 MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																
COURSE NAME : DIPLOMA IN CHEMICAL ENGINEERING																
COURSE CODE : CH																
DURATION OF COURSE : 6 SEMESTERS										WITH EFFECT FROM 2009-10						
SEMESTER : FIFTH										DURATION: 16 WEEKS						
PATTERN : FULL TIME										SCHEME : E						
SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									
				TH	TU	PR	PAPER HRS	TH (01)		PR (04)		OR (08)		TW (09)		SW (16005)
								MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1	Heat Transfer Operation	HTO	12204	03	--	04	3	100	40	50#	20	--	--	25@	10	50
2	Energy Management	EMA	12205	02	--	02	3	100	40	--	--	--	--	25@	10	
3	Chemical Reaction Engineering.	CRE	12206	03	01	--	3	100	40	--	--	--	--	--	--	
4	Plant Safety and Maintenance	PSM	12207	02	--	02	3	100	40	--	--	--	--	25@	10	
5	Chemical Instrumentation and Process Control	CIP	12208	02	--	02	3	100	40	50#	20	--	--	25@	10	
6	Industrial Project and Entrepreneurship Development	IPE	12209	01	01	02	--	--	--	--	--	--	--	25@	10	
7	Professional Practice -V	PPR	12210	--	--	05	--	--	--	--	--	--	--	50@	20	
TOTAL				13	02	17	--	500	--	100	--	--	--	175	--	50
Student Contact Hours Per Week: 32 Hrs. THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH. Total Marks : 850 @ Internal Assessment, # External Assessment, No Theory Examination.																
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work.																
<ul style="list-style-type: none"> ➤ Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW). ➤ Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms. ➤ Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code. 																

Course Name : Chemical Engineering Group

Course Code : CH

Semester : Fifth

Subject Title : Heat Transfer Operation.

Subject Code : 12204

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	04	03	100	50#	--	25	175

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

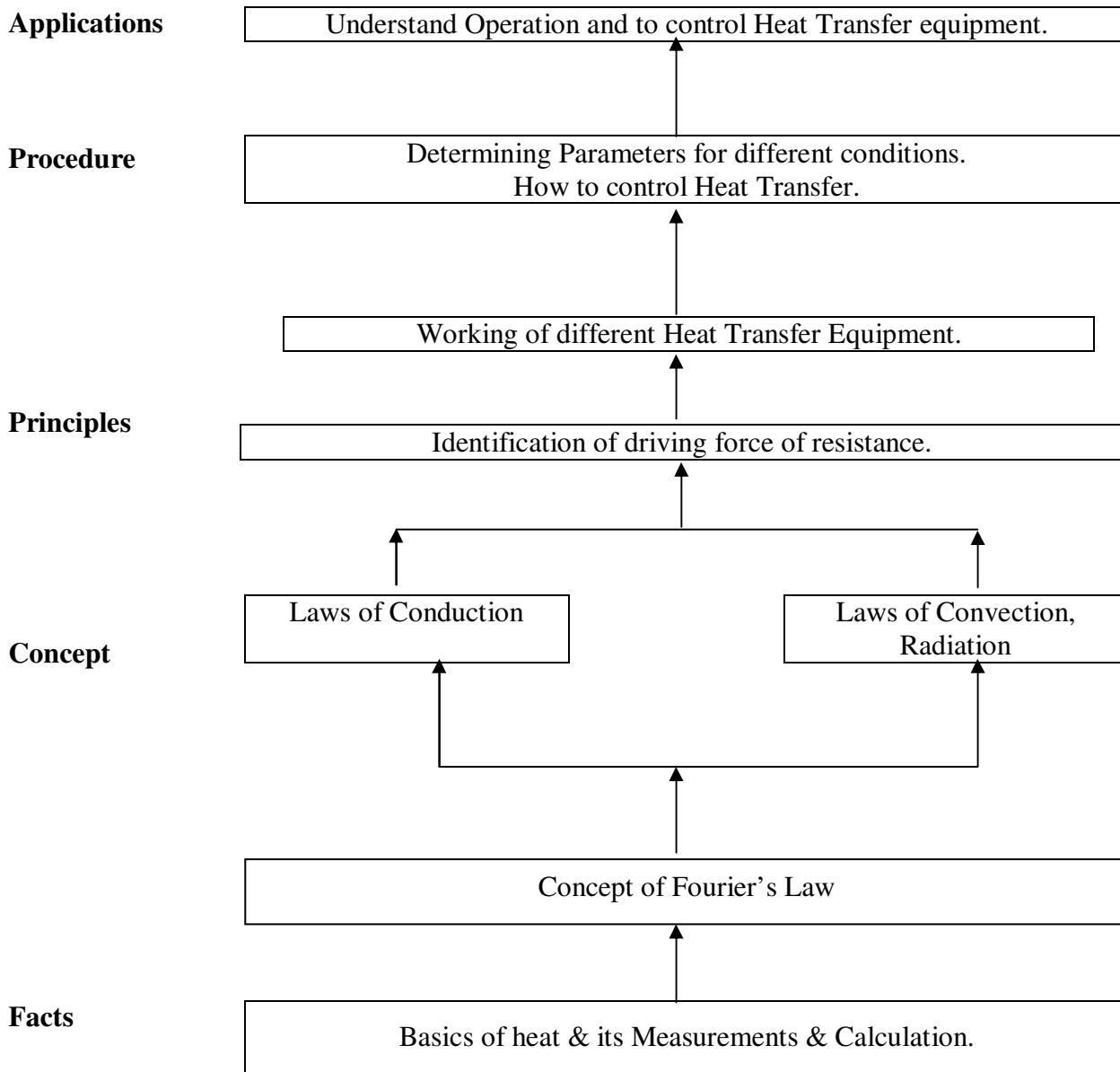
The subject gives the knowledge of measurement of fluid flow and various fluid transportation machinery. The knowledge gained by this subject is directly used in different subjects studied in Chemical Engineering. The knowledge of this subject helps in installation of different fluid flow and fluid transportation machinery.

Objectives:

The Student will be able to:

1. Calculate the amount of heat loss through flat wall, cylinder and sphere.
2. Study film coefficient, overall heat transfer coefficients.
3. Calculate the amount of radiation between the plates.
4. Compare and study construction, working and application of various types of heat transfer equipment.
5. Analyse an evaporator problem and to calculate the material and energy requirement of an evaporator.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
1	<p>CONDUCTION</p> <p>1.1 Introduction- Modes of Heat Transfer (Conduction, Convection, Radiation)</p> <ul style="list-style-type: none"> Fourier's Law, Steady state conduction, Conduction through Rectangular block, Compound resistances in series, Problems. 8 Marks <p>1.2 Conduction through cylinder, Sphere, concept of log mean radius for thick walled cylinders, Problems on the above topic.</p> <ul style="list-style-type: none"> Variation of Thermal conductivity with temperature, Problems. Optimum Thickness of Insulation- Concept and Definition. 12 Marks 	10	20
2	<p>CONVECTION.</p> <p>2.1 Natural & Forced Convection.</p> <ul style="list-style-type: none"> Definition of Film concept in heat transfer by convection. Film coefficient and its comparison with Thermal Conductivity. Derivation of Overall Heat Transfer coefficient from hot fluid to cold fluid through a metal wall. Effect of surface coefficient on overall heat transfer coefficient. Dimensional analysis for heat transfer for understanding the use of Reynolds number, Prandtl number, nusselt number and Grashoff number in calculating film coefficient. 20 Marks <p>2.2 Calculating heat transfer in Laminar and Turbulent flow by ittus Bolter & Sider Tate Equation.</p> <ul style="list-style-type: none"> Co-current and Counter current Heat Exchanger. Their comparison and the concept of Log Mean temperature difference and its derivation, Problem. Significance of Heat transfer coefficient in boiling liquid and condensing vapors. Dropwise and Film wise condensation. 20 Marks 	14	40
3	<p>Radiation.</p> <ul style="list-style-type: none"> Definition of Kirchoff's law. Statement and equation of Plank's law, Stefan Boltzman law. Absorptivity, Reflectivity, Transmissivity, Black body, Gray body, emissivity. Radiation between two surfaces. 8 Marks 	03	08
4	<p>Heat Transfer Equipments</p> <p>Description with sketches and construction details of the following Heat Exchangers.</p> <ul style="list-style-type: none"> Double pipe Heat Exchanger. Shell & Tube – Multi pass Heat Exchanger. 	10	16

