - Departmental purpose, rules and specification of materials. - Inventory control. - Stores management layout, method of storage, and stores maintenance i.e. bincards, leadger etc. - Use of utilities in the plant.	Skill in leadership, Skill in communication techniques.
1.1.5	Safety of workers and equipments.	- Safety rules and other departmental precautions in this respect. - Importance of safety in an industry. - Knowledge of different safety procedures. - Different safety equipment its principle of working, layout and operation.	Skill in operation of plants and equipment. Skill in conducting safety operations. Skill in operating safety equipments. Skill in first aid operations.
1.2	SUPERVISOR FOR CHEMICAL ANALYSIS :		
1.2.1	Analysis of sample	- Knowledge of chemical analysis. - Knowledge of qualitative and quantitative analysis. - Knowledge of analytical instruments.	Skill in handling various instruments and requirements in the lab.
1.2.2	Interpretation of results of analysis.	- Knowledge to present the results in a qualitative form. - Knowledge of basic chemical calculations.	Skill in reaching at conclusion.

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S.No.	Activity	Knowledge Required	Skill Required
1.3	SUPERVISOR FOR ERECTION AND COMMISSIONING OF CHEMICAL PLANTS:		
1.3.1	Reading and interpreting the sketches, drawings.	- Principle of projections first angle projection & third angle projection.	Skill in reading and interpreting drawing & sketches.
		- Descriptions, working and use of various drawing instruments & equipments.	Skill in use of drawing instrument and equipment.
		- Knowledge of various process and equipment.	Skill in reprography , preparations of detailed manufacturing drawings.
		- Methods of reading and interpreting the drawings and blue prints.	
		- Preparation of detailed manufacturing drawing from line diagrams.	
1.3.2	Preparing inventory control and costing.	- Inventory control methods	Skill in maintenance of stores and ordering procedures.
		- Store-keeping	
		- Cost estimation	
1.3.3	Preparation of working schedule.	- Realistic time estimates for various jobs.	Skill to handle labour.
1.3.4	Erection and commissioning of plant.	- Knowledge of plant and machinery and process.	Skill to handle labour.
		- Workshop Practice	Skill in workshop practice, skill in demonstration.
		- Foundation practice	Skill in testing of commissioned equipments.
		- Handling equipment - Transporation of equipment. - equipments used for erection. - Knowledge of safety of equipment - Simple design calculations.	

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S.No.	Activity	Knowledge Required	Skill Required
1.4	Supervisor for equipment testing and inspection :		
1.4.1	Inspection & testing performance of individual equipment.	- Necessity of inspection at various stages of manufacture, operation and maintenance. - Modern methods of conducting inspections. - Various tests and testing procedures to determine the process-performance of the individual equipment. - Importance of performance test for equipment and to fix its periodicity.	Skill in inspection techniques. Skill in testing the equipment.
1.4.2	Fault finding or trouble shooting and its rectification.	- Knowledge of various process and equipment. - Various probable fault which are likely to occur in processes and equipments. - Techniques in fault investigation and trouble shooting. - Methods of repair and overhauling. - Importance of maintenance in running of a factory. - Preventive maintenance and preparation of its schedule.	Skill in conducting preventive maintenance and process monitoring. Skill in trouble shooting. Skill in repair and overhauling of equipment.
1.5	Sales representatives / purchase assistants or marketing / sales supervisors in various chemical units :		
1.5.1	Explaining the salient features & performance if the product and comparison with regard to other such available equipments in the market.	- Knowledge of the manufacturing processes of the product & its utilities. - Description, principle of working and special features of the equipment. - Modern methods of sales promotion.	Skill in explaining the performance of the product. Skill in good Sales-manship. Skill in demonstrating the working of the equipment.

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S.No.	Activity	Knowledge Required	Skill Required
		- Knowledge of other similar products in the market. - Operation of the equipment and demonstrating the performance.	
1.5.2	Preparing estimates & contract documents.	- Principle of estimation. - Various methods of estimation. - Knowledge of departmental rules and general sale/ purchase conditions such as earnest money, security deposits, warranty claims etc. - Preparation of estimates and contract documents.	Preparation of estimates. Preparation of contract documents. Skill in setting warranty claims.
1.5.3	Booking of orders and making relevant documents and correspondence.	- Knowledge of office procedures initiating a correspondence, putting the notes, drafting letters and coresspondence.	Skill in making official correspondence.
		- Techniques in procedure of placing orders. - Knowledge of market demand and trend. - Methods of conducting market survey to determine market trend.	Skill in office procedure.
1.5.4	Servicing of equipment and instruments.	- Importance of service after sales in promotion of product sale. - Principle of working of various equipment and instruments manufactured. - Various defects and its repair. - Explaining the importance of preventive and routine maintenance to customer.	

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S.No.	Activity	Knowledge Required	Skill Required
1.5.5	Inventory control and determination of material requirement.	- Principle of inventory control. - Knowledge for consolidating the requirement of material and lead time.	
1.5.6	Preparation of tender docu - ments and investing tenders.	- Detailed specification of materials. - Preparation of tender documents with various conditions. - Inviting tenders according to departmental rules and regulations.	Skill in praparing tender documents.
1.5.7	Placing orders and receiving the supplies.	- Method of making compera- tive statement. - Decision making for ordering the material on quality-cum-cost basis. - Preparing the orders laid down clearly the various conditions of supply. - Receipt of supplies and inspection of materials according to specification for accepting and rejecting.	Skill in preparing the supply orders. Skill in inspection of material for accepting and rejection.
1.6	Technical assistants in financial corporation, banks for the secruting project reports for the purpose of loaning :		
1.6.1	To secrutinise the project reports for Chemical plants from the point of view of feas- ibility and finances involved.	- Specifications of various raw material used in chemical industry. - Knowledge of availability of man power in the area where industry is likely to be setup. - Various concessions provided by the Govt. such as cheep electricity water, land on concessional rates etc.	Skill in secruti- nising the report.

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S.No.	Activity	Knowledge Required	Skill Required
		- Knowledge of processes and products its market availability. - To make comparative study and analysis of project report for its feasibility.	
1.7	To work as a technician in teaching / research organisation and in training organisation of large chemical unit :		
1.7.1	To assist the teachers in imparting ins tructions to students.	- Knowledge of the subjects. - Teaching methodology. - Students psychology.	Communication Skill.
1.7.2	To set up laboratory equipments for experi-mental work.	- Description and working of the equipment. - Method of setting the equipment. - Knowledge of the experiment.	Operation of equipment and conduct the experiments.
1.7.3	Preparation of specifications of various equipments and instrumets.	- Principle of specifying the machines, equipments and instruments. - Methods of laying down specifications. - Knowledge of various machines, equipments and instruments.	Skill in preparing the specifications.
1.7.4	Preparing of tender.	- Specifications of various equipments and materials required. - Preparation of tender documents. - Knowledge of various sources of availability of chemical equipments and material. - Preparation of comparative statement and recommending the item on quality-cum-cost basis.	Skill in inviting tenders Skill in preparation of tender documents

S.No.	Activity	Knowledge Required	Skill Required
1.7.5	Receipt of supplies and their inspection &testing according to specification.	- Receipt of the material. - Method of inspection and testing the materials. - Conducting inspection and testing of materials according to specification for acceptance and rejection.	Skill in inspection and testing of the equipments and materials.
1.7.6	Maintenance of equipments and instruments in the laboratory.	- Importance of maintenance in institution and engineering industry. - Various maintenance methods. - Importance of preventive maintenance preparation of preventive maintenance, schedule for each machine, equipments & instrument. - Types of fault, its detection repair and overhauling. - Keeping the maintenance record of each machine equipment and instrument.	Skill in conducting preventive maintenance. Skill in repairing and overhauling of machines, equipments and instruments.

(B) SELF EMPLOYEMENT :

Self employment in small scale unit such as manufacturing of paints, varnishes, chemicals, rubber and plastic :

(a)	Setting of small scale chemical industry.	- Methods of conducting market survey for the feasibility of the industry. - Factor affecting site selection. - Knowledge of various financial sources with their norms and conditions. - Knowledge of various concessions provided by government to young enterpreunures. - Knowledge of process	Skill in conducting market survey.

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S.No.	Activity	Knowledge Required	Skill Required
		- market trends for the sale of product. - Safety and waste treatment.	
(b)	Setting up an ancillary industry for big chemical plants.	- Market survey to collaborate with big industry. - Various financial sources for financing ancillary industry. - Concessions provided by government. - Knowledge of manufacturing processes for the item. - Effective and efficient management of the industry.	Skill in setting up of unit.

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VIII- COURSE OBJECTIVE

At the end of course the students should be able to get:

(A) KNOWLEDGE :

(1) Understand the various unit operation and unit processes and their application in different chemical industries like fertilizer, process industry, sugar and plastic etc.

(2) Understand various instruments used in process control of chemical industry including use of computer.

(3) Understand the organisation and his place in it. Understanding the general procedures of stores, purchase and inventory etc.

(4) Understand the techniques of installation, erection and commissioning of equipments/instruments in chemical plants.

(5) Understand, interpret and prepare plant layout and flow diagrams.

(6) Understand, interpret and prepare project reports.

(7) Understand safety goals, waste control and waste treatment (effluent control)

(8) Understand the energy conservation and balance.

(9) Develop attitude for safety consciousness

(B) SKILL :

(10) Acquire skill in operation, testing and adjustment of chemical equipment/materials used in chemical industry.

(11) Acquire the skill in diagnosis of common faults and troubles in process, equipment and instrument and their rectification, repair and overhauling.

(12) Acquire skill in reading interpreting and prepare plant layout and flow diagrams.

(13) Acquire skill in preparing erection schedule/charts and knowledge of coordination of the organisation using CPM and PERT.

(14) Develop skill in operation of chemical plants.

(15) Develop skill in use of instruments in chemical industry.

(16) Develop skill in communication oral/written/through devices.

(17) Develop skill in repair and maintenance of chemical instruments and equipments.

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IX- CURRICULUM ANALYSIS FOR IDENTIFICATION OF SUBJECTS

SNo.	Course Objective	Subject(s) of study
(A)	KNOWLEDGE :	
(1)	To understand the various unit operations and unit processes and their application in different chemical industries like fertilizer, process industry, sugar and plastic etc.	- Chemical Technology - Unit Operations - Electives - Fluid Mechanics - Mechanical Operation & Solid Handling - Heat transfer - Mass transfer
(2)	To understand various instruments used in process control of chemical industry including use of computers.	- Instrumentation - Computer Application For Engineering
(3)	To understand the organisation and his place in it. understanding the general procedure of stores, purchase and inventory etc.	- Industrial Management & Enterprenurship Development
(4)	To understand the technique of installation, erection and commissioning of equipments/ instruments in chemical plants.	- Process equipment design - Workshop Practice (Installation and commissioning)
(5)	To understand, interpret and prepare plant layout and flow diagrams.	- Chemical Technology
(6)	To understand, interpret and prepare project reports.	- Project work
(7)	To understand safety goals, waste control and waste treatment (effluent control).	- Pollution Control & Industrial Safety - Safety and Chemical hazards.
(8)	To understand the energy conservation and balance.	- Material Energy Balance
(9)	To develop attitude for safety consciousness.	- Industrial Safety .
	SKILL :	
(1)	To acquire skill in operation, testing and adjustment of chemical equipment / materials used in chemical industry.	- Workshop Practice. - Field Exposure

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(2)	To acquire the skill in diagnosis of common faults and troubles in process - equipment and instrument and their rectification, repair and overhauling.	- Workshop Practice relating chemical engineering. - Field Exposure
(3)	To acquire the skill in reading, interpreting and prepare plant layout and flow diagrams.	- Engineering Drawing - Chemical Tech. - Process - Equipment Design. - Field Exposure
(4)	To acquire skill in preparing erection schedule/ charts and knowledge of coordination of the organisation using CPM and PERT.	- Industrial Management - Process Equipment Design - Workshop Practice. - Field Exposure
(5)	To develop skill in operation of chemical plants.	- Field Exposure - Chemical Technology - Workshop
(6)	To develop skill in use of instruments in chemical industry.	- Measuring Instruments & Measurements - Field Exposure
(7)	To develop skill in communication oral/ written/ through devices.	- Communication Techniques - Industrial Management
(8)	To develop skill in repair and maintenance of chemical instruments and equipments.	- Workshop Practice - Field Exposure

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I Semester

1.1 PROFESSIONAL COMMUNICATION

[Common to All Engineering/Non Engineering Courses]

L	T	P
5	-	3

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.	10	-	-
3.	Development of expression through			
	A. Letters(English & Hindi)	10	-	-
	B. Report writing (English) Note making and minutes writing	10	-	-
4.	Paragraph writing, Essey writing, Proposal writing	10	-	-
5.	Composition	10	-	-
6.	Remecial Grammer & Vocabulary Building	15	-	-
		70	-	42

1. PART I : COMMUNICATION IN ENGLISH (40 Marks)

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

1.2 Technical communication Vs. General Communication : 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 Paragraph writing, Essay writing, Proposal writing.

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1.3.2 Business and personal correspondence (Letters) :
Kinds of letters:-
Official, demi-offical, unofficial , for reply or in reply, quotation, tender and order giving letters. Application for a job, Resume.

1.3.3 Report writing and Note making and minutes writing.

1.4 Functional Grammer : Study of sentences and parts of speech (word class), Preposition, Verb, Articles, Abbreviations.

1.5 Vocabulary Building : Homophones, One word substitution, Idioms and Phrases.

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

2. PART II : COMMUNICATION IN HINDI (10 Marks)

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, Press release in Hindi, Report writing.

Note: Paper should be in two parts, part I - English and part II Hindi.

REFERENCE BOOKS

1. Bookshelf worksheet of Professional Communication, New Delhi : Bookshelf 2008

2. Functional Skills in language and literature by R. P. Singh, New Delhi : Oxford University Press.

3. Oxford Engilsh Hindi English Dictionary, New Delhi : Oxford 2008

LANGUAGE LAB PRACTICE

For the practice/exercise the following is suggested :-

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 teacher concerned.

THE FOLLOWING MODEL IS PROPOSED :

1. a picture/photograph
2. an opening sentence or phrase

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3. a newspaper/magzine clipping or report
4. factual writting which should be informative or argumentative.

(The students may refer to "Bookshelf worksheet" for technical communication)

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.
7. Through drilling of model words involving different phonetic symbols (Vowels, Consonants, Difthongs).

4. Aural :

Listening to conversation/talk/reading of short passage and then writting 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 THE PAPER OF PROFESSIONAL COMMUNICATION

Distribution of Marks

Theory Paper : 50 Marks
Sessional : 20 Marks
Pratices : 30 Marks

Q1. Question based on the topics of the prescribed syllabus will be set for testing 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

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Q3. Report Writting on given outlines 5 Marks

Q4. There will be a number of short answer questions to test the candidates knowledge of functional grammer, 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 expresed 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 Noune 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 abbrevation, uses of idioms and Phrases, Homophones.

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 ceteria 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.

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1.2 APPLIED MATHEMATICS I(A)

[Common to All Engineering Courses]

L	T	P
3	2/2	-

Rationale:

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

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

DETAILED CONTENTS:

1. ALGEBRA-I : (10 Marks)

1.1 Series : AP and GP; Sum, nth term, Mean

1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.

1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Crammer's rule

2. ALGEBRA-II:(10 Marks)

2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.

2.2 Complex number.

Complex numbers, Representation, Modulus and amplitud Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..

3. TRIGONOMETRY :(8 Marks)

3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relation ship between sides and angle of a triangle.

3.2 Inverse circular functions : Simple case only

4. DIFFERENTIAL CALCULUS - I : (12 Marks)

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

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4.2 Methods of finding derivative, - Function of a function, Logaritimic differentiation, Differentiation of implicit functions.

5. DIFFERENTIAL CALCULUS -II :(10 Marks)

5.1 Higher order derivatives, Leibnitz theorem.

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

5.3 Application - Finding Tangants, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

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1.3 APPLIED PHYSICS-I

[Common to All Engineering Courses]

L	T	P
3	2/2	-

Rationale:

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

TOPIC WISE DISTRIBUTION OF PERIODS

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

DETAILED CONTENTS:

1. Units and Dimensions (4 Marks)

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

i) Checking the correctness of physical equations,

ii) Deriving relations among various physical quantities,

iii) Conversion of numerical values of physical quantities from one system of units into another. Limitations of dimensional analysis.

2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measuremnts, accuracy and precision, random and systematic errors, estimation of probable errors in the results of measurement(Combination of erros in addition, substraction, multipication and powers). Significant figures, and order of accuracy in respect to instruments,

3. Circular Motion (5 Marks)

Central forces. Uniform Circular motion (Horizental and Vertical cases),angular velocity,angular acceleration and centripetal acceleration.Relationship between linear and angular velocity and acceleration. Centripetal and

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centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

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

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

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

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

6. Fluid Mechanics :(5 Marks)

Surface tension, Capillary action and determination of surface tension from capilary rise method, Equation of continuity (A1V1=A2V2), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. Friction :(4 Marks)

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

8. Harmonic Motion (6 Marks)

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

9. Heat & Thermodynamics: (6 Marks)

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

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

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1.4 APPLIED CHEMISTRY

[Common to All Engineering Courses]

L	T	P
6	-	4

Rationale:

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

TOPIC WISE DISTRIBUTION OF PERIODS

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

DETAILED CONTENTS:

1. ATOMIC STRUCTURE :(3 MARKS)

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

2. CHEMICAL BONDING :(4 MARKS)

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

3. CLASSIFICATION OF ELEMENTS :(3 MARKS)

Modern classification of elements (s,p,d and f blcok elements), Periodic properties : Ionisation potential electro negativity, Electron affinity.

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4. ELECTRO CHEMISTRY-I:(3 MARKS)

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

5. ELECTRO CHEMISTRY-II:(3 MARKS)

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

6. CHEMICAL KINETICS :(3 MARKS)

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

7. CATALYSIS :(2 MARKS)

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

8. SOLID STATE :(2 MARKS)

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

9. FUELS :(3 MARKS)

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

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

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

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

Numerical Problems based on topics

10. WATER TREATMENT :(3 MARKS)

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Sods lime, Zeolote and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge

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formation, Corrosion, Caustic embritlement, primming and foarming in biolers.

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

11. COLLOIDAL STATE OF MATTER :(3 MARKS)

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

12. LUBRICANTS :(3 MARKS)

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.

13. HYDROCARBONS:(4 MARKS)

A. Classification and IUPAC nomeuclature of organic compounds hamologous series (Functional Group)

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

14. ORGANIC REACTIONS & MECHANISM:(4 MARKS)

1. Fundamental auspects -

   A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion
   B. Inductive effect, Mesomeric effect, Electromeric effect.

2.A. Mechanism of addition reaction (Markonicove's Rule, Cyanohydrin and Peroxide effect),

B. Mechanism of Substitution reactions; (Nucleophillic) hydrolysis of alkyle halide, electrophillic substitution halogenation, Sulphonation, Niration and friedel-Craft reaction.

C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehyrohalogenation of primary alkyl halide.

15. POLYMERS :(3 MARKS)

1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)

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2. Thermosetting and Thermoplastic resen -

   A. Addition polymers and their industrial application- Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.

   B. Condensation polymer and their industrial application : Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.

3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers(Silicon)

16. SYNETHETIC MATERIALS :(4 MARKS)

A. Introduction - Fats and Oils
B. Saponification of fats and oils , Manufacturing of soap.
C. Synthetic detergents, types of detergents and its manufacturing.
3. EXPLOSIVES: TNT, RDX, Dynamite.
4. Paint and Varnish

LIST OF PRACTICALS

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

   A. Basic Radicals :

   NH_4^+, Pb^{++}, Cu^{++}, Bi^{+++}, Cd^{++}, As^{+++}, Sb^{+++},

   Sn^{++}, Al^{+++}, Fe^{+++}, Cr^{+++}, Mn^{++}, Zn^{++}, Co^{++}

   Ni^{++}, Ba^{++}, Sr^{++}, Ca^{++}, Mg^{++}

   B. Acid Radicals :

   CO_3^{--}, S^{--}, SO_3^{--}, CH_3COO^-, NO_2^-,

   No_3^- , Cl^-, $Br\_$, I^- , So_4^{--}

2. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.

3. To determine the total hardness of water sample in terms of $CaCo_3$ by EDTA titration method using Eriochroma black-T indicator.

4. To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalium as indicator.

5. To determine the Chloride content in supplied water sample by using Mohr's methods.

6. Determination of temporary hard ness of water sample by O-Hener's method.

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1.5-MEASURING INSTRUMENTS AND MEASUREMENTS

[Common to Three year Diploma Course in Chemical Technology : (1) Fertilizer Technology, (2) Rubber and Plastic Technology]

L	T	P
4	2	-

Rationale:

The curriculum of measuring instruments and measurements deals with various measuring instruments like pressure and vacuum gauges, thermometers, pyrometers, orifice, venturimeters, rotameters etc. The students will be well aware of use of these instruments which will inculcate their knowledge.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction and Classification of Instruments.	12	6	-
2.	Pressure and Vacuum gauges	12	6	-
3.	Thermometers and Pyrometers	12	6	-
4.	Mass & Weight Measurement	10	5	-
5.	Liquid level meters	10	5	-
		56	28	-

DETALLED CONTENTS

1. INTRODUCTION & CLASSIFICATION OF INSTRUMENTS:

Importance of instruments in chemical process industries. General classification of industrial instruments. Indicating and recording type of instruments. Static & Dynamic characteristics of instruments. Description and constructional details, working principle, ranges and application of following instruments.

2. PRESSURE AND VACUUM GAUGES:

Liquid column gauges, Bourdan tube gauge, Melleod gauge, Ionization and thermal conductivity meters.

3. THERMO METERS AND PYROMETERS:

Bimetallic thermometers, liquid expansion thermometers, thermocouples, resistance thermometers, optical and radiation pyrometers.

4. MASS & WEIGHT MEASUREMENT :

Measurement equipment - Two pan balance and single pan mechanical balances, Single pan electronic balance.

5. LIQUID LEVEL METERS:

Visual indicators, Float actuated level meters, static

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pressure type instruments. The bubbler system, diaphragm box and air trap system. Electrical contact type liquid level indicators.

REFERENCE BOOKS

1. Industrial instrumentation by Donald, P. Ekman
2. Instrumentation by Krik and Ramboi.

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1.6 ENGINEERING DRAWING

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

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

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

L	T	P
4	-	10

Rationale

Drawing, which is known as the language of engineers, is a widely used means of communication among the designers, engineers, technicians, draftmen and craftmen 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 perosonnel 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, providedto 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 refered 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 deversified fields of engineering. It is expected that at the end of this session, the students acqures 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	5	-	4
2.	A.	Lettering techniques	3	-	16
	B.	Introduction to scales	2	-	8
3.		Conventional Presentation	5	-	8
4.	A.	Principles of projections	3	-	12
	B.	Point Line, Plane	2	-	28
5.		Orthographic projection of simple geometrical solids	5	-	12
6.		Section of Solids	5	-	20
7.		Isometric Projection	5	-	20
8.		Free Hand Sketching	5	-	8
9.		Development of surfaces	5	-	24
10.		Orthographics Projection of Machine Parts	5	-	12
11.		Practice on Auto Cad	6	-	24
			56	-	140

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C O N T E N T S

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

1. Drawing, instruments and their uses. 1 Sheet

1.1 Introduction to various drawing, instruments. 1

1.2 Correct use and care of Instruments.
1.3 Sizes of drawing sheets and their layouts.

2. (a) Lettering Techniques 2 Sheet

Printing of vertical and inclined, normal single stroke capital letters.

Printing of vertical and inclined normal single stroke numbers.

Stencils and their use.

(b) Introduction to Scales 2 Sheet

Necesssity and use, R F

Types of scales used in general engineering drawing. Plane, diagonal and chord scales.

3. Conventional Presentaion : 1 Sheet

Thread (Internal and External), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts.

4. (a) Principles of Projection 1 Sheet

Orthographic, Pictorial and perspective.

Concept of horizontal and vertical planes.

Difference between I and III angle projections.

Dimensconing techniques.

(b) Projections of points, lines and planes. 1 Sheet

5 (a) Orthographic Projections of Simple 2 Sheet

Geometrical Solids

Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with referance planes.

(b) Orthographic views of simple composite solids from their isometric views.

(c) Exercises on missing surfaces and views

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6. Section of Solids 2 Sheet

Concept of sectioning

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

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

7. Isometric Projection. 2 Sheet

Isometric scale

Isometric projection of solids.

8. Free hand sketching 1 Sheet

Use of squared paper

Orthographic views of simple solids

Isometric views of simple job like

carpentary joints

9. Development of Surfaces 2 Sheet

Parallel line and radial line methods of developments.

Development of simple and truncated surfaces (Cube, prism, cylinder, cone and pyramid).

10. ORTHOGRAPHIC PROJECTION OF MACHINE PARTS: 2 Sheet

Nut and Bolt, Locking device, Wall bracket

11. PRACTICE ON AUTO CAD : 2 Sheet

Concept of AutoCAD, Tool bars in AutoCAD, Coordinate System, Snap, Grid and Ortho mode.Drawing Command - Point, Line, Arc, Circle, Ellipse. Editing Commands - Scale, Erase, Copy, Stretch, Lengthen and Explode. Dimensioning and Placing text in drawing area. Sectioning and hatching. Inquiry for different parameters of drawing.

NOTE :

A. The drawiang should include dimension with tolerence whereever necessary, material list according to I.S. code. 25% of the drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle figure

B. Practice on AutoCAD latest software is to be done in AutoCAD lab of Mechanical Engineering Department of the Institute.

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II Semester

2.1 APPLIED MATHEMATICS I (B)

[Common to All Engineering Courses]

L	T	P
3	2/2	-

Rationale:

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

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

DETAILED CONTENTS:

1. INTEGRAL CALCULUS - I : (14 Marks)

Methods of Indefinite Integration :-

1.1 Integration by substitution.

1.2 Integration by rational function.

1.3 Integration by partial fraction.

1.4 Integration by parts.

2. INTEGRAL CALCULUS -II :(14 Marks)

2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.

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

2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases.

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

3.1 CIRCLE :

Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

3.2 Standard form and simple properties

Parabola x2=4ay, y2=4ax,

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

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

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

4.1 Straight lines and planes in space -

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

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

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2.2 APPLIED PHYSICS-II

[Common to All Engineering Courses]

L	T	P
3	2/2	4

Rationale:

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

TOPIC WISE DISTRIBUTION OF PERIODS

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

1. Optics (4 Marks)

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

2. Introduction To Fibre Optics :(5 Marks)

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

3. Lasers and its Applications (4 Marks)

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

4. Electrostatics :(4 Marks)

Coutomb's Law, Electric field, Electric potential, Potential energy, Capacator, Energy of a charged capacitor, Effect of dielectric on capacators.

5. D.C. Circuits (5 Marks)

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

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

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

7. Semiconductor Physics (4 Marks)

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

8. Junction Diode and Transister : (6 Marks)

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

9. Introduction To Digital Electronics : (6 Marks)

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

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

(a) Wind energy : Introduction, scope and significance, measurement of wind velocty by anemometer, general principle of wind mill.

(b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

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PHYSICS LAB

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.

2. Determination of 'g' by plotting a graph T2 verses l and using the formula g=4n2/Slope of the graph line

3. Determine the force connstant of combinationof springs incase of 1. Series 2. Parallel.

4. To verify the series and parallel combination of Resistances with the help of meter bridge.

5. To determine the velocity of sound with the help of resonance tube.

6. Determination of viscosity coefficient of a lubricant by Stoke's law.

7. Determination of E1/E2 of cells by potentio meter.

8. Determination of specific resistance by Carry Foster bridge.

9. Determination of resitivity by P.O.Box.

10. Verification of Kirchoff's Law.

11. To draw Characteristics of p-n Junction diode.

12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

NOTE :

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

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2.3 APPLIED MECHANICS

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

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

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

L	T	P
5	1	2

RATIONALE

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

TOPIC WISE DISTRIBUTION OF PERIODS

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

DETAILED CONTENTS

1. Introduction:

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

2.A. System of Forces :

Concept of coplaner and non-coplaner forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a praticle,conditions of equilibrium of coplaner concurrent

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force system.

B. General Condition of Equilibrium:

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

3. Moment & couple:

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

4. Friction:

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

5. Machines:

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

6. Centre of Gravity:

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

7. Moment of Inertia:

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

8. Beams & Trusses:

Definition of statically determinate and indeterminate trusses. Types of supports. Concept of tie & strut, Bow's notation, space diagram, polar diagram, funicular polygon; calculation of reaction at the support of cantilever and simply supported beams and trusses graphically and

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analytically; graphical solution of simple determinate trusses with reference to force diagram for determining the magnitude and nature of forces in its various members. Analytical methods: method of joints and method of sections.(simple problems only)

Applied Mechanics Lab : Practicals

1. To verify the law of Polygon of forces.
2. To verify the law of parallelogram and triangle of forces.
3. To verify the law of principle of moments.
4. To find the coefficient of friction between wood,steel, copper and glass.
5. To find the reaction at supports of a simply supported beam carrying point loads only.
6. To find the forces in the jib & tie of a jib crane
7. To find the forces in the members of a loaded roof truss. (King / Queen post truss)
8. To find the mechanical advantage, velocity ratio and efficiency of any three of the following machines:
   (i) Simple wheel & axle
   (ii) Differential wheel & axle
   (iii) Differential pulley block
   (iv) Simple Screw jack
   (v) Simple Worm & worm wheel
   (vi) System of Pulleys (any type).
9. To find out center of gravity of regular lamina.
10. To find out center of gravity of irregular lamina.

