CURRICULUM FOR THREE YEAR
(SIX SEMESTER)
DIPLOMA COURSE IN

CHEMICAL TECHNOLOGY
(RUBBER AND PLASTIC)

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(RUBBER & PLASTICS)
(Effective From Session)

I SEMESTER

Curriculum							Scheme of Examination								
Periods Per Week								Theory			Practical			Grand Total
Lec.	Tutorial	Draw	Lab	Work Shop	Total	S U B J E C T	Examination Dur.	Sess. Marks	Total Marks		Examination Dur.	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 Polymer Chemistry	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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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 Chemical Engineering Thermodynamics And Kinetics	2.5	50	20	70	--	--	--	--	70
5	2		--		7	3.3 Technology of Plastic And Rubber Materials	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
25	8	-	9	-	42	<---------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	4.1 Plastic & Rubber Process.-I	2.5	50	20	70	-	--	--	--	70
5	2	-	6	--	13	4.2 Fibre Reinforced Plastics	2.5	50	20	70	4	60	30	90	160
6	2		8		16	4.3 Fluid Mechanics & Solid Handling	2.5	50	20	70	3	100	50	150	220
4	2		--		6	4.4 Process Plant Utilities	2.5	50	20	70	--	--	--	--	70
20	8	-	14	--	42	<---------TOTAL---------->	--	200	80	280	--	160	80	240	520
						Games/NCC/Social and Culturl Activity + Discipline (15 + 10)									25
														Aggregate	545

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(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 Semester (Examination Marks : 100, Sessional Marks : 50). (See Annuxure-I)

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(Effective From Session)

V 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.	Examination Marks	Sess. Marks	Total Marks	Examination Dur.	Examination Marks	Sess. Marks	Total Marks	
6	2		--		8	5.1 Industrial Management and Enterprenurship Development	2.5	50	20	70	--	--	--	--	70
4	2	-	4	--	10	5.2 Heat & Mass Transfer	2.5	50	20	70	4	60	30	90	160
5	2	-	4	--	11	5.3 Plastic & Rubber Processing-II	2.5	50	20	70	3	60	30	90	160
6	2		--		8	5.4 Pollution Control & Industrial Safety	2.5	70	30	100	--	--	--	--	100
5	2	-	--	--	7	5.5 Elective (Any One) A.Plastic & Rubber Formulation B.Foam & Adhessive Technology C.Plastics In Building Service	2.5	50	20	70	--	--	--	--	70
26	10	-	8	--	44	<---------TOTAL---------->	--	270	110	380	--	120	60	180	560
						Games/NCC/Social and Culturl Activity + Discipline (15 + 10)									25
														Aggregate	585

VI SEMESTER

5	2	-	4	--	11	6.1 Quality Control & Testing of Polymers	2.5	50	20	70	3	60	30	90	160
6	2	-	--	--	8	6.2 Plastic & Rubber Mould Die Design & Construction.	2.5	50	20	70	--	--	--	--	70
6	2	-	--	--	8	6.3 Mould & Die Design Drawing	2.5	50	20	70	--	--	--	--	70
	-	-	--	10	10	6.4 Project									
						a. Project Problem	--	--	--	--		80	40	120	
						b. Field Exposure					3	50	20	70	190
17	6	--	4	10	37	<---------TOTAL---------->	--	150	60	210	--	190	90	280	490
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
														Aggregate	515

30% of I & II Semester	342
70% of III & IV Semester	700
100% of V & VI Semester	1100
Grand Total	2142

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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C O N T E N T S

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MAIN FEATURES OF THE CURRICULUM

1.	Title of the Course	:	Diploma in Chemical Technology (Rubber & Plastic)
2.	Duration of the Course	:	Three Years (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 Technology(Rubber & Plastic) at I.R.D.T. U.P., Kanpur on 01.04.15 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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IV- NEED ANALYSIS

It was considered essential to revise the curriculum of Three year diploma course in Chemical Technology (Rubber & Plastic) to accomodate new areas of technology as well as update and modernise the existing course contents so as to make it more relevant to the needs of the world of work. The world of knowledge is evergrowing and there always remains something to aid to make the students update. So it is imperative to make relevant changes in the curriculum in the form and content both. Accordingly, a workshop was held to look into the gaps in the existing curriculum and revise the same in semester system. A number of professionals representing various fields, organisations, higher technological institutions and polytechnics were involved in updating the curriculum for Three year diploma course in Chemical Technology (Rubber & Plastic).

A number of formal and informal workshop were held in this institute it self and other institutions also for this purpose and upshots of these workshop have been properly arranged to systematise classroom teaching.

Based on the above, curriculum of diploma course in Chemical Technology (Rubber & Plastic) was revised and developed in semester system.

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

1. In the second year level, in the paper " Technolog of Plastic Materials and Technology of Natural and Synthetic Rubber" are clubbed and renamed as "Technology of Plastics and Rubber Materials".

2. In the second year level, a new paper added as named "Chemical Engineering Thermodynamics and Kinetics".

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 institutions and polytechnics for getting information about job opportuntities, manpower requirements and job activities of diploma holders in Chemical Technology (Rubber & Plastic).

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

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 detailed course contents and coverage time.
7. Determining resource input in terms of human and information resources.

Review of this draft of the structure of curriculum was done in a workshop held at the I.R.D.T., U.P., Kanpur through a group of experts from field , higher technological institutions and polytechnics.

It is hoped that the revised curriculum for Three Year Diploma in Chemical Technology (Rubber & Plastic) will prove useful in producing the desired type of middle level trained man power for Chemical Technology field.

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VI. JOB POTENTIONAL/JOB OPPORTUNITIES:

The diploma holders may be employed in following occupations:

- Supervisor/Foreman/Shop-floor personnel; Production Personnel; Sales and Service Presonnel/Tool Room Personnel, in plastic and other allied industries.

- Inspector/Technician/Technical Assistant Quality Control, in Plastic Industry or Institutions.

- Self Employment.

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VII. JOB ACTIVITIES AND ACTIVITY ANALYSIS:

1. PRODUCTION MANAGEMENT:

1.1 Preparation of material, equipment and labour schedule for making plastic products and dies and moulds.

1.2 Salection of raw materials, process and machines for making plastic products.

1.3 Supervision/operation/demonstration of working of plastic processing machines and onsures traget production.

1.4 Preparation of inspection schedule for different stages of production, machines and equipment.

1.5 Examining defective plastic products or raw material and suggests corrective measures.

1.6 Keeping records of production.

1.7 Ensuring safety in various sections.

1.8 Communication with workers and handle their grievances.

1.9 Training to workers engaged as apprentices.

2. ERECTION, MAINTENANCE AND REPAIR:

2.1 Supervision of erection and installation of machines/equipment according to specifications and schedule.

2.2 Preparation of routine and preventive maintenance schedule for machines/equipment and other installtion.

2.3 Checking the repaired and overhauled machines/equipment/ instruments.

2.4 Preparation of estimate for maintenance and repair works.

2.5 Selection of cables, ,motors, batteries, instruments and equipment for erection and replacement.

2.6 Preparation of inventory for spares.

3. TESTING AND QUALITY CONTROL:

3.1 To undertake standard tests on raw materials, finished products and interpret test results and written test reports.

3.2 To undertake quality control.

4. DESIGN AND DRAWING:

4.1 To prepare drawings of products, moulds and dies.

4.2 To read and interprets drawings and prepare freehand sketches for conveying information.

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4.3 To assist in the design of product, mould and dies.

5. ESTIMATING AND COSTING:

5.1 To prepare cost estimates of plastic products.

5.2 To work out break-even production.

5.3 To prepare cost benefit analysis of plastic products.

6. INVESTIGATION AND MARKETING:

6.1 To conduct market survey.

6.2 To promotes sale of product and nes applications.

6.3 To collect feedback on the performance of products.

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ACTIVITY ANALYSIS:

DETERMINING THE KNOWLEDGE AND SKILLS REQUIRED TO PERFORM VARIOUS ACTIVITIES

Activity	Knowledge	Skills
1.0 PRODUCTION MANAGEMENT		
1.1 To prepare material, equipment & labour schedule for making products die and moulds.	- Types of machines, die or mould. - Manpower requirement. - Knowledge about product and material.	Exercises in scheduling of material equipment and labour.
1.2 To select raw material process and machines for making plastic products.	- Polymeric materials - Additives and compounding. - Plastic processing techniques ; Estrusion, injection, moulding, compression moulding, blew moulding, their moforming. - Related machines to the process; Working principle, parameters, controls,defects and their solutionns.	-Grading raw materials specifications. -Analysis of raw materials -Extensive practice on each process and allied machinery for making plastic products and compounds.
1.3 To supervise/operate/ demonstrate, working of plastic processing machines and ensures target production.	- Working principles, parameters, controls, defects and their solutions for various machines. - Safety code. - Production rate and its optimization of various processes. - Human relations.	-Estensive practice in handling various machines and techniques. -To find out optimum cycle time.
1.4 To prepare inspection schedules for different stages of production, machines & equipment.	- Ability to identify different elements in production. - Allotment of time for each element. - Capability of machines to conform with the	-Exercises in testing and quality control -Exercises in moulding defects and their solution. -Preparation of check lists.

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	above.	
	- Check list for inspection of the product.	
	- Type of defects and their solutions of a particular process technique.	
1.5 To examine defective plastic products or raw material and suggests corrective measures.	- Analytical chemistry. - Testing of products and raw materials. - Mould and die design. - Product design. - Minimum aceptable standards.	-Exercises in testing and quality control. -Exercises in moulding defects and their solutions.
1.6 To keep records of production.	- Standard forms. - Plant and machine capacity. - Cycle time. - Production per labour and/or machine.	
1.7 To ensures safety in various sections.	- Safety code of machines. - Hazards and First Aid. - Fire fighting.	
1.8 To communicate with workers and handles their grievances.	- Labour problems. - Labour laws. - Communivation Techniques. - Industrial Psychology.	
1.9 To train workers engaged as apprentices	- Overall knowledge of production, process, testing and quality control and human relation.	
2.1 To supervise erection and installation of machine/equipment according to specifications and schedule.	- Knowledge of machine foundations. - Power requirement. - Specification of installation. - Different types of motor and their electrical connection.	-Exercies on installation and commissioning of small machine
2.2 To prepare routine and preventive	- Routine and preventive maintenance.	-Exercises on fault finding.