	<ul style="list-style-type: none"> • Plate type heat exchanger. • Graphite block heat exchanger. • Extended surface heat exchanger. • Scrapped surface heat exchanger. • Advantages & disadvantages of multi pass heat exchanger • Problems on Heat Exchangers <p style="text-align: right;">16 Marks</p>		
5	<p>Evaporation.</p> <ul style="list-style-type: none"> • Evaporation as a Unit Operation, Comparison of Evaporation, Drying, Distillation. • Properties that influences evaporation, capacity and economy of evaporator, Problems. Method to improve economy, feeding of multiple effect evaporator, mechanical recompression, thermal recompression. • Material and Enthalpy balance for Single effect evaporator, Problems based on this topic. • Detail study of construction and working of open pan evaporator, Horizontal tube evaporator. Vertical tube evaporator, long tube vertical evaporator, Forced circulation evaporator. <p style="text-align: right;">16 Marks</p>	11	16
TOTAL		48	100

Practicals:

Skills to be developed:

Intellectual Skills:

- a. To calculate the Physical property (thermal conductivity) of material.
- b. To calculate the rate of heat flow through different materials.
- c. To calculate the overall heat transfer coefficient.

Motor Skill:

- a. To operate different types of heat exchange.
- b. To control the operating parameters of heat exchange.

List of Practicals:

1. To find the thermal conductivity of material at different temperatures.
2. To calculate the rate of heat loss through composite wall.
3. To calculate the overall heat transfer coefficient for finned tube heat exchanges.
4. To calculate the overall heat transfer coefficient for shell and tube heat exchanges.
5. To calculate the overall heat transfer coefficient for double pipe heat exchanges.

6. To calculate the emissivity of a material.
7. To calculate heat transfer coefficient for natural and forced convection.
8. Measures various parameters controlled in a heat exchanger using process simulator.

Learning Resources:**Books:**

Sr. No.	Name of Book	Name of Author	Name of Publisher
1.	Introduction to Chemical Engg.	Mr. Walter L. Badger & Mr. Julius T. Bachero	Mc Graw Hill International.
2.	Unit Operations of Chemical Engineering.	McCabe, W. L. Smith & Harriot.	Mc Graw Hill International.
3.	Process Heat Transfer	Kern D.Q.	Mc Graw Hill International.

Course Name : Chemical Engineering Group

Course Code : CH

Semester : Fifth

Subject Title : Energy Management

Subject Code : 12205

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
02	--	02	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

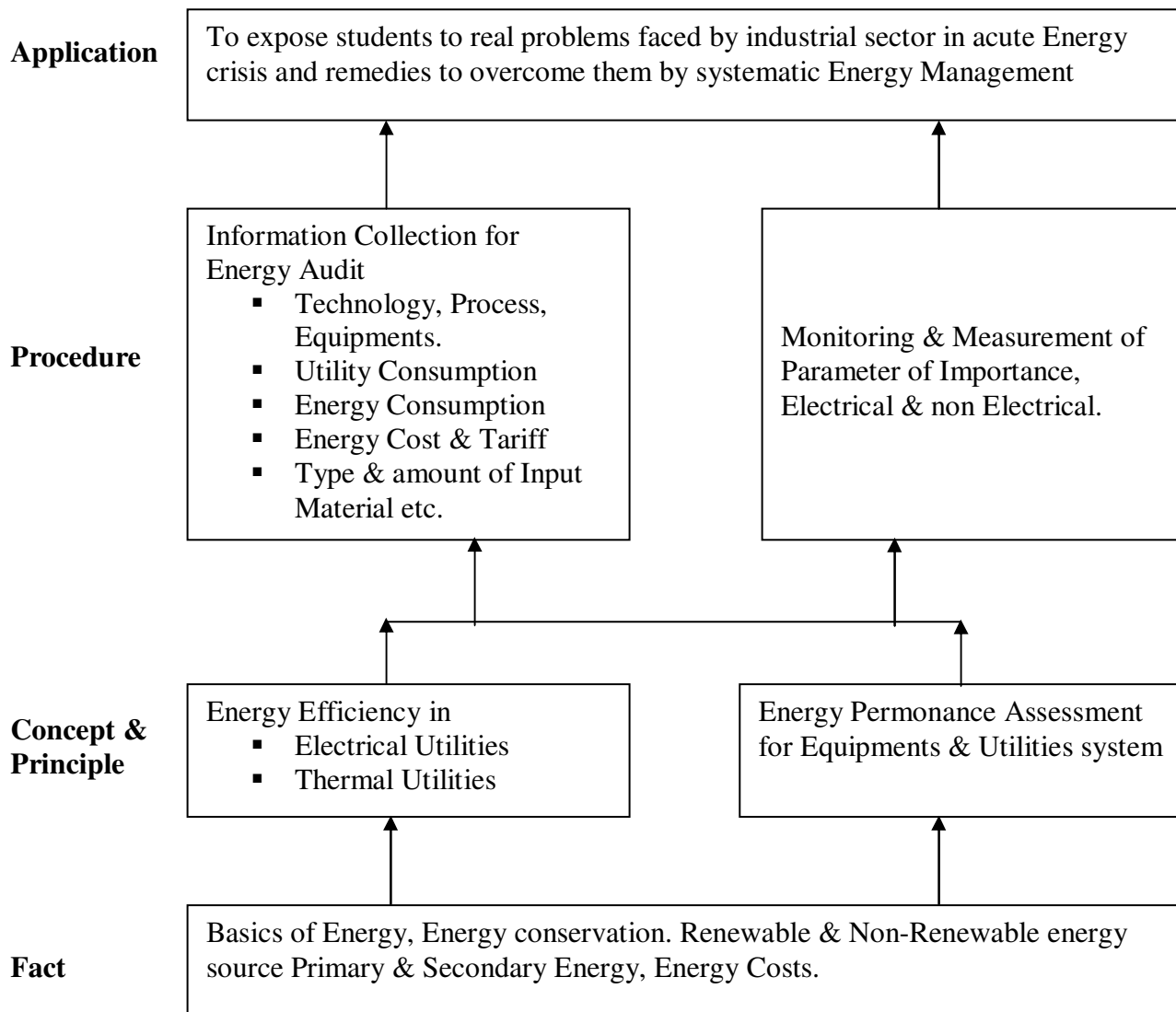
Today's energy management challenges are much more dynamic than they were in the past. Industries are facing acute energy crisis. On one hand they are caught with scarcity of electric supply, and on the other, the ever increasing cost of energy. Hence energy management is an essential and unavoidable activity in most of the industrial sector. The subject details with systematic energy management and energy audit.

Objectives:

The student will be able to

1. To understand the general energy scenario & various provisions of the Energy Conservation Act, 2001.
2. To perform basic effective energy audit report.
3. To prepare an effective energy audit report.
4. To judiciously select equipments from energy efficiency perspectives.
5. To identify the application of non-conventional & renewable energy the process.