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2.4 MECHANICAL OPERATION AND SOLID HANDLING

[Common to Chemical Technology (Fertilizer), Chemical Engineering (Petrochemical)

L	T	P
4	2	4

Rationale:

Solid handling is the fundamental of different machine and equipments used in the chemical industries such as grinding, crushing, ball mills etc. chain belts and screw conveyor, filteration & mixing equipments. Theoretical and experimental work will indicate their interest in learning and teaching among the students and teachers.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	6	3	-
2.	Characterisation of Solid Particles	6	3	-
3.	Size Reducation	8	4	-
4.	Fluidzation of Solid Particles	12	6	-
5.	Mechanical Separation	12	6	-
6.	Mixing Equipments	12	6	-
		56	28	56

DETAILED CONTENTS

1. INTRODUCTION:

Concept and role of unit operation in Industries.

2. CHARACTERISATION OF SOLID PARTICLES:

Characterisation of solid particles, screening equipments, standard screens, screen analysis, Grizzles, trommels.

3. SIZE REDUCTION:

Theory of crushing, Rittinger's law, Kick's law, Crushing and grinding machinery; their classification, general description of jaw crusher, gyratory crusher, rol crusher, hammer mills, ball mills, open circuit and closed circuit Systems.

4. FLUIDIZATION OF SOLIDS PARTICLES:

Conveying equipments, their classification general construction and industrial application, Belt conveyors, chain conveyors and screw conveyors.

5. MECHANICAL SEPARATIONS:

(i) Types of filtration equipement, their application and operation, sand filters, filter press, leaf filters, rotary filters, filter aids. Centrifugal filtration.

(ii) Classifiers.

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(iii)Thickener

(iv) Cyclones.

6. MIXING EQUIPMENTS:

Details of mixing equipment, Homogenious mixing equipment, Mixing equipments used for liquid-liquid, liquid-solid and liquid-gas system.

REFERENCE BOOKS

1. Unit operation of chemical engineering by Mc Cabe & Smith
2. Mechanical Operation for Chemical Engineers by C.M. Narayan and B. C. Bhattacharya
3. Chemical Engineering Vol. II by Rechardson & Coulson.
4. Momentum Transfer Operation By S. K. Gupta, TMC, 1979

MECHANICAL OPERATION AND SOLID HANDLING LAB

1. To draw a layout of Chemical Engineering lab.

2. To analyse the given sample on a set of screens and report the analysis.

3. To determine the critical speed of a ball mill.

4. To determine the efficiency of disintegrator.

5. To determine filteration constant by a plate and frame filter press.

6. To determine the rate of settling of slurries of various concentration draw a height VS time curve.

7. To determine the efficiency of Jaw crusher.

8. To study and sketch a Rotary filter.

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2.5 WORKSHOP PRACTICE

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

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

L	T	P
-	-	14

Rationale

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

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

DETAILED CONTENTS

1. Carpentry Shop :

EX-1 Introduction & demonstration of tools used in carpentry shop and different types of joints, types of wood, seasoning and preservation of wood

EX-2 Planing and sawing practice

EX-3 Making of lap joint

EX-4 Making of mortise and tenon joint

Ex-5 Making of any one utility article such as wooden-picture frame, hanger, peg, name plate, etc.

2. Painting and Polishing Shop:

EX-1 Introduction of paints, varnishes, Reason for surface preparation, Advantange of painting, other method of surface coating i.e. electroplating etc.

EX-2 To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.

Ex-3 To prepare metal surface for painting, apply primer and paint the same.

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

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* The sequence of polishing will be as below:
i) Abrassive cutting by leather wheel.
ii) Pollishing with hard cotton wheel and with polishing material.
iii) Buffing with cotton wheel or buff wheel.

3. Sheet Metal and Soldering Shop :

EX-1 Introduction and Types of sheets, measuring of sheets
EX-2 Study and sketch of various types of stakes/anvil.
EX-3 Introduction & demonstration of tools used in Sheet metal working shop.
EX-4 Cutting, shearing and bending of sheet.
EX-5 To prepare a soap case by the metal sheet.
EX-6 To make a funnel with thin sheet and to solder the seam of the same.
EX-7 To make a cylinder and to solder the same.
EX-8 Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.
EX-9 To braze small tube/conduit joints.

4. Fitting Shop, Plumbing Shop & Fastening Shop:

EX-1 Study of materials, limits, fits and toterances.
EX-2 Introduction & demonstration of tools used in Fitting Shop.
EX-3 Hacksawing and chipping of M.S. flat. Filing and squaring of chipped M.S. job. Filing on square or rectangular M.S. piece.
EX-4 Making bolt & nut by tap and die set and make its joints
Ex-5 To drill a hole in M.S. Plate and taping the same to creat threads as per need.
EX-6 Utility article-to prepare double open mouth spanner for 18" hexagonal head of a bolt.
EX-7 Cutting and threading practice for using socket, elbow and tee etc. and to fit it on wooden practice board.
EX-8 Study of-bib cock, cistern or stop cock, wheel valve and gate valve etc.
EX-9 Practice of bolted joints
EX-10 To prepare a rivetted joint
EX-11 To make a pipe joint
EX-12 To make a threaded joint
EX-13 Practice of sleeve joint

5. Foundry Work

Ex-1 Study of metal and non metals
Ex-2 Study & sketch of the foundry tools.
Ex-3 Study & sketch of cupula & pit furnace.
Ex-4 To prepare the green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould)
Ex-5 Casting of non ferous (lead or aluminium) as per exercise 3.

6. Smithy Shop :

EX-1 Study & Sketch of Tools used in smithy shop.
EX-2 To prepare square or rectangular piece by the M.S. rod.
EX-3 To make a ring with hook for wooden doors.

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EX-4 Utility article-to preapre a ceiling fan hook.

7. Welding Shop :

EX-1 Introduction to welding, classinfication of welding, types of weld joints.
EX-2 Welding practice-gas and electric.
EX-3 Welding for lap joint after preparing the edge.
EX-4 Welding of Butt joint after preparation of the edge.
EX-5 'T' joint welding after preparation of edge.
EX-6 Spot welding, by spot welding machine.

8. Machine Shop

EX-1 Study & sketch of lathe machine.
EX-1 Study & sketch of grinders, milling M/c, Drilling M/c and CNC Machines
Ex-2 Plain and step turning & knurling practice.
Ex-3 Study and sketch of planning/Shaping machine and to plane a Ractangle of cast iron.

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III SEMESTER

3.1 APPLIED MATHEMATICS II

[Common to All Engineering Courses]

L	T	P
5	2	-

Rationale :

The study of mathematics is an important requirement for the understanding and development of concepts of Engg.The purpose of teaching mathematics to the Diploma Engg. students is to give them basic foundation and understanding of mathematics so that they can use the same for the understanding of engineering subjects and their advancements.

Sl.No.	Units	Coverage L	T	Time P
1.	Matrices	16	6	-
2.	Differential Calculus	15	6	-
2.	Differential Equations	15	6	-
4.	Integral Calculus	12	5	-
5.	Probability & Statistics	12	5	-
		70	28	-

DETAILED CONTENTS

1. MATRICES :(12 Marks)

1.1 Algebra of Matrices, Inverse :

Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermition, Orthagonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix.

Definition and Computation of inverse of a matrix.

1.2 Elementry Row/Column Transformation :

Meaning and use in computing inverse and rank of a matrix.

1.3 Linear Dependence, Rank of a Matrix :

Linear dependence/independence of vectors, Definition and computation of a rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors,Consistency of equations.

1.4 Eigen Pairs, Cayley-Hamilton Theorem :

Definition and evaluation of eign values and eign vectors of a matrix of order two and three, Cayley-Hamilton theorem (without Proof) and its verification, Use in finding inverse and powers of a matrix.

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2. DIFFERENTIAL CALCULUS :(10 Marks)

2.1 Function of two variables, identification of surfaces in space, conicoids

2.2 Partial Differentiation :

Directional derivative, Gradient, Use of gradient f, Partial derivatives, Chain rule, Higher order derivatives, Eulens theorem for homogeneous functions, Jacobians.

2.3 Vector Calculus :

Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. DIFFERENTIAL EQUATION :(10 Marks)

3.1 Formation, Order, Degree, Types, Solution :

Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, Nonlinear equation.

3.2 First Order Equations :

Variable seperable, equations reducible to seperable forms, Homogeneous equtions, equtions reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.

3.3 Higher Order Linear Equation :

Property of solution, Linear differential equation with constant coefficients (PI for X=eax, Sin ax, Cos ax, Xn, eaxV, XV.

3.4 Simple Applications :

LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical and mechanical system

4. INTEGRAL CALCULUS - II: (12 Marks)

4.1 Beta and Gamma Functions :

Definition, Use, Relation between the two, their use in evaluating integrals.

4.2 Fourier Series :

Fourier series of f(x),-n<x<n, Odd and even function,Half range series.

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4.3 Laplace Transform :

Definition, Basic theorem and properties, Unit step and Periodic functions, inverse laplace transform, Solution of ordinary differential equations.

5. PROBABILITY AND STATISTICS :(6 Marks)

5.1 Probability :

Introduction, Addition and Multiplication theorem and simple problem.

5.2 Distribution :

Discrete and continuous distribution, Bionimal Distribution, Poisson Distribution, Normal Distribution..

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3.2-CHEMICAL ENGINEERING THERMODYNMICS

L	T	P
6	2	-

Rationale:

The subject incolves the laws of thermodyunamics, refrigeration process, chemical reactions and their equilbrium and chemical kinetics. The student will be well conversent the stratagies involved in the processes.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Definitions	12	4	-
2.	First Law	16	6	-
3.	Second Law	20	6	-
4.	Entropy	12	4	-
5.	Refrigerations & Liquefaction	12	4	-
6.	Vapour Liquid Equilibria	12	4	-
	Total	84	28	-

DETAILED CONTENTS

1. INTRODUCTION

Scope of Thermodynamics,open & closed system, Thermodynamic properties-Temperature, Volume, Pressure, Specific heat atconstant volume, Isothermal & Adiabetic process, irreversible & reversible process, Intensive & Extensive properties.

T hermodynamic system, properties and state of a substance, processes and cycle, equality of temp. the Zeroth law of thermodynamics; the pure substance; phases of a pure substance; Phase Rule Independent properties of a pure substance; eqation of state for vapor phase (Wonder Wall Equation).

2. FIRST LAW:

Various froms of energy; Heat work, Internal energy, Enthalpy comparison of heat and work, calculation of U, KE, PE, Q & W first law of thermodynamics for a closed system undergoing a cycle; for a change in state of a closed system; Joule Thomson coefficient J; Throttling process. Calculation of U, H, Q & W for Ideal gas under going reversible isometric, Isothermal, Isobar and adiabatic processes.

3. SECOND LAW:

Kelvin, Planck and Classius statement, the reversible process, Factors that render process irreversible: the Carnot cycle, Two propositions regarding the efficiency of a Carnot cycle. Thermodynamic temperature scale and ideal gas temperature scale. thermal thermodynamic equation-Maxwell relation.

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4. ENTROPY :

Inequality of classius, entropy- a property of a system, Entropy change in reversible process; Entropy change for an open system; principle of increase of entropy; efficiency, irreversibility and availability; simple numerical problem

for calculation of entropy change; thermodynamic relations.

5. REFRIGERATIONS & LIQUEFACTION :

The Cornot refrigeration cycle, the air refrigeration cycle, vapor compression cycle, Absorption refrigeration-flow diagram and their descriptions; coefficient of performance (C.O.P).liqefaction process. Latest refrigerant and their qualities and application.

6. VAPOUR LIQUID EQUALIIBRIA :

Concept of chemical potential, Roult's Law, Henery's Law, Fugacity, Fugacity coefficient activity coefficient.

NOTE:- At least one Question should be asked from each topic (1 To 5).

REFERENCE BOOKS

1. Introduction to Chemical Engineering Thermodynamics by J. M. Smith
2. Chemical Engineering Thremodynamics by Pandey and Chaudhary
3. Chemical Engineering Thermodynamics by Mishra and Rastogi

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3.3-MATERIAL ENERGY BALANCE

L	T	P
6	2	-

Rationale:

The subject deals with the different units such as S. I. units and their conversion, behaviour of ideal gas, Dalton and Amgat's law, humidity and saturation, material balances, crystalization, evaporation, drying, chemical reactions. Different forms of energy like exothermic and endothermic. The students of chemical engineering will enhance their knowledge in this field.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Scope	5	-	-
2.	Dimension, Units	12	4	-
3.	Stricheometric relationship	12	4	-
4.	Behaviour of Ideal Gases	12	4	-
5.	Material balance	12	4	-
6.	Combustion processes			
	(A) Analysis of product	5	2	-
	(B) Problems on fuel analysis	5	2	-
	(C) Problems on fuel gas analysis.	5	2	-
	(D) Oxidation of sulphur	4	2	-
7.	Energy Balance	12	4	-
	Total	84	28	-

DETAILED CONTENTS

1. Scope of material & energy balance in process industries.

2. (a) Dimensions, Units and their conversion factors, S.I units, mole unit, Concept of gm mole, gm atom Use of gravitational conversion factor gc.

   Problems relating conversion of one set of units in a function of equation into another equivalent set for mass, length, time, temperature, area, volume,pressure, energy and force of an expression for heat capacity from one set of units to another.

   (b) Density & specific gravity, mole fraction (or percent) mass fraction (or percent). conversion of the composition of a mixture from mole fraction (or percent) to mass(wt.) fraction (or percent) and reverse.

   Transform a material from one measure of concentration to another, including mass/volume, moles/volume, PPM, molality, normality and molarity.

3. THE CHEMICAL EQUATION AND STRICHEOMETRY :

   Definition of excess and limiting reactant, conversion, degree of completion and yield in a reaction. Relating problems. Identification of limiting and excess reactant

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and calculation of percent excess reactant, the percent conversion, Degree of completion of reaction, Yield for a chemical reaction with reactants being in nonstoichlometric proportion.

4. BEHAVIOUR OF IDEAL GASES :

P V T relationship, standard conditions, partial pressure and pure component volume. Dolton's and Amaget's laws, average molecular weights of a gaseous mixture. Problems relating calculation of composition, average molecular weight, density and molar density, concentration of a gasious mixture.

5. MATERIAL BALANCE :

Tie substance, bye pass streams, recycle and purge, simple problems relating various chemical reactions and without chemical reactions.

6. COMBUSTION PROCESS:

(a) Analysis of products of combustions :- Proximate and ultimate analysis.

(b) Problems of fuel analysis, Air-fuel ratio, Theoretical oxygen/air required.

(c) Problems on flue gas analysis .

(d) Oxidation of sulphur and its compounds.

7. ENERGY BALANCE :

Forms of Energy, Definition of

(i) Exothermic and endothermic reaction.

(ii) Standard heat of reaction.

(iii) Heat of combustion.

(iv) Heat of formation.

