

**Scheme of Teaching and Examination for
IV Semester DIPLOMA in CHEMICAL ENGINEERING**

THEORY

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION SCHEME					
			Periods per Week	Periods in one Session	Hours of Exam.	Terminal Exam. (A) Marks	Final Exam. (B) Marks	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
1	Fuel & Combustion	14401	4	50	3	20	80	100	26	36
2	Chemical Technology-I	14402	4	50	3	20	80	100	26	36
3	Machine Drawing	25403	12	120	4	20	80	100	26	36
4	Industrial Chemical Calculation	14404	5	50	3	20	80	100	26	36
5	Chemical Engineering Thermodynamics	14405	5	50	3	20	80	100	26	36
Total :-			30					500		

PRACTICAL

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION SCHEME					
			Periods per Week	Periods in one Session	Hours of Exam.	Marks Internal Exam. (A)	Marks External Exam. (B)	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
6	Workshop Practice	14406	6	120	6	20	80	100	32	42
7	Pollution Control & Waste Disposal Lab.	14407	6	50	3	10	40	50	16	21
Total :-			12					150		

SESSIONAL

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION SCHEME			
			Periods per Week	Periods in One Session	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject
8	Machine Drawing	25409	-	-	40	60	100	50
Total :-							100	

Total Periods per Week	42	Total Marks	750
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FUEL & COMBUSTION

Subject Code 14401	Theory			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	04	-	-	Internal Exam.	:	20

Rationale & Objective:

Fuel plays an important role in an industry for power generation & for providing process heat. Students will learn about classification of industrial fuel techniques. They will also know different types of industrial furnaces.

S.No.	Topics	Periods
01	Classification of Fuels	(01)
02	Solid Fuels	(22)
03	Liquid Fuels	(07)
04	Gaseous Fuels	(08)
05	Solid, Liquid & Gaseous Fuels	(03)
06	Furnaces	(09)
		(50)

CONTENTS:

TOPIC: 01 – CLASSIFICATION OF FUELS: [01]

- 01.01 Primary fuel
- 01.02 Secondary fuel
- 01.03 Tertiary fuel

TOPIC: 02 – SOLID FUELS: [22]

- 02.01 Physical properties
 - 02.01.01 Bonded constituents in coal
 - 02.01.02 Mineral matter in coal
 - 02.01.03 Classification of coal
 - 02.01.04 Spontaneous combustion of coal
 - 02.01.05 Storage of coal
 - 02.01.06 Briquetting
 - 02.01.07 Characteristics of coal for steam raising
 - 02.01.08 Characteristics of coal for domestic heating
 - 02.01.09 Characteristics of coal for gas making
 - 02.01.10 Characteristics of coal for metallurgical industry
- 02.02 Formation of coal
- 02.03 Analysis & testing of coal
 - 02.03.01 Proximate analysis
 - 02.03.02 Ultimate analysis
 - 02.03.03 Heating value
 - 02.03.04 Ash softening temperature
- 02.04 Carbonisation of coal
 - 02.04.01 Thermal decomposition of coal
 - 02.04.02 The process of carbonisation in by product ovens
 - 02.04.03 Product of coal carbonisation
 - 02.04.04 Properties of coke
- 02.05 Combustion of coal
 - 02.05.01 The process of combustion
 - 02.05.02 Ash & clinker formation
 - 02.05.03 Mechanical stokers
 - 02.05.04 Pulverised coal
 - 02.05.05 Excess air and flame temperature calculation

- 02.06 Miscellaneous solid fuels
- 02.06.01 Petroleum coke
- 02.06.02 Peat
- 02.06.03 Wood
- 02.06.04 Charcoal
- 02.06.05 Straw
- 02.06.06 Bagasse

TOPIC: 03 – LIQUID FUELS: [07]

- 03.01 Petroleum
- 03.02 Distillation
- 03.03 Pyrolysis
- 03.04 Polymerisation
- 03.05 Paraffins
- 03.06 Crude oil

TOPIC: 04 – GASEOUS FUELS: [08]

- 04.01 Description of various fuels
- 04.02 Producer gas
- 04.03 Water gas
- 04.04 Carburetted water gas

TOPIC: 05 – SOLID, LIQUID AND GASEOUS FUELS: [03]

- 05.01 General properties
- 05.02 Relative importance
- 05.03 Field of utility

TOPIC: 06 – FURNACES: [09]