Learning Structure:



Contents: Theory

Chapter	Contents	Hours	Marks
1	Energy Scenario 1.1 Classification of Energy 1.2 Indian Energy Scenario 1.3 Energy Security? 1.4 Energy Conservation and it's importance. 1.5 Energy conservation Act, 2001.	04	12
2	Basics of Energy 2.1 Electrical basics- <ul style="list-style-type: none"> • DC & AC current , Power Factor (PF). • Load Management, Electricity Tariff 2.2 Thermal basics- <ul style="list-style-type: none"> • Types of Heat, Heat Capacity, Heat Transfer, Modes of Heat Transfer • Fuels, Contents of Fuel, Calorific Value of Fuel 	04	16
3	Energy Audit & Monitoring 3.1 Types of Energy audit. 3.2 Understanding Energy Costs. 3.3 Benchmarking and Energy Performance. Energy monitoring & Targetting.	08	16
4	Energy Efficiency in Electrical & Thermal Utilites. 4.1 Pumps & Pumping system. 4.2 Cooling towers 4.3 Fuel & Combustion. 4.4 Energy efficient Technologies.	08	24
5	Energy Performances Assessment 5.1 Water pumps 5.2 Heat Exchangers..	04	16
6	Non-Conventional & Renawable Energy Sources. 6.1 Solar Energy. 6.2 Wind Energy. 6.3 Bio Energy. 6.4 Hydro Energy. 6.5 Tidal & Ocean Energy.	04	16
TOTAL		32	100

Practical:**Skills to be developed****Intellectual Skills:**

- Ability to identify and select proper instruments for measuring parameter of importance.
- Ability to prepare energy audit report & present it.

Motor Skills:

- Ability to measure parameter of importance in electrical & non electrical system.
- Ability to acquire Hands-on experience.

Practicals:**Experiment/Assignment/Presentation:-**

- 1) To measure the parameters of importance other than electrical such as temperature / Air & Gas flow / Liquid flow / revolutions per minute / noise & vibration / dust concentration etc.
- 2) To measure basic electrical parameters in AC & DC system – Voltage / Current / Power Factor / Active power / Apparent power / Energy consumption etc.
- 3) To Prepare preliminary audit report for any organization Considering following points.
 - i) Energy Consumption in the Organization.
 - ii) Scope of Saving.
 - iii) Identify the mostly and the easiest areas of attention.
 - iv) Identify immediate improvements/ saving etc.
- 4) To collect information for detailed audit report such as.
 - i) Energy consumption by department, type of Energy.
 - ii) Energy Cost and Tariff data.
 - iii) Process and Material flow diagram.
 - iv) Sources of Energy supply.
 - v) Material balance data.
 - vi) Capacity Utilisation etc.
- 5) To Prepare detailed Energy audit report for any Organisation.
- 6) Report Presentation with case studies on any one topic in Energy Management.
- 7) Visit to any industrial sector where energy Management Policy is Implements.
- 8) To Collect Information about Energy Management Policy of any 2 Companies using web source.

Learning Resources:**a) Books**

Sr. No.	Author	Name of Book	Publisher
1	--	Guide book for Nation Certification Examination for Energy Managers & Energy Auditors Book 1 to 4	Bureau of Energy Efficiency, New Delhi.
2	Robert L. Loftness	Energy Handbook	Non Nostrand Reinhold Compnay

b) Web Source

- (i) www.bp.com/centres/energy.
- (ii) www.epa.org
- (iii) www.calculator.org/properties.html
- (iv) www.eeca.govt.nz
- (v) www.energyusernews.com/
- (vi) www.bce-india.nic.in

Course Name : Chemical Engineering Group

Course Code : CH

Semester : Fifth

Subject Title : Chemical Reaction Engineering

Subject Code : 12206

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	01	--	03	100	--	--	--	100

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

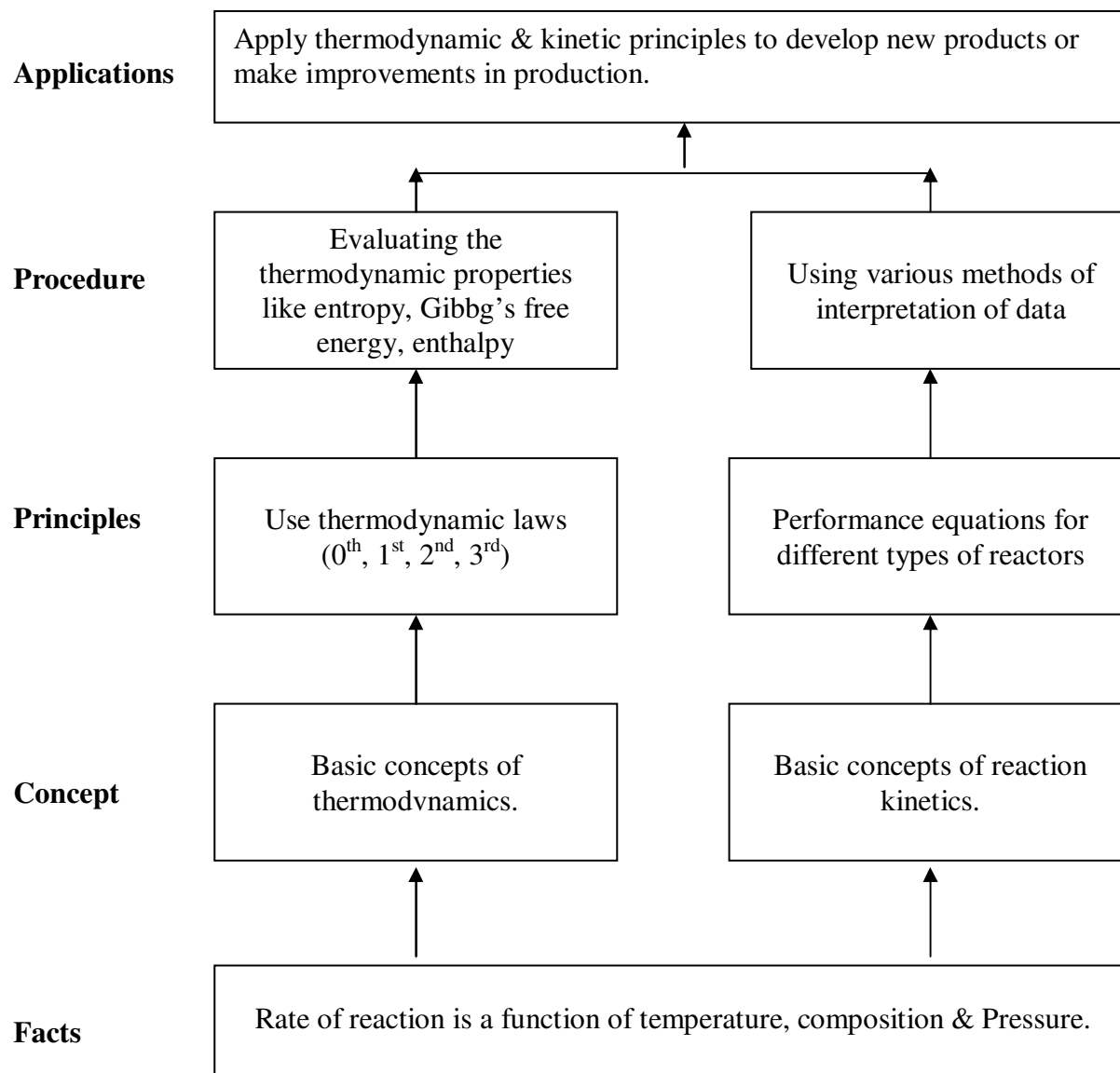
Rationale:

This subject outlines the basic principles of kinetics. These principles which are useful in developing new concept and operating the plant. It enables the students to have an idea about the different types of reactors and it's design also gives knowledge about the importance of catalyst in various chemical processes in the industries.