(v) Heat capacity &mean heat capacity.

(vi) Net and gross heating value (LHV & HHV).

Calculation of:

(i) Enthalpy changes (without change of phases).

(ii) Standard heat of reaction from heat of formation and combustion data.

(iii) Heat of formation and combustion from combination of heat of reactions at reference temprature.(25o c).

(iv) Heat of reaction at constant pressure or constant volume.

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(v) Heat of reaction at a temperature different from standard conditions i.e. 25o c (when reactant & products are not at 25o c).

REFERENCE BOOKS

1. Stoichiometry by B. L. Bhatt & S. M. Vora
2. Chemical Process Principles Part - I by O. A. Hougen & K. M. Watson
3. Chemical Process Principles Part - I by R. A. Rastogi
4. Solved Example in Chemical Engineering by G. K. Ray

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3.4 ELECTRICAL TECHNOLOGY & ELECTRONICS

(Common with Diploma in Mech., Dairy Engg.)

L	T	P
5	2	4

Rationale :

The superiority of electricity as power over other means in use in home or industry can not be denied. So it is imperative to introuce the mechanical engineering students with electrical machines and their various uses.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Electric Induction	3	1	-
2.	A. C. Theory	5	3	-
3.	Three Phase Circuits	5	3	-
4.	Measurement & Measuring Instruments	12	4	
5.	Electronics	12	4	-
6.	D. C. Machines	8	3	-
7.	Transformers	5	2	-
8.	Synchronous Machines	5	2	-
9.	Induction Motors	6	2	-
10.	Electro Heating	6	3	-
11.	Electro Plating	3	1	-
		70	28	56

DETAILED CONTENTS

1. ELECTRIC INDUCTION:

Faraday's Laws of electromagnetic induction. Self and mutual induction. Statically and Dynamically induced e.m.f., Lenz's law. Fleming's left hand and right hand rule.

2. A. C. THEORY:

Production of alternating e.m.f. Definition of cycle, Frequency, Amplitude, Time period, Instantneous, Average, R.M.S. maximum values of sinosoidal wave. Form factor, peak factor.

Representation of a sinosoidal quantity by a mathematical expression and phasor, phase and phase difference, Relationship of voltage and current for pure resistance, pure inductance and pure capacitive reactance,impedance. Solution and phasor diagrams of simple R.L.C. series and parallel circuits. Active and reactive power. Significance of P.F.

3. THREE PHASE CIRCUITS:

Production of Three phase voltage, advantages of three phase

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supply. Concept of star and delta connections. Relationship between phase and line values of currents and voltages, Power in three phase circuits, simple numerical problems.

4. MEASUREMENT & MEASURING INSTRUMENTS:

(i) Primary and secondary instruments-Indicating, Recording and Integrated instruments.

(ii) Working principle and construction of the following instruments.

(a) Ammeter & Voltmeter (Moving coil & Moving Iron). Extension of their ranges.

(b) Dynamometer type wattmeter.

(c) Single Phase A. C. Engery Meter.

(iii) Measurement of power in a single phase and three phase circuits by wattmeter, Use fo digital multimeter for measurement of voltage, Current and testing of devices.

5. ELECTRONICS:

Basic idea of semi conductors P & N type. Semi conductor diodes, Zener diodes and their applications in rectifiers. Transistors-PNP and NPN-their characteristics and uses at an amplifier (Brief description only). Prniciple characteristics and application of SCR. Devices like UJT, FET, DIAC, TRIAC (Brief introduction, Introduction to operational amplifier, Introduction to basic logic gates and microprocessors.

6. D. C. MACHINES:

D. C. Generator:

Working principle, Constructional details, e.m.f. equation, Types of generators and their applications.

D. C. Motor:

Working principle, Back e.m.f., Types of D. C. motor and

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elementary idea of their characteristics. Torque equation, Methods of speed control (Description Only).

7. TRANSFORMERS:

Working principle and constructional details of a single phase and 3 phase transformers, e.m.f. equation, Losses and efficiency, Cooling of transformers, Elementry idea of auto transformers and welding transformers.

8. SYNCHRONOUS MACHINES:

(a) Alternators:

Working principle, Types of alternators, Constructional details, E.M.F. equation, Condition for parallel operation.

(b) Synchronous MOtors:

Working principle, Constructional details, Vector diagram, Effect of excitation on armature current and power factor, Synchronous condenser.

9. INDUCTION MOTORS:

(a) Three Phase Induction Motors:

Working principle and constructional details-Types of induction motors-Slipring and Squirrel cage. Slip in induction motors. Speed torque characteristic, Starting and speed control. Application of induction motors in industry. General faults and their remedies.

(b) Single Phase Induction Motors:

Working principle and constructional details and application of single phase motors (Split phase, Capacitor start and Run Motor). A. C. series motors, General faults and their remedies.

10. ELECTRO HEATING:

Types of electro heating. Brief description of resistance ovens and induction furnace and core furnaces.

11. ELECTROPLATING:

Importance of electroplating, Principle of electroplating and equipement used. Processes used in electroplating, Anodising.

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ELECTRICAL TECHNOLOGY & ELECTRONICS LAB

1. To change the speed and direction of rotation of d.c. shunt motor by

   (a) Armature control method.
   (b) Field control method.

2. To change the speed and direction of rotation of d.c. compound motor by

   (a) Armature control method.
   (b) Field control method.

3. To measure the terminal voltage with variation of load current of

   (a) D.C. shunt generator.
   (b) D.C. compound generator.

4. To perform load test on a single phase transformer and determine its efficiency.

5. To start and run a induction motor by

   (a) Star Delta Starter.
   (b) Auto Transformer Starter.

6. To measure slip of an induction motor by direct loading.

7. To start and change the direction of rotation of an induction motor.

8. To measure transformation ratio of a single phase transformer.

9. To measure power and P.F. in a single phase circuit by Ammeter, Voltmeter and Wattmeter.

10. To measure power and P.F. in a 3 phase/A.C. circuit by two wattmeter method.

11. To calibrate a single phase energy meter at different P.F.'s and different loads.

12. To locate the faults in an electrical machine by a megger.

13. To connect a fluorescent tube and note its starting and running current.

14. To draw characteristics od Silicon Controled Rectifier (SCR).

15. Testing of electrical devices - Zenor, Diode, Transistor, FET, UJT, SCR.
16. Use of operational amplifier as adder, substractor, comparator, differentiator and integrators.

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3.5 INTRODUCTION TO COMPUTER

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

L	T	P
2	-	5

Rationale:

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

TOPIC WISE DISTRIBUTION OF PERIODS

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

DETAILED CONTENTS

1. Introduction to Computer:

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

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

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

3. WORD PROCESSING:

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

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Format: Font, Paragraph, Bullets & Numbering, Borders & Shading, Column, Change case, Back ground, etc.
Tools : Spelling & Grammer, Language, Word Count, Letters & Mailing, Options, Customize, etc.
Table : Draw, Insert, Delete, Select, Auto Format, AutoFit, Convert, Sort, Formula, etc.
Mail Merge

4. WORKSHEET:

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

5. PRESENTATION :

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

6. DATABASE OPERATION :

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

7. Introduction to Internet:

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

8. INTRODUCTION TO ADVANCE TOOLS :

I. Steps requires to solving problems.
A. Flow Chart
B. Algroithm
C. Programming

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

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INTRODUCTION TO COMPUTER LAB

List Of Practicals

1. Practice on utility commands in DOS.

2. Composing, Correcting, Formatting and Article (Letter/Essay/ Report) on Word Processing tool Word and taking its print out.

3. Creating, editing, modifying tables in Database tool.

4. Creating labels, report, generation of simple forms in Database tool.

5. Creating simple spread sheet, using in built functions in Worksheet tool..

6. Creating simple presentation.

7. Creating mail ID, Checking mail box, sending/replying e-mails.

8. Surfing web sites, using search engines.

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

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IV SEMESTER

4.1. CHEMICAL TECHNOLOGY

L	T	P
6	2	8

Rationale:

A comprehensive study of the following chemical industries involving process technology, availability of raw materials, production trend, preparation of flow sheet, engineering problems invloving material of construction and uses.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Industrial Gases	8	3	
2.	Fertilizer Industries	8	3	
3.	Chlor-Alkali Industries	8	2	
4.	Sulphur Industries	6	2	
5.	Cement Industries	6	2	
6.	Inseticides, Pesticides and Hertricides	6	2	
7.	Process Industries	-	-	
A.	Petroleum Refining	6	2	
B.	Suger Industries	6	2	
C.	Fermentation Industries	6	2	
D.	Soap & Detergent Industries	6	2	
E.	Pulp & Paper	6	2	
F.	Polymer Industry	12	4	
		84	28	112

DETAILED CONTENTS

1. INDUSTRIAL GASES :

   Manufacture and uses of Oxygen, Hydrogen, Nitrogen, Carbon Dioxide.

2. FERTILIZER INDUSTRIES :

   Ammonia, Nitric acid, Ammonium Sulphate, Urea, Ammonium Nitrate, Phosphorus, Phosphoric Acid, Calcium Phosphates-Super Phosphates, Triple Super Phosphate, Nitro Phosphate, N-P-K fertilizer.

3. CHLOR-ALKALI INDUSTRIES :

   Common Salt, Caustic Soda, Chlorine, Hydrochloric Acid, Soda-Ash, Bleaching Powder.

4. SULPHUR INDUSTRIES :

   Manufacture of Sulphuric acid, Oleum.

5. CEMENT INDUSTRIES :

   Manufacture of Portland Cement.

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6. INSECTISIDES, PESTICIDES & HERBICIDES :

Defnition, types of insectricides, pesticides and hertricides, Uses and Quantity adn variety, beniits.

7. PROCESS INDUSTRIES

A. Petroleum Refining :

Constituent of petrolium including petrolium gases, products of refining, distillation- atmospharic distillation unit and vaccum distillation unit.

B. Suger Industry :

Manufacture of cane suger.

C. FERMENTATION INDUSTRY :

Introduction, Types of fermentation processes, Production of ethyl alcohal by fermentation, Industrial alcohol, manufacture of industrial alcohol-, Beers, Wines & Liquors.

D. SOAP & DETERGENTS INDUSTRY :

Manufacturing of soap, glycerine as by products from soap manufacturing Detergents, Detergents raw material and manufacturing of detergents. House disinfanct (Phynyle).

E. PULP AND PAPER INDUSTRY:

Sulfite & ground wood pulp for paper manufacture of paper, specially paper.

F. POLYMER INDUSTRY :

Types of polymer, Polymerization Process, Manufacture of Polyethylene, Styrene Nylon 6, Nylon 66

REFERENCE BOOKS

1. Outline of Chemicals Technology by M. Gopala Rao.
2. Chemical Process Industry by Shreve and Austin
3. Chemical Technology Vol I & II by G. N. Pandey
4. Industrial chemicals by Faith, Keyes and Clark
5. Industrial Chemistry by Dr. B. K. Sharma

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CHEMICAL TECHNOLOGY LAB.

1. Preparation of Phenyl (domestic disinfectant).

2. Preparation of Soap.

3. Preparation of Detergent/liquid detergent.

4. Atmospheric distallation of Petroleum Fractional analysis of petroleum.

5. Determination of fife and flash point : Open Cup & Closed Cup

   A. Cleav land open cup (COC)
   B. Penskgymartin closed cup (PMC)

6. Preparation of Polymer by Bulk Polymerization.

7. Preparation of Thermo Plastics PMMA.

8. To find out the viscosity and viscosity index of given sample by red wood no-1 and red wood no-2 viscometer.

9. To findout viscosity of and viscosity index given sample by Saybolt viscometer.

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4.2-CONVENTIONAL AND NON CONVENTIONAL SOURCE OF ENERGY

L	T	P
5	2	-

Rationale:

The student of chemical engineering has to deal with various types of fuels and materials. The fuels generally used are solid liquid and gaseous. Their properties advantages and disadvantages are included in the curriculum. The student will enhance their knowledge in the field of fuel technologies related to chemical industries.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
PART-A	: CONVENTIONAL ENERGY SOURCE			
1.	Introduction	4	2	-
2.	Solid Fuels	10	3	-
3.	Liquid Fuels	10	3	-
4.	Gaseous Fuels	8	2	-
5.	Combustion Calculation	8	2	-
PART-B	: NON CONVENTIONAL ENERGY SOURCE			
1.	Solar Energy	5	2	-
2.	Wind Energy	5	2	-
3.	Bio Energy	5	3	-
4.	Hydro Energy	5	3	-
5.	Geothremal Energy	5	3	-
6.	Wave and Tidal Energy	5	3	-
	Total	70	28	-

DETAILED CONTENTS

PART-A : CONVENTIONAL ENERGY SOURCE

1. INTRODUCTION

Introduction of various Solid, Liquid and Gaseous fuels.

2. SOLID FUELS:

Wood, Charcol, Coal (Peat, Lignite, Bituminous and Anthracite) and Coke . Calorific value Definition and experimental determenation by bomb callorimeter and calculations. Washing of coal, Purpose of washing, Principle description and operation of Jigs and washers,Carbonization (Low temperature and High temperature).

3. LIQUID FUELS:

(i) Fuel Oil, Gasoline, Desel Fules, Kerosine, Biogas, Biomass, GNG, PNG.

(ii) Properties (Sp. gravity, Viscosity, Flash & fire Point,

Octane no, Cetane no. & Ignition delay).

(iii Advantages and disadvantages of liquid fuels.

4. GASEOUS FUELS:

Natural Gas, LPG -Advantages and disavantages of gaseous fuels.

5. COMBUSTION CALCULATION:

Calculation of percentage of products of combustion, numerical Quostions.

PART-B : NON CONVENTIONAL ENERGY SOURCE

1. SOLAR ENERGY:

Energy from the Sun, Application of solar technology : Solar thermal, Electricity production, Fuel production, Energy storage methods.

2. WIND ENERGY :

Source of wind energy, Wind power : Types of wind power, Wind power industry : Wind forms, wind turbine.

3. BIO ENERGY:

Resource of Bio energy, Solid biobass, Electricity generation from biomass, Bio energy product.

4. HYDRO ENERGY:

Types of Hydropower, Advantage and disadvantages of hydroenergy

5. GEOTHERMAL ENERGY:

Types of Geothermal energy, Resources, Production, Renewability and sutainability.

6. WAVE AND TIDAL ENERGY:

Generation of Tidal energy and wave energy. Generating methods, Difference between wave and tidal energy.

REFERENCE BOOKS

1. Nonconventional Energy Resources by D. S. Chauhan
2. Thermal Engineering by R. K. Rajpoot
3. Fundamental of Renewable Energy System by D. Muknergy

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4.3-FLUID MECHANICS

L	T	P
4	2	4

Rationale:

The subject will enhance the knowledge of students about fluids and their properties like shear, laminar, turbulent, continuity equation, friction losses and other properties of incompressible fluids. Time of emptying a tank, transportation of fluids and measurement of flowing liquids. Theoretical and experimental work will inculcate their interest in learning and teaching among the students and teachers.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Fluids	6	4	-
2.	Flow of incompressible fluids	10	5	-
3.	Measurement of flowing fluids	10	5	-
4.	Pipe and Pipe Fittings	10	5	-
5.	Transportation of fluids	10	5	-
6.	Flow meters	10	4	-
	Total	56	28	56

DETAILED CONTENTS

PART - A

1. FLUIDS

(i) Properties

(ii) Classification of Fluids.

(iii)Fluid manometers, description and simple numerical problems.

2. FLOW OF INCOMPRESSIBLE FLUIDS:

(i) Shear stress distribution in a cylindrical tube, velocity distribution for Newtonion fluid.

(ii) Reynold No.Elementry knowledge of laminar and turbulent flow, Reynold experiment.

(iii) Continuity equations, Bernaulli's theorem, fluid heads and power requirement calculation.

(iv) Friction factor, Fanning equation and Hagen Poiseuille equation friction losses in pipes, calculation of friction loss due to enlargement, contraction, fittings and valves.

(v) N.P.S.H., cavitation, pipes, tubing, fittings & (Valves numerical problems)

3. MEASUREMENT OF FLOWING FLUIDS:

Orifice meter, venturimeter, pitot tube, rotameter, weirs and notches (Their construction and derivation of formulae simple mumerical problems, Definition:-Cofficient

of contraction, Coefficient of velocity, coefficient of discharge (Simple numerical problems).

4. PIPE AND PIPE FITTINGS :

Tupes. Pipes, Schedule Number, Difference between tube and pipes, Various type of valves (Gate, Close, Check, Pressure Reducing valve, Steam Traps, etc). Pipe fittings (Flange, Socket, Albow, Tees, Star, etc.).

5. TRANSPORTATION OF FLUIDS:

A. Classification of pumps, construction and operation of Air lift, reciprocating, rotary, centrifugal and gear pumps.

B. NPHS, Cavitation, Simples numerical problems.

6. FLOW METERS:

Orifice, venturi and nozzle type flow meters, pitot tube, rotameters positive displacement type flow meters.

REFERENCE BOOKS

1. Unit operation of chemical engineering by Mc Cabe and Smith
2. Chemical Engineering Vol I & II by Coulson & Richardson.
3. Hydraulics, Hydraulic Machine and Fluid Mechanics by R. S. Khurmi.

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FLUID MECHANICS LAB

1. To determine the co-efficient of discharge of orifice-meter by Flow measurement

2. To determine the co-efficient of discharge of venturimeter.

3. To determine the co-efficient of discharge of V-Notches.

4. To determine the co-efficient of discharge of Rectangular Notches.

5. To determine coefficient of velocity (Cv), coefficient of discharge (Cd),coefficient of contraction (Cc) and verify the relation between them.

6. To determine friction losses in pipes and fittings.

7. To verify loss of head due to

   (a) Sudden Enlargement.

   (b) Sudden Contraction.

8. To verify Bernoullie's Theorem .

9. To perform Reynold's experiments.

10. To determine the efficiency of a centrifugal pump.

11. Study the following.

    (a) Reciprocating Pump.

    (b) Pressure Gauge/Water Meter/Mechanical Flow Meter/Pitot Tube.

    (c) Valves (Gate, Gloves, Cock, Check, Butterfly, Steam trap, Safety valve, Ball valve.

    (d) Fittings (Flange, Socket, Union, Nipple, Elbow, Reducer, T, Plug)

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4.4-PROCESS PLANT UTILITIES

L	T	P
4	2	-

Rationale:

Air, water and steam are principal plant utilities in any chemical process. Detailed knowledge concerning these utilities will enable the superviser on chemical shop floor to run the various process equipment efficiently.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Generation, Process & Steam Properties	6	3	--
2.	Types of fuels used in boilers	2	1	--
3.	Steam Generator.	6	3	--
4.	Steam Distribution	6	3	--
5.	Pressure & Vaccum system	6	3	--
6.	Water	6	3	--
7.	Water Treatment Technique	8	4	--
8.	Demmiralization	8	4	--
9.	Cooling Water	8	4	--
	Total	56	28	--

DETAILED CONTENTS

1. GENERATION, PROCESS & STEAM PROPERTIES :

Generations of steam at constant pressure, phases of transformation. Pressure-temperature, curve for steam. Latent Heat-external work of evaporation, Sensible heat of water,dry & saturated steam. Dryness fraction,Latent heat of wet steam, detail of wet steam, total heat of super-heated steam, specific volume of wet & super-heated steam. Simple problems using steam-table,

2. TYPES OF FULES USED IN BOILERS :

Types of fuels used in boilers, Coal,Fuel Oil, Rice husk, Natural gas, etc. produced/forced draught concept.

3. STEAM GENERATOR:

Type of steam generators (boilers)-Fire tube & water tube and their principles. Elementry concept and principles of modern water tube boilers. Boiler mountings and accessories. Quantity of heat spent in generation. Ideal cycle of a steam plant. Ways of increasing the efficiency to steam power plant (No numerical question).

4. STEAM DISTRIBUTION:

Pipe quality, lay out of piping, steam trap, pressure reducing station : Steam ejectors.

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5. PRESSURE & VACCUM SYSTEM:

COnstruction and working of Blowers, Fan, Compressures, Vaccum Pump, Steam Ejectors.

6. WATER :

Different water resources, storage, quality parameters like hardness, suspended solids, turbidity, etc.

7. WATER TREATMENT TECHNIQUES

Water treatments techniques, Flow diagram, Coagulation by Iron compounds like Alum, sedimentation, filteration, Softened by Sodium Carbonate and Bi-carbonate.

8. DEMINERALIZATION :

Demmiralization flow diagram, Cation and Anion exchangers milded bed, Regeneration of cation and anion exchangers and degasor.

9. COOLING WATER :

Recycling of water, Cooling towers, Principals, details and problems like sealing use of inhibitors, like sodium and chromates.

REFERENCE BOOKS

1. Engineering Chemistry by P. C. Jain
2. Unit Operation of Chemical Engg. by Macabe and Smith
3. Thermal Environmental Engineering by J . K. Thiked

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V SEMESTER

5.1 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

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

RATIONALE

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

TOPIC WISE DISTRIBUTION OF PERIODS

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

DETAILED CONTENTS

1. **Principles of Management**
   - 1.1 Management, Different Functions: Planning, Organising, Leading, Controlling.
   - 1.2 Organizational Structure, Types, Functions of different departments.
   - 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment.
   - 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work.
2. **Human Resource Development**
   - 2.1 Introduction, objectives and functions of human resource development (HRD) department.
   - 2.2 Recruitment, methods of selection, training strategies and career development.
   - 2.3 Responsibilities of human resource management – policies and functions, selection – Mode of selection – Procedure – training of workers, Job evaluation and Merit rating.
3. **Wages and Incentives**
   - 3.1 Definition and factors affecting wages, methods of wage payment.
   - 3.2 Wage incentive – type of incentive, difference in wage, incentive and bonus; incentives of supervisor.
   - 3.3 Job evaluation and merit rating.
4. **Human and Industrial Relations**
   - 4.1 Industrial relations and disputes.
   - 4.2 Relations with subordinates, peers and superiors.
   - 4.3 Characteristics of group behaviour and trade unionism.
   - 4.4 Mob psychology.
   - 4.5 Grievance, Handling of grievances.

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4.6 Agitations, strikes, Lockouts, Picketing and Gherao.
4.7 Labour welfare schemes.
4.8 Workers' participation in management.

5. **Professional Ethics**
5.1 Concept of professional ethics.
5.2 Need for code of professional ethics.
5.3 Professional bodies and their role.

6. **Sales and Marketing management**
6.1 Functions and duties of sales department.
6.2 Sales forecasting, sales promotion, advertisement and after sale services.
6.3 Concept of marketing.
6.4 Problems of marketing.
6.5 Pricing policy, break even analysis.
6.6 Distribution channels and methods of marketing.

7. **Labour Legislation Act (as amended on date)**
7.1 Factory Act 1948.
7.2 Workmen's Compensation Act 1923.
7.3 Apprentices Act 1961.
7.4 PF Act, ESI Act.
7.5 Industrial Dispute Act 1947.
7.6 Employers State Insurance Act 1948.
7.7 Payment of Wages Act, 1936.
7.8 Intellectual Property Rights Act

8. **Material Management**
8.1 Inventory control models.
8.2 ABC Analysis, Safety stock, Economic ordering quantity.
8.3 Stores equipment, Stores records, purchasing procedures, Bin card, Cardex.
8.4 Material handling techniques.

9. **Financial Management**
9.1 Importance of ledger and cash book.
9.2 Profit and loss Account, Balance sheet.
9.3 Interpretation of Statements, Project financing, Project appraisal, return on investments.

10. **Entrepreneurship Development**
10.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.
10.2 Distinction between an entrepreneur and a manager.
10.3 Project identification and selection.
10.4 Project formulation.
10.5 Project appraisal.
10.6 Facilities and incentives to an entrepreneur.

11. **Fundamental of Economics**
11.1 Micro economics.
11.2 Macro economics.

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

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5.2 HEAT TRANSFER OPERATIONS

L	T	P
5	1	3

Rationale:

The subject already dealt as mechanical operations & Solid handling fluid mechanics in first and second year was the fundamentals.To further study the subject Heat transfer Operations is included to get the knowledge of modes of Heat transfer like conduction, convection and radiation. Different heat exchangers, condensers, evaporators, crystalysers, insulators used in chemical plant. Different types of simple numerical will be dealt to get the chemical engineering students aware of the problems generally occuring the industries.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Modes of Heat transfer	5	1	--
2.	Conduction.	8	2	--
3.	Convection.	8	2	--
4.	Radiation.	8	2	--
5.	Heat Exchanger	8	2	--
6.	Condenser.	8	2	--
7.	Evaporaters.	8	1	--
8.	Crystalliysers.	8	1	--
9.	Insulation.	9	1	--
	Total	70	14	52

DETAILED CONTENTS

1. MODES OF HEAT TRANSFER:

   Conduction, convection & radiation.

2. CONDUCTION:

   Fourier's law, Thermal conductivity, Conductance,flat Wall, Multilayer flat wall, Hollow cylinder, Multilayer cylinder log mean area, geometric mean area & Arthmatic mean area, Simple numerical problems in S.I. Units.

3. CONVECTION:

   Natural and froced convection,
   Physical significance of dimension less number. Reynold No, Prandle No., Nusselt No., Stanton No., Peclet No., Grashoff No., Dittus Boelter's equation-simple numerical problems using Dittus Boelter equation. Fouling factor. Individual heat transfer coefficient and over all heat transfer coefficient.

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4. RADIATION:

Reflection, absorption and transmission of radiation, Kirchoff law, Emissive power, Wein's displacement law, the stefen Boltman law, Heat transfered by radiation exchange of energy between two parallel planes of difference emissivity, Radiant Heat transfer coefficient, Solar radiation, gray surfaces or gray body.

5. HEAT EXCHANGERS:

Log.-Mean-temp.-Difference (L.M.T.D.) for parallel or cocurrent - flow, counter-current-flow, cross - flow, construction and description of

1. Double pipe heat exchangers.
2. Shell & Tube heat exchanger.
3. Finned tube heat exchangers.
   Scale formation and cleaning devices, Wilson's plot (Simple Numerical Problems).
4. Plate type heat exhanges.

6. CONDENSER:

Film-wise and Drop-wise condensation. Construction & description of contact condenser and surface condenser.

7. EVAPORATORS:

Construction and description of

1. Horizontal tube types.

2. Standard vertical type or calendria type.

(a) Natural and forced circulation type.
(b) Entrainment and foam formation.
(c) Method of feeding evaproators-Forward,Backward & cross, mixed multi effect evaproation.
(d) BOILING : Nucleare boiling, film boiling, Transition boiling, Maximum flux and critical temperature drop, construction & description of Kettle type boilers. Boiling point rise (B.P.R) and effect, steam economy for single effective evaporator (Simple Numerical Problem).

8. CRYSTALLIZERS:

Classification of crystallizers; construction and description of
1. Swensen walker.
2. Vacuum crystalizer.

9. INSULATION:
Purpose of insulation common insulators, critical thickness of insulation for cylinder and spheres, optimum thickness of insulation, Heat loss from a pipe.

REFERENCE BOOKS

1. Heat Transfer by D. Q. Kern
2. Unit Operating in Chemical Engineering by Mc Cabe & Smith
3. Introduction to Chemical Engineering by Badger & Bancaro

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5.3-MASS TRANSFER OPERATIONS

L	T	P
5	1	3

Rationale:

It is the further step of Unit Operation deals with the gas absorption, distillation, boiling point diagrams, extraction operation, humidification and drying processes in chemical industry. The subject have experiments as well, to be aware of the facts involved in actual process.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Diffusion	10	2	-
2.	Absorption	15	3	-
3.	Distillation	15	3	-
4.	Extration	15	3	-
5.	Humidification	10	2	-
6.	Drying	5	1	-
	Total	70	14	42

DETAILED CONTENTS

1. DIFFUCION:

Definition of diffusion, Rate of diffusion in Mass Transfer, Fick's law, diffusion in the gas phase-Equimolecular counter diffusion, diffusion through a stationary gas (Stefan's Law), Mass. Transfer Coefficient. Film theory and penetration theory of Mass Transfer, Diffusion in solids. Derivation of the following relations.

I. $$\frac{1}{KG.a} = \frac{1}{kG.a} + \frac{m}{kL.a}$$

II. $$\frac{1}{KL.a} = \frac{1}{kL.a} + \frac{1}{m.kG.a}$$

2. ABSORPTION:

Introduction, importance, absorption with chemical reaction, Mechanism of absorption - two film theory, Diffusion of gases through a stagnant gas, Diffusion in liquid phase, Rate of absorption, Relation between film and overall coefficient, Factors influencing the transfer coefficient. Gas absorption equipments - Plate and packed calumn, Spray towers, Choice of solvent for absorption, Height of Transfer Unit (HTU), Number of Transfer Unit (NTU), Meaning and their relationship (Simple Numerical Problems).

3. DISTILLATION:

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Various distillation methods:-

1. Equilibrium or flash distillation .
2. Differential distillation
3. Batch distillation.
4. Vacuum and Steam distillation.
5. Azeotropic and Extractive distillation.

Types of distillation columns:-

1. Perforated plate or sieve plate column
2. Bubble cap plate column

Vapor liquid equilibrium diagram, Raoult's law; Relative volatility, constant boiling mixtures, equilibirium diagram and construction of equilibrium diagram, Fractionating column calculation- Heat & material balance, Reflux ratio, equilibrium plate, Location of feed plate. Sub cooled reflux; effect of reflux ratio, Total reflux, Minimum reflux ratio Entrainment; Mc-Cable Thiele diagram-section above and below feed plate; Intersection of operating line. Location of q-line, optimum reflux ratio, calculation of no. of equilibrium plate by Mc-Cable Thiele diagram. Overall plate efficiency.

4. EXTRACTION :

    1. Applications of this operation.
    2. Choice of solvent.
    3. Steps of extraction operation
    4. Solid Liquid extraction, construction and description of

        A. Bed Basket type oil seed extractor or Bollman extractor.

        B. Rotocel extractor.

    Liquid extractor; description and construction of

        A. Mixer settler extraction system.

        B. Perforated plate and baffle towers.

5. HUMIDIFICATION:

    Definition and calculation of

1. Humidity
2. Percentage humidity
3. Relative humidity
4. Humid volume.
5. Humid heat.
6. Enthalpy and its calculation.

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7. Dry bulb and wet bulb-temp.

8. Adiabatic saturation temperature.

9. Use of humidity chart. Dew point, simple numerical problem using humidity chart, construction and description of cooling towers. (Natural and induced draft)

6. DRYING

General drying behaviour-Critical moisture content, equilibrium moisture content: Discription and construction of dryer.

1. Tray dryer.
2. Screen conveyor dryer.
3. Rotary dryer.

NOTE:- At Least One Question From Each Topic.

REFERENCE BOOKS

1. Mass Transfer Operation by R. Treybal
2. Chemical Engineering Vol. II by Richardson & Coulson
3. Unit Operation of Chemical Engineering by Mc Cabe & Smith
4. Introduction To Chemical Engineering by Badger & Bancher

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HEAT & MASS TRANSFER LAB.

LIST OF EXPERIMENT

(At Least 7 experiment to be Performed)

1. To determine over all heat transfer coefficient for an open pan evaperater in steady state conditions.

2. To determine over all heat transfer coefficient for an open pan evaporater in unsteady state conditions.

3. To determine 'U' for a double pipe heat exchanger in steady state conditions and also to determine efficiency of heat utilization.

4. To determine 'U' for a shell and tube heat exchanger in steady state conditions and also to determine efficiency of heat utilization.

5. To study a shieve plate distillation operation and to calculate over-all efficiency of the distillation column.

6. To determine steam economy of a single and double effect evaporator.

7. To study the rate of drying in a vacuum dryer.

8. To determine the pounds of volatile compounds distilled per unit pounds of steam distilled in a steam distillation operation.

9. To determine rate of setting of crystals in a crystaliser.

10. To study the rate of drying in Rotary dryer.

11. To determine drying rate for a wet material in a Tray Dryer.

12. To study packed tower in various industries.

13. To study various extractors in solvent extraction plant.

14. To study a spray pond in suger and other industries for cooling system.

15. Determination of Thermal conductivity of Asbestus Powder.

16. Study of Insulating Material (Glass wool, Mineral wool, Ceramic blanket, Fire brik, Fire cement, Fire clay, Asbestus power, Fire crete)

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5.4-POLLUTION CONTROL & INDUSTRIAL SAFETY

L	T	P
6	2	-

Rationale:

A chemical engineering technician must have the knowledge of different types of pollution caused due to industrialsation so that he may help in balancing the eco-system and control the pollution by means of control devices. The technician must know various types of accidents which occour in chemical plants and how to safe gaurd them to avoid injury to men and material. The content of the subject have been developed to cater the above needs.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	6	1	-
2.	Air Pollution	9	2	-
3.	Water Pollution	12	5	-
4.	Environment Protection	12	5	-
5.	Radioactive Pollution	12	2	-
6.	Solid Waste Management	6	2	-
7.	Pollution Acts	12	5	-
8.	Safety in Chemical Industry	12	5	-
9.	Disaster Management	3	1	-
	Total	84	28	-

DETAILED CONTENTS

1. INTRODUCTION:

What is environment ? What is Pollution? Classification of pollution e.g. Land, Water, Air, Noise. Impact assesment of development projects. Character and origin of industrial wastes.

2. AIR POLLUTION:

(i) Definition of air pollution, Types of Air pollutants and their sources like SPM, SOX, NOX, NH3, F, Cl, CFC, Co2 etc.

(ii) Air pollution control equipment in industries.
- (a) Settling chambers
- (b) Cyclones
- (c) Scrubbers (dry & wet)
- (d) Multiclones
- (e) Electro Static Precipitations (ESPS)
- (f) Bug Filters

(iii) Ambient air quality measurement & their standards.

(iv) Vehicular Pollution and its control

(v) Noise Pollution and its control mechanism.

3. WATER POLLUTION:

Water pollution, standards for drinking water, domestic waste water and industrial waste water. Methods of measurement of various parameter like BOD, SS, pH, COD, TDS etc. Methods of treatment of industrial waste water like

(a) Chemical treatment

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(b) Physio-Chemical treatment
(c) Bio-chemical treatment
(d) Any other advance treatment

4. ENVIORNMENT PROTECTION :

Enviornmental protection from hazardeous Chemicals & Waste :-

Terminology relating to chemical hazards and air pollution, classification of chemical hazards and hazardous chemicals, codes of safety for operational hazards in laboratories, industries etc. (Reference should be made of I.S. Codes)

5. RADIO ACTIVE POLLUTION:

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

6. SOLID WASTE MANAGEMENT:

Municipal solid waste, Biomedical waste, Plastic waste and Its Management.

7. POLLUTION ACTS:

A water pollution prevention control Act 1974, Air pollution Act 1981, Environment protection Act 1986, Hazardous chemical manufacturing, Storage and impact rules 1989 and hazardous waste and management and handling rules 1989, Noise Pollution Act.

8. SAFETY IN CHEMICAL INDUSTRY:

Receiving and storing chemicals-Transporting and moving chemicals- Safety in chemical reactions, Pipe-lines in chemical factories. Precautions in the case of processes in operations involving explosive or inflammble dusts, gases, vapours etc. Maintenance of chemical plants-corrosion health hazards in common chemical processes, Fire hazards and their Prevention. Codes of practice and specification for safety equipment (Reference should be made from I.S. Codes).

9. 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 benifit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan.

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

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REFERENCE BOOKS

1. Safety in Process Plant Design by Wells
2. Safety and Accident Prevention in Chemical Operation by H. H. Tawcatte and W S Wood
3. Engineering Chemistry by P. C Jain

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5.5 FERTILIZER TECHNOLOGY-I

L	T	P
5	2	-

Rationale:

The students are supposed to be familliar with various types of Fertilizers i.e. Nitrogeneous, Phasphatic and Potassic and their manufacturing processes. Use of catalysts in manufacturing processes will strengthen their knowledge and will be useful in the world of work.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	10	4	-
2.	Nitrogeneous Fertilizer	20	8	-
3.	Potassic Fertilizer	20	8	-
4.	Catalyst	20	8	-
	Total	70	28	-

DETAILED CONTENTS

1. INTRODUCTION :

Origin, Development and use of commercial fertilizers, types of chemical fertilizers with special reference to availibility in Indian conditions. Role of fertilizers in plant growth and their application.

2. NITROGENEOUS FERTILIZERS:

(a) Feed stock for production of Ammonia-Natural gas, Associated gas, Coke oven gas, Napha Petroleum heavy stock, Coal, Lignite, Coke, Electricity.

(b) Nitrogeneous Fertilizers :

Ammonium Sulfate, Urea, Ammonium Nitrate and Calcium Ammonium Nitrate, Ammonium Chloride - their methods of production, Characteristics and specifications. Storage and handling problems, operational problems in the plants.

3. POTASSIC FERTILIZERS:

Production of Potassium Chloride, Potassium Sulfate, their specifications and characteristics.

4. CATALYST:
Catalyst used in fertilizer industry - Reforming catalyst (Primary and Secondary), High Temperature, Low Temperature, Shift Reaction Catalyst, Ammonia Synthesis Catalyst, Methanation Catalyst etc.

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VI SEMESTER

6.1 CHEMICAL REACTION ENGINEERING (CRE)

L	T	P
5	1	-

Rationale:

Chemical reaction engineering is concerned with all those engineering activities which involves exploitation of chemical reactions on a commercial scale.

The subject involves homogeneous chemical reactions and their equilibrium, chemical kinetics and types of reactor hetrogenous reaction.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	5	1	-
2.	Homogenous Reactions	15	3	-
3.	Interprtation of constation volume batch reactor data	15	3	-
4.	Ideal Reactors	15	3	-
5.	Introduction to Heterogenous reacting systems	15	2	-
6.	Introduction of Various Types of Industrial reactor	10	2	-
	Total	70	14	-

DETAILED CONTENTS

1. INTRODUCTION :

Chemical kinetics, classification of reactions variables affecting the rate of reaction;

2. HOMOGENEOUS REACTIONS :

Concentration dependent term of a rate equation, single and multiple reaction, series and parallel reactions. Elementary and Non-elementary reactions, Kinetic view for elementary reactions molecularity and order of reaction, Rate constant K. Representation of a reaction rate, Temperature dependant term of a rate equation, Temperature dependancy from - (Arrhenius law, Thermodynamics and collision theory).
Activation energy and Temperature dependency. Simple numerical problems.

3. INTERPRETATION OF CONSTANT VOLUME BATCH REACTOR DATA :

Constant volume batch reactor-Integral method of Analysis of data, Differential method of analysis of data temperature and Reaction rate.
The search for a rate equation.
Simple Numerical problems.

4. IDEAL REACTORS :

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Classification of reactors and application & their comparision, Ideal batch reactor, space time and space velocity, steady-state mixed flow reactor, steady state plug flow reactor. Holding time and space time for flow systems. Simple numerical problems.

5. INTRODUCTION TO HETROGENEOUS REACTING SYSTEMS :

Rate Equation for Hetrogeneous Reactions. Contacting pattern for two phase system Simple Numerical problems.

6. INTRODUCTION OF VARIOUS TYPES OF INDUSTRIAL REACTORS :

CSTR, Tricle, Sheray, Packed bed, Fludizer bed.

REFERENCE BOOKS

1. Chemical Engineering Kinetics by J. M. Smith
2. Chemical Reaction Engineering by Octave Levenspal
3. Reaction Engineering by Walas
4. Chemical Reaction Engineering I & II by K. A. Gawhane

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6.2-AUTOMATIC PROCESS CONTROL

L	T	P
6	2	6

Rationale:

The subject automatic process control deals with the different types of controls in process in chemical industries including automatic control system. Process characteristics is of first order that is time constant element and second order that is oscillatroy type element. Different modes of control action and closed loop in automatic control are well known. The student will be well conversent with these processes.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	10	3	-
2.	Elements of control system	10	3	-
3.	Process Characterstics	16	5	-
4.	Controller Characteristics	12	3	-
5.	Closed loop in Auto control	12	4	-
6.	Programmable Logic Controller	12	4	-
7.	Distributed Control System	12	4	-
	Total	84	28	84

DETAILED CONTENTS

1. INTRODUCTION:

What is Automatic control, Advantage of Automatic control, manual and automatic control, physical and block diagram.

2. ELEMENTS OF CONTROL SYSTEM:

Definition-Input means, controlling means, actuating means, measuring means, final control elements.

3. PROCESS CHARCTERISTICS:

Process variables, process degree of freedom, forcing function, step fn., ramp, impulse, sinusiodal function, laplace transformation.

Elements of process dynamics:- Proportional, Capacitance.

Time constant and oscillatory element, determination of system function or transfer function of the following:- (Sketch physical diagram and block diagram)

(a) Ist order system or time constant element:-

(i) Naked bulb thermometer.

(ii) Stirred tank heater.

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(iii) Mixing process.

(iv) R.C. Circuit.

(v) Liquid levels.

(vi) Two time constant type liquid vessel cascaded i.e. Non interacting and non cascaded, i.e. interacting

(vii) Contionuous stirred tank chemical reactor with Ist order chemical reaction.

(b) IInd order system or oscillatory type element.

(i) Bulb in thermowell.
(ii) Mechanical damper.
(iii) Fluid manometer or U tubes.

Response of Ist order system to step, ramp, impulse and sinusoidal inputs, Response of IInd order systsm to step change (Transient response).

4. CONTROLLER CHARACTERISTEIC OR MODES OF CONTROL ACTION:

Elements of controller, proportional control, Integral control, proportional-integral control, proportional derivative control, proportional-integral-derivative control, Two positions control.

5. CLOSED LOOP IN AUTOMATIC CONTROL:

Standard block diagram symbol , overall transfer fn. for a single loop system, overall transfer function for change in set point and for change in load, overall transfer fn. multi loop control system, unit step response of the following.

(i) Proportional control at stirred tank heater for set point change and for load change.

(ii) P.I control of stirred tank heater for set point change and load change.

6. PROGRAMMABLE LOGIC CONTROLER (PLC):

Introduction, Principle of operation, Architecture of programmable controller, Programming the programmable controler, Application of programmable control.

7. DISTRIBUTED CONTROL SYSTEM (DCS) :

Real time computer control system - concept, functional requirements of distributed process control system, configuration some popular DCS.

REFERENCE BOOKS

1. Process System Analysis and Control by Coughnowr and Koppel
2. Chemical Process Control by George Stephanopalous
3. Computer Control of Industrial Process by S. Savas, Emenule
4. Industrial Instrumentation by D. P. Eckman

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AUTOMATIC PROCESS CONTROL LAB

LIST OF EXPERIMENT

(At Least 8 experiment to be Performed)

1. To measure time constant of a single capacity thermal process (water bath & heater).

2. Caliberation of thermo couple.

3. To study the transient response of first order system (thermo couple) and find out time constant.

4. To study the transient resposne of a simple R-C network and plot Bodey's diagram.

5. To study on of type water level control and to find out steady state voltage.

6. To study the frequency response of a second order electrical circuit equipment to a physical system (R-L-C network).

7. Caliberation of pressure Gauge by Dead Weight tester.

8. To study, sketch and operation of strip chart recorder and Directing pen recorder.

9. Claiberation of bimetallic thermometer.

10. To study the response of bimetallic thermo meter for a step input and find its time constant.

11. To calibrate the pneumatic control valve (Diaphram type).

12. To calibrate the given manometer for level measurement.

13. To study the response of two tank non interacting liquid level system and two tank interacting liquid level system.

14. A study of automatic ON and cut of A.C. supply by a solid state (Built in relay and transformer) voltage stablizer.

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6.3 PROCESS EQUIPMENT DESIGN

L	T	P
4	2	-

Rationale:

The topics included in the subject process equipment design are design of machine elements, storage vessels, pressure vessels with the consideration of stress involved in materials and their protective coatings. The student are expected to solve the elementary problems of different equipments used in process industry.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Basic Engineering Materials	3	2	-
2.	Basic Considerations Process Equipment Design	3	3	-
3.	Design Considerations	8	4	-
4.	Power Requirement of Pumps	8	4	-
5.	Pressure Vessels	8	4	-
6.	Distillation Column	12	4	
7.	Heat Exchangers & Condensers	8	4	-
8.	Evaporators	6	3	-
	Total	56	28	-

DETAILED CONTENTS

1. BASIC ENGINEERING MATERIALS:

Ferrous Materials, Non Ferrous materials, Synthetic Materials, Natural materials.