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Activity	Knowledge	Skills
maintenance shedule for machines/equipment and other installations.	- Spare parts. - Common faults.	-Exercises in repair of small faults.
2.3 To check the repaired and overhauled machines/equipment/instruments.	- Working specifications for various machines/ equipment. - Testing instruments and their use.	
2.4 To prepare estimate for maintenance and repair works	- Cost of spares. - Labour cost. - Material cost.	-Exercises in preparing estimates for maintenance & repair works
2.5 To select cables, motors, batteries, instruments and equipments for erection and replacement.	- Accessories and specification for various machiness/equipments/ instruments.	-Exercises of selecting motor, battery, cable and control circuit component are to be given.
2.6 To prepare inventory for spares.	- Knowledge of spare parts needed in various machine.	
3.1 To undertake standard tests on raw material finished products and interpret test results by writing test reports.	- Preparation of test Specimen.	-Exercises on operation of IM roll mill, compression moulding of test specimen. -Exercises on punching, cutting and maching of test specimen.
	- Identification of Plastic	-Exercise on analystical chemistry.
	- Physical Properties	-Exercise on testing of density, water abrasion etc.
	- Strength of Polymers	-Conduct of Tensile test and F.S., S.S., I.S., C.S. etc.
	- Short and long term mechanical properties.	
	- Thermal Properties.	-Conduct of various thermal test practicals HDT, Thermal conductivity, TGA, LOI,DTA etc.
	- Electrical Properties.	-Exercises on various electrical test, breakdown, Voltage, Die-electric

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Activity	Knowledge	Skills
		constant, Volume, resistivity.
	- Flow Properties.	-Exercises on Flow Test Plasticity, rheometry
	- Optical Properties	-Exercises on various optical tests in plastic clarity gloss etc.
	- Testing of finished products.	-Exercises on individual product such as drop test, tensile, impect, abrasion etc.
	- Various formula and equation involved in calculation in test results.	-Exercises on the use of different formula and equations.
	- Format on test report.	-Exercises in preparing test report.
	- Interpretation of test result.	
3.2 To undertake quality control.	- SQC techniques (Use the relevant IS)	-Exercises in SQC.
	- Inspection (Visual)	-Exercises on visual inspection to find out defects in surface, glass colour etc.
	- Testing of raw material for different applications.	
	- Testing of finished products.	
	- Interpreation of test data.	
	- Application of test data to control processing parameters.	-Evaluation of test results,relationship between test result and processing parameters.
	- Assessment of properties of finished product in relation to service requirement.	-Performing of the test as per standard procedure.
	- Standards & specification.	
	- Preconditioning and test atmosphere.	

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Activity	Knowledge	Skills
4.0 DESIGN AND DRAWING		
4.1 To prepare drawings of- products moulds and dies	- Basic Engg, Drawing.	- Exercises on sectioning dimentioning and views.
	- Various processing techniques, Tolerances ,Basic Metrology.	- Exercises on plan, elevation and selection of Moulds and dies to be given.
	- Knowledge of various mould components.	- Exercises on tolerances for a plastics produsts and general engg. component.
	- Knowledge of material for mould and dies.	- Exercises on study of mould and dies of various type.
	- Knowledge of Plastic materials.	- Exercises on identification of Plastic materials.
	- IS code of practice for Engineering Drawing.	- Exercises on various Measuring instruments screwgage, bevel protector, radius gauge, etc.
4.2 To read & Interpret drawings & prepares free hand sketches for conveying information	- Knowledge of above given in 4.1	- Demonstration various processing techniques.
	- Knowledge of various tool room machines and their operation.	- Demonstration on various tool room machine lathe,drill milling, broing, shaping, grinding die, sinking machine etc.
4.3 To assist in the design of product mould and dies.	- Knowledge of sprue, runner, gate, shrinkage, Flashlines, taper and drafts, wall thickness, radi and fillets, ribs, bosses, holes, moulded thread and insert.	- Exercises on design of injection mould (different types), Compression mould, blow mould, extrusion dies.
	- Various types of moulds like injection mould, compression mould transfer mould blow mould,	- Exercises on study of shrinkage of product and other various defects.

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Activity	Knowledge	Skills
	rotational mould, extrusion dies. - Properties of materials to be used for mould and die. - Knowledge of materials to be used for construction. - Understanding of processing methods and tool method.	Exercises on dies design. - Practice for free-hand sketching and Blue print reading.
5.0 ESTIMATING AND COSTING		
5.1 To prepare cost esti-mates of plastic products	- Fixed captical, working captical, raw material, machine, time, utility cost, cost of production depreciation, excise duty, return, investment (Profitability) maintenance cost. - Costing methods; Factors affecting breadeven point.	- Exercises on finding cost of small plastic products. - Exercises on finding interest, cash flow.
5.2 To work out Break even production	- Market survey. - Marketing procedure. - Technical Assistance from various agencies. - Types of organisations. - Industrial Law and wages. - Project report. - Financial assistance available and the prodedure for applying for financial assistance. - Leadership qualities. - Procedure details. - Task analysis and feedback. - Types of treades. - Ancilliary services.	- Exercises on determining the break even point of a manufacturing firm.

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Activity	Knowledge	Skills
	- Ancilliary industries.	
5.3 To prepare cost benifit analysis of Plastic products.	- Design Aspects. - Material Selection. - Quality Check. - Optimum utilisation of plant. - Request specification. - Simple accounting procedure for making balance sheet.	- Exercise on preparing cost benefit analysis.
6.0 INVESTIGATION & MARKETING		
6.1 To conduct market survey	- Principles of conducting market survey, Techniques of simpling and market survey. - Knowledge of interpretation of market survey result.	- Exercise on market survey.
6.2 Promote sales of products & new application	- Marketing Principles. - Management of Human resources. - Market trend analysis from available information. - Communication and Public relation. - Advertising and sales promotion.	- Exercise on identification of plastic product for replacing a product, conventional change from one plastic another for samae product.
6.3 Collect feedback on the performance of product.	- Quality of good product. - Identification procedure for the reason of bad performance in field.	- Testing and understanding of plastic products failure during use, environmental condition effec etc.

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COURSE OBJECTIVES:

Student after undergoing course should be able to :

1. Select manufacturing processes, machine and tools for various products.

2. Supervise production processes.

3. Identify and select appropriate raw material for products.

4. (a) Understand role of additives in formulations.

   (b) Formulate suitable compounds such as to make a plastic product of desired properties.

5. Prepare, interpret and assist in design and drawing of products, moulds and dies.

6. Estimate the cost of manufacturing plastic products.

7. Undertake testing for quality control.

8. Erect, maintain and repair processing equipment.

9. (a) Promote marketing of the products.

   (b) Give technical service for guiding consumers.

10. Prepare feasibility and project report of the manufacture of plastic product.

11. Understand the value of human relations and team spirit in the organisation.

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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 formation, Corrosion, Caustic embritlement, primming and

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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 :

NH4+, Pb++, Cu++, Bi+++, Cd++, As+++, Sb+++,

Sn++, Al+++, Fe+++, Cr+++, Mn++, Zn++, Co++

Ni++, Ba++, Sr++, Ca++, Mg++

B. Acid Radicals :

CO3--, S--, SO3--, CH3COO-, NO2-,

No3- , Cl-, Br_ , I- , So4--

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

3. To determine the total hardness of water sample in terms of CaCo3 by EDTA titration method using 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 POLYMER CHEMISTRY

L	T	P
4	2	4

Rationale:

The purpose of this paper is to aquaint the students with known Polymers and their reactions, Polymerisation techniques, classification, Molecular weight, Distribution of molecular weight, Degradation and scope of Plastic and Elastomers which will be useful in practical working atmosphere.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	4	2	-
2.	Classification of Polymers	8	4	-
3.	Types of Polymerization	8	4	-
4.	Chemistry of Polymerization	8	4	-
5.	Polymerization Technique	10	5	-
6.	Chemical & Geometrical Structure of Polymer Molecules	4	2	-
7.	Polymer properties & Effect of polymer structure on properties	8	4	-
8.	Polymer reactions	6	4	-
	Total	56	28	56

DETAILED CONTENTS

1. INTRODUCTION:

Introduction & historial background macromolecular concept, monomer & polymers, nomenclature of polymers, characteristic features of a polymer, definition of polymerisation, rate of polymerization, average degree of polymerisation, polymerisation and functionality, high polymers and oligopolymers. Scope of elastomeric, fabre forming and plastic materials.

2. CLASSIFICATION OF POLYMERS (Brief Study):

Classification of polymers on the basis of

A. Origin - natural, semisynthetic & synthetic.
B. Thermal response - Thermoplastic & Thermosetting.
C. Mode of formation - Addition & Condensation.
D. Line structure - Linear, branched, Cross linked.
E. Application & Physical Properties - Rubber, Plastic and fibers.
F. Tacticity - Isotactic, syndiotactic and atactic.
G. Crystallinity - Non crystalline (amorphous), Semi-crystalline and crystalline.

3. TYPES OF POLYMERISATION:

Addition (chain) polymerisation, condensation polymerisation, comparison between addition and condensation

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polymerisation, copolymerisation, types of co-polymer - randon, alternate block and graft.

4. CHEMISTRY OF POLYMERISATION:

Mechanism of addition polymerisation - Intiation step, propagation step and termination step, chain transfer, Types of initiations, inhibitors, types of polymerisation reactions as - free radical polymerisation, amionic and cantionic polymerisation reactions co-orination polymerisation or ziegler - natta polymerisation, polycondensation polyaddition polymerisation, ring opening polymerisation, miscellaneous polymerisation reactions.

5. POLYMERISATION TECHNIQUES:

Supension,Bulk and Emulsion & Solution polymerisation.

6. CHEMICAL & GEOMETRIAL STRUCTIRE OF POLYMER MOLECULES:

General remarks on polymer microstructure, microstructure based on chemical structure (a) organic and inorganic polymers (b) homochain and hetero chain polymers (c) homopolymers and copolymers.
Microstructure based on the geometrical structure i.e. linear, branched and cross linked polymers, random, alternating, block and graft copolymers, stereo regular polymers.

7. POLYMER PROPERTIES & EFFECT OF POLYMER STRUCTURE ON PROPERTIES :

A. Glass Transition Temperature :

What is glass transition temperature, glassy solids and glass transition, transition and associated properties factors in fluencing the glass transition temperature and molecular weight, Glass transition temperature and plasticisers. Glass transition temperature of co-polymers, Glass transition temperature and melting point. Importance of glass transition temperature, Heat distortion temperature.

B. Crystillinity in Polymers :

Degree of cristallinity crystallisability polymer crystallisation, effect of crystallinity on the properties of polymers.

C. Polymer Degradation :

What is polymer degradation, types of degration.

D. Molecular Weight of a Polymer :

Determination of molecular weight of a polymer average molecular weight, number average molecular weight (Mn), weight - average molecular weight (Mw), viscosity average molecular weight (Mv) molecular weight and degree of polymerisation, polydisperisity index and molecular weight distribution in polymers, the practical significance of polymer molecular weight, size of polymer molecules.

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E. Effect of Polymer Structure on Properties :

1. Strength
2. Plastic deformation
3. Physical state of polymer
4. Chemical resitance
5. Crystallinity
6. Mechanical behaviour of polymers

8. POLYMER REACTIONS:

Hydrolysis, Acidolysis, Aminolysis, Hydrogenation, addition and substitution reactions of various specific groups, cyclisation reaction, cross linking reaction, miscellaneous reactions.

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LIST OF PRACTICALS

1. Preparation of Phenol Formaldehyde moulding powder.

2. Preparation of Urea Formaldehyde moulding powder.

3. Preparation of Melamine formaldehyde moulding powder.

4. Polymerisation of Styrene of emulsion polymerisation.

5. Polymerisation of styrene by suspension polymerisation.

6. Polymerisation of Methyl Methacrylate monomer by bulk polymerisation and casting in a mould.

7. Polymerisation of Styrene monomer by bulk polymerisation.

8. Preparation of Cellulose Acetate from cotton flock.

9. Depolymerisation of Polystyrene, Preparation of Styrene from polystyrene.

10. Preparation of unsaturated polyester resin by phthalic anyhydride and propylene glycol.

11. Determination of melting point of Plastics/Rubber samples.

12. To determine the Density/Specific gravity of known Plastics/Rubber samples.

13. To determine the Density/Specific gravity of unknown Plastics/Rubber samples.

14. Purification of monomers (Vinyl Acetate, Methyl Methacrylate & Styrene).

15. To determine there fractive index of monomers.

16. To identify the known plastics/Rubber by burning and chemical tests.

17. To identify the unknown plastics/Rubber by burning and chemical tests.

18. Determination of ash and Sulpher contents of Valcanized rubber.

19. Vulcanization of synthetic rubbers.

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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.

4.3 Laplace Transform :

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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 THERMODYNAMICS AND KINETICS

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. 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.	Definitions	6	1	-
2.	First Law	10	4	-
3.	Second Law	10	4	-
4.	Refrigerations & Liquefaction	10	4	-
5.	Chemical Kinetics	6	2	-
6.	Homogenous Reactions	10	4	-
7.	Interpretation of constation volume batch reactor data	8	3	-
8.	Ideal Reactors	8	2	-
9.	Introduction to Heterogenous reacting systems	8	2	-
10.	Introduction of Various Types of Industrial reactor	8	2	-
	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.

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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. 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.

4. 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.

5. CHEMICAL KINETICS :

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

6. HOGENEOUS 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.

7. 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.

8. IDEAL REACTORS :

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.

9. INTRODUCTION TO HETROGENEOUS REACTING SYSTEMS :

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

10. INTRODUCTION OF VARIOUS TYPES OF INDUSTRIAL REACTORS :

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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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3.3 TECHNOLOGY OF PLASTIC AND RUBBER MATERIALS

L	T	P
5	2	-

Rationale:

The knowledge of this paper will equip the student with the knowledge of plastic material, raw material i.e. Vinyl Polymers, Flurocarbon Polymers etc. which will prove useful in practical atmosphere.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Topic-I	15	5	-
2.	Topic-II	15	5	-
3.	Topic-III	10	5	-
4.	Topic-IV	10	4	-
5.	Topic-V	10	4	-
6.	Topic-VI	10	5	-
	Total	70	28	

DETAILED CONTENTS

I. Introduction of General parts of polymerisation plants. Batch & continous production processes. Sources and history of natural and synthetic rubber. Advantage and disadvantage of natural and synthetic rubber.

II. Industrial Manufacturing processes of common thermo- plastic such as polyethylenes polypropylenes and polystyrenes and its co-polymers i.e.: ABS & SAN polyvinylchloride acryclic polymers along with their properties and applications. Introduction to new polymers such as polycarbonates, polypsulphones, polyimide,PET (Polyethylene terephthalate, PTFE (Poly Tetra Fluro Ethylene). Chemistry and Production of nylon 6 and nylon 6.6

III. Manufacturing process, properties and application of synthetic condensation polymers (Themro setting Plastic of synthetic such as phenol germaldehyde, urea formaldehyde, melamine formaldehyde polyster (saturated and unsaturated) epoxy resins, vinyl esters)

IV. Advance polymer material such as Liquid crystal polymer, Conducting polymer, High energy absorbing material, Smart material, Nano polymer, etc.

V. Production of different grades of natural rubber from latex such as pale crepe and smoke sheet rubber and different grades use of latex.

VI. Manufacturing process, Properties and application of SBR, Nitrile Rubber, Butyl, Neoprene and Polysulphide.

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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 Time L	T	P
1.	Introduction to Computer	4	-	-
2.	Introduction To Operating System (MS DOS/Windows)	3	-	-
3.	Word Processing	4	-	-
4.	Worksheet	4	-	-
5.	Presentation	4	-	-
6.	Data Base Operation	3	-	-
7.	Introduction to Internet	2	-	-
8.	Introduction to advance tools	4	-	-
		28	-	70

DETAILED CONTENTS

1. Introduction to Computer:

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

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

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

3. WORD PROCESSING:

   File : Open, Close, Save, Save as, Search, Send to, Print Preview, Print and Page Setup
   Edit : Cut, Copy,Paste, Office Clipboard, Select All, Find, replace, Goto, etc.
   View : Normal/Web Layout/Print Layout; Tool Bars; Header/Footer; Zoom, etc.
   Insert: Break, Page Number, Date & Time, Symbol, Comment, Reference, etc.
   Format: Font, Paragraph, Bullets & Numbering, Borders &

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

4. WORKSHEET:

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

5. PRESENTATION :

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

6. DATABASE OPERATION :

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

7. Introduction to Internet:

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

8. INTRODUCTION TO ADVANCE TOOLS :

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

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

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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 PLASTIC AND RUBBER PROCESSING-I

L	T	P
6	2	-

Rationale:

The purpose of this paper is to make the students aware of Plastic and Rubber processing i.e. different types of moulding, mixing and casting techniques which will prove to be a powerful tool in the world of work.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
	PLASTIC PROCESSING			
1.	Introduction	3	1	-
2.	Extruder	9	3	-
3.	Injection Moulding	9	3	-
4.	Blow Moulding	9	3	-
5.	Compression Moulding	6	2	-
6.	Transfer Moulding	6	2	-
7.	Equipment For Compression & Transfer Moulding	9	3	-
8.	Rotational Moulding	9	3	-
	RUBBER PROCESSING			
1.	Introduction To Rubber Processing	6	2	-
2.	Mastification & Mixing	6	2	-
3.	Moulding	6	2	-
4.	Coating of Textile Fabires	6	2	-
	Total	84	28	-

DETAILED CONTENTS

PLASTIC PROCESSING

1. Introduction To Plastic Processing.

2. EXTRUDERS:

Basic principle of Extruders, Extrusion process, Single screw extruder and multiple screw extruder. Extruder component such as Barrel, Screw hopper, Die-L/D ratio and Compression ratio of screw. Advantage and disadvantage of single screw extruder over multiple screw and vice-versa. Extruder performance and their curves; Flow in extruder barrels statics, drag pressure and pressure flow.. Heat and temperature control in extruders cooling and take off system. Extrusion lines for production of pipes, cables, profile, sheets flat film and tubular film. Static, Drag pressure and Pressure flow.

3. INJECTION MOULDING:

Basic process and materials, Elements of Injection moulding, i.e. Injection unit, Clamping unit, Mould and machine controls. Classification of Injection Moulding Machine, Hand operated and Power operated, Plunger and Screw type.

Advantages of screw type and plunder type machine. Injection moulding cycle, Nozzle, Mould Temperature control, Specification of machine, Moulding defects and their remedies, Application of injection moulding, Elementry knowledge of Reaction Injection Moulding.

4. BLOW MOULDING:
Basic Process and Materials, Types of Blow moulding i.e. Hand operated and Power operated, Extrusion blow moulding, Injection blow moulding machine, Stretch blow moulding, Finishing operation, Moulding defects and their remedies. Application of blow moulding.

5. COMPRESSION MOULDING:
Basic Process and materials, Moulding cycles, Advantages and limitations for compression moulding, Application of compression moulding, Defects and their remedies.

6. TRANSFER MOULDING:
Basic processes and materials, Types of transfer moulding, Advantage and limitation of Transfer moulding, Defects and their remedies.

7. EQUIPMENTS FOR THE COMPRESSION AND TRANSFER MOULDING:

Hard Press, Manully operated hydraulic press, Automatic hydraulic press, Preheaters, Performers, Heating system, Cleaning and finishing devices.

8. ROTATIONAL MOULDING:

Basic process and material, Types of rotation moulding machines, Single spindle, Multiple spindle, Straight spindle and Jacketed moulding rational machine, Application of rotational moulding.

RUBBER PROCESSING:

1. Introduction to Rubber Processing.
2. MASTIFICATION AND MIXING:
Two roll mill, Internal mixer, Bumbing type mixture. Mastification, Machinery of mastification, Chemistry of mastification. Compounding of natural and synthetic rubber compounding ingredients and mentods of compounding
3. MOULDING:
Compression and Transfer moulding of rubber, Injection moulding of rubber components, Moulding strinkage, Mould lubrication, Mould cleaning.
4. COATING OF TEXTILE FIBRES:

Adhesion of rubber to Textile substances. Application of rubber.

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4.2 FIBRE REINFORCED PLASTICS

L	T	P
5	2	6

Rationale:

In certain engineering applications plastics of greater strength are needed. Therefore, efforts have been made to reinforce the plastic with fibres. The process and technology will certainly prove very useful for students of this field in practical applications.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	6	2	-
2.	Commerical Application of Compesites	12	5	-
3.	Preparation and Properties of Plastics to be reniforced	12	5	-
4.	Reinforcing Material (Fibres)	12	5	-
5.	Additives for Reinforced Plastics Excluding Resin and Reinforcing Material With Special Reference to Glass Reinforced Polyster Resin.	12	5	-
6.	Techniques of Fabracting	8	3	-
7.	Preparation & Finishing of Molds	8	3	
		70	28	84

DETAILED CONTENTS

1. INTRODUCTION:

Definition, Preperties of composites, History and development of fibres reinforced plastics.

2. COMMERICAL APPLICATION OF COMPOSITES:

Application of composites in chemical industry, Aerospace, Electrical Application, Marine Application, Automobile Industry and Miscellaneous Applications.

3. PREPARATION AND PROPERTIES OF PLASTICS TO BE REINFORCED:

Preparation of unsaturated polyster rein and their varieties and properties. Preparation of epoxy resin and polypropylene for reinforcement and their properties.

4. REINFORCING METERIALS (FIBRES):

Glass fibres their varieties and specific applications. Carbon fibre, asbestos cotton, Nylone, Rayon, Graphite fibre their properties and applications.

5. ADDITIVES:

ADDITIVES FOR REINFORCED PLASTICS EXCLUDING RESINES AND REINFORCING MATERIALS WITH SPECIAL :

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Reference to glass reinforced Polyster resin.

CATALYST AND ACCELERATORS FITTERS PIGMENTS MONOMERS MOULD RELEASE AGENTS BINDERS:

6. TECHNIQUES OF FABRICATING REINFORCED PLASTICS:

(a) Hand lay up or contact moulding.

(b) Spray up.

(c) Encasulation.

(d) Filament winding

(e) Centrifugal Casting.

(f) Contineous pultrusion.

(g) Match dir mpulding.

(h) Continuous Laminating.

(i) Pultrusion

7. PREPARATION AND FINISHING OF MOULDS FOR FRT PRODUCTS

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FIBRE REINFORCED PLASTICS LAB

List of Practicals

1. Preparation of unsaturated polyaster sresin.

2. Surface treatment of glass fibre for moulding.

3. To prepare a compound of glass fibre and polyster resins for pipe production and to make pope of it.

4. To produce a sample of a given component using reinforcing materials other than glass fibre.

5. To produce sink of glass fibre reinforced polyster resin by hand lay up techniques.

6. To produce a laminate of glass fibre reinforced plastics by hand lay up method and to determine its tensile strength and impact strength.

7. To study the effect of cross linking manomer on the mechanical properties (tensile strength and impact of the composites.)

8. To complete the tensile strength and impact strength of two different composites made of same resin and different reinforcing materials.

9. To determine the strength to weight ratio composites and steel and to prepare comparative chart.

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4.3-FLUID MECHANICS & SOLID HANDLING

L	T	P
6	2	8

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. 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 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
A-				
1.	Fluids	6	1	-
2.	Flow of incompressible fluids	12	3	-
3.	Measurement of flowing fluids	12	3	-
4.	Transportation of fluids	12	4	-
B-				
1.	Introduction	5	3	-
2.	Characterisation of Solid Particles	5	2	-
3.	Size Reduction	6	2	-
4.	Handling of Solids	8	3	-
5.	Mechanical Separation	6	3	-
6.	Mixing Equipments	12	4	-
	Total	84	28	112

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. TRANSPORTATION OF FLUIDS:

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

PART - B

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. HANDLING OF SOLIDS:

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.

(iii)Thickener

(iv) Cyclones.

6. MIXING EQUIPMENTS:

Mixing equipments used for liquid-liquid, liquid-solid and liquid-gas system.

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FLUID MECHANICS & SOLID HANDLING LAB

1. To determine the co-efficient of discharge of orifice-meter.
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.
12. To study and draw a sketch of Chemical Engineering lab.
13. To analyse the given sample on a set of screens and report the analysis.
14. To determine the critical speed of a ball mill.
15. To determine the efficiency of disintegrator.
16. To determine filteration constant by a plate and frame filter press.
17. To determine the rate of settling of slurries of various concentration draw a height VS time curve.
18. To determine the efficiency of Jaw crusher.
19. To study and sketch a Rotary filter.

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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:

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

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, Principles, details and problems like scaling 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 AND MASS TRANSFER

L	T	P
4	2	4

Rationale:

The purpose of this paper is to aquaint the students with the tools needed in Unit Operation like Modes of heat transfer, Coduction, Convection, Radiation, Heat exchanger and Evaporator, to meet the challenges of industrial atmosphere

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
	PART 'A'			
1.	Mode of Heat transfer	4	2	-
2.	Conduction	4	2	-
3.	Convection	4	2	-
4.	Radiation	6	3	-
5.	Heat Exchangers	6	3	-
6.	Evaporators	6	3	-
	PART B			
7.	Gas Absorption	4	2	-
8.	Distillation	4	2	-
9.	Extraction	6	3	-
10.	Humidification	6	3	-
12.	Drying	6	3	-
	Total	56	28	56

DETAILED CONTENTS

PART-'A'

1. MODE OF HEAT TRANSFER:

Conduction, Convection and Rediation.

2. CONDUCTION:

Fourier's Law, Thermal conductivity, Conductance wall, Multilayer flat wall, Hollow cylinder, Multilayer cylinder, Logmean Area, Geometric mean area and Arithmetic mean area. Simple Numerical Problems in S. I. Units.

3. CONVECTION:

Natural and Forced convection, dimensional analysis, Pi theorem, Physical significance of dimension less number, Reynold number, Pranatle number, Nusselt number, Stanten number, Peclit number, Grashaff number, Ditlus Baltier's equation - Simple Numerical Problems using Ditlus Baltiers equation. Individual heat transfer coefficients and overall heat transfer coefficients.

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4. RADIATION:

Reflection, absorption and transmission of radiation, Kirchoff's law, Emmisive power, Wein's displacement law. The Stefen's Boltzman law, Heat transfer by radiation, Exchange of energy between two parallel planes of different emissivity, Radiant heat transfer coefficient, Solar radiation gray surface or gray body.

5. HEAT EXCHANGERS:

Log mean temperature difference (L.M.T.D.) for parallel or Cocurrent flow, Counter current flow, Cross flow, Construction and discription of (i) Double pipe heat exchangers, (ii) shell and tube heat exchangers. Wilson plat calculation of individual and over all heat transfer coefficients.

6. EVAPORATORS:

Construction and Description of (1) Basket type (2) Horizontal tube types (3) Vertical tube or Long tube type. Boiling point rise (B.P.R.) and its effect, Steam economy for single effect evaporator.

PART 'B'

7. GAS ABSORPTION:

Properties of tower packing. Types of tower packing and Stone ware tower construction.

8. DISTILLATION:

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 capplate column (3) Packed column. Fractional column accessories.

Boiling point diagrams, Roult's law, Henery's law, Relative volatility, Constant boiling mixture, Equlibrium diagram and constant of equilibrium diagram. Fractionating calumn calculations - Heat and material balance Reflux ratio equilibrium plate, Enthalpy composition diagram, Graphic solution - Selection of column above and below feed plate, Location of feed plate, Subcooled reflex effect on reflux ratio, entrainment M/c cabe thiele diagram - Section above and below feed plate. Intersection of operation line, Location of 'q' line Optimim reflux ratio, Calculation of number of equilibrium plate by M/c cabe thiele diagram, over all plate efficiency. The merphy plate efficiency. The murphy point efficiency.

9. EXTRACTION:

(1) Choice of Solvent (2) Steps of Extraction operation (3) Solid liquid Extraction construction and description of (a) stationery solid bed-basket type oil seed extractor or Pallman extractor (c) Rotoal extractor (d) liquid

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extraction.

10. HUMIDIFICATION:

Determination of (1) Humidity (2) Percentage himidity (3) Relative humidity (4) Humid volume (5) Humid heat (6) Dry bulb and wet bulb temperature (7) Adiabalic saturation temperature (8) Use of Humidity chart (9) Dew point temperature. Simple numerical problems using humidity chart construction and description of cooling towers.

11. DRYING:

General drying behaviour - Critical moisture content equilibrium moisture content, Description and construction of dryers.

1. Tray Dryer
2. Rotary Dryer
3. Screw Conveyor.

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HEAT AND MASS TRANSFER

List of Practicals

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

2. To determine over all heat transfer coffienents for an open pan evaporator in a unsteady state cindition.

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

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

5. To study a sieve plate distillation column operation and to calculate over all effiency of the distillation column.

6. To determine steam economy of a open pan evoperator.

7. To study the construction and working of various chemical equipments.

8. To study the rate of drying in vacuum dryer.

9. To determine the pounds of volatile compound distilled per unitpounds of steam distilled in a steam distillation operation.

10. To determine ratio setting.

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5.3 PLASTIC AND RUBBER PROCESSING-II

L	T	P
5	2	4

Rationale:

The purpose of this paper is to equip the student with the knowledge of equipment and processes utilised in Plastic and Rubber processing and finishing of Rubber components. These equipment and processes are common almost in all Plastic and Rubber plants.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
	PLASTIC PROCESSING			
1.	Costing	5	3	-
2.	Calendering	8	2	-
3.	Machining & Finishing of Plastics	5	2	-
4.	Thermo Forming & Foaming	5	2	-
5.	Welding & Sealing of Plastics	5	2	-
6.	Reinforcing	5	3	-
7.	Fibre Spinning	5	2	-
	RUBBER PROCESSING			
1.	Extrusion	8	3	-
2.	Hand Building & Forming	8	3	-
3.	Vulcanisation	8	3	-
4.	Finishing of Rubber Components	8	3	-
	Total	70	28	56

DETAILED CONTENTS

PLASTIC PROCESSING

1. CASTING:

History, Basic process, Different Coasting Processes, Sheet casting of M.M.A. rotational casting and typical applications.

2. CALENDERING:

Basic principles of calendering processes, types of Roll arragement. Heating and cooling system, Calendering variables, Faults and Remedies.

3. MACHINING & FINISHING OF PLASTICS:

Machining of plastics in the form of sheets, rods and bulks. Finishing operations; Filing, tumbling, grinding and sanding, buffing and polishing, Machining of plastics; Thrning, Drilling, Tapering, Threading, Sanding, Grinding.

4. THERMOFORMING & FOAMING:

Thermoforming sheet forming, different processes for

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thermoforming by using heating and air pressure or vacuum. Vacuum forming machines methods of heating, economics of heating, thining of sheets in relation to forming process, effect of tool shape size on thining, economics of sheet forming and comparison other methods of fabrication. Analysis of faults and their remedies. Foaming process and types of foaming

5. WELDING AND SEALING OF PLASTICS:

Characteristics of cemented and welded joints with the major thermoplastics materials, strength of joints, aging of joints processes of welding heated tool sealing and welding, hot gas welding dielectric sealing, Induction welding frictional welding equipment used, rate of production economics of the processes.

6. REINFOCEING:

Basic principle of reinforcing, types of reinforcing, reinforce materials.

7. FIBRE SPINNING :

Basic principle of spinning, types of spinning, fibre after treatment, finishing of fibre.

RUBBER PROCESSING:

1. EXTRUSION:

Screw extrusion, Ram extrusion and Extrusion Technology.

2. Hand building and forming.

3. Vulcanisation by methods other than moulding Batch curing methods, Continuous vulcanising methods.

4. Finishing of Rubber components, Flash and spow removal, Punching grinding, Shafft blasting, Painting and lacquering chemical surface treatment. Types of take off system.

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PLASTIC AND RUBBER PROCESSING-II LAB

PLASTICS PROCESSING SHOP

1. To determine effect of change in temperature of melt pressure, mould temperature on shrinkage in injection moulding machine.

2. To determine effect of change in temperature of melt, pressure mould temperature on quality of product in injection moulding machine.

3. Study and operation of compression moulding machine (Semi automatic).

4. To produce two components of Thermosetting plastic by compression moulding press and to prepare a quality record.

5. To develop formulation for a given colour shade and to produce a sample by dry mixing and to make granulor of it by granulator.

6. To produce 100 components by hand operated injection moulding machine and prepare a quality record.

7. Study and operation of Semi Automatic injection moulding machine and to produce 10 components by the same machine.

8. To produce 100 battle from below moulding machine and to prepare a quality record.

9. To produce components of Glass Reinforced polyster resin by hand lay up techniques.

10. Study and operation of Extruder.

11. Experimental production of lay flat tubing.

12. Study and operation of vaccum forming machine.

13. Vaccum forming of a tray.

14. To produce PVC sheets by two rolls calender.

15. Surface treatment of polytelene component for printing and to make a print on that by screen printing.

16. To visit works of a plastics moulding workshop and observe moulding and to prepare a report.

RUBBER PROCESSING SHOP

1. Identification of elastomers.
2. Compounding of rubbers by two roll mill to study the curing characteristics .
3. Determination of Mechanical properties like tensile strength, elongation etc of cured rubber sheets.

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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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ELECTIVES(ANY ONE)

5.5 (i) PLASTICS & RUBBER FORMULATIONS

L	T	P
5	2	-

Rationale:

Formulation of Plastics and rubber needs basic knowledge of common ingredients used in the processes. A student having practical knowledge of these ingredients and their application in right manner is of great importance to practical fields.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	5	2	-
2.	Common Application of vinyl & Its Properties	18	6	-
3.	Common Ingredients for Formulation of Plastics & Rubber Compounds	15	6	-
4.	Vulcanization	15	6	-
5.	Formulation For Some Plastics & Rubber Components	9	4	-
6.	Compounding of PVC	8	4	-
		70	28	-

DETAILED CONTENTS

1. INTRODUCTION:

Meaning of formulation, their purpose and industrial importance.

2. COMMON APPLICATION OF VINYL & ITS PROPERTIES:

Application of polyvinyl chloride in different fields, Properties and their uses.

3. COMMON INGREDIENTS FOR FORMULATION OF PLASTICS & RUBBER COMPOUNDS:

Common ingredients such as plasticizers, fillers, extenders, antiozonatc, antioxidants, antistatic agents, stabilizers, colourants, flame retardants blowing agents, lubricants, curing agents. Their function and properties.

4. VULCANIZATION:

Sulpher and non-sulpher Vulcanization continous vulcanization and tockines.

5. FORMULATION FOR SOME PLASTIC AND RUBBER COMPONENTS:

(A) For clear PVC film, general purpose insulating compounds, tranparent calandering compound for PVC, house by extrusion rigid PVC pipes, fitting and conduits, blow moulded PVC clear bottles and containers, for PVC leather cloth - for spreading

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techniques as -well as for calendering for flooring compounds and for gramophone record, PVC compounds for cables.

(B) Rubber, Hosepipes, Belts, Cycle tubes and tyres, footwear, water.

6. COMPOUNDING OF PVC:

Compounding, Need of compounding, Application and properties in different fields.

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5.5 (II) FOAM AND ADHESSIVE TECHNOLOGY

L	T	P
5	2	-

Rationale:

Foam and Adhessive are now a days becoming much popular in every day use in public as well as in private sectors. Many kinds of adhessives are available with different trade names for specific and general applications. Infact, we can not imagine modern life without adhessives. The student is supposed to have some idea about these adhessives.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
	A. Foam			
1.	Introduction	5	4	-
2.	Properties	25	12	-
	B. Adhesive	40	12	-
		70	28	-

DETAILED CONTENTS

(A) FOAM:

1. INTRODUCTION:

Introduction to Foam- Meaning, Application, Types of foam flexible and Rigid foam chemistry of physics of foam formation, Foaming in greadients such as Blowing agents etc., Their effects on foam morphology and physical properties of cellular plastics.

2. PROPERTIES:

Chemistry, formulation and manufacturing processes and properties of the following foams, Pelythylene foams, Polyurethene(rigid & flexible) foams, Polyethylene foam LD & HD epoxy resin foams etc.

(B) ADHESSIVES:

Multipurpose adhesives - Resins and anaerobic compounds for sealing, jointing, fitting, fixing, locking and filling etc. A few popular commerical names to mention such as Araldits, Stellon compounds Fevicols, Specfit, Specinstabond, Loctites, Silastics, M-seal, etc., their properties and usage.

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5.5 (iii) PLASTICS IN BUILDING SERVICES

L	T	P
5	2	-

Rationale:

Plastics now a days are getting application in almost every field of life i.e. Agruculture, Civil Engineering and Industries, etc.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	6	3	-
2.	Application of Plastics in Building	12	4	-
3.	Polythelene Film For Water Proofing	12	5	-
4.	Thermal & Sound Insulation By Plastics	12	5	-
5.	Plastics Roofing & Cladding & Flooring	10	5	-
6.	Miscellaneous	18	6	-
		70	28	-

DETAILED CONTENTS

1. INTRODUCTION:

Increasing use of Plastics in Building, their advantage as a building materials, Review and types of plastics, Thermoplastic and thermo sets. Their engineering and allied properties. Behaviour of different plastics in fire.

2. APPLICATION OF PLASTICS IN BUILDING:

General use as flooring, Hand rails, curtain rails and Window stages, Wall titles, Roof lights, Steel and Partition panels, False ceiling, PVC sheets, Insulation materials, Electrical fitting and fixture, Tublin, Basins and Furniture etc.

3. POLYTHELENE FILM FOR WATER PROOFING:

Properties, Advantages of polythelene film, Damp proofing at ground level at roof. Arrangement for laying film on ground, road and roof and detail of construction.

4. THERMAL AND SOUND INSULATION BY PLASTICS:

Purpose, Material Selection, Insulation of theater, Roof, Air conditioned building walls, Sandwich construction.

5. PLASTICS ROOFING AND CLADDING AND FLOORING:

Material selection, Roofing and Cladding of external walls, Advantage of plastics, Flooring in comparision to concrete, wooden and other general types of flooring, selection of material of flooring.

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6. MISCELLANEOUS:

Plastics tape and valves, Plastics in sanitary wares, Plastics conduit and fitting, Plastics cables in Electrical wiring, Decorative laminates in building, Plastic in surface coating, Plastics door, window and fixtures. Their different types material selection with causes, Advantages and application.

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VI SEMESTER

6.1 QUALITY CONTROL AND TESTING OF PLASTICS

L	T	P
5	2	4

Rationale:

For checking quality of the manufactured material its physical properties as well as chemical methods of analysis are required. The student having knowledge of Rheology and Testing will prove useful in the industrial atmosphere.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Quality Control	5	2	
2.	Rheology	10	3	-
3.	Structural & Physical Propertics	10	3	-
4	Characterization of Polymers	12	5	-
5.	Mechanical Properties	8	3	-
6.	Electrical Properties	8	3	-
7.	Thermal Properties	6	3	-
8.	Optical Properties	6	3	-
9.	Identification of Plastics	5	3	
		70	28	56

DETAILED CONTENTS

1. QUALITY CONTROL:

Introduction to quality control for plastic products, Need of quality control, General methods of quality control and introduction to various standards like IS, BS and ASTM etc.

2. RHEOLOGY:

Introduction to polymer rheology, types of deformation. Newtonion and Non-newtonion flow, Classification of Non-newtonion fluid, Time dependent and time independent fluids, Visco-clestics fluids.

3. STRUCTURAL & PHYSICAL PROPERTIES:

Structural and physical properties such as mechanical, electrical, thermal and optical properties.

4. CHARACTERIZATION OF POLYMERS :

Elementary knowledge of physico-chemical methods of analysis such as I.R., D.T.A., T.G.A.,D.S.C. & U.V. chromatography etc.

5. MECHNAICAL PROPERTIES:

Testing of polymers according to standard methods like A.S.T.M. or B.I.S. Impact strength like Izod, Charpy, Fallind Dart and Tensile strength.

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6. ELECTRICAL PROPERTIES:

Such as dieletric sterngth, arc resistance, volume and surface resistivity.

7. THERMAL PROPERTIES:

Like melt-flow index vicat softening point, Heat distorsion temperature.

8. OPTICAL PROPERTIES:

Like transmittance and haze glass.

9. IDENTIFICATION OF PLASTICS:

Identification of polymers, simple physical methods of identification like visual examination, heating, burning, solubility, elements detection and confirmatory chemical tests.

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QUALITY CONTROL & TESTING OF PLASTICS LAB

List of Practicals

1. Study and sketch of the Universal Testing M/c.
2. To find out the tensile strength and elongation (Tensile compression/elengation) at break of plastic film as per IS2508.
3. To find out the tensile strength and elongation at break of rigid plastic material.
4. To find out the impact strength of polythene film as per IS 2508.
5. To find out the kinetic coefficient of frivation of polythene film as per IS 2505.
6. To find out the density of polythene.
7. To find out the impact strength of PVC rigid pipe as per IS 4985.
8. To find out the vicot softening point of given plastic material.
9. To find out the short term internal hydrostatic pressure of PVC rigid pipe as per IS 4985.
10. To find out the impact strength of plastics by Charpy test and Izod Test machines.
11. To determine the gloss of plastic material.
12. To determine the haze of the P. Material.
13. To determine the Hardness of plastic and rubber material.
14. To determine the flexural strength of Rubber and Plastic material.
15. To determine capacity of PVC pipe.
16. To determine the Shear hardness of the Rubber and Plastic sample.
17. To determine the Shear resistance.

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6.2 PLASTIC AND RUBBER MOULD DIE DESIGN AND CONSTRUCTION

L	T	P
6	2	-

Rationale:

The objective of this paper is to equip the student with the knowledge of different kinds of moulds, making of moulds and design of moulded articles. The skill and knowledge of die design and construction is of utmost importance in world of work

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Design of Moulded Articles	24	8	-
2.	Principle of Operation and Design			
a.	Compression Moulds	12	4	-
b.	Transfer Moulds	12	4	-
c.	Injection Moulds	12	4	-
d.	Extrusion Dies	12	4	-
3.	Mould Making	12	4	-
		70	28	-

DETAILED CONTENTS

1. DESIGN OF MOULDED ARTICLES:

Basic principles, Shrinkage, Flash lines, Under cuts, Wall thickness, Taner and drafts, Raddi filters, Ribs abd Bosses, Moulded holes, Moulded threads, Moulded letters, Inserts, Selection of metal for inserts, Problems in moulding with inserts, Types of inserts.

2. PRINCIPLES OF OPERATION AND DESIGN:

Design of the following types of moulds and dies.

a. COMPRESSION MOULDS:

Positive, Semi positive and Flash type.

b. TRANSFER MOULDS:

Plunger transfer mould and pot type mould.

c. INJECTION MOULDS:

Design of two plates and three plates mould with splits and side cores, method of colloiding, Feed system sprue, runner, gates and methods of injection.

d. EXTRUSION DIE:

Design and construction, die design for tubes, pipes, sheets rod, slits, flat film and wire coating.

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3. MOULD MAKING:

Selection of steels and mould materials, types of mould making machinery, copy milling and die sinking, machines, spark errosion machines, holding, finishing processes, heat treatment, fitting and mould polishing.

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6.3 MOULD & DIE DESIGN DRAWING

L	T	P
6	2	-

Rationale:

Preparation of Drawing of a design is very inportant. The construction of mould is not possible without accurate drawing. The student is supposed to develop safficient knowledge and skill in preparing drawings of moulds and dies.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Cross working dies rubber and Plastic technology.	30	10	-
2.	Drawing of moulds from the Following Exercises	30	10	-
3.	Drawing of moulds from the following Exercises.	24	8	-
		70	28	-

DETAILED CONTENTS

1. CROSS WORKING DIES RUBBER AND PLASTIC TECHNOLOGY:

(i) Assembly/Dissembly drawing of press working die with its components such as spring loaded stripper, Automatic step standard dies of Roller stock.
1PLATE

(ii) Drawing of cutting dies : Automatic stop, Roller stock, Punch and Die holders etc. (Simple, Compound and Progressive types) Blanking die, Piercing dies, Piercing punch.
1 PLATE

(iii) Drawing of non cutting dies (Simple, Compound and Progressive Type).

(a) Bending dies.
(b) Shallaw drawing dies.
(c) Deep drawing and broning die. 2 PLATE

(iv) Drawing of combination dies (Simple compound and progressive and Rubber pad forming dies.
1 PLATE

2. DRAWING OF MOULD FROM THE FOLLOWING EXERCISES:

(a) Compression mould for simple articles 1 PLATE

(b) Multi cavity moulds 1 PLATE

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(c)	Moulds with side ores	1 PLATE
(d)	Moulds for articles incorporating inserts	1 PLATE
(e)	Split moulds	1 PLATE
(f)	Three plate moulds	1 PLATE
(g)	Transfer moulds plunder and pot auxilliary types transfer mould.	1 PLATE

3. DRAWING OF MOULDS FROM THE FOLLOWING EXERCISES:

a.	Various types of injection moulds	2 PLATE
b.	Extrusion dies	1 PLATE
c.	Simple blew moulds	1 PLATE

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6.4 PROJECT

A. RATIONALE:

The Objective of the diploma project is to give practice to the students to make an effective literature survoy as well as to utilise the knowledge acquired. The part of the project may include following points as given below:-

1) General introduction of the problem.

2) History of the project including raw materials and finished product,present capacity of production of the raw materials in World and India.

3) Raw materials- Imported/exported. Demand in the country for future and measure/steps taken by the Government.

4) Physical and chemical properties of the raw materials and final product.

5) Discussion of diffrent schemes, and processes and selection of the process and detailed description of the selected process with neat flow diagrams.

6) The selected process has to be discussed with instrumentation schemes.

7) Discussion of the equipment required in the project scheme.

8) Detailed discussion of the main equipment required in the scheme and detailed drawings of the equipment.

9) Discussion of the accessories used in the process for the production including dies, moulds, motors, blowers, mixer,etc.

10) Finished product- quality control, evaluation which is required for the product, inspection and application.

11) Marketing of the products.

12) Plant organisation and Management.

13) Plant location and plant layout.

14) Estimation of the capital cost-fixed cost, recurring cost, total investment required, depreciation, break even point profitability of the product.

15) Future expansion of the plant/fature planning.

16) Actual design of the mould/dies and drawing to the scale for the specific product.

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B. LIST OF PROJECT (Guide Lines)

1. Extrusion

- Manufacture of cables.
- Manufacture of pipes (Rigid).
- Manufacture of woven sacks.
- Manufacture of films (PVC).
- Production of granules from waste materials (Recyling).
- Production of bags .
- Production of nylone ropes.
- Production of plastic canes.
- Production of Tube (Flexible).

2. Blow Moulding

- Manufacture of bottles.
- Manufacture of garrycans.
- Different types of containers of various materials.
- Extrusion blow stretch and injection blow stretch.

3. Injection moulding

- Manufacture of polyethylene switches.
- Manufacture of Household items.
- Manufacture of Industrial items.
- Manufacture of T.V., Transistors and Radio-Cabinets.
- Manufacture of Automobile components.
- Manufacture of items such as Lamp, shades, fan blades.

4. Fiber Glass Products

- Manufacture of solar Cooker.
- Manufacture of latrin seats.
- Manufacture of Bio-gas holders.
- Manufacture of corrugated seats.
- Lining of industrial Vessels.
- Manufacture OF Tank.

5. Compression/Transfer Moulding

- Manufacture of electrical items.
- Manufacture of industrial items.
- Manufacture of machine parts by IMC (Dough Moulding Compound) and SMC (Sheet Moulding Compound).

- Manufacture of

a) Sign board
b) Name plates
c) Pen stand etc.

6. Fabrication project

1. Fabrication of plastic testing machine for Impact testing of pipe.
2. Fabrication of plastic testing machine for Impact testing of pipe.
3. Fabrication of Hand operated injection moulding machine.
4. Fabrication of hand operated blow moulding machine.

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5. Fabrication of Glass Reinforced Plastic Products such as chairs and tables.

7. Fabrication of Dies & Moulds

- Fabrication of mould for hand operated injection moulding machine.
- Fabrication of mould for hand operated blow moulding machine.
- Fabrication of mould for semiautomatic injection moulding machine.
- Fabrication of moulds for semi-automatic blow moulding machine.
- Fabrication of mouldsfor vaccum forming machine (Comparison of wooden mould and Al.moulds).
- Fabrication of Dies for the manufacture of cables/pipes/sheets.

8. Printing & Decorations

- Screen printing of plastic.
- Spray painting and In foil Moulding Electro Plating Vaccum Metalising.

9. Thermoforming

- Fabrication of egg trays, refrigeration lining and disposable products.

10. Lamination

- Production of industrial Laminates, decorative laminates (Table top)etc.

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DIPLOMA IN CHEMICAL TECHNOLOGY(RUBBER & PLASTICS)
STAFF STRUCTURE

Intake of the Course 60
Pattern of the Course Semester System

Sl. No.	Name of Post	No.	
1.	Principal	1	
2.	H.O.D.	1	
3.	Lecturer Plastic Technology	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 the staff of other disciplines of the Institute may be utilized if possible
2. Qualifications of Staff : as per service rules
3. The staff required for the each institution shall be worked out in accordance with the norms laid down in G.O. No. 2281/Pra. Shi.-3-1989-60(B)/85 Dated June 27, 1989
4. The post of "Computer Programmer" is not needed in the institutions where diploma in "Electronics Engineering" is running.

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SPACE REQUIREMENT

SPACE REQUIREMENT

		No.	M2
	A. Administrative Block		
1.	Prinicipal's room	1	30
2.	Steno room	1	6
3.	Confidential room	1	10
4.	Reception Lounge	1	25
5.	Main Office	1	(.25 Sqm./Student)
6.	Library (common with other disciplines)	1	150
7.	Common room	3	150
	A. Boys Common Room	1	50
	B. Girls Common Room	1	50
	C. Staff Common Room	1	50
8.	Class rooms	2	120
9.	Store (100+0.1xStudent Population)	1	109
10.	Confrence Room	1	75
11.	Head of Department Room	1	15
12.	Lecturer Room		(10 Sqm./Lecturer)
13.	Confidential Office for Examination work	1	25
14.	Estate Office (Security,Campus,Services)	1	25

[B] Academic Block

Sl.No.	Detail of Space	No.	@ Sq.m	Floor Area Sq.m.
1.	Drawing Hall	1	90	90
2.	Physics Lab			75
3.	Applied Chemistry Lab-I/ Polymer Chemistry Lab			60
4.	App. Mechanics Lab.			60
5.	Electrical Engg. & Electronics Lab			75
6.	Unit Operation/Heat & Mass Transfer Lab Over Head Tank 2000 Litre Cap; Under Ground Tank 600 Litre Cap;			120
7.	Fibre Reinforced Plastics Lab.			60
8.	Quality Control & Testing of Plastic Lab			60
9.	Computer Lab (Air Cond.Glass Partition and Special type pvc flooring and false ceiling)			60
10.	Plastic & Rubber Processing Lab			75

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

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	(i) Foundry		75

[D]. Common Facilities

1.	Dispensary	1	75
2.	Canteen, Cooperative Store,Bank Extension Centre, Postal Services etc.	1	150
3.	Parking space		
	A. Cycle Stand	(1 Sqm./Cycle For 25% Students)	
	B. Scooter Stand	(3 Sqm./Scooter For 25% Students)	
	C. Car Garage	(15 Sqm./ Car)	
	D. Bus Garage	(55 Sqm./ Bus)	
4.	N.C.C. block	1	(2 Sqm/Student)
5.	Guest room (with 2 guest rooms and service facility)	1	100

E. Residential Facilities

1.	Hostel for students	1	for 50% boys & 100% girls students to be provided in seperate block)
2.	Staff quarters		
	Principal	1	Type IV
	HOD/Warden	2	Type IV
	Sr. Lect./Lect.	2	Type IV
	Technical/Ministerial staff	4	Type II
	Class IV	6	Type I
3.	Play ground (common)	1	1500-2500 Sqm depending upon availability of land

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/HEAT MASS TRANSFER 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.), Length 500mm (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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PLASTIC AND RUBBER PROCESSING LAB

Experimental models/Prototypes/Lab Models may be purchased in place of costly machines/equipment.

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Hand operated Injection moulding machine 10 gm capacity with thermosetting.	2	4000	8000
2.	Hand operated Injection moulding machine 25 gram capacity.	1	5000	5000
3.	Hand operated compression moulding machine with thermo-state (10 Ton).	1	6000	6000
4.	Automatic Injection Moulding machine (100 T)	1	175000	175000
5.	Automatic Blow moulding machine with blower 1 like.	1	40000	40000

Production Rate	BPH	2800
No ov Cavities	No	2
Max Container Dia	mm	115
Max Container Hight	mm	350
Max Container Volume	Liters	2
Max Neck Size	mm	38
Max Blowing Pressure	Kg/Cm2	40
Length(A+B)	mm	5600
Width(C)	mm	2800
Height(E)	mm	3300
Weight(Approx)	Ton	5.7
Utilities Electrical		
Total Load	KW	38
Heating Load	KW	27
Air Requirement		
Boiling Air	Nm3/Hr	164
Calculated For		2800/H X 1L X 32 Bar
Operation Air	Nm3/Hr	0
Cooling Water Requirements		
Chiller	TR	8
Cooling Tower	TR	15
Production Rate	BPH	2800
No of Cavities	no	2
Max Container Dia	mm	115

6.	Oven (1.2 m. x 0.6 m x 0.8 m) having 3 shelves.	1	10000	10000

Item	Convection Oven
Type	Quarter Size
Overall Length (In.)	21-1/2

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
	Overall Width (In.)	19		
	Overall Height	15-3/4		
	Max. Pan Size (In.)	13 X 9-1/2		
	Cooking Chamber Size H X W X D	9 X 14-1/8 X 11-1/4		
	Holding Capacity	3 Quarter Size Sheet Pans		
	Heat Setting	175-500 Degree F		
	Voltage	120		
	Amps	12		
	Watts	1450		
	Plug NEMA-5-15 P			
	Material	Stainless Steel		
	For Use Width	11U490,11U487		
7.	Embrossing M/c	1	10000	10000
8.	Grinder cum polisher 1 H.P.	1	10000	10000
	HP	1		
	K.W.	0.75		
	Phase	1		
	RPM	2800		
	Wheel Size	250		
	Spindle Size	165		
	Base Size	227/232		
	Base Hole Distance	200/205		
	Overall Length	615		
	Approximate Weight	39 Kg.		
9.	Horizontal Injection machine 30-50 gram capacity hydraulic operated with pyrometic control.	1	400000	400000

Screw Diameter	mm	18 20 22
Injection Pressure	Kgf/Cm3	3252 2634 2177
Theoretical Shot Volume	Cm3	23 28 34
Shot Weight of Injection(PS)	Gram	21 26 31
Injection Rate	Cm3/sec	26.7 32.9. 39.9
Injection Speec	mm/sec	105
Mould Clamping Unit		
Mold Campling Unit	Ton F	30
Mould Clamping Stroke	mm	230
Suggested Mainmum Mold Dim. (H X V)	mm	170 X 170
Mould Thickness	mm	100-300
Distance Between Tie Bars (H X V)	mm	260 X 260
Mould Platen (H X V)	mm	380 X 380
Ejector Stroke	mm	50
Electrical Equipment		
Pump Drive Motor	HP(Kw)	10 (7.5)
Temperature Controller (Range) Set		(0-400oC) X 4
Heater Capacity	KW	3.4
Others		
Machine Diemension (L X W XH)	mm	4100 X 1100 X 1600
Oil Tank Capacity	Liter	140

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
	Machine Weight	Metric Tons	2	
	Max. System Pressure	Kgf/Cm3	140	
10.	Compression moulding machine hydraulic operated 25 ton.	1	40000	40000
11.	Extruder 35 mm. size with motor Catter and take off drive.	1	300000	300000
	Roller Diameter			6" X 15 "
	Roller Rotating Speed (RPM) Slow Roller			20
	Fast Roller			24
	Motor HP			7.5
	Weight of M/C (KG)			7
	Overall Dimension			1000 X 1000
12.	a. Pipe Making Device b. Granular & Cutter divice c. Blown filter device (Take off device)			
13.	Ball Mill	1	100000	100000
14.	Two roll mill.	1	185000	185000
15.	Rotational Moulding M/c	1	150000	150000

Floor Space (Mtrs.)/Off-Set Arm (MM)/Straight Arm (mm)

L	B	H	OMS	OA	OH1	SMS	SA	SH2	SH3
9.5	8	3.1	2300	1200	1725	2300	1400	710	400

16.	Automatic Injection Moulding M/c (100 Ton).	1	400000	400000
	Screw Diameter			32mm
	Shot Volume			150 Cm cube
	Injection Weight			136 g
	Injection Pressure			232 Mpa
	Screw Strock			175 mm
	Screw Speed			210
	Clamping Unit			
	Clamp Tonnage			1000
	Toggle Stroke			340
	Space Between tie bars			375 * 375
	Max Mold Height			400
	Min. Mold Hieight			160
	Ejector Stoke			95
	Ejector Tonnage			30
	Ejector			5
17.	Vacuum Forming M/c	1	65000	65000
18.	Induction Welding M/c	1	300000	300000
	Electronic Induction Coil Welding Spot Welding, Butt Welding, Stitch Welding Seal Welding, Automatically or Semi- Automatically Electronical Induction Coil Laser Welding Machine			

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.

Max Input Power Frequency : 45 W
Frequency : 1-20 KHz
Max Input Current : 68 A
Output Current : 15-95 A
Output Voltage : 70-550V
Input Voltage : 3 Phase 380 V
Duty Cycle : 100%
Timer : 0.1-99.9
Whole System Water Flow >0.2 Mpa > 6L/Min
Power Supply Water Flow >0.2 Mpa > 3L/Min
Max. water Temperature : 40 oC
Water Way : 1 watre inlet, 1 water outlet
Generator weight : 47 KG
Generator Size : 650 X 350 X 550

19.	Plastics Laminating M/c For Films	1	25000	25000
20.	Filament Winding M/c	1	75000	75000
21.	Pultrusion M/c	1	100000	100000

Clamping Force By Pneumatic System
Compressed Air Requirement Approx 10-12 CFM & 5-6 Kg./Sq.Cm Pressure
Grippres 2 or 3 Nos/Carriages
Power Requirements 2.0 to 7.5 Kw for Hydraulid Power Pack (Electrical)
Pulling Capacity 2000 Kgf to 10000 Kgf
Pulling speed 0.08 Meter/Min. to 2.1 Meter/Min.

22.	Semi-Automatic Injection Moulding M/c One ounce	1	25000	25000
23.	Hand operated Blow Moulding M/c Half & One once	1	10000	10000
24.	Semi Automatic Transfer Moulding M/c	1	45000	45000
25.	Twin Screw Extruder For Rigid PVC pipe Plant RC100 Conical Twin Secrew Extruder CE2-65	1	300000	300000

Main Motor : AC Motor
Control System : Siemens PLC Controls downstream synchronization, individual climate control, speed and torque's display
Technical Specification of BCE2-65/132 :
Power : 10Kw
Driving Motor Speed : 1500 RPM
Throughput : Max. 50 - 250 Kg/h
Depends on the formula of PVC, Pipe Geometry and Mold System
Barrel Xones 4
Heating Capacity of barrel zones
Zone 1 = 12.0 Kw
Zone 1 = 7.5 Kw
Zone 1 = 5.0 Kw

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
	Zone 1 = 5.0 Kw Barrel Cooling Zones 3 Adaptor Zone 1 Die Heating Zones 8 Adaopters heating capacity max. 1.1 kw Screw diameter D : 65-132 mm Air capacity of vacuum pump : 40 m3/h Hooper content : 120 d m3 (with visible window)			
26.	Extruder For LDPE Film (30 mm. dia)	1	300000	300000
	Screw Diameter	O55		
	Screw Ratio (L/D)	28:1		
	Heater Capacity(Kw)	11		
	Driving Motor Power (KW	15		
	Temperature Control Pannel	12 Zones		
	Take-up Roller Width (mm)	150 X 500 X 2		
	Take-up Power (kw)	0.55 X 2		
	Take-up Speed (Max.m X Min.)	20-75		
	Die Diameter (mm)	(O) 30-70		
	Air Blower Power (kw)	2.2 X 2		
	Film Width (mm)	80-400		
	Film Thickness (mm)	0.20-0.10		
	Extrusion output (kg/h)	50		
	Assembly Dimension (L X W X Hm)	5 X 2.8 X 3.8		
27.	Compression Moulding Press	1	200000	200000
	Production Range	From 10 Tons to 5000 Tons Pressing Capacity		
	Platen Size	From 10: X 10" To 10' (Feets) X 30' (Feets)		
	Construction	4-Pillars/Ring Type/H-Type/Four Columns Type		
	Operation	PLC controlled/with PLC (Relay/Contractor based)		
	No. of Heating Platens	2 Nos. Standards, Multi Platens can also be provided		
	Cooling arrangement in platens	Should be provided		
28.	Transfer Moulding Press (100 T)	1	100000	100000

- Linear position control
- Work Table
- High speed hydraulic package
- Air-cooled heat exchanger
- Water saver valve for heat exchanger
- Low pressure system
- Clam pressing speed control
- Adjustable fast close control
- Hydraulic part ejector
- Digital dispaly of clamp or transfer force
- Electronic force control
- Fused electrical disconnect
- 7 day timer for heaters
- Alternate safety guarding system

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
-	Extra heat zones in platens			
-	Audible or visual alarms			
-	Temperature controller and plugs for mold heaters			
-	Mold protection package			
-	220, 380 or 575 volt operation			
-	Mould mounting holes in platen			
	Capacity Ton	100		
	Platen Size (MM)	400 X 400		
	Day Light GAP (MM)	400		
	Stroke (MM)	250		
	Bore/Ram Dia (MM)	250		
	Transfer Cyl. Cap (MM)	40		
	Transfer Cyl. Stroke (MM)	150		
	Pressure Kg/Cm2	210		
	Motor HP	5		

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FIBRE REINFORCED PLASTICS LAB

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Bench Grinder	1	2000	2000
2.	Spray machine	1	8000	8000
3.	Pultrusion Machine	1	35000	35000
4.	Consumables	LS/Yr.	1000	1000

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POLYMER CHEMISTRY LAB

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Abbe's Refractometer	2	5000	10000
2.	Centrifuge (Lab Model)	1	3000	3000
3.	Hot Air Oven	2	3000	6000
4.	Mechanical Stress	10	2000	20000
5.	Analytical Balances	10	2000	20000
6.	Physical Balances	2	2000	4000
7.	Water Distillation Unit	1	8000	8000
8.	Water Baths	10	500	5000
9.	Temperature Regulators	5	500	2500
10.	Thermostatic Baths	2	10000	20000
11.	P. H. Meter	1	5000	5000
12.	Heating Mentles Cap 500 ml.	10	500	5000
13.	Ostwald Viscometer	2	5000	10000
14.	Universal Testing M/c (5 Ton)	1	800000	800000

Technical Details :

Technical specification for computer controlled servo hydraulid universal testing machine

