

INSTITUTE	DIPLOMA STUDIES
PROGRAM	DIPLOMA ENGINEERING (CHEMICAL ENGINEERING)
SEMESTER	3
COURSE TITLE	INDUSTRIAL STOICHIOMETRY
COURSE CODE	09CH2302
COURSE CREDITS	4

Objective:

- 1 To learn various quantitative methods to calculate the results related to basic chemical processes

Course Outcomes: After completion of this course, student will be able to:

- 1 Prepare a solution of certain concentration
- 2 Predict the condition of gas or gas mixtures
- 3 Balance the IN & OUT going material streams in a process.

Pre-requisite of course: Basic Chemistry, Mathematics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	2	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Introduction Importance of process calculations, Dimensions and systems of units, Fundamental quantities, Derived quantities, Definition and units of force, volume, pressure, work energy, power, heat, Simple unit conversion problems in FPS, MKS and SI systems.	3
2	Basic Chemical Calculations Definition of Atomic weight and Molecular wt., Calculation of Molecular weight of various compounds, Introduction to Avogadro's Number & Moles concept, relation between Mole and Atomic weight, Basic Mole calculations, Equivalent weight, density, specific gravity. Properties of Solutions and calculations: Molarity, Normality, Molality. Properties of gases and calculations: Dalton's Law of partial pressure, Charle's Law, Boyle's Law, Gay-Lussac's Law, Ideal Gas Law. NTP & STP	7

Contents : Unit	Topics	Contact Hours
3	Material Balance In Process Without Chemical Reactions Definition of Law of Conversation of Mass, Process flow diagram, significance of Material balance in chemical industry, Simple M.B. problems on operations like Drying, Distillation, Absorption, Mixing, Evaporation. Introduction to Recycle & By-pass operation.	6
4	Material Balance In Process Involving Chemical Reactions Definition: limiting Reactant, Excess reactant, Simple problems for finding yield, conversion and composition, Simple calculation of material balance based on reaction.	4
5	Energy Balance Concept of Heat capacity and Specific Heat , Concept of heat capacity of gas and liquid mixture, Concept of latent heat of Fusion, Sublimation, Vaporization, Sensible Heat, Calculations of Heat of Reaction from heat of formation and combustion Data.	4
6	Combustion Types of fuels, Calorific values of fuels: GCV & NCV, Brief idea about Proximate and Ultimate analysis of solid fuels, Bomb calorimeter working, Simple problems to find out calorific values of fuels and mixtures. Concept of Flue gas.	4
Total Hours		28

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Tutorial 1 tutorial	4
2	Tutorial 2 tutorial	6
3	Tutorial 3 Tutorial	4
4	Tutorial 4 Tutorial	6
5	Tutorial 5 Tutorial	4
6	Tutorial 6 Tutorial	4
Total Hours		28

Textbook :

- 1 Introduction to Process calculations , K.A. Gavhane, Nirali Publications., 2017

References:

- 1 Stoichiometry, Stoichiometry, B.I. Bhatt, S.M. Vora, McGraw Hill Publication, 2015

References:

- 2 Basic principles of calculation in chemical engineering , Basic principles of calculation in chemical engineering , David Himmelbau, PHI Publications, 2016

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
40.00	40.00	10.00	10.00	0.00	0.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- 1 https://onlinecourses.nptel.ac.in/noc22_ch02/preview