Objectives:

After studying this subject student will be able.

1. To know the laws of thermodynamics.
2. To know about rate of chemical reaction.
3. To understand various types of reactors.
4. To know the fundamentals of reactor design.

Learning Structure:-

Contents: Theory

Chapter	Name of the Topic	Hours	Marks
1	<p>Thermodynamics</p> <p>1.1 General basic terms used:</p> <ul style="list-style-type: none"> • Thermodynamics, System, Surrounding, State and path functions, Intensive and extensive properties, Cyclic process, equilibrium process, Heat and work as form of energy. • First law of Thermodynamics. • Second law of Thermodynamics. • Third law of Thermodynamics, Zeroth law of thermodynamics. • Concept of internal energy, enthalpy, entropy • Calculation of entropy changes for ideal gas process (derivation). • Concept of free energy, Chemical potential • Feasibility of chemical reaction from free energy change. (10 Marks) <p>1.2 Relation between Gibbs free energy change and equilibrium constant (derivation).</p> <ul style="list-style-type: none"> • Relation between k_p, k_c and k_y. (derivation) • Van't Hoff equation (derivation) , Variation of equilibrium constant with temperature at constant pressure, Variation of equilibrium constant with pressure at constant temperature. • Extent of reaction (Derivation). Variation of extent of reaction with temperature at constant pressure, Variation of extent of reaction with pressure at constant temperature • No problem from thermodynamics. (12 Marks) 	13	22
2	<p>Introduction to Chemical kinetics.</p> <p>2.1 Concept of rate of reaction, rate equation, rate constant, order of reaction, Molecularity of reaction, Chain reaction, Non chain reaction. (08 Marks)</p> <p>2.2 Type of intermediate formed in non chain reaction.</p> <p>2.3 Single reaction multiple reaction, elementary reaction and non-elementary reaction.</p> <p>2.4 Theories of reaction rates constant.</p> <ol style="list-style-type: none"> Arrhenius law & Problems based on it. From Thermodynamics. From Collision theory. From Transition state theory. Activation Energy. (14 Marks) 	08	22
3	<p>Interpretation of batch reactor data.</p> <p>3.1 Concept of Batch reactor data, constant and variable volume reactions (concept of Σ i.e., fractional change in volume). Problem to calculate Σ for reactions.</p>	13	22

	<p>3.2 Analysis of total pressure data.</p> <p>3.3 Integral and Differential method of analysis of batch reactor data. (10 Marks)</p> <p>3.4 Integral method of analysis for constant volume irreversible unimolecular first order reaction, bimolecular second order reaction, n^{th} order, zero order and auto catalytic reaction. Problem based on constant volume irreversible zero order, first order and second order reactions. (08 Marks)</p> <p>3.5 Half-life concept for the overall order of irreversible reactions and problem based on that.</p> <p>3.6 Differential method- Partial analysis of rate equation (method of isolation, method of excess, method of least square, method of initial rates). (04 Marks)</p>		
4	<p>Introduction to reactor design</p> <p>4.1 Types of reactors</p> <ul style="list-style-type: none"> • (Batch reactor, Continuous reactor, Plug flow reactor, Mixed flow reactor, Biological reactor, Fixed (packed) bed reactor, fluidized bed reactor. • Concept of space-time, space velocity and holding time • Performance equation for ideal batch reactor, mixed flow reactor and plug flow reactor for constant volume irreversible first order reaction. Problems based on the above topic. (14 Marks) <p>4.2 Size comparison of the reactors</p> <ul style="list-style-type: none"> • Batch reactors vs PFR (For first order reactions) • PFR vs MFR (For constant volume irreversible first order reactions) and Problems based on the above topics. • Multiple reactor systems <ul style="list-style-type: none"> a. Equal size MFR in series. b. Different size MFR in series. (Finding final conversion for given system and finding the best system for achieving desired conversion.) c. PFR in series. d. PFR in parallel. e. PFR in parallel-series combination and problems based on that. f. Reactors of different type in series. (12 Marks) 	12	26
5	<p>Catalysis.</p> <p>5.1 Definition, types and classification.</p> <p>5.2 Preparation of catalyst, ingredients (Promoters, inhibitor, accelerator)</p> <p>5.3 Catalyst Poisoning, regenerator.</p> <p>5.4 Theories of catalysis- Adsorption.</p> <p>5.5 Desired properties of catalyst.</p>	02	08
TOTAL		48	100

LIST OF ASSIGNMENTS:

SR. NO.	TOPIC	NO. OF HRS
1	Introduction to chemical kinetics Problems on Arrhenius law and activation energy.	02
2	a) Problems on unimolecular first order reaction. b) Problems on bimolecular second order reaction. c) Problems on half life. d) Problems on zero order reaction.	01 02 02 01
3	Introduction to reactor design (Find volume & conversion) a) Problems on batch reactor. b) Problem on Plug flow reactor. c) Problem on CSTR. d) Problems on multiple reactor (Find volume & conversion) 1) PFR in series – parallel combination. 2) MFR in series. 3) MFR – PFR series parallel combination.	01 01 02 01 01 02
Total		16

Learning Resources:**Books:**

Sr. No.	Name of Book	Name of Author	Name of Publisher
1.	Chemical Reaction Engineering	Octave Levenspiel	Wiley Eastern Ltd.
2.	Chemical Engineering Kinetics	J. M. Smith	Mc Graw Hill Publication
3.	Chemical Engineering Thermodynamics	J. M. Smith H. C. Vanness	Mc Graw Hill
4.	Thermodynamic for Chemists	Samuel Glasstone	East Wet Pvt. Ltd.

Course Name : Chemical Engineering Group

Course Code : CH

Semester : Fifth

Subject Title : Plant Safety and Maintenance

Subject Code : 12207

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
02	--	02	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

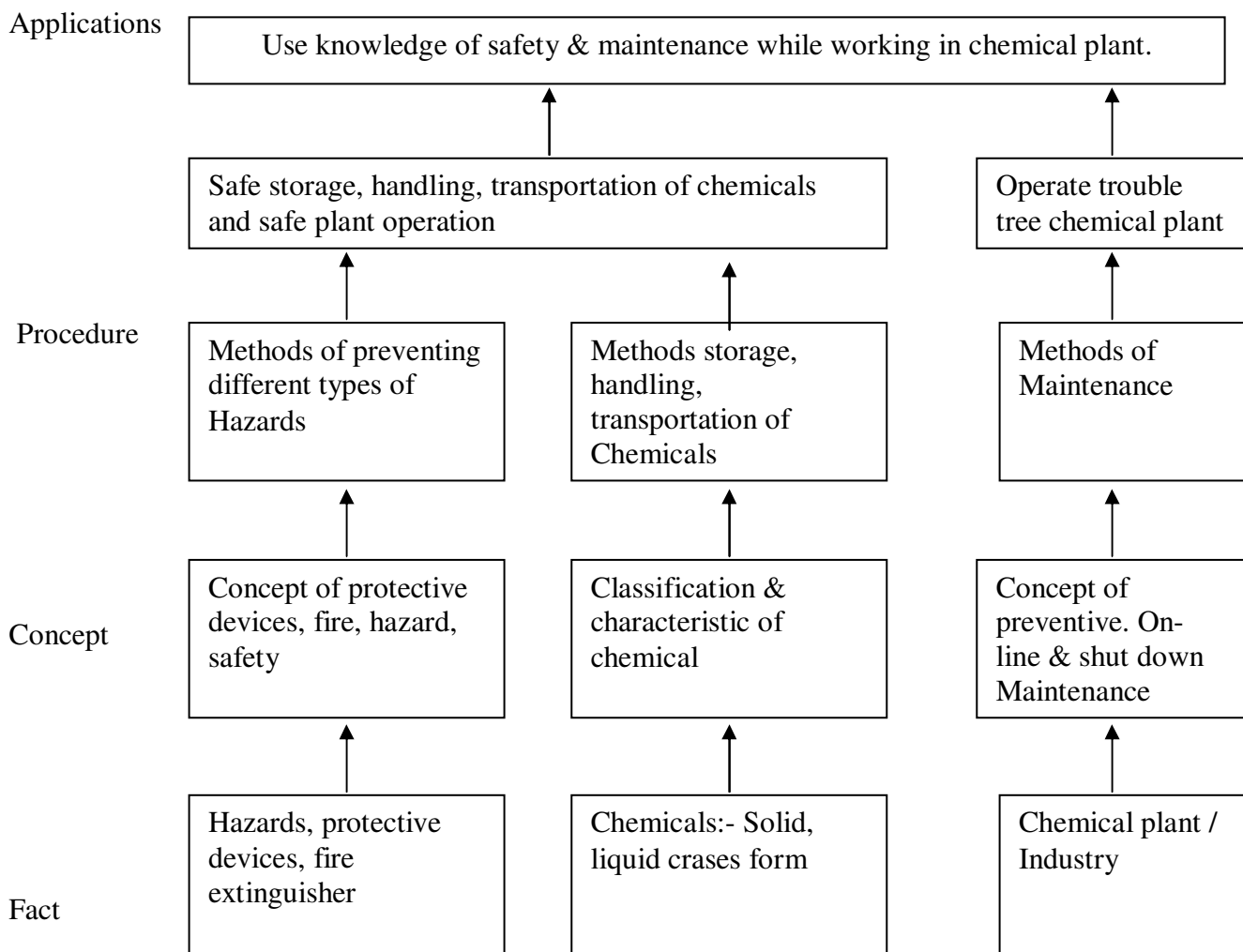
In the chemical process industry plant safety is important. Knowledge of plant safety is essential to prevent accidents and damages while working in plant. Maintenance of plant and machinery is one of the most important aspects of process industry. This subject deals with safe practices, various types of maintenance and their significance.

Objectives:

The students will be able to:

1. Describe the safety procedures to be observed while working in a plant.
2. Identify types of hazards associated in a chemical process industry.
3. Prepare safety audit report & safety report.
4. Explain procedure for preventive maintenance, on-line maintenance, shut down maintenance.

Learning Structure :



Contents: Theory

Chapter	Topics	Hours	Marks
1	Plant Safety 1.1 Importance & objectives of safety 1.2 Safety in chemical industry 1.3 Criteria for setting & layout of chemical plant. 1.4 Instrumentation for safe plant operation.	04	08
2	Plant Hazards 2.1 Chemical hazards, Toxic hazards, Explosion hazard, Electrical hazards, Mechanical hazards, Radiation hazards, Noise hazards. (08) 2.2 Control, precautions & prevention, Safety measures in plant. (08)	05	16
3	Personal Protective Equipment 3.1 Respiratory equipment 3.2 Non-respiratory equipments.	03	12
4	Fire Prevention 4.1 Classification of fires. Causes of fire. 4.2 Prevention of fire: Portable extinguishers, Water systems, carbon-di-oxide systems, foam extinguisher system, dry chemical extinguisher systems.	03	12
5	Storage & Transportation of chemicals 5.1 Different methods of storage 5.2 Characteristics of chemical with special reference to safe storage & handling of chemicals. 5.3 Layout of storage 5.4 Various modes of transport 5.5 Safety precautions in transportation of different types of chemicals.	05	16
6	Safety Audit 6.1 Objective of safety audit 6.2 Procedure for safety auditing 6.3 Audit report, Safety report.	03	08
7	Plant Maintenance 7.1 Concepts of maintenance, Preventive maintenance, ON-line Maintenance. (16) 7.2 Shut down Maintenance, Procedure for startup, Commissioning and shut down of plant. (12)	09	28
TOTAL		32	100

Practicals:

Intellectual Skills:

- Proper selection of personal protective devices, fire extinguishers, storage devices, Transportation system.
- Analyze the potential hazards & take corrective measures.

- Prepare plant layout based on safe plant operation.
- Prepare on-site & off site emergency plans, Fire Prevention check list.
- Prepare safety audit report, safety report.
- Prepare maintenance schedule.

Motor Skills:

- Proper handling of personal protective devices, fire extinguishers.
- Adopt safe procedure while handling & storing chemicals.
- Ability to acquire hands-on experience in handling emergencies, trouble shooting of chemical plant problem.

List of Experiments:

- 1) Demonstration and practice in the use of personal protective devices.
- 2) Demonstration and practice in the use of fire extinguishers.
- 3) Prepare plant setting and layout of chemical plant.
- 4) Prepare safety Audit report for a given plant.
- 5) Prepare fire prevention check list.
- 6) Prepare checklist of potential hazards in chemical plants.
- 7) Analyse case studies of major Industrial disasters.
- 8) Prepare Preventive Maintenance chart for given equipment.
- 9) Prepare PERT-Chart for shutdown maintenance for given plant.
- 10) Fault finding and repairing of given equipment used in process plant.

Learning Resources:**Books:**

Sr. No	Name of the Book	Author	Publication
1.	Safe Handling of Hazardous Chemical	A.K. Rohatgi	J.K. Enterprises, Bombay
2.	Safety & Accident prevention in Chemical operation	H.H Faucet & W.S. Wood	Interscience Publishers of Jhon Wiley & Sons, New York
3.	Safety in Process Plant Design	G.L. Wells	John Wiley & Sons.
4.	Industrial Safety Handbook	William & Handley	McGraw Hill
5.	Plant Maintenance	S.S. Apte	Delhi Productivity Council
6.	Maintenance Engineer's Handbook	C.L. Morrow	McGraw Hill

Video Cassettes / Posters on Safety:

- 1) Loss prevention Association of India Ltd.
Warden House, Sir P.M. Road,
Mumbai – 400 001
- 2) National Safety Council
Plot No. 98A, Sector – 15,
Industrial Area, CBD Belapur, Navi Mumbai – 400 614

Course Name : Chemical Engineering Group

Course Code : CH

Semester : Fifth

Subject Title : Chemical Instrumentation & Process Control

Subject Code : 12208

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
02	--	02	03	100	50#	--	25@	175

NOTE:

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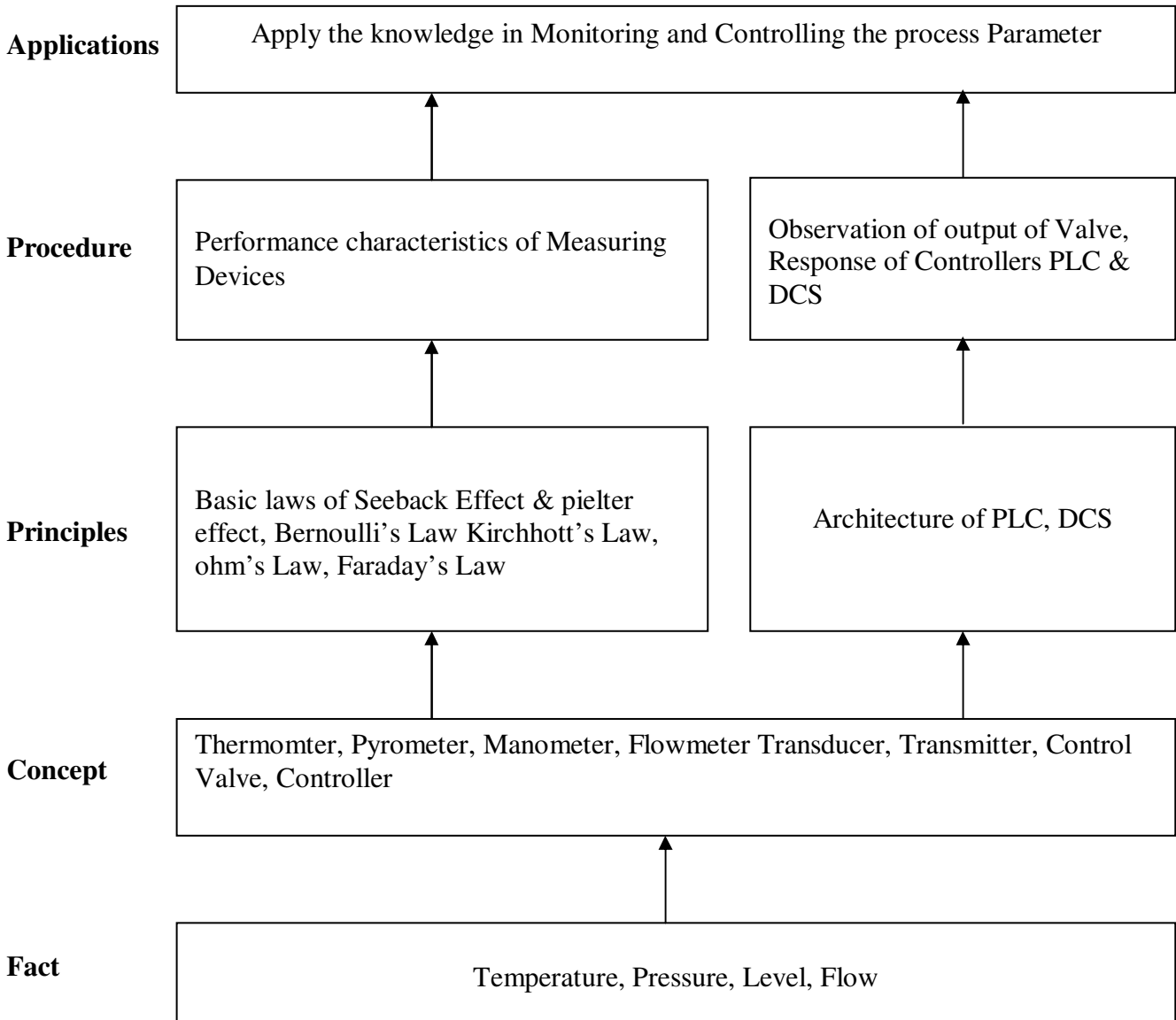
Rationale:

Monitoring and control of processes is an important activity of Chemical Engineer. The subject deals with measurement principles of process parameters like temperature, pressure, level flow. With knowledge of this subject student will be able to control the process parameter as per the desired value for the optimization of the process.

Objectives: The students will be able:

1. To learn the operating principles, construction and working of temperature, pressure, level and flow measuring devices.
2. To select the most suitable measuring device based on its performance characteristics for specific measuring task.
3. To test, Calibrate, Maintain process control elements.
4. To know the use of Controllers, PLC & DCS in process Industry.

LEARNING STRUCTURE:



Theory Contents:-

Chapter	Topics	Hours	Marks
1	Measurement Systems 1.1 Measurement and its aim 1.2 Measurement system element 1.3 Static characteristics Calibration, Accuracy, Precision, Repeatability, Drift, Sensitivity, Resolution, Dead zone, Static error. 1.4 Dynamic Characteristics Speed of response, fidelity, lag, Dynamic error.	01	04
2	Temperature 2.1 Temperature Scales;- Centigrade, Kelvin, Fahrenheit, Rankine Methods of Temperature Measurement. 2.2 Expansion Thermometer- Bimetallic thermometer, Glass thermometer 2.3 Filled-system Thermometer- Gas, liquid & Vapour 2.4 Electrical Temperature Instruments- RTD, thermocouple & thermistor 2.5 Pyrometer- Optical & Radiation	05	14
3	Pressure 3.1 Units of Pressure Methods of Pressure Measurement 3.2 Manometers- U tube, Well type 3.3 Elastic Pressure Transducer- Bourdon tube, Bellows, Diaphragm 3.4 Force-balance Pressure Gauges- Dead weight tester, Bell type 3.5 Electrical Pressure Transducer- Strain gauge, capacitive, LVDT 3.6 Measurement of Vacuum- Capsule, McLeod gauge	05	14
4	Level Methods of Liquid level Measurement 4.1 Direct Methods: Sight Glass, Float, Displacer. 4.2 Indirect Methods: Pressure gauge, Air Bellow, Air purge, Radioactive, Ultrasonic, Capacitive. 4.3 Solid level Measurement.	03	12
5	Flow Methods of flow Measurement 5.1 Inferential Flow Measurement- <ul style="list-style-type: none"> • Variable head- flow nozzles, Variable area- Piston type, Magnetic meter, Turbine meter, Vortex- Swirl meter, Ultrasonic flow meter- Time difference type 5.2 Quantity Flow meter: <ul style="list-style-type: none"> • Positive displacement meters- Nutating disc meters, Rotating vane meter, • Metering Pump- Peristaltic pump • Mass Flow meters: Gyroscopic Flowmeter, Thermal flowmeter. 	05	16
6	Process Control System & Controllers 6.1 Open, closed loop system, cascade control system.	05	14

	6.2 System input step, ramp, sinusoidal, pulse. 6.3 Control Action -On-Off, proportional, integral, derivative. 6.4 Controllers <ul style="list-style-type: none"> • Pneumatic Controllers- P, PI, PD, PID • Electronic Controllers - P, PI, PD, PID 		
7	Control Valve 7.1 Valve characteristics.- Linear, Equal %, Quick opening 7.2 Valve types- single seated, Double seated 7.3 Valve actuators. 7.4 Valve positioners. 7.5 Valve selection and sizing.	04	14
8	Computer-Aided Measurement & Control System 8.1 Elements of computer-aided measurement and control. 8.2 Computer aided process control Architecture- Distributed Digital Control Architecture. 8.3 Man-machine Interface (MMI). 8.4 Computer- aided process control hardware. 8.5 Programmable Logic controller (PLC) Architecture. 8.6 Distributed Control System (DCS) Architecture.	04	12
TOTAL		32	100

PRACTICALS:**Intellectual Skills:**

- To verify the principles, laws, using given measuring instruments under different conditions.
- To read and interpret the graph.
- To interpret the results from observations and calculations.

Motor Skills:

- Proper handling of measuring devices.
- Measuring physical quantities accurately.
- To observe the phenomenon and to list the observations in proper tabular form.
- To adopt proper procedure while performing the experiment.
- To plot the graphs.

List of Practicals:

- 1) Measurement of temperature using thermocouple or RTD or thermistor and to find their characteristics.
- 2) Measurement of high temperature using radiation or optical pyrometer
- 3) Measurement of pressure using LVDT or strain gauge transducer

- 4) Calibration of pressure gauge using Dead Weight Tester or study of Measurement of level using air purge or capacitance type level detector or level swithes.
- 5) Measurement of flow using magnetic flow meter or ultrasonic flow meter or rotating vane flow meter or turbine wheel flow meter.
- 6) Determine the characteristics of ON- OFF or proportional or proportional integral or proportional derivative or proportional integral derivative controller.
- 7) Determine the characteristics of control valve or study of valve positioners/ actuators.
- 8) Practice plant operating skills like start up and shutdown of plant, analyze normal operating conditions, attend any malfunction operate the plant safely using DCS / PLC based process simulator on any two unit operations.