- 06.01 Classification of furnaces
- 06.02 Parts of furnaces
- 06.03 Strength and durability of furnaces
- 06.04 Important furnaces
- 06.05 Waste heat recovery
- 06.06 Temperature control

Books Recommended:

Text Books

- 1. Engineering Chemistry - Uppal, M.M. Khanna
- 2. Fuel & Combustion - Kumar and Wadhva

Reference Books

- 1. Fuel & Their Combustion - R.T. Haslam McGraw Hill
- 2. Fuel - J.J. Brame & J.G. King Dward Aronold
- 3. Industrial Furnaces Vol. I & II - W. Trinks, John Willy
- 4. Fuel & Combustion - Sarker
- 5. Fuel Furnaces and Refractory - O.P. Gupta, Khanna
- 6. Engineering Chemistry - Jain & Jain S. Chand

CHEMICAL TECHNOLOGY-I

Subject Code 14402	Theory			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	04	-	-	Internal Exam.	:	20

Rationale:

Process technology of manufacture of various chemicals is essential for working in any chemical industry for diploma holders in Chemical Engineering. The knowledge of commercial production processes of various chemicals and different parameters is the basic requirement to work as operators/ supervisors in chemical industry.

Objective:

The objective of the syllabus is to make the students conversant with commercial processes and steps involved in these processes. The student must understand the effects of various parameters on production rate, quality and cost.

S.No.	Topics	Periods
01	Industrial Manufacture of Acids	(14)
02	Fertilizer Industries	(14)
03	Cement	(08)
04	Water	(14)
		(50)

(Technology and process involved in the commercial manufacturing of the above topics with respect to the flow sheets and symbols used in it. Conversion yield and byproducts, study of reaction kinetics such as temperature, pressure, concentration catalysts etc. are needed.)

CONTENTS:

TOPIC: 01 – INDUSTRIAL MANUFACTURE OF ACIDS: [14]

- 01.01 Hydrochloric Acid
- 01.02 Nitric Acid
- 01.03 Phosphoric Acid
- 01.04 Sulphuric Acid

TOPIC: 02 – FERTILIZER INDUSTRIES: [14]

- 02.01 Ammonia
- 02.02 Urea
- 02.03 Complex Fertilizer
- 02.04 Ammonium Sulphate & Ammonium Nitrate
- 02.05 Superphosphate

TOPIC: 03 – CEMENT: [08]

- 03.01 Definition
- 03.02 Composition & types
- 03.03 Uses
- 03.04 Portland Cement Manufacture

TOPIC: 04 – WATER: [14]

- 04.01 Sources of Water
- 04.02 Hard and Soft Water
- 04.03 Requisites of industrial water and its uses
- 04.04 Methods of water treatment
- 04.05 Resins used for water softening
- 04.06 Recycling of water

Books Recommended:

Text Books

- 1 Outlines of Chemical Technology - C.E. Dryden Affiliated, East West Press

Reference Books

- 2 Industrial Chemistry - E.R. Riegel Reinhold
- 3 Inorganic Process Industries - K.A. Kobe Macmillan
- 4 Chemical Process Industries - R.N. Shreve Mc Graw Hill
- 5 Chemical Technology - Faith

MACHINE DRAWING

Subject Code 25403	Theory			No of Period in one session : 120		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	12	-	-	Internal Exam.	:	20

Rationale:

For a technician to work efficiently he must have a very sound knowledge of drawing. The main objective of framing syllabus of Machine Drawing is to make the technician well trained in drawing, so that he may be able to work in different fields such as in industry, department of sales or services or in the department of drawing and design etc.

Objective:

By going through the contents student will be able to:

- (i) Understand drawing and develop capacity to represent any matter/object with the help of picture.
- (ii) Develop primary knowledge of working drawing.
- (iii) Produce orthographic drawing of different machine parts.
- (iv) Develop skill to produce assembly drawings.
- (v) Develop skill to produce detailed drawings of machines parts from assembly drawing.

<u>S. No.</u>	<u>Topics</u>	<u>No. of sheets</u>	<u>Periods</u>
01	Introduction	(01)	(09)
02	Free Hand Sketching of Machines Parts	(01)	(24)
03	Riveting	(01)	(09)
04	Nuts and Bolts	(01)	(06)
05	Conversion of Isometric Views into Orthographic Projection.	(01)	(18)
06	Sectional Views	(01)	(09)
07	Assembling of Different Machine Parts from Disassembling Views.	(01)	(21)
08	Disassembling of Machine Parts from Assembled Views	(01)	(24)
			120

CONTENTS:

TOPIC: 01 – INTRODUCTION: 1 Sheet

- (i) Different types of lines
- (ii) Different materials – Ferrous, non ferrous, atone, bricks, wood.