2. BASIC CONSIDERATIONS IN PROCESS EQUIPMENT DESIGN :

Introduction, General Design Procedures, Fabrication Techniques, Equipment Classification, Power for rotational motion.

3. DESIGN CONSIDERATIONS

Introduction ,Materials Selections, Corrosion Prevention, Stresses Created due to Static & Dynamic Loads, Elastic Instability, Combined Stresses and Theories of Failure, Fatigue, Brittle, Fracture, Creep, Temperature Effect, Radiation Effects, Effects of Fabrication Methods, Economic Conisideration.

4. POWER REQUIREMENT OF PUMPS:

Problems relating calculations of horse power (H.P.), N.P.S.H., for flow of incompressible fluid.

5. PRESSURE VESSELS:

Selection of type of vessels, causes of failure of vessels , methods of fabrication, types of formed heads, stress in thin shells subjected to internal pressure, Longitudinal and

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cirumfrential stress, joint efficiency and corrosion allownance, Crown and Knuckle radius, Problems relating calculation of shell thickness of cylindrical and spherical shells, Thickness of Torispherical heads subjected to internal pressure as per I.S. code.

6. DISTILLATION COLUMN:

Preparation of equilibrium diagram, Problems relating calcualtion of theoretical plates at a given reflux ratio and total reflux, minium reflux ratio, Feed plate location, by McCabe-thiele methods for separation of ideal binary mixtures, Derivation of q-line equation.

7. HEAT EXCHANGER AND CONDENSERS:

Problems relating calculation of L.M.T.D., individual and overall heat-transfer coefficients, Number of tubes, Number of passes, Heat-transfer coefficient for condensing vapors by Wilson's plot.

8. EVAPORATORS:

Problems relating calculation of heating area, Steam requirement, Steam economy for single and double effect evaporators. Methods of feeding evaporators and effect of Boiling Point Rise (B.P.R) and Hydrostatic Head.

REFERENCE BOOKS

1. Process Equipment Design by B. E. Brownell & E. M. Young
2. Process Heat Transfer by D. Q. Kern
3. Mass Transfer Operation by R. E. Treybal
4. I. S. Code for Unfire Pressure : IS No. 2825-1969 Pressore Vessel

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6.4 FERTILIZER TECHNOLOGY-II

L	T	P
5	1	4

Rationale:

Besides Nitrogeneous, Phosphatic and Potassic fertilizers, mixed and NPK fertilizers are also important and their manufacturing technology is of great importance in the industry. The students are supposed to have knowledge about these fertilizers also.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Phosphatic Fertilizer	14	2	-
2.	Complex and NPK Fertilizer	14	3	-
3.	Mixed Fertilizer	14	3	-
4.	Bio-Fertilizers	14	3	-
5.	Environmental Issue on Fertilizer Industries	14	3	-
	Total	70	14	56

DETAILED CONTENTS

1. PHOSPHATIC FERTILIZERS:

   (a) RAW MATERIALS:

   Phosphate rock, Pyrites etc.

   (b) Processes for manufacture of Sulfuric and phospheric acid.

   (c) PHOSPHATIC FERTILIZERS:

   Ground rock phosphate bone meat raw and steamed, single and triple super phosphet is, thermal phosphates - their methods of production, characteristics and specification. Operational details of plants.

2. COMPLEX AND NPK FERTILIZERS:

   Methods of production of Ammonium Phosphate Sulfate, Diammonium Phosphates, Nitrophasphate, Urea Ammonium Phosphates.

3. MIXED FERTILIZER:

   Their advantage and disadvantages. Materials used in mixed fertilizers, Manufacture of granulated NPK mixed fertilizer. Granulation techniques. Approved mixed fertilizer grades.

4. BIO-FERTILIZER (Nitrogenfixing)

   Introduction to Bio-Fertilizer (Nitrogen fixing).

5. ENVIRONMENTAL ISSUE ON FERTILIZER INDUSTRIES :

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Fertilizer best management practices, Food Security, Gree Economy, Human Health. Safety, Health and Environment Principal

FERTILIZER TECHNOLOGY I & II AND POLLUTION CONTORL LAB

LIST OF EXPERIMENTS

1. Analysis of fertilizers.
2. Estimation of water soluble phosphate and total phosphates.
3. Estimation of total nitrogen, ammonical nitrogen and nitrate.
4. Estimation of potessium as per Chlorate.
5. Estimation of free acid in ammonium sulphate in time.
6. Analysis of blue gases, fuel gas and processed gases.
7. Analysis of feed stock (Naptha, Fuel Oil, Fertilizer Feed Stock).
8. Estimation of Zn.
9. Determination of pH-value.
10. Determination of Turbidity.
11. Determination of Total Dissolved Solid (TDS).
12. Determination of Dissolved Oxygen (DO).
13. Determination of Chemical Oxygen Demand (COD).
14. Determination of Biochemical Oxygem Demand(BOD).

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PROJECT

6.5 Equipment design project

L	T	P
-	-	10

Rationale:

Every diploma holder have to do a project work before going into the world of work so that he may have sufficient knowledge to face the various problems involved in solving the project. Chemical engineering technician must be well aware of these too. So the project on the design of pressure vessel, storage tanks, heat exchanger, distillation column and evaporator are included in the subject.

Every Students is supposed to design one of the following problems alloted by Head of Deptt. and prepare the complete Project Report. The viva - voce will be conducted by the external examiner appointed by the board of Technical Education for the purpose.

The Students should be acquinted with the various codes and standards and the requirements of inspection and safety.

Problem -I.

Design of Pressure Vessel

(a) Shell
(b) Head or Cover
(c) Nozzle
(d) Flanged Joint
(e) Support

Problem-II.

Design of Storage Tanks

(a) Material
(b) Bottom Design
(c) Shell Design
(d) Wind graders for open - Top Tanks
(e) Roof - Curb Angles
(f) Self - Supporting Roof Design
(g) Column Supported Roofs
(h) Nozzles and Mountings

Problem - III.

Design of Heat Exchanger (Shell & Tube)

(a) Shell Design
(b) Shell Cover
(c) Tubes
(d) Tube Sheet
(f) Tie Rods and Spacers
(g) Baffles
(h) Channel
(i) Channel Cover

Problem - IV.

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Design of Distillation Column

(a) Shell Thickness
(b) Stresses in Column Shell
(c) Column Internal Details
(d) Head
(e) Support
(f) Tray

Problem - v

Design of Evaporator

(a) Shell design
(b) Shell cover
(c) Tubes
(d) Steam Economy & Heating area
(e) Vacuum creating device
(f) Impingement Baffles

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INDUSTRIAL TRAINING/FIELD EXPOSURE

Student have to go for a industrial training of 4 weeks in a chemical industry under the guidance of their H.O.D.. The student will submit a industrial training report which will be scrutinized and examined by the external examiner appointed by the B.T.E.. There will be viva voce of 100 marks and sessional marks 50.

TRAINING SCHEDULE

04 weeks structured supervised branch specific, task oriented Industrial Training to be organised during summer vacation after IInd year examination. The student during the industrial training must under take training in at least any one of the following and submit the training report in the format given at Annexure-I & II.

1. OPERATION OF CHEMICAL PLANT:

   Operation of chemical plant, Process control, Management of labour, Material and utility, Safety of workers and equipments.

2. CHEMICAL ANALYSIS:

   Analysis of sample, Interpretation of results of analysis.

3. ERECTION & COMMISSIONING OF CHEMICAL PLANT:

   Reading and inter-preting the skeches, drawings, layout, planning etc. Erection of chemical plants, Commisioning of chemical plants.

4. INSPECTION & TESTING OF CHEMICAL EQUIPMENT:

   Inspection, testing and performance of individual equipment, Fault finding or trouble shooting and its rectification.

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INDUSTRIAL TRAINING/FIELD EXPOSURE

Student have to go for a industrial training of 4 weeks in a chemical industry under the guidance of their H.O.D.. The student will submit a industrial training report which will be scrutinized and examined by the external examiner appointed by the B.T.E.. There will be viva voce of 100 marks and sessional marks 50.

TRAINING SCHEDULE

04 weeks structured supervised branch specific, task oriented Industrial Training to be organised during summer vacation after IInd year examination. The student during the industrial training must under take training in at least any one of the following and submit the training report in the format given at Annexure-I & II.

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   Inspection, testing and performance of individual equipment, Fault finding or trouble shooting and its rectification.

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STAFF STRUCTURE

THREE YEAR(SIX SEMESTER) DIPLOMA IN CHEMICAL ENGGINEERING(FERTILIZER)

Intake of the Course — 60
Pattern of the Course — Semester Pattern

Sl. No.	Name of Post	No.	
1.	Principal	1	
2.	H.O.D.	1	
3.	Lecturer Chemical Engineering	6	
4.	Lecturer in Mech. Engg.	1	Parttime/ Common with other disciplines if the intake is more than 180
5.	Lecturer in Maths	1	
6.	Lecturer in Chemistry	1	
7.	Lecturer in Physics	1	
8.	Lecturer in Comm. Tech.	1	
9.	Lecturer in Elect. Engg.	1	
10.	Computer Programmer	1	
11.	Steno Typist	1	
12.	Accountant / Cashier	1	
13.	Student / Library Clerk	1	
14.	Store Keeper	1	
15.	Class IV	6	
16.	Sweeper	Part time as per requirement	
17.	Chaukidar & Mali	as per justification	

Note :

1. Services of other discipline staff of the Institute may be utilized if possible

2. Qualifications of Staff : as per service rule

3. The post of "Computer Programmer" in not needed in the institutions where diploma in "Electronics Engineering" is running.

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SPACE STRUCTURE

[A] ADMINISTRATIVE BLOCK

Sl. No.	Details of Space	Floor Area Sq. metres	Remark
1.	Principal's Room	30	
2.	Confidential Room	10	
3.	Steno's Room	6	
4.(a)	Office including Drawing Office	80	
(b)	Record Room	20	
5.	Staff Room		
	(a) Head 1	15	
	(b) Lecturer 10 sq.m./ Lect. for 8 Lecturers	80	
6.	Library and Reading room	150	
7.	Store	100	
8.	Students Common room	80	
9.	Model Room	90	

[B] Academic Block

Sl.No.	Detail of Space	No.	@ Sq.m	Floor Area Sq.m.
1.	Class Room	2	60	120
2.	Drawing Hall	1	90	90
3.	Physics Lab			75
4.	Chemistry Lab			120
5.	App. Mechanics Lab.			60
6.	Electrical Engg. Lab.			120
7.	Unit Operation-I,II Over Head Tank 2000 Litre Cap; Under Ground Tank 600 Litre Cap;			120
8.	Unit Operation-III,IV			120
9.	Automatic Process Control Lab.			75
10.	Fertilizer Technology/Petroleum & Petro Chemical Lab.			120
11	Computer Lab (Air Cond.Glass Partition and Special type pvc flooring and false ceiling)			60

[C] Work shop

I	Workshop Supdt. Room	12
II	Store	20
III	Shops	
(a)	Carpentry Shop	50
(b)	Smithy Shop	70
(c)	Fitting Shop	50

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(d) Welding Shop		50
(e) Painting Shop		50
(f) Sheet Metal ,Soldering & Brazing shop		50
(g) Plumbing shop		50
(h) Machine Shop		150
(i) Foundry		75

[D] Student's Aminities

1.	Hostel	40	%	of Strength of Students
2.	Cycle Stand	50	%	of Strength of Students
3.	Canteen and Tuck shop	50		
4.	N.C.C. Room	70		
5.	Dispensary	40		
6.	Guest Room(Attached Bath) incuding kitchen & store	45		

[E] STAFF RESIDENCES

1.	Principal	1	100	100
2.	Head of Department	1	100	100
3.	Lecturer	4	80	320
4.	Non teaching & Supporting staff	8	60	480
5.	Class IV	6	30	180

Priorty to be given in following order

(1)
 a. Administrative Building
 b. Labs
 c. Workshop
 d. Over head Tank
 e. Boundary Wall
 f. Principal Residence
 g. Fourth Class Quarters (2/3)

(2)
 a. Hostel
 b. Students Aminities

(3)
 Residences of employee

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LIST OF EQUIPMENTS

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

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

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

I. APPLIED PHYSICS LAB

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

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

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

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II. APPLIED CHEMISTRY LAB

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

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

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III. APPLIED MECHANICS LAB

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

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

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V. WORKSHOP PRACTICE

CARPENTRY SHOP

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

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

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FITTING SHOP

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

WELDING SHOP

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

PAINTING & POLISHING SHOP

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

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PLUMBING SHOP

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

FOUNDRY SHOP

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

MACHINE SHOP

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

NOTE:-

1. The institutes running mechanical engg. course need not purchase these two items sepreately because they will have one complete machine shop for the course

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

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INTRODUCTION TO COMPUTER (Common to all Trades)

COMPUTER CENTRE

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

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

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UNIT OPERATION LAB

Sl.No.	Name of Equipment	No.	Rate	Amount
1.	Apparatus to verify Bernoulli's Thorem	1 set	15000	15000
2.	Apparatus for conducting experiments on venturimeter with collecting and supplying tank	1 set	15000	15000
3.	Reynold's apparatus with storage tank and flow steadying arrangement with 1/2 HP pump and accessories	1 set	10000	10000
4.	Apparatus for determining Cc, Cv and Cd (with set & micrometer guage)	1 set	15000	15000
5.	Apparatus for determining various head losses in pipes (Fitted with all valves & Orificemeter along with storage tank)	1 set	25000	25000
6.	Notch apparatus with set of notches with v-type, square-type notch	1 set	13000	13000
7.	Model of Reciprocating pump-1.4"	1	5000	5000
8.	Model of Centrifugal pump	1	5000	5000
9.	Pressure gauge Borden's type Max. 4 Kg/Cm2/1/4" connection Nipple	1	5000	5000
10.	In place of item no. 1,2,4,5 & 8 Hydraulic bench may be purchased with all accessories or such institution if already have above items may purchase one unit, Otherwise 6 units	6	20000	20000
11.	Misc. for tools, Manometer Pitot's tube, Differential manometer and minor equipments			20000
12.	Orifice Meter(Orifice Diameter 25mm)	1	1000	1000
13.	Rota Meter 40-400 lit. per. min. with all parts	1	10000	10000
14.	Stop Watch (1/10 racer)	3	1200	3600
15.	Centrifugal Pump with Motor 230 V, 1HP Single Phase	1	15000	15000
16.	Plate & Frame filter Press 240X240 mm, 6 No. of Folter Plate/5 Nos. of frame with stand, tray, tighting arrangement, filter cloth & moterized pump & tank	1		55000
17.	Sieve Shaker with Motor & Time Switch/stop watch	1		7000
18.	Test Sieve with FHP Motor through a reduction gear suitable to carry upto 7 sieve of 50 cm. or 20 cm. diameter	1 Set		15000
19.	Sieve Plate(S.S.) Distillation Column Column dia 6-8" test size 200mm dia with Reboiler and condenser	1		75000