Learning Resources:

Sr. No.	Name of the Book	Author	Publication
1.	Industrial Instrumentation and control	S.K.Singh	Tata McGraw Hill publishing company Ltd
2.	Instrumentation	Franklyn Kirk & Nicholas Rimboi	D.B.Taraporevala Sons & Co Private Ltd
3.	Industrial control and Instrumentation	W. Bolten	Universities Press (India) Ltd
4.	Process control	Peter Harriott	Tata McGraw Hill Publishing Company Ltd

Course Name : Chemical Engineering Group

Course Code : CH

Semester : Fifth

Subject Title : Industrial Project and Entrepreneurship Development

Subject Code : 12209

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	01	02	--	--	--	--	25@	25

- Notes:**
1. Two practical hours are for industrial project
 2. One theory and one tutorial hours are for Entrepreneurship Development (EDP). Twenty five marks for term work are for report prepared under EDP

Content:

PART A) Industrial Project

Following activities related to project are required to be dealt with, during this semester

1. Form project batches & allot project guide to each batch. (Max. 4 students per batch)
2. Each project batch should select topic / problem / work by consulting the guide & / or industry. Topic / Problem / work should be approved by Head of department.
3. Each project batch should prepare action plan of project activities & submit the same to respective guide .
4. At the end of semester, each project batch should submit the action plan and abstract of the project along with list of materials required if project involves fabrication or other facilities required in other kinds of project.
5. Action Plan should be part of the project report.

Part B: Entrepreneurship Development**Rationale:**

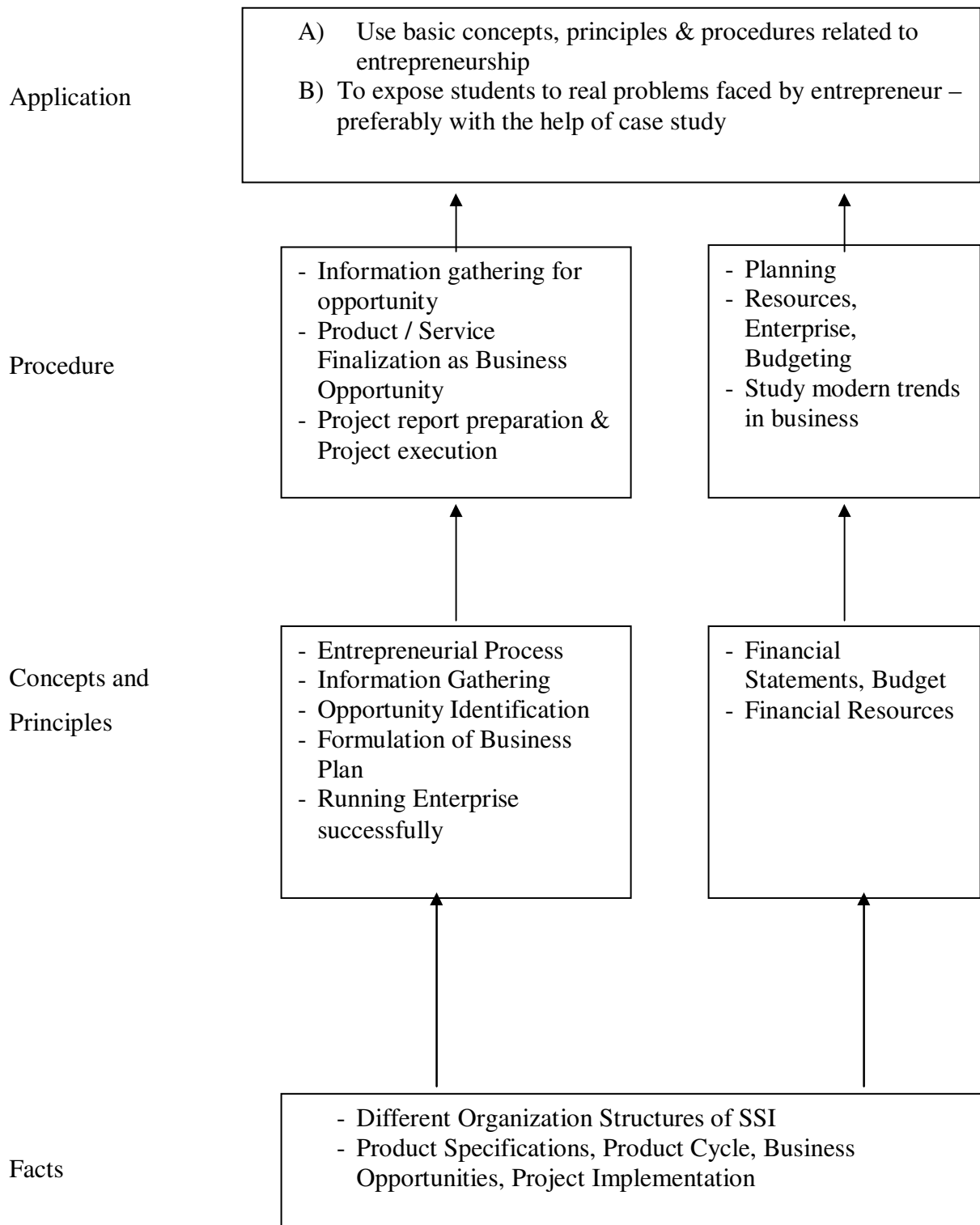
Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white-collar jobs. The educational institutions should also demonstrate their uniqueness in the creation of enterprising personalities in their colleges. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

Objectives:

Students will be able to

- 1) Identify entrepreneurship opportunity.
- 2) Acquire entrepreneurial values and attitude.
- 3) Use the information to prepare project report for business venture.
- 4) Develop awareness about enterprise management.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours
01	<p>Entrepreneurship, Creativity & Opportunities</p> <p>1.1) Concept, Classification & Characteristics of Entrepreneur</p> <p>1.2) Creativity and Risk taking. 1.2.1) Concept of Creativity & Qualities of Creative person. 1.2.2) Risk Situation, Types of risk & risk takers.</p> <p>1.3) Business Reforms, 1.3.1) Process of Liberalization. 1.3.2) Reform Policies. 1.3.3) Impact of Liberalization. 1.3.4) Emerging high growth areas.</p> <p>1.4) Business Idea Methods and techniques to generate business idea.</p> <p>1.5) Transforming Ideas in to opportunities transformation involves Assessment of idea & Feasibility of opportunity</p> <p>1.6) SWOT Analysis</p>	03
02	<p>Information And Support Systems</p> <p>2.1) Information Needed and Their Sources. Information related to project, Information related to support system, Information related to procedures and formalities</p> <p>2.2) Support Systems 1) Small Scale Business Planning, Requirements. 2) Govt. & Institutional Agencies, Formalities 3) Statutory Requirements and Agencies.</p>	03
03	<p>Market Assessment</p> <p>3.1) Marketing -Concept and Importance 3.2) Market Identification, Survey Key components 3.3) Market Assessment</p>	02
04	<p>Business Finance & Accounts</p> <p>Business Finance</p> <p>4.1) Cost of Project 1) Sources of Finance 2) Assessment of working capital 3) Product costing 4) Profitability 5) Break Even Analysis 6) Financial Ratios and Significance</p> <p>Business Account</p> <p>4.2) Accounting Principles, Methodology 1) Book Keeping 2) Financial Statements 3) Concept of Audit,</p>	03

05	<p>Business Plan & Project Report</p> <p>5.1) Business plan steps involved from concept to commissioning: Activity Recourses, Time, Cost</p> <p>5.2) Project Report</p> <p>1) Meaning and Importance 2) Components of project report/profile (Give list)</p> <p>5.3) Project Appraisal</p> <p>1) Meaning and definition 2) Technical, Economic feasibility 3) Cost benefit Analysis</p>	03
06	<p>Enterprise Management And Modern Trends</p> <p>6.1) Enterprise Management: -</p> <p>1) Essential roles of Entrepreneur in managing enterprise 2) Product Cycle: Concept And Importance 3) Probable Causes Of Sickness 4) Quality Assurance 5) Importance of Quality, Importance of testing</p> <p>6.2) E-Commerce</p> <p>Concept and process</p> <p>6.3) Global Entrepreneur</p>	02
Total		16

Sr. No	Assignments
1	Assess yourself-are you an entrepreneur?
2	Prepare project report and study its feasibility.

