CHEMICAL PROCESS CALCULATIONS-II

Course Code: 13CH1109

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Course Outcomes:

On successful completion of the course, the student should be able to

CO 1 Solve material balance problems related to drying and crystallization.

CO 2 Solve material balance problems involving recycle, bypass and purge.

CO 3 Define heat capacity, Kopps rule, latent heats, Trouton's rule, Kistya Kowsky equation and evaluate amount of heat required.

CO 4 Calculate heat of reaction and theoretical flame temperature.

CO 5 Estimate flue gas analysis, percentage excess air. Arrange equations and solve them using simultaneous and sequential modular approaches.

UNIT-I (14 Lectures)

Material balance calculation involving drying, dissolution and crystallization.

UNIT-II (10 Lectures)

Processes involving recycle, bypass and purge.

UNIT-III (11 Lectures)

THERMOPHYSICS:

Energy, energy balances, heat capacity of gases, liquid and mixture solutions. Kopp's rule, latent heats, heat of fusion and heat of vaporization, Trouton's rule, Kistyakowsky equation for non polar liquids enthalpy and its evaluation.

UNIT-IV (15 Lectures)

THERMOCHEMISTRY:

Calculation and applications of heat of reaction, combustion, formation and neutralization, Kirchoff's equation, calculation of theoretