VIDHYADEEP UNIVERSITY
Holy Flame of Knowledge

SECOND-YEAR DIPLOMA ENGINEERINGSYLLABUS

Semester:3rd

Course Code:002206307 **Type of Course: PCC-4**

Course Name:Stoichiometry

Course Prerequisites: Process calculation provides the fundamental information to determine the material and energy balances for all types of unit operations and unit processes across the equipment and overall chemical plant. Material and energy balance calculations are of prime importance for design and also for conservation of mass and energy to reduce the losses and cost that enhances overall economy of plant. The unit conversions, material and energy balance are the essential part in the practice of other courses such as mechanical operations, fluid flow, heat Transfer, mass transfer etc.

COURSE OBJECTIVE(S):

The purpose of this course is to help the student to attain the following industry identified competency through various teaching learning experiences: Determine material and energy balance for different unit operations and processes

TEACHING & EXAMINATION SCHEME:

Teaching Scheme (Hrs/Week)				Examination Scheme					
Theory	Tutorial	Practical	Credit	SEE		CA			Total
				Th	Pr	MSE	PLE	LA	
4	0	0	4	60	00	20	20	00	100

SEE: Semester End Examination; CA: Continuous Assessment; Th: Theory; Pr: Practical; MSE: Mid Semester Examination; PLE: Participatory Learning Experience; LA: Laboratory Assessment

*TOTAL Theory Hours: No. of Th. and Tut. Hrs/Week*15 = 60*

COURSE CONTENT(S):

Unit No.	Content	Hours	Weightage (%)
1	**Unit-I Unit Systems** 1.1 Introduction to process calculation 1.2 Dimensions and systems of units 1.3 Fundamental quantities of units, Derived quantities 1.4 Definition and units of force, volume, pressure, work, energy, power, heat 1.5 Unit conversions in FPS, MKS and SI systems	4	08
2	**Unit– II Basic Chemical Calculations** 2.1 Definition and calculations of mole, atomic weight, molecular weight, equivalent weight, specific gravity and API gravity 2.2 Expression of composition of mixtures and solutions 2.3 Morality, Normality, Morality, gm/lit and related simple numerical	8	12
3	**Unit-III Ideal Gas Law** 3.1 Concept of ideal gas 3.2 Derivation of ideal gas law 3.3 STP and NTP conditions 3.4 Dalton's law, Amagat'slaw,Raoult's Law and Henry's Law 3.5	7	11

SECOND-YEAR DIPLOMA ENGINEERINGSYLLABUS

	Relation between mole%, volume% and pressure% of ideal gases 3.6 Calculation of average molecular weight, density, mole%, weight% in gas mixture in SI/MKS systems		
4	**Unit– IV Material Balance In Processes Without Chemical**Reactions 4.1 Law of conversation of mass 4.2 Brief description and simple material balance calculation of drying, distillation, absorption, mixing, crystallization, evaporation 4.3 Single stage material balance calculation of leaching and extraction 4.4 Brief idea regarding recycling, purging and by passing operation	11	20
5	**Unit– V Material Balance In Processes Involving Chemical Reactions** 5.1 Definition: Limiting reactant, Excess reactant, conversion, yield and selectivity 5.2 Simple numerical for finding yield, conversion and composition 5.3 Simple calculation of material Balance based on reaction.	09	14
6	**Unit– VI Energy Balance** 6.1 Heat capacity and specific heat 6.2 Mean heat capacity of gases 6.3 Heat capacity of gas mixture and liquid mixture 6.4 Calculations of heat capacity by integral equation up to three terms 6.5 Brief explanation of sensible and latent heat of fusion, sublimation, vaporization 6.6 Calculations of standard heat of formation from heat of combustion data 6.7 Calculations for heat of reaction from heat of formation and heat of combustion data 6.8 Hess's Law and calculations	13	23
7	**Unit– VII Combustion** 7.1 Introduction of combustion 7.2 Types of fuels 7.3 Calorific values of fuels 7.4 Proximate and ultimate analysis of solid fuel 7.5 Numerical related to calorific values of fuel from composition 7.6 Numerical related to air Requirement and composition of flue gases	8	12
	TOTAL	60	100%

Text Book(s):

Title of the Book	Author(s)	Publication
Introduction to Process Calculations(Stoichiometry)	K.A. GAVHANE	Nirali Prakasan, Pune, 2015

SECOND-YEAR DIPLOMA ENGINEERINGSYLLABUS

Reference Book(s):

Title of the Book	Author(s)	Publication
Stoichiometry	B I Bhatt and S B Thakore	McGraw Hill Education; 5th edition (1 July 2017)
Basic Principles and Calculations in Chemical Engineering	Himmelablau David M.	PHI Learning, New Delhi, Year-2003
Stoichiometry and Process Calculations	Narayanan K.V. and Lakshmikutty B	PHI; 2nd edition,Year2016

Web Material Link(s):

- https://nptel.ac.in/courses/103103165
- Basic Principles & Calculations in Chemical Engg (CD Rom)
- https://www.unitoperation.com/

Equivalent/Corresponding Course on NPTEL (SWAYAM):

NPTEL course on

- https://nptel.ac.in/courses/103103165

COURSE EVALUATION:

Sr. No.	Activity	Marks	Weightage
1	Semester End Examination (External Th)	60	60%
2	Internal Examination	40	40%
2(a)	Mid Semester Examination	20	50%
2(b)	Attendance	10	25%
2(c)	Assessment Types (Any One from 2(c).1 to 2(c).7)	10	25%
2(c).1	Subject (Course) based Mini-Project		
2(c).2	Industry/Site Visit & Report		
2(c).3	Assignment		
2(c).4	Seminar		
2(c).5	Case Study		
2(c).6	Surprise Class Quiz		
2(c).7	Design Exercise		
2(c).7	Presentation		
2(d)	Practical (if Applicable)		

* For 4 Credit Subjects

SECOND-YEAR DIPLOMA ENGINEERINGSYLLABUS

1 Credit = 25 Marks
Theory: 3 Credits = 75 Marks
practical: 1 Credit = 25 Marks
SEE Evaluation will be of 100 marks and converted to 50 Marks (75 Th + 25 Pr)
CA Evaluation will be of 100 Marks and converted to 50 Marks. (75 Th + 25 Pr)

Distribution of Marks for Theory Evaluation as per Bloom's Taxonomy Level:

Level	Remember	Understand	Apply	Analyze	Evaluate	Create
% Weightage	12%	21%	37%	10%	10%	10%

COURSE OUTCOMES:*(in the range of 4 to 6)*

CO1	Apply stoichiometric principles for solving chemical engineering problems.
CO2	Calculate material balance for chemical process.
CO3	Calculate energy balance for chemical process.
CO4	Estimate amount of fuel and amount of air required for combustion process.