TOPIC: 02 – FREE HAND SKETCHING OF MACHINE PARTS: 1 Sheet

- (i) Rules of free hand sketches & its use.
- (ii) Concept of Sectioning, full sectioning, half sectioning, part sectioning. Sketching of different machine parts i.e. knuckle joint, cotter joint, coupling (flange & flexible, universal).
- (iii) Bearing (All types i.e. journal, bush, foot step etc.), Fast & loose pulley.– (Not to the scale).

TOPIC: 03 – RIVETTING: 1 Sheet

Introduction of shapes of rivet heads. Caulking & fullering, pitch. Diagonal pitch, margin, back pitch etc. types of riveting (lap & butt joint, zig & chain structure).

TOPIC: 04 – NUTS & BOLTS: 1 Sheet

Classification of nuts, terminology used in the drawing of nuts & bolts. Drawing of orthographic projections (Top view, Front view & Side view) of a bolt, imperial relations of dimensions of nut & bolt w.r.t. bolt head dia.

TOPIC: 05 – CONVERSION OF ISOMETRIC VIEW INTO ORTHOGRAPHIC PROJECTION (GENERAL): 1 Sheet

TOPIC: 06 - SECTIONAL VIEWS: 1 Sheet

Orthographic Sectional View of Piston of 2 stroke & 4 stroke I.C. Engine.

TOPIC: 07 - ASSEMBLING OF DIFFERENT MACHINE PARTS FROM DISASSEMBLED

VIEWS:

Expansion joint, cross head of steam engine, steam stop valve big end of connecting rod.

1 Sheet

TOPIC: 08 - DISASSEMBLING OF MACHINE PARTS FROM ASSEMBLED

ASSEMBLED VIEWS:

Knuckle joint, Flanged coupling, bushed bearing I.C. engine parts.

1 Sheet

(At least 8 sheets should be done in sessional).

Books Recommended:

- | | | |
|----|-----------------|--------------------|
| 1. | Machine Drawing | - N.D. Bhatt |
| 2. | Machine Drawing | - P.S. Gill |
| 3. | Machine Drawing | - Mittal & Agrawal |
| 4. | Machine Drawing | - Nagpal |

INDUSTRIAL CHEMICAL CALCULATION

Subject Code 14404	Theory			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	05	-	-	Internal Exam.	:	20

Rationale & Objective:

The gaining of skill in solving practical engineering problems is very important. Keeping in view the design problems the application of certain industrially important principles of chemistry and physics prove their utilities. It is required to have intensive quantitative training in the practical applications of the principles of physical chemistry to the solution of complicated industrial problems and in methods of predicting missing physico-chemical data from generalised principles. The students will be able to learn the applications of general physical chemistry, thermophysics, thermochemistry, laws of thermodynamics, material balance & energy balances.

S.No.	Topics	Periods
01	Mathematical Procedures	(03)
02	Stoichiometric and Composition Relation	(05)
03	Behaviour of Ideal Gases	(05)
04	Vapour Pressure	(03)
05	Humidity and Saturation	(07)
06	Solubility and Crystallization	(07)
07	Material Balance	(10)
08	Thermophysics	(03)
09	Thermochemistry	(07)
		(50)

CONTENTS:

TOPIC: 01 – MATHEMATICAL PROCEDURES:

[03]

- 01.01 Solution of equation by trial and error procedures
- 01.02 Solution of simultaneous equation
- 01.03 Graphical Integration
- 01.04 Graphical Differentiation
- 01.05 Log-Log Graph
- 01.06 Semi-logarithmic Graph Paper
- 01.07 Triangular Diagrams
- 01.08 Conversion numeric values
- 01.08.01 Conversion of units
- 01.08.02 Conversion of equations
- 01.08.03 Dimensionless groups & constants

TOPIC: 02 – STOICHIOMETRIC & COMPOSITION RELATIONS:

[05]

