

**STATE COUNCIL OF TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA
TEACHING AND EVALUATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES**

TEACHING AND EVALUATION SCHEME

Branch: CHEMICAL ENGINEERING

Semester: VI

DISCIPLINE: CHEMICAL ENGINEERING						SEMESTER: 6TH						
SL NO	SUBJECT CODE	SUBJECT	PERIODS			EVALUATION SCHEME						
			L	T	P	INTERNAL EXAM			END SEM EXAM	TERM WORK	PRACTICAL EXAM	TOTAL MARKS
						TA	CT	Total				
THEORY												
1.	HMT 601	ENTREPRENEURSHIP AND MANAGEMENT	5	-	-	10	20	30	70			100
2.	CHT 601	CHEMICAL REACTION ENGINEERING & CATALYSIS	4	-	-	10	20	30	70			100
3.	CHT 602	INSTRUMENTATION & PROCESS CONTROL	4	-	-	10	20	30	70			100
4.	CHT 603	NOBEL SEPARATION TECHNOLOGY	4	-	-	10	20	30	70			100
5.	CHT 604	ELECTIVE (Any One)	4			10	20	30	70			100
		1.PETRO-CHEMICAL TECHNOLOGY										
		2.BIO-TECHNOLOGY & BIO-PROCESS ENGINEERING										
		3.FERTILIZER TECHNOLOGY										
PRACTICAL/TERM WORK												
6.	CHP 601	REACTION ENGINEERING LAB	-	-	4					25	25	50
7.	CHP 602	INSTRUMENTATION & PROCESS CONTROL LAB	-	-	4					25	25	50
8.	CHP 603	PROCESS EQUIPMENT DESIGN LAB	-	-	4					25	25	50
9.	CHP 604	PROJECT WORK	-	-	6					50	50	100
GRAND TOTAL			21	-	18	50	100	150	350	125	125	750
Total Contact hours per week: 39 Abbreviations: L-Lecture, T-Tutorial, P-Practical, TA- Teacher's Assignment, CT- Class test												
Minimum Pass Mark in each Theory Subject is 35% and in Practical subject is 50%												

ENTREPRENEURSHIP & MANAGEMENT

(Code :HMT-601)

Period/Week: 05
Total Periods: 75

Total Marks: 100
Theory End Exams: 70; CT (20) +IA (10)

(COMMON TO ALL BRANCHES OF ENGG EXCEPT CIVIL/ CSE/ IT)

OBJECTIVES:

On completion of the course, students will be able to :

1. Understand the concept of different forms of organization including MSME and various managerial functions.
2. Understand Entrepreneurship and choose it as a career option after study.
3. Learn about the basic financial accounting and cost control.
4. Know different areas of management relating to stores and purchase, finance, production, sales and marketing and human resources in an organization.
5. Learn about various reasons of industrial sickness and its remedial measures.
6. Have a comprehensive idea on important legislations relating to employment in Factory.

SYLLABUS

- 1. Concept of Organization & Enterprise Management: 12 periods**
 - 1.1. Meaning, features and components of Business
 - 1.2. Different forms of Business Organizations with features
 - 1.3. Meaning, definitions and importance of management
 - 1.4. Difference between Management & Administration
 - 1.5. Functions of management- Planning, Organizing, Staffing, Directing (including Motivation, Leadership & Communication), Coordinating and Controlling.
 - 1.6. Principles of Scientific Management.
- 2. Entrepreneurship & Management of MSME: 12 periods**
 - 2.1. Meaning & Need of Entrepreneurship
 - 2.2. Qualities of an Entrepreneur
 - 2.3. Relevance of Entrepreneurship of Socio-economic gain
(Generating national wealth, creating wage & self employment, developing MSME enterprises, Optimizing human and national resources, building enterprising personalities and society
 - 2.4. Micro, Small and Medium Enterprises. (investment limits of MSME)
 - 2.5. Project Report- PPR & DPR. (Preparation of a PPR)
 - 2.6. Incentives available to MSME as per the latest IPR
 - 2.7. Role of DIC, OSFC, OSIC, IDCO, SIDBI, IPICOL and Commercial Banks in the context of MSME.
- 3. Financial Accounting & Cost Control: 12 periods**
 - 3.1. Double- entry System of Book –keeping and types of accounts
 - 3.2. Journal, Ledger, Cash Book (different types), Trial balance

- 3.3. Components of Final Accounts- Trading A/c, Profit & Loss A/c and Balance Sheet
- 3.4. Elements of Cost and Preparation of Cost Sheet
- 3.5. Break-even Analysis

- 4. Financial Management: 04 periods**
 - 4.1. Meaning & Importance
 - 4.2. Finance Functions
 - 4.3. Types of Capital- Fixed & Working Capital
 - 4.4. Components of Working Capital, Working Capital Cycle

- 5. Stores & Purchase Management: 05 periods**
 - 5.1. Inventory Control : Importance & Techniques
 - 5.2. Purchase management-Principles & Procedures
 - 5.3. Important Store Records (Bin Card, Stores Ledger & GRN)

- 6. Production Management:_ 04 periods**
 - 6.1. Production & Productivity
 - 6.2. Production , Planning & Control- (meaning & steps)

- 7. Sales & Marketing Management: 08 periods**
 - 7.1. Sales & Marketing Management- Meaning & Importance
 - 7.2. Selling Methods
 - 7.3. Product Policy- (Branding, Packaging, Labeling)
 - 7.4. Product-mix, Pricing methods and Sales Promotion including its techniques.
 - 7.5. Advertising & its media

- 8. Human Resource management: 06 periods**
 - 8.1. Need & Importance
 - 8.2. Recruitment & its sources
 - 8.3. Selection- Methods
 - 8.4. Training- Need, & Methods
 - 8.5. Need of Performance Appraisal

- 9. Industrial Sickness: 04 periods**
 - 9.1. Meaning & Symptoms of Sickness
 - 9.2. Causes of Industrial Sickness
 - 9.3. Remedial measures of Sickness

- 10. Industrial Legislation: 08 periods**
 - 10.1. Major Provisions of Factories Act relating to Health, Welfare, Safety, Accidents, Hours of Work, employment of Women
 - 10.2. Duties and Power of Factory Inspector
 - 10.3. Major Provisions of Employee's Compensation Act.

Books Recommended

1. Industrial Engineering & Management : O.P.Khanna
2. Entrepreneurship for Engineers : B.Badhei
3. Principles & Practice of Management : L.M.Prasad
4. Industrial Engineering & Management: Banga & Sharma
5. Mercantile Law: N.D.Kapoor
6. Industrial Engineering & production Management: M.Mahajan
7. Industrial Policy Resolution (latest)

CHEMICAL REACTION ENGINEERING AND CATALYSIS

L 4	T 0	P 0		CHT 601
Total Contact hours: 60 Theory : 60 hours Theory Exam. : 3 hours.			Total Marks: 100	End Exam.: 70 marks Class Test 20 marks Teacher's Assignment: 10 marks

RATIONALE:

This subject is of great importance in chemical engineering profession. It is necessary to study the principles of kinetics and catalysis, which will provide knowledge in understanding chemical reaction mechanisms.

OBJECTIVES:

After completion of study, the student will be able to

- (i) Understand about the rate at which a reaction occur and it's order
- (ii) Specify the conditions for the feasibility of a reaction
- (iii) Explain the role of catalyst on a chemical reaction
- (iv) Differentiate different types of reactors used in chemical industries and their application.

COURSE CONTENT

CHAPTER-1 CHEMICAL KINETICS

15 periods

- 1.1 Classification of chemical reaction.
- 1.2 Rate of reaction, rate constant.
- 1.3 Elementary and non-elementary reaction.
- 1.4 Molecularity and order of reaction.
- 1.5 Arrhenius equation.
- 1.6 Concept of activation energy.
- 1.7 Half-life reaction.
- 1.8 Solve problems to determine order of reaction.

CHAPTER-2 INTREPETATION OF BATCH REACTOR DATA

10 periods

- 2.1 Derivation of integrated rate equation for irreversible unimolecular type, first-order reaction, irreversible bimolecular type second order reaction.
- 2.2 Methods of interpretation of Batch reactor data.
- 2.3 Derivation of equation for constant volume batch reactor.
- 2.4 Solve numerical based on topics 2.1 to2.3

CHAPTER-3 CATALYSIS

10 periods

- 3.1. Define and classify catalysis with example.
- 3.2. Characteristics of catalytic reaction.
- 3.3. Promoter and its action.
- 3.4. Catalytic poisoning.
- 3.5. Autocatalysis, negative catalysis, enzyme catalysis.
- 3.6. Activation energy and catalysis.
- 3.7 Discuss theories of catalysis

CHAPTER-4 REACTORS**10 periods**

- 4.1 Construction and operation of Batch reactors, semi batch reactor, continuous reactor, Tank Reactors, Tubular Reactor, Fixed Bed Reactor, Fluidized bed Reactor, Spray column reactor, Packed column Reactor, Reactor with catalyst.
- 4.2 Basic design equations for batch, CSTR, TFR.
- 4.3 Space velocity, space-time, and residence time.
- 4.4 Choice of a reactor and material of construction of reactor.

CHAPTER-5 CHEMICAL EQUILIBRIUM**15 periods**

- 5.1 Reversible reaction with example.
- 5.2 Chemical equilibrium, characteristic of chemical equilibrium.
- 5.3 Law of Mass action, equilibrium constant
- 5.4 Le Chatelier's Principle.
- 5.5 Condition for maximum yield in industrial processes

TEXT BOOK:-

1. Chemical kinetics – J.M.SMITH , Mc GRAWHILL
2. Chemical Reaction engineering – LEVENSPIEL,
3. Chemical Reaction engineering – K.A GAVHANE, NIRALI
4. Essential of physical chemistry – BAHL & BHAL, S.CHAND.
5. Chemical Reaction engineering – S.C. RAY, C.GUHA, DHANPAT RAI & SONS.

INSTRUMENTATION AND PROCESS CONTROL

L 4	T 0	P 0		CHT 602
Total Contact hours: 60 Theory : 60 hours Theory Exam. : 3 hours			Total Marks: 100	End Exam.: 70 marks Class Test: 20 marks Teacher's Assignment: 10 marks

Rationale:

Number of control equipment and measuring devices are used in the operation of chemical engineering unit operation equipment to control of process variable, these variables like temperature, pressure, level, viscosity, density, refractive index etc. affect the processing equipment and ultimately affect the product quality. It is necessary to study the principle of operation of process variables measuring devices, so that they may be used either on-line or off line for this purpose.

Objectives :

After completion of study of Instrumentation and Process Control the student will be able to :

1. Understand working principle, construction, repair and maintenance of measuring instrument and their used to control chemical engineering unit operations and processes.

TOPIC WISE DISTRIBUTION OF PERIODS

SL. No.	Topic	Periods
1	Instrument	05
2	Measurement	10
3	Liquid level measurement	05
4	pH measurement	10
5	Temperature measurement	10
6	Pressure measurement	10
7	Automatic control	10
	Total	60

1.0 INSTRUMENT

- 1.1 Define instruments
- 1.2 Explain the functions of instruments
- 1.3 Explain the functional elements of instruments
- 1.4 Explain the performance characteristics of an instrument

2.0 MEASUREMENTS OF CHARACTERISTICS

- 2.1 Describe measurement of density and hydrometer
- 2.2 Describe measurement of viscosity by various viscometer
- 2.3 Describe the principle and uses of spectrophotometer
- 2.4 Describe measurement of refractive index by Refractometer and Polarimeter

3.0 LIQUID LEVEL MEASUREMENT

- 3.1 Explain the direct and indirect measurement liquid level both in open and closed vessels.

4.0 pH & CONDUCTIVITY MEASUREMENT

- 4.1 Describe the measurement of pH
- 4.2 Describe the measurement of electrical conductivity

5.0 TEMPERATURE MEASUREMENT

- 5.1 Name different temperature scales.
- 5.2 List the names of different methods of temperature measurement.
- 5.3 Describe the temperature measurement by liquid in glass thermometer.
- 5.4 Describe temperature measurement on electrical phenomena – like thermocouple, Describe temperature measurement on electric phenomena—like thermocouple, resistance thermometer, optical pyrometer, radiation pyrometer.

6.0 PRESSURE MEASUREMENT

- 6.1 Name different methods of measurement of pressure.
- 6.2 Describe pressure measurement by Bourdon tube, Bellows, and Diaphragm
- 6.3 Describe pressure measurement by Pirani gauge, McLeod Gauge, ionization gauge.

7.0 AUTOMATIC CONTROL

- 7.1 Define the automatic control system and explain the application with example.
- 7.2 Explain elementary idea about transfer function for a first order system and time constant.
- 7.3 Describe different idea about different types of automatic controllers.
- 7.4 Explain principle of PLC and Explain computer Aided measurement and control

BOOKS

- 1. Industrial Instrumentation – D.P. Eckman
- 2. Industrial Instrumentation and control – S.K. Singh
- 3. Fundamentals of Automatic Process control – A. S. Narayan.

Nobel Separation Technology

L 4	T 0	P 0	CHT 603
Total Contact hours: 60 Theory : 60 hours Theory Exam. : 3 hours.		Total Marks: 100	End Exam.: 70 marks Class Test 20 marks Teacher's Assignment: 10 marks

RATIONALE :

Membrane technologies have been established as very effective and commercially attractive options for separation and purification processes in the chemical and allied industries dealing with biochemical, pharmaceuticals, petrochemicals, food and beverages and so on. Membranes are now competitive to conventional techniques, by virtue of the facts that they work without addition of chemicals, with a relatively low energy use and in a compact modular design. Therefore, knowledge of membrane technology assumes paramount importance for the success of chemical engineers.

OBJECTIVE: On completion of study of Nobel Separation Technology the student will be able to understand

1. Nature of membrane, its module, flow pattern
2. Concept of Membrane, type and module
3. Understand concept of Reverse Osmosis, Nano Filtration, Ultra filtration, Micro filtration
4. Understand concept of Gas separation and pervaporation.
5. Understand application of Ion Exchange and other membrane application

Sl. No.	Topics	Periods
1	Introduction	08
2.	Membrane Type, Module, Flow pattern	10
3.	Reverse Osmosis	10
4.	Nano Filtration, Ultra filtration, Micro filtration	12
5.	Gas separation and pervaporation	10
6.	Ion Exchange and other membrane application	10
	Total	60

COURSE CONTENT

1.0 INTRODUCTION

- 1.1 What is a membrane?
- 1.2 Basic principle of membrane separation
- 1.3 Classification of membrane processes
- 1.4 Advantages and disadvantages of membrane processes
- 1.5 Major application area of membrane separation
- 1.6 Future processes of membrane separation

2.0 MEMBRANE TYPE, MODULE, FLOW PATTERN

- 2.1 Types of synthetic membrane
- 2.2 Micro porous membrane, Asymmetric membrane, Thin film composite, Electrically charged, inorganic membrane
- 2.3 Membrane module- Plate and frame, Tubular, Spiral wound, Hollow fiber
- 2.4 Types of flow pattern

3.0 REVERSE OSMOSIS

- 3.1 Concept of Osmosis, Determination of osmotic pressure, Thermodynamic consideration of osmosis
- 3.2 Isotonic solution
- 3.3 High Pressure and low pressure reverse osmosis
- 3.4 Advantages and disadvantages of reverse osmosis
- 3.5 Membrane plugging
- 3.6 Application of reverse osmosis

4.0 NANO FILTRATION, ULTRA FILTRATION, MICRO FILTRATION

- 4.1 Principle of Nano filtration.
- 4.2 Process limitation of Nano filtration.
- 4.3 Industrial application of Nano filtration
- 4.4 Principle of Ultra filtration and its advantages
- 4.5 Ultra filtration vis-à-vis conventional filtration
- 4.6 Configuration of Ultra filtration unit
- 4.7 Types of devices in Ultra filtration.
- 4.8 Factors affecting the performance of Ultra filtration
- 4.9 Industrial application of Ultra filtration
- 4.10 Principle of Micro filtration
- 4.11 Fouling in Micro filtration membrane
- 4.12 Application of Micro filtration

5.0 GAS SEPARATION AND PERVAPORATION

- 5.1 Basic principle of gas separation
- 5.2 Membranes for gas separation
- 5.3 Application of Gas separation
- 5.4 Basic principle of Pervaporation
- 5.5 Membrane characteristics and mass transfer in pervaporation
- 5.6 Application of pervaporation

6.0 ION EXCHANGE AND OTHER MEMBRANE APPLICATION

- 6.1 Principle of Ion exchange
- 6.2 Characteristic of ion exchange resin
- 6.3 Application of ion exchange
- 6.4 Membrane Distillation
- 6.5 Membrane reactors

Reference Books:

1. Membrane Separation Processes –KaushikNath, PHI Publication
2. Unit operation by McCabe& Smith
3. Chemical Engineering Volume-2: Richardson and Coulson

PETRO-CHEMICAL TECHNOLOGY (ELECTIVE)

L 4	T 0	P 0		CHT 604
Total Contact hours: 60 Theory : 60 hours Theory Exam. : 3 hours.			Total Marks: 100	End Exam.: 70 marks Class Test 20 marks Teacher's Assignment: 10 marks

RATIONALE :

Petroleum industry ranks highest of all the chemical industries in India. The demand for refinery products and petrochemicals are increasing day by day. Process so, petroleum refining and production of petrochemicals are very much important for synthetic organic chemical industry. Therefore knowledge of petroleum refinery and petrochemicals are necessary for the success of chemical engineer.

Objectives :

After completion of study of Petro Chemical technology,

1. The student will be able to distinguish between petroleum refining process and petrochemical.
2. Understand the concept of synthesis of refinery products, their properties and uses.
3. Understand about growth and future of petroleum refinery and petrochemical industries in India

Topic Wise Distribution of Periods

Sl. No.	Topics	Periods
1	Introduction	08
2.	Petroleum Refining	10
3	C1 and C2 petrochemicals	10
4	C3 and C4 Petrochemicals	10
5	Aromatic Petrochemicals	10
6	Lubricants	08
7	Future of Petrochemical Industry	04
	Total	60

Chapter –1 INTRODUCTION

- 1.1 Define Petroleum Refining
- 1.2 Define petrochemicals & describe the importance of petrochemical industry
- 1.3 Explain choice of process, classification, feed stock for petroleum Refinery/petrochemical industry

Chapter-2 PETROLEUM REFINING

- 2.1 Describe dehydration and desalting of crude petroleum
- 2.2 Describe production of LPG
- 2.3 Describe crude oil distillation

Chapter-3 C1 and C2 PETROCHEMICAL

- 3.1 Describe steam cracking of naphtha
- 3.2 Explain manufacture of ethanol, Acetaldehyde and acetic acid

Chapter-4 C3 AND C4 PETROCHEMICALS

- 4.1 List chemicals from propylene
- 4.2 Explain manufacture of iso propane, butadiene
- 4.3 Explain manufacture of methanol, ethanol, butadiene

Chapter-5 AROMATIC PETROCHEMICALS

- 5.1 Describe manufacture of BTX
- 5.2 Describe manufacture of aniline, styrene, benzoic acid

Chapter-6 LUBRICANTS

- 6.1 List different types of lubricants
- 6.2 Describe manufacture of lubricants

Chapter-7 FUTURE OF PETROCHEMICAL INDUSTRY

- 7.1 Explain integrated petrochemical complex
- 7.2 Describe recent development in petroleum industry
- 7.3 Explain energy crisis, impact on ecology.
- 7.4 List different trends of petrochemical industry.