Learning Resources:**1. Books:**

Sr.No.	Name of Book	Author	Publisher
1	Entrepreneurship Development	E. Gorden K.Natrajan	Himalaya Publishing. Mumbai
2	Entrepreneurship Development	Preferred by Colombo plan staff college for Technical education.	Tata Mc Graw Hill Publishing co. ltd. New Delhi.

3	A Manual on How to Prepare a Project Report	J.B.Patel D.G.Allampally	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
4	A Manual on Business Opportunity Identification & Selection	J.B.Patel S.S.Modi	
5	National Directory of Entrepreneur Motivator & Resource Persons.	S.B.Sareen H. Anil Kumar	
6	New Initiatives in Entrepreneurship Education & Training	Gautam Jain Debmuni Gupta	
7	A Handbook of New Entrepreneurs	P.C.Jain	
8	Evaluation of Entrepreneurship Development Programmes	D.N.Awasthi , Jose Sebastian	
9	The Seven Business Crisis & How to Beat Them.	V.G.Patel	
10	Entrepreneurship Development of Small Business Enterprises	Poornima M. Charantimath	
11	Entrepreneurship Development	--	
12	Entrepreneurship Theory and Practice	J.S. Saini B.S.Rathore	
13	Entrepreneurship Development	--	

2. Video Cassettes

No	Subject	Source
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entrepreneur skill	

Glossary:

Industrial Terms:

Terms related to finance, materials, purchase, sales and taxes.

Components of Project Report:

1. Project Summary (One page summary of entire project)
2. Introduction (Promoters, Market Scope/ requirement)
3. Project Concept & Product (Details of product)
4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength)
5. Manufacturing Process & Technology
6. Plant & Machinery Required
7. Location & Infrastructure required
8. Manpower (Skilled, unskilled)
9. Raw materials, Consumables & Utilities
10. Working Capital Requirement (Assumptions, requirements)
11. Market (Survey, Demand & Supply)
12. Cost of Project, Source of Finance
13. Projected Profitability & Break Even Analysis
14. Conclusion.

Course Name : Chemical Engineering Group

Course Code : CH

Semester : Fifth

Subject Title : Professional Practices-V

Subject Code : 12210

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	05	--	--	--	--	50@	50

Rationale:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

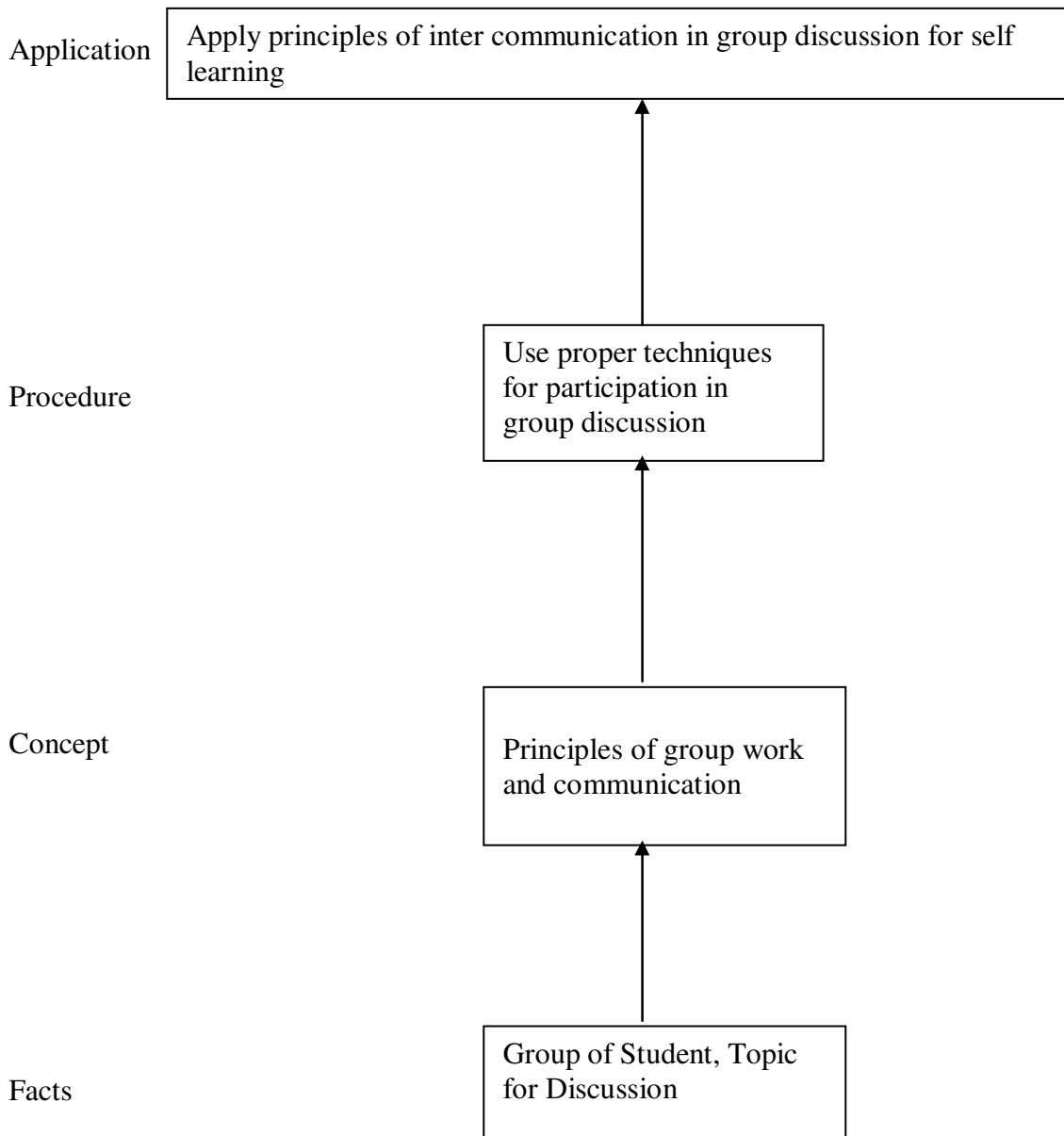
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Learning Structure:



Sr. No.	Activities	Hours
01	<p>Industrial Visits: Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work.</p> <p>Visits to any two of the following :</p> <ul style="list-style-type: none"> i. Fabrication Industry involved in manufacturing Chemical Engineering equipments like Reaction kettle, HE, Tanks etc. ii. Petroleum industry to see Safety equipments. iii. Factory to see various instruments like Thermocouple, Flow measuring Devices, Level measuring Devices Level. iv. Chemical Industry for Studying various types of heat exchange equipments. 	28
02	<p>Lectures by Professional / Industrial Expert / Student Seminars based on information search to be organized from any of the following areas:</p> <ul style="list-style-type: none"> i) Industrial Engineer in a Chemical Industry. ii) Controllers used in a Chemical Industry. iii) Safety Engineer a Chemical Industry. iv) E. T. P. plant in a Chemical Industry. 	16
03	<p>Student Activities : The students in a group of 3 to 4 will perform any one of the following activities (others similar activities may be considered Activity :</p> <ul style="list-style-type: none"> i) Collect 2 types of Pressure Gauges & 2 types of Vacuum Gauges. ii) Visit a Chemical factory & see Working of GLC. 	36
Total		80