- 02.01 Conservation of Mass
- 02.02 Stoichiometric Relations
- 02.03.01 Nature of chemical compounds
- 02.03.02 Mass Relations in chemical reactions
- 02.03.03 Volume Relations in chemical reactions
- 02.03 The Gram-Atom and Pound-Atom
- 02.04 The Gram-Mole and Pound-Mole
- 02.05 Relation between Mass & Volume for gaseous substances
- 02.06 Use of Molal Units in computations
- 02.07 Excess Reactions
- 02.08 Degree of completion
- 02.09 Basis of calculation
- 02.10 Methods of expressing the composition of mixture of solutions.
- 02.10.01 Weight percent & volume percent
- 02.10.02 Mole fraction & Mole percent
- 02.10.03 Atomic fraction & Atomic percent
- 02.10.04 Mass of material per unit mass of reference substance
- 02.11 Density & specific gravity

TOPIC: 03 – BEHAVIOUR OF IDEAL GASES:

[05]

- 03.01 Standard conditions
- 03.02 Gas densities and specific gravities
- 03.03 Gaseous Mixtures
- 03.04 Laws of Dalton & Amagat

- 03.05 Average Molecular Weight of a gaseous mixture
- 03.06 Densities of gaseous mixtures
- 03.07 Volume changes with change in composition
- 03.08 Pure component volume method
- 03.09 Partial Pressure method
- 03.10 Gases in chemical reactions

TOPIC: 04 – VAPOUR PRESSURES:

[03]

- 04.01 Vaporization
- 04.02 Boiling Point
- 04.03 Effect of temperature on Vapour Pressure
- 04.04 Vapour Pressure plots
- 04.05 Raoult's Law

TOPIC: 05 – HUMIDITY & SATURATION:

[07]

- 05.01 Partial Saturation
- 05.02 Vaporization Processes
- 05.03 Condensation
- 05.04 Wet and Dry-bulb thermometry
- 05.05 Humidity chart

TOPIC: 06 – SOLUBILITY & CRYSTALLIZATION:

[07]

- 06.01 Dissolution of crystallization
- 06.02 Supersaturation
- 06.03 Dissolution
- 06.04 Crystallization

TOPIC: 07 – MATERIAL BALANCE:

[10]

- 07.01 Process involving chemical reactions
- 07.02 Recycling operations

TOPIC: 08 – THERMOPHYSICS:

[03]

- 08.01 Internal Energy & External Energy
- 08.02 Heat and Work
- 08.03 Heat Capacity of gases
- 08.04 Specific Heats of Gases, hydrocarbons
- 08.05 Mean Heat capacities of gases
- 08.06 Heat capacities of solids

TOPIC: 09 – THERMOCHEMISTRY:

[07]

- 09.01 Standard heat of reaction
- 09.02 Heat of formation
- 09.03 Law of thermochemistry
- 09.04 Standard heat of combustion
- 09.05 Heat of formation calculated from heat of combustion
- 09.06 Standard heat of reaction calculated from heat of formation
- 09.07 Standard heat of reaction calculated from heat of combustion

Books Recommended:

Text Books

- 1 Chemical Process Principles, Part-I - Ollalf A. Hodgen & Kennel M.M. Watson, Asia Publicity House, New Delhi
- 2 Industrial Stoichiometry - Lewis, Radasch and Lewis McGraw Hill
- 3 Material Energy Balances - Wiley

Reference Books

- 4 Solved Examples in Chemical Engineering - G.K. Roy Khanna Publishers, New Delhi
- 5 Stoichiometry for Chemical Engineering - Williams & Johnsons McGraw Hill
- 6 Stoichiometry - Bhatt & vkora
- 7 Manual of Process Engineering Calculations - G.S. Clarke
- 8 Process Calculations - K. Kammermeyer & J.O. Osburn Prentice Hall

CHEMICAL ENGINEERING THERMODYNAMICS

Subject Code 14405	Theory			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	05	-	-	Internal Exam.	:	20

Rationale & Objective:

The objective of this subject is to provide an introduction to the principles and applications of thermodynamics for students of Chemical Engineering which is a highly important tool of great practical value. Thermodynamics provides a mean of evaluating a wide range practical results and conclusions through a network of equations and definitions.

It is mainly concerned with:

- (i) Heat and work requirement for chemical & physical changes.
- (ii) Work obtainable from power cycles.
- (iii) Determination of equilibrium conditions both for chemical and physical processes.