BOOKS

1. Introduction to Petrochemical – Maiti
2. Modern Petrochemical refining Process – B.K.B. Rao
3. A textbook of Petrochemicals – B.K.B. Rao
4. Fuel and petroleum Processing – B.K. Sharma

BIO-TECHNOLOGY & BIO-PROCESS ENGINEERING (ELECTIVE)

L 4	T 0	P 0		CHT 604
Total Contact hours: 60 Theory : 60 hours Theory Exam. : 3 hours.			Total Marks: 100	End Exam.: 70 marks Class Test 20 marks Teacher's Assignment: 10 marks

Rationale:

The term Biotechnology was coined during late 1970s when the advances in molecular and cell biology catalysed new industrial ventures to exploit these advances for the benefit of mankind. The European Federation of Bio-technology has defined Biotechnology as the integrated use of biochemistry, microbiology and engineering sciences in order to achieve technological or industrial application of capabilities of microorganisms. In simple terms, Biotechnology is the use of living organisms to make products of value of man. The use of term biotechnology may imply a single subject, but the essence of biotech is its multi disciplinary nature. Biotechnology has involved from integrated use of life sciences, chemical sciences and engineering sciences.

Objective:

After completion of the study of Biotechnology & Bioprocess Engineering the student will be able to:

1. Know about biotechnology and its relation to society and mankind.
2. Know about different branches of biotechnology and their utility to improve the life style.
3. Know about different discoveries related to biotechnology and their application to improve the mankind.
4. Know about the medicines and antibiotics produced by manipulation and application of some bio-technological processes.

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Biotechnology	05	09
2.	Genetics and Biotechnology	14	15
3.	Bioprocess and Fermentation Technology	10	15
4.	Enzymology	12	15
5.	Environmental Biotechnology	07	06
6.	Medicines in relations to Biotechnology	06	05
7.	Biotechnology in Agriculture and Forestry	06	05
	Total	60	70

1. BIOTECHNOLOGY

- 1.1 Define Biotechnology
- 1.2 Describe the public perception on Biotechnology
- 1.3 Describe about Biotechnology in the developing world
- 1.4 List natural raw materials
- 1.5 List the Chemical and Biochemical feed stocks
- 1.6 State about raw materials and future of Biotechnology

2.0 GENETICS AND BIOTECHNOLOGY

- 2.1 Define industrial genetics
- 2.2 Describe protoplast and cell fusion technologies
- 2.3 Define genetic engineering
- 2.4 Define and explain about PCR

3.0 BIOPROCESS AND FERMENTATION TECHNOLOGY

- 3.1 State the principles of microbial growth
- 3.2 Describe bio reaction
- 3.3 Define scale-up
- 3.4 State the media design for fermentation process
- 3.5 Define down stream processing

4.0 ENZYMOLOGY

- 4.1 State the nature of enzymes
- 4.2 List out the application of enzymes
- 4.3 Describe the technology for enzyme production
- 4.4 Define immobilized enzyme

5.0 ENVIRONMENTAL BIOTECHNOLOGY:

- 5.1 Define environmental biotechnology
- 5.2 Describe waste water and sewage treatment
- 5.3 List out the landfill technology
- 5.4 Describe composting briefly
- 5.5 Define bioremediation
- 5.6 Show the relation between microbes and the geological environment
- 5.7 Define sustainability

6.0 MEDICINES IN RELATIONS TO BIOTECHNOLOGY

- 6.1 Define pharmaceuticals and Biopharmaceuticals
- 6.2 Define and list out different antibiotics
- 6.3 Define vaccines
- 6.4 Define and explain monoclonal antibodies
- 6.5 Explain gene therapy

7.0 BIOTECHNOLOGY IN AGRICULTURE AND FORESTRY

- 7.1 Explain plant biotechnology briefly
- 7.2 Explain animal biotechnological briefly
- 7.3 Describe about biological control
- 7.4 Define and write about forestry

Text books:

1. Biotechnology: Demystifying the concept- D. Bourgaize, T.R.Jewell & R.G.Buiser (Pearson Education Publication.)
2. Understanding Biotechnology – A.Borem, F.R.Sautas & D.E.Bower (Pearson Education Publication)

REACTION ENGINEERING LAB

L 0	T 0	P 4	CHP-601
Total Contact hours. : 60		Total Marks :25	Sessional: 25 marks

EXPERIMENT Wise Distribution of Periods

Sl.No.	Experiment	Periods
1	To determine the value of rate constant for the hydrolysis of ethyl acetate catalysed by hydrochloric acid	08
2	To study the hydrolysis of ester(ethyl acetate) by alkali (NaOH).Show the reaction is kinetically second order. Also calculate the velocity constant	08
3	To calculate value of rate constant "K" for the saponification of ethyl acetate with NaOH in batch reactor-I (where M=1)	08
4	To calculate value of rate constant "K" for the saponification of ethyl acetate with NaOH in TFR.	08
5	To calculate value of rate constant "K" for the saponification of ethyl acetate with NaOH in Continuous Stirred Tank Reactor	08
6	To calculate value of rate constant "K" for the saponification of ethyl acetate with NaOH in packed bed reactor	08
7	To calculate value of rate constant "K" for the saponification of ethyl acetate with NaOH in CSTR in series	12
Total		60

INSTRUMENTATION AND PROCESS CONTROL LAB

L 0	T 0	P 4	CHP-602
Total Contact hours : 60		Total Marks : 50	Sessional:25 marks

EXPERIMENT Wise Distribution of Periods

SR NO	EXPERIMENT	PERIODS
1	Demonstrate different types of pressure gauges and temperature measuring devices	06
2	Determine the viscosity of an Oil by Red Wood Viscometer at different temperature and plotting a graph between viscosity and temperature	06
3	Calibration of a thermocouple	06
4	Demonstrate function of digital multi-meter	06
5	Practice plant operating skills like start up and shut down of the plant, analyse normal operating condition, attend any malfunction to operate the plant safety using DSC/PLC based process simulator on any two unit operations	36

PROCESS EQUIPMENT DESIGN LAB

L 0	T 0	P 4		CHP-603
Total Contact hours : 60			Total Marks : 50	Sessional:25 marks

EXPERIMENT Wise Distribution of Periods

SR NO	EXPERIMENT	PERIODS
1	Use of different data books	10
2	Fundamental practices in equipment design	10
3	Design and draw a pressure vessel	10
4	Design and draw a shell and tube heat exchanger	10
5	Design and draw a batch reactor	10
6	Design and draw an evaporator	10

PROJECT WORK

L 0	T 0	P 6		CHP-604
Total Contact hours : 90			Total Marks : 50	Sessional:50 marks

Rationale:

Assignment of a project involving a selected chemical engineering operation will give an opportunity to study individually the requirement of setting up a chemical engineering Unit Operation, starting preparation process flow diagram, plant layout, design requirement for processing equipment, process safety, provision for effluent treatment etc.

The object of the project is to make use of the knowledge gained by the student at various stages of the diploma course. This helps to judge the level of proficiency, originality and capacity for application of knowledge attained by the student at the end of the course. Project work is a team work; the students may be divided into different groups or may be in a single group depending upon the type of project work to be carried out. For the external 50 marks, the project shall be assessed by viva-voce examination to be conducted by the external examiner at the end of the year. Each student must give a seminar talk of 10 to 15 minutes duration. Each group should submit a typed copy of the project report. Each staff member of the Department should guide one group of students. Any one of the topics may be chosen for the project work. The list of topics suggested for project work is.

1. Pumping installation.
2. Absorption system.
3. Extraction
4. Water treatment
5. Crystallizer unit
6. Evaporation system.
7. Dryer.
8. Reactor.
9. Thickener.
10. Prepare a report on Industrially important chemicals like Phenyl, dyes, ink, liquid soap, Phenol
11. Design and fabrication of a small prototype chemical Engineering Equipment useful for doing experiments in the laboratory.
12. Different modern analytical methods used for testing of oils, paints, in various chemical industries.
13. Environmental pollution analysis of an industry.