Driving Method	Hydraulic
Test Curve Mode	Stress-strain curve

Output parameters from computer : Yield strength, Max Load poiint, breaking strength, tensile strength, deformation, elongation

Maximum Capacity	5 Ton
Load Resolution	20 N or better
Load Accuracy	+ 1% or better
Strain measuring accuracy	+ 1% or better
Speed	2-40 mm/min
Grips for round specimen (mm)	8-30 or better
Grips for flat specimen (mm)	0-20 or better
Beinding distance between rollers(mm)	50-300
Normal diameter for bend test	18 mm to 60 mm

Standard Accessories

Grips for round specimen	2 sets each (minimum)
Grips for flat speciment	2 sets each (Minumum)
Transverse/bending attachment	1 set
Electronic extensometer(Travel 25mm min.)	1 set

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
15.	Izod Impact Testing M/c	1	10000	10000
16.	Chorpy Impact Testing M/c	1	10000	10000
17.	Vicot Softening Temperature Measuring Equipment	2	5000	10000
18.	Melt Flow Index Tester	2	5000	10000
19.	Shore Hardness Tester	1	10000	10000
20.	Falling Dort Impact Tester	1	10000	10000
21.	Abrasion Tester	1	8000	8000
22.	PVC Pipe Testing Machine			
	Long Term	1	10000	10000
	Short Term	1	5000	5000

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QUALITY CONTROL AND TESTING OF POLYMER LAB

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Universal Testing Machine 0-250 Kgs.	1	450000	450000
2.	Conditioning Chamber Thap Con Condition The Specimen To 0oC Temperature (Minimum).	1	150000	150000

Microprocessor based conditioning chamber is an ideal to condition sample prior to testing. The textile conditioning unit is specifically designed to rapidly bring textile samples to the standard condition of 21oC and 65% RH (Tolerance of +2oC and +2% RH). Depending on the weight of the sample.
TECHNICAL SPECIFICATION :

The conditioning chamber is triple walled at the backside and bottom side. Both inner walls are Stainless steel adn outer walls are Mild Steel with powder coated.

The conditioning Chamber is provided with front door with Magnetic Gasket to close the door properly. A glass window is provided to remove Fog for viewing objects.

Cooling assembly consists of CFC free gases "KIRLOSKAR" sealed compressor to give proper temperature with overload protector to cut off the compressor in case of over heating.

Two adjustable perforated shelves for keeping the samples.
Temperature controlled by Digital Temperature Indicator and Controller.
Humidity controlled by Digital Humidity Controller.
Day light arrangement inside chamber to see the samples.
Push type door locking system

Power : 220 Volt AC 50 Hz Single Phase
Temp. Range : 10oC To 60oC
Humidity Range : 40% RH to 95% RH
Accuracy : +2oC and +2% RH
Capacity : 6 CU/FT 170 LTRS
Internal Diamension : 50 X 40 X 85 CMS

3.	Dial Micrometer 0.01 mm.	1	5000	5000
4.	Micro Meter 0.01 mm.	1	5000	5000
5.	Falling Dart Impact Testing Machine For Polythene Film As Per I.S. 2508	1	25000	25000
6.	Specific Gravity Apparatus	1	5000	5000
7.	Stop Watch (0.1 Sec)	1	1500	1500
8.	Steel Scale (60 Cm.)	1	L.S.	1000
9.	Scissor	1		
10.	Cello Tape	1		
11.	Specific Gravity Bottles	1		

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
12.	Chemical Balance/Single Pan Balance (0.1 mg. Sensitvity)	1	80000	80000
13.	Falling Dart Impact Testing Machine For PVC Rigid Pipe.	1	400000	400000
14.	Vicat Saftening Apparatus	1	200000	200000
	TECHNICAL SPECIFICATION			
-	MOC : Inner : S.S. Outer :MS			
-	Sample loading : Station easily raised and lowered manually and locked in position avoiding messy oil spills.			
-	Deflection/Penetration : Measured on dial gauge accurately with the resoulution 0.01 mm			
-	Safety device : Over temperature protection independent of machine control.			
-	Standard Model of 2 station			
-	Load calculating calculator will be supplied			
-	Manual cooling system			
-	Temperature Range : Ambient to 350oC			
-	Resolution : 0.1oC			
-	Accuracy : + 0.1oC			
-	Test Weight - For Vicat : 1 Kg and 5 Kg for HDT : Set of 14 modular binary test weight			
-	Temperature ramp rates : 50oC/h, 120oC/h			
-	Specimen thickness : 13 mm maximum			
-	Fiber stresses : 4.5 Mpa & 1.8 Mpa			
-	Span Supports : 100 mm defaults (Other optional)			
-	Supply : 230 V AC/ 50 Hz			
-	Paint : Powder Coated			
15.	Thermometer (0-300oC)	3	800	2400
16.	Short term & Long Term Internal Hydrostatic Pressure Testing Machine as Per I.S. 4985	1	250000	250000
	TECHNICAL SPECIFICATION			
-	No's of Stations : 8 (others optional)			
-	Pressure Range : 0- 100 bars (others optional)			
-	Resolution : 0.1 bar			
-	Accuracy : 0.25% of sp			
-	Units : Bar			
-	Timer Range : 9999.9 hrs			
-	Supply : 230 V AC/50 Hz			
-	Paint : Powder coated			
17.	Air Compressor (200 lt. to 400 lt)	1	20000	20000
-	Max. Pressure : 10 bar			
-	Max. Pressure (Continuous) : 8 bar			
-	Tank Capacity : 200 Liters			
-	Air Flow : 33, 4 m3/h			
-	Power : 4 KW			
-	Overall dimensions (mm) : 1600 X 520 X 1050 (h)			
-	Weight approx : 125 kg.			
18.	Izod Impact M/c	1	25000	25000
19.	Charpy Impact M/c	1	25000	25000
20.	Glass Meter	1	5000	5000
21.	Hazemeter	1	50000	50000

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
22.	Resilience Tester	1	150000	150000
23.	Shore A Hardness Tester	1	10000	10000
24.	Shore D Hardness Tester	1	25000	25000
25.	Flexural Sterngth Testing M/c Capacity 100 KN Electrical Centre distance between supporting rollers for beam size 150 X 150 X 700=600 mm, 100 X 100 X 500 = 400 mm. Centre distanace between loading for bean size 150 X 150 X 700 = 200 mm 100 X 100 X 500 = 133 mms. Power supply 220 V, Single Phase AC motor	1	150000	150000
26.	Rockwell Hardness Tester	1	60000	60000

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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

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S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
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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LIST OF BOOKS

1. Plastics Materials by Brydson J. A.
2. Plastics Extrusion Technology by Friedhelm Hensen
3. Plastics : Product Design and Process Engineering by Belofsky H.
4. Principle of Polymer Processing by Tadmor, Z and Gogos
5. Melt Rheology and Its Role In Plastic Processing by John F Dealy and Kurt F. Wissburn
6. Fundamental of Polymer Science adn Engineering by Anil Kumar and R. P. Gupta
7. Principle of Polymerzation by G. Odian
8. Text Book of Polymer Science by Bilmeyer F. W.
9. The Role of Additives in Plastics by Mascia, Edword Arnold
10. Basic Engineering Handbook by Michael L. Berions
11. Plastic Processing Data Handbook by Rasato and Rasato
12. Process of Plastic by A. S Athalye
13. Polymer Science & Technology by Premamoy Ghosh
14. Polymer Blends adn Applys by Arends
15. Polymers Science & Technology by Jrfried
16. Plastics Materials by Brydson
17. Engineering Polymers by Dyson
18. Polymer Materials and Processing by Jean Michael Charrier
19. Testing of Plastics by Roger Brown
20. Plastics - Materials and Processing by A Brentsrong
21. Plastics Testing by Vishu Shal
22. Identification of Plastics by Cipet
23. Identification of Plastics by As Athalye.

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ANNEXURE - I

FORMAT FOR INDUSTRIAL TRAINING

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 QUESTIONNAIRE

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

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holders in Chemical Technology (Rubber & Plastic).

PURPOSE: To revise Three Year diploma curriculum in Chemical Technology (Rubber & Plastic).

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 Technology (Rubber &
Plastic).

6.Please give names of modern equipment/machines handled by a diploma holder in Chemical Technology (Rubber & Plastic).

1. 2. 3.

4. 5. 6.

7.What proficiencies are expected from a diploma holder in Chemical Technology (Rubber & Plastic).

1. 2. 3.

4. 5. 6.

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

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

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3. Skill Development ----------%

9.Do you think " on the job training" / Industrial training should form a part of curriculum. (Yes/ No)
if yes then
(a) Duration of training ----------
(b) Mode of training 1. Spread over different semesters

2. After completion of course

3. Any other mode

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

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

11. Mention the capabilities/ Qualities looked for while recruiting diploma holder in Chemical Technology (Rubber & Plastic).
(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 Technology (Rubber & Plastic).

15. In which types of organisations can a diploma holder in Chemical Technology (Rubber & Plastic) can work or serve.

1 2 3

4 5 6

16. Job prospects for the diploma holder in Chemical Technology (Rubber & Plastic) 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 Technology (Rubber & Plastic).

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. Yes/ No
If yes : Please give names of experts in your organisation to whom contact.

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

21. What changes in technologies are to be incorporated in the development of curriculum in Chemical Technology (Rubber & Plastic).

(Signature)

Kindly mail the above questionnaire duly filled to:-

Lal Ji Patel
T. B. O.
Institute of Research,Development & Training,U.P.
Govt. Polytechnic Campus
Kanpur-208024

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

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ANNEXURE III

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

1. To launch and sustain funtional literacy programmes.

2. To train the rural youth in different trades/skills.

3. Training by innovating and improving the efficiency of house hold gadgets.

4. To control and reduce pollution effecting the social fabric of rural life i.e.

   - Construction of Soak Pits and Sanitary Latrines, Tree Plantation, Social Forestry, Installation of Smokeless Chulhas.

5. To disseminate information on sources of non conventional energy. Installation and maintenance of Solar Street Lights, Solar Photovoltaic Pumps, Wind Mills, Bio Gas Plants etc shall be undertaken.

6. Transfer of appropriate Technology/Demonstration of cheap houses by use of locally available material, treatment of mud walls innovation of mud floor, treatment of thatch roofs etc shall be taken with provisions for training to the villagers.

7. Training and demonstration of new agricultural implements, house hold gadgets and appliances of non conventional energy.

8. To help the rural youth in preparing project reports to set up industrial units and entrepreueurial development.

9. All community polytechnics shall render repair and maintenance of agricultural implements, appliances of non conventional energy, household gadgets etc and train the rural youth in such skills.

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