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Sl.No.	Name of Equipment	No.	Rate	Amount
20.	U Tube Double Pipe Heat Exchanger 1800 mm length inside pipe 30mm OD 25 mm, welded leak proff with inlet and outlet valves & steam trip, all fitted on M.S. structure	1		55000
21.	Stainless Steel Spherical Jackted Open Pan Evaporator. 1X4' with jacket for cooling stirrer	1		50000
22.	Stainless Steel Crystalizer 500 Lit. with stirrer motor and Gear Box	1		40000
23.	Rotatory Dryer Drying Shell : Material Stainsteel 1.5 M Dia 110 mm, Feed Hopper, Product receiver, Heating Chamber, Heater, Temperature Sensors, Standard make on/off switch Main indicator, etc	1		100000
24.	M.S. Thickner	1		45000
25.	S.S. Spherical Jackted Open Pan Evaporator With Stirrer. 500 liter with Stirrer motor and gear box	1		50000
26.	Shell & Tube Heat Exchanger System water ro water (1-2 shell & tube type) Shell : Material Stainless Steel dia 220 mm, length 500 mm(Aprox.), Tube : OD 16 mm (Aprox.), Length500mm (24 Nos.)	1		50000
27.	Tray Dryer Drying Chamber:Stainless Steel Material, Heater, Temperature Sensors, Digital Temperature Controller with standard make on/off switch	1		70000
28.	Rotary Vacuum Filter Drum Dia 1'-1.5 slurry through vaccum/suction pump	1		50000
29.	Electric Bioler with temperature control recorder & pressure guage (100-800hp, 15-300 psig)	1		80000
30.	Disintegrator Alongwith Wattmeter and voltmeter fitted with Motor and stand, hammer type Common guage plate input hopper and discharge element (1 Horse Power)	1		25000
31.	Jaw Crusher alongwith Wattmeter and voltmeter 4"X4" 40 kg. per hour with 3 HP motor made of heavy steel body with meganetic steel jaws and stand	1		50000

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Sl.No.	Name of Equipment	No.	Rate	Amount
32.	Ball Mill Moc : MS Chamber Size : 300(D) * 350 (L) mm Speed : 65 RPM with step pully arrangement Evevation : Centre line of the shell @ 50 cm high from the ground level 2 hp ac motor, 1440 rpm, single phase, 230V & 50 Hz with step pulleus to give Three different speed of drum. Accessories : Set of Step pulleys & Suitable belt 50 nos. 25 mm dia proelain Ball/ms balls 1 no. or product collection Tray of suitable size of MS with painted	1		600000
33.	Vacuum Pump Water Ring Type	1		
34.	Vacuum Pump Oil Ring Type	1		
35.	Valves (Gate, Gloves, Cock, Check, Butterfly, Steam trap, Safety valve, Ball valve.	1 Each		
36.	Fittings (Flange, Socket, Union, Nipple, Elbow, Reducer, T, Plug)	1 Each		
37.	Thermal Conductivity Meter (For Asbestos Powder)	1		

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AUTOMATIC PROCESS CONTROL LAB

Sl.No.	Name of Equipment	No.	Rate	Amount
1.	Electronic Microprocessors Based Balance 300/310 Gm. Accuracy 0.001 gm., reproductibility 0.001gm, stabilization +3ppm/oC sample pan size 135mm dia, min. Input weight reading 1gm. operating Temperature range 0oC-40oC RH-85%, Power supply AC Adopter 220V or other +10%-15%, 50-60 Hz supplied Acrylic wind shunt	1		35000
2.	Strip Chart Recorder	1		35000
3.	Automatic Rapid Moisture Tester.	1		32000
4.	Air Compressor (Single Stage) Single Phase	1		12000
5.	Aircompressor With Automatic Control Switch.	1		8000
6.	Bimetallic Thermometer	1		1500
7.	Stop Watch 1/10 sec. Magnetic 7 jwels	2		1500
8.	Platinum Resistance Thermometer	1		1500
9.	Thermo Couple With Indicator and Control Recorder	1		10000
10.	Recording Type Gas/Vapour Filled Thermometer (Single Pen)	1		9000
11.	Pressure Transducer With Indicator	1		16000
12.	Rate Meter 40-400 lit./min with all parts	1		10000
13.	Pneumatic Control Valve 1" twoway max, pressure 5kh. on/off (Diaphram Type)	1		8000
14.	Float & Tape Type Liquid Level Measuring Depth.	1		1500
15.	Flap or Nozzle Arrangement For Demonstration.	1		1000
16.	Pressure Regulator with Air Filter Niddle. (Max. Pressure 5 Bar 25 connector 1/4)	1		3000
17.	M.S. Tanks 1.5x1x0.7 M.	3		15000
18.	M.S. Tank Cylinderical With Inlet & Outlet type.	6		18000
19.	Bourdan Pressure Gauge	3		4500
20.	Tullo Pump of Minium Capacity 1/4 HP	3		15000
21.	Auto Transformer 2 amp	3		6000
22.	Voltage Stabilizer Input 80-280 V/Output 230 V	2		3000
23.	Millivoltmeter Milliameter Micrometer Each 0-100 Amp.	3		24000
24.	Hot Plate Heater/Water Heater	2		6000

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FERTILIZER TECHNOLOGY & POLLUTION CONTROL LAB

Sl.No.	Name of Equipment	No.	Rate	Amount
1.	Carbon dioxide generator	1		
2.	Combustion assembly	1		
3.	Shift Niteometer	1		
4.	K-ieldahl flask (300 C.C.) Connecting Kjeldal flask, Distillation unit, receiver, Heater connecting pipings and suitable holding fixtures	6	10000	60000
5.	Electric Oven	2		
6.	Electronics Balance 200-300 gm, 0.001gm back light LED with glass enclosure and Lab weight for calibration	1		30000
7.	Reflux Condenserer with k-jacketed flask & fixture	1		3000
8.	COD Heater Portable Pen Type	1		45000
9.	Rubber Tube	10 Meter		800
10.	Condenser 1.5' to 2'	1		700
11.	Round Bottom Flask with Joint B-24, 500 ml	1		600
12.	BOD Incubator Temperature range 5-50oC uniform cooling temperature uniformaity +1oC opreating at 20oC, +1oC Digital temperature indicator And controller graduated in 1oC	1		60000
13.	BOD Bottle 300ml	1		4800
14.	Refrigerator 280 Lit., 180V-230V, 50 cycle	1		45000
15.	Laboratory Oven 2'X2'X2' thermometer, max temperature 140 Degree C	1		42000
16.	Laboratory Incubater Temperature range 5-50oC uniform cooling temperature uniformaity +1oC opreating at 20oC, +1oC Digital temperature indicator And controller graduated in 1oC	1		26000
17.	Turbidity Meter (Protable pen type with a wide range of 0-4000 NTUs)	1		60000
18.	TDS Portable Meter (Protable pen type with suitable Probe)	1		25000
19.	pH Meter (Protable pen type with suitable Probe)	1		15000
20.	CNH Analyser	1		
21.	Ion Exchange Apparatus (DM Water Pilot Plant)	1		
22.	Membrane Type Water Purifier	1		

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PETROLEUM & PETRO-CHEMICAL LAB

Sl.No.	Name of Equipment	No.	Rate	Amount
1.	Red Wood Viscometer as per I.S. 1448 & I.P. 70 With	1		65000
	Stop Watch	1		
	Measuring Flasks (50 ML.)	1		
	Thermometers I.P.S.C.			
	Low Range Thermometer	1		
	Medium Range	1		
	High Range	1		
2.	Englier Viscometer As Per I.S. 434 & AS TM 490 with Stop watch & Measuring flasks (200 to 240 M.L.)	1		85000
	Thermometers ASTM 23oC			
	ASTM 24oC			
	ASTM 25oC			
3.	Saybalt viscometer ASTM 58 with Stop watch and Measuring flask 60 M.L.	1		77000
	Thermometers ASTM 17oC			
	Saybalt ASTM 22oC			
	Saybalt ASTM 18oC			
4.	Pensky Master Flask Point Apparatus As Per I.P. 34 & 151448 closed cup types with	1		36000
	Thermometers I.P. 15oC Low range			
	I.P. 16oC High range			
5.	Cleave Land Flask & Fire Point Apparatus as per I.P.-36/67 & ASTM D-92 open cup types with	1		35000
	Thermometers I.P. 28oC			
6.	Smoke Point Apparatus as per I.P. 57 & I.C. 1448	1		46000
7.	Analine Point Apparatus as per I.P. 2 with	1		32000
	Thermometer I.P. 20oC to			
	I.P. 21 oC			
8.	Cloud & Pore Point Apparatus As per I.P 15 & I.S. 1448 With Thermometer I.P. 1oC (cloud & pore point)	1		
	I.P. 2oC			
9.	Renstometer as per I.P 49 & I.S.-1448 with	1		
	Thermometer I.P.-38oC			
10	Photo Electric calorimeter	1		
11.	Hydrometer I.P. 160	1		
12.	Carbon Residue (Rans Bottom) I.S. 1448 & 14/65	1		
13.	Carbon Residue(conradson) I.P.13/42	1		
14.	Distillation of Petroleum Product-I.P. 123/68	1		
15.	Colour by Lovibound Tinfometer	1		

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CHEMICAL TECHNOLOGY LAB

1.	Distillation Apparatus (Glass) Sieve and Plate type	1	350000
2.	Heating Mental-2"-3"	1	15000
3.	Red Wood Viscometer as per I.S. 1448 & I.P. 70 With Stop Watch Measuring Flasks (50 ML.) Thermometers I.P.S.C. Low Range Thermometer Medium Range High Range	1 1 1 1 1	65000
4.	Saybalt viscometer ASTM 58 with Stop watch and Measuring flask 60 M.L. Thermometers ASTM 17oC Saybalt ASTM 22oC Saybalt ASTM 18oC	1	77000
5.	Pensky Master Flask Point Apparatus As Per I.P. 34 & 151448 closed cup types with Thermometers I.P. 15oC Low range I.P. 16oC High range	1	36000
6.	Cleave Land Flask & Fire Point Apparatus as per I.P.-36/67 & ASTM D-92 open cup types with Thermometers I.P. 28oC	1	35000
7.	Polymer Testing Apparatus	1	

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ELECTRICAL TECHNOLOGY & ELCETRONICS LAB

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	D.C. Shunt Motor 3 Kw. 1500 RPM with 3 Point Starter.	2	10000	20000
2.	D.C. Compound Motor 3 Kw. 1500 RPM	2	10000	20000
3.	Single Phase Transformer 1 KVA 50 Hz. Primary Voltage 230 with tapping at 50%, 86.6 % Facility	2	6000	12000
4.	3 Phase Induction Motor 415 V., 50 Hz, 440 RPM, 3 KVA Star/Delta/Autotransformer Starter.	2	5000	10000
5.	Loading Drum Spring Balance & Belt Arrangement.	2 Set		
6.	Tachometer (Analog/Digital)	1	2000	2000
7.	3 Phase Inductive Loading of Variable Nature	1	8000	8000
8.	Single Phase Inductive Loading Variable 0-10 Amp., 50 Hz.	1	8000	8000
9.	Moving Coil Ammeter 0-10 Amp.	8	1000	1000
10.	Moving Coil Voltmeter 0-300 V.	8	1000	8000
11.	Moving Iron Ammeter 0-10 Amp.	8	1000	8000
12.	Moving Iron Voltmeter 0-300 V.	8	1000	8000
13.	Wattmeter Single Phase Dynamo Type 75/300/600 V. 2.5/5 Amp.	4	2500	10000
14.	Three Phase Variable Inductive Loading.	1	8000	8000
15.	Single Phase Variable Inductive Loading with Rheostat.	1	8000	8000
16.	Megger 0-20 Mega Ohm, 500 RPM .			
17.	Flouroscant Tube With Choke.	1	100	100
18.	SCR Bread Board	1	1000	1000
19.	Power Supply 230 V.	1	1000	1000
20.	Moving Coil Ammeter 0-500 M.A.	1	1000	1000
21.	Moving Coil Voltmeter 0-250 V.	1	1000	1000
22.	Energy Meter Single Phase 230 V., 5 Amp	1	2000	2000
	Misc.		L.S.	1500

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LEARNING RESOURCE MATERIALS

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

ote :

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

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ANNEXURE - I

FORMAT FOR FIELD EXPOSURE

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, Machine 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. Discripton of any breakdown and its restoring.
13. Use of computer - if any.
14. Visit of units store, Manner of keeping store items, Their receiving & distribution.
15. Safety measures on work place & working conditions in general - comfortable, convenient & hygeinic.

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ANNEXURE - II

TRAINEES ASSESSMENT

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

1. Name of the trainee

2. Date of

   i. Joining.

   ii. Leaving.

3.

   i. Regularity & Punctuality

   ii. Sense of responsibility

   iii. Readiness to work/learn

   iv. Obedience

   v. Skill aquired

4. Name of the sections of the unit he attended during his stay.
   His activities/worth of being there.

5. Any thing specific

Sinnature of the Assessor

Date :- Designation

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ANNEXURE-III QUESTIONNAIRE

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

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holder in Chemical Engg.(Fertilizer)

PURPOSE: To design and develop Threer Year(Six Semester) diploma curriculum in Chemical Engg .

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

1.Name of the organisation:_____
_____

2.Name & Designation of the officer filling the questionnaire _____
_____

3.Name of the department/section/ shop _____
_____

4.Important functions of the department/section/shop _____
_____

5.Number of diploma holder employees under your charge in the area of Chemical Engg.(Fertilizer) _____

6.Please give names of modern equipments/machines handled by a diploma holder in Chemical Engg.(Fertilizer)

1. 2. 3.

4. 5. 6.

7.What proficiencies are expected from a diploma holder in Chemical Engg.(Fertilizer)

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

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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 Chemical Engg.(Fertilizer)

(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 Chemical Engg.(Fertilizer)

15. In which types of organisations can a diploma holder in Chemical Engg.(Fertilizer) can work or serve.

1 2 3

4 5 6

16. Job prospects for the diploma holder in Chemical Engg.(Fertilizer) 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 Chemical Engg.(Fertilizer)

Theory Practical

18. Kindly mention particulars regarding topics/areas which should be given more emphasisin the curriculum .

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	Theory	Practical

19. Kindly state whether your organisation can contribute towards improvement of curriculum in above field. If yes : Please give names of experts in your organisation to whom contact. — Yes/ No

20. Kindly give your valuable suggestions for being considered at the time of finilisation of curriculum.

21. What changes in technologies are to be incorporated in the development of curriculum in Chemical Engg.(Fertilizer)

(Signature)

Kindly mail the above questionnaire duly filled to:-

Lal Ji Patel
Text Book Officer
Institute of Research,Development & Training,U.P.
Govt. Polytechnic Campus
Kanpur-208024

(Please note that all information in this survey is confidential

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