S.No.	Topics	Periods
01	Introduction	(04)
02	The First Law & Other Basic Concepts	(08)
03	Volumetric Properties of Fluids	(12)
04	Heat Effects	(10)
05	The Second Law of Thermodynamics	(10)
06	Properties of Steam	(06)
		(50)

CONTENTS:

TOPIC: 01 – INTRODUCTION:

[04]

- 01.01 The scope of thermodynamics
- 01.02 Fundamental Quantities
- 01.03 Time
- 01.04 Length
- 01.05 Mass
- 01.06 Force
- 01.07 Temperature
- 01.08 Secondary Quantities
- 01.09 Volume
- 01.10 Pressure
- 01.11 Work
- 01.12 Energy
- 01.13 Heat

TOPIC: 02 – THE FIRST LAW & OTHER BASIC CONCEPTS:

[08]

- 02.01 Joule's experiment
- 02.02 Internal energy
- 02.03 Formulation of the First Law of Thermodynamics
- 02.04 The thermodynamic state and state functions
- 02.05 Enthalpy
- 02.06 The steady state flow process
- 02.07 Equilibrium
- 02.08 The Reversible process
- 02.09 Heat Capacity & Specific Heat

TOPIC: 03 – VOLUMETRIC PROPERTIES OF PURE FLUIDS:

[12]

- 03.01 The PVT behavior of pure substances
- 03.02 The ideal gas
 - 03.02.01 Constant Volume (isometric) process
 - 03.02.02 Constant Pressure (isobaric) process
 - 03.02.03 Constant Temperature (isothermal) process
 - 03.02.04 The adiabatic process
 - 03.02.05 The polytrophic process
- 03.03 Vander Waals Equation of state

TOPIC: 04 – HEAT EFFECTS:

[10]

- 04.01 Heat capacities of Gases as a function of temperature
- 04.02 Heat capacities of Solids & Liquids
- 04.03 The Standard Heat of Reaction
- 04.04 The Standard Heat of Formation
- 04.05 The Standard Heat of Combustion
- 04.06 Effect of Temperature on Standard Heat of Reaction
- 04.07 Heat Effects of Industrial Reaction

TOPIC: 05 – THE SECOND LAW OF THERMODYNAMICS:

[10]

- 05.01 Statement of the Second Law
- 05.02 The Heat Engine
- 05.03 The thermodynamic temperature scale
- 05.04 The Carnot Cycle
- 05.05 Concept of Entropy
- 05.06 Second Law Limitation and Real Process
- 05.07 Entropy change and Irreversibility

TOPIC: 06 – THERMODYNAMIC PROPERTIES OF FLUIDS:

[06]

- 06.01 Thermodynamic properties
- 06.02 Relationship among thermodynamic properties for constant composition.
- 06.03 Thermodynamic properties of a single-phase system.
- 06.04 Maxwell Equations.
- 06.05 Thermodynamic properties of a homogeneous phase of constant composition as a function of two intensive variables.

Books Recommended:

Text Books

- 1 Introduction to Chemical Engineering Thermodynamics - J.M. Smith & H.C. Van Ness
McGraw Hill Publications

Reference Books

- 1. Engineering Thermodynamics with Applications - David Burghardt Harper International Edition
- 2. Chemical Engineering Thermodynamics - G.N. Pandey & S.C. Chaudhary Khanna Publishers
- 3. Chemical Engineering Thermodynamics - B.F. Dodge McGraw Hill Publications

WORKSHOP PRACTICE

Subject Code 14406	Practical			No of Period in one session : 120		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	-	-	06	Internal Exam.	:	20

Rationale & Objective:

A Diploma holder technician should get more opportunity to know about machines, equipments & its operations which will help to be more confident & practical.

S. No.	Topics	Periods
A	Machine Shop	
B	Welding Shop	
C	Foundry Shop	
D	Fitting Shop	

CONTENTS:

TOPIC: A – MACHINE SHOP:

- A.01 Safety precautions, Machine cleaning, checking, making ready for operation. Selection of tools, preparing it in ready condition (tool sharpening)
- A.02 Lathe:
Setting of job on three jaws, four jaw check, centering, tool/tools fitting, adjustment of tail stocks (if required).
Practice of operations: Turning, facing, taper turning on sample jobs. Job configuration checking,
Preparing a job by above processes (Sessional Preparation)
- A.03 Shaper:
Study of quick return mechanism.
Repair of faults (minor) in machines.
Tool setting on Ram.
Practice of feed depth of cut, no. of pass on sample job.
Preparation of V block on a sample job.
- A.04 Drilling:
Checking of drill bit.
Making of sample blind hole.
Making hole in a tapered job/V block.

TOPIC: B – WELDING SHOP:

- B.01 Safety precautions, handling of tools & equipment.
- B.02 Gas welding: Flame adjustment, practical on welding, soldering & brazing on two parts (sample job).
- B.03 Electric welding:
(i) Flame adjustment, use of electrodes on jobs (T- shape, L-shape), Coarse & fire welding.
(ii) Preparation of chair & grill.

TOPIC: C – FOUNDRY SHOP:

(Pattern, Molding & Cutting)

- C.01 Tools, cope, drag. Different types of pattern – introduction & use.
- C.02 Preparation of foundry sand.
- C.03 Demonstration & handling of mould (A sample mould should be prepared by teacher/Institute)
- C.04 Preparation of different types of moulds using single piece, spit or any available pattern – at least 3 moulds should be prepared by each student.
- C.05 Taking photographs of different moulds prepared by students.
- C.06 Non-Fe Casting of one of the above.

TOPIC: D – FITTING SHOP:

- D.01 Tools – Introduction & its use.
- D.02 Different processes (Sawing, filing, drilling, tapping, dieing, scraping, reaming etc.)
- D.03 Different types of fitting – Round fitting, Square fitting, Triangular fitting etc.
- D.04 Use of above D. 02 & D.03 on sample jobs, L-shape, T-shape etc.
- D.05 Practical Use of fitting.
- D.06 Preparation of threads in pipes using tap & die – sessional preparation.

POLLUTION CONTROL & WASTE DISPOSAL LAB

Subject Code 14407	Practical			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	50
	L	T	P/S	Annual Exam.	:	40
	-	-	06	Internal Exam.	:	10

Rationale & Objectives:

As far as Chemical Industries are concerned, the Industrial pollution and waste disposals are burning problems which have become prominent during recent years. The balance is to be maintained for the survival of mankind. Chemical pollutants and industrial wastes are more hazardous so it is required to train the students for analyzing the different parameters for controlling the pollution. The students will learn the various techniques of analysis and determination of different of water, air and industrial, effluent.

CONTENTS:

- 01 To determine the chemical oxygen demand (COD) of the given sample of water.
- 02 To determine the dissolved oxygen of given sample.
- 03 To treat a given phenol effluent and determine the content of phenol before and after the treatment.
- 04 To determine the concentration of mercury in as effluent containing mercuric salt.
- 05 To determine the concentration of sodium in the given sample.
- 06 To determine the Biological Oxygen Demand (BOD) of the given sample.
- 07 Determination of dust particles in the ambient air.
- 08 To determine the concentration of SO₂ and Co in the work room.
- 09 Measurement of emission from stack.
- 10 Measurement of noise level in work zone area.

LIST OF THE MACHINES & EQUIPMENTS FOR POLLUTION CONTROL AND WASTE DISPOSAL LAB

Sl. No.	Name	Specification	Qty.
1	C.O.D. Apparatus	3.6 kw power supply	2
2	Dissolved Oxygen meter	--	1
3	Spectrophotometer	Spectrophotometer 106	2
4	Photoelectricmeter	Photoelectric Calometer	1
5	Flame Photometer	Flame Photometer burner unit	12
6	BOD incubator	0, 25 KW power supply	1
7	High Volume Air Sampler	Power supply 0.375 KW	1
8	Stack Samgeler Kit	as per recomant atom of NEERI	1
9	Noise level meter	30 to 150 dba	1
10	Murcuric Analyzer	0.1 ug/li sec	1
11	Ion selective Analyzer	For NH ₃ , Hg, Heavy Metals	1

MACHINE DRAWING

Subject Code 25409	Sessional			No of Period in one session : -		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	60
	-	-	-	Internal Exam.	:	40

Rationale & Objective:

A Diploma holder technician should be able to command the concepts of machines through vigorous practice by copying, plotting, orthographic-isometric conversion, different fastening devices, assembly & disemby etc.

<u>Sl, No.</u>	<u>Topics</u>	<u>No. of Sheets</u>
01	Introduction	(01)
02	Free Hand Sketching of Machines Parts	(01)
03	Riveting	(01)
04	Nuts and Bolts	(01)
05	Conversion of Isometric Views into Orthographic Projection.	(01)
06	Sectional Views	(01)
07	Assembling of Different Machine Parts from Disassembled Views	(01)
08	Disassembling of Machine Parts from Assembled Views	(01)
		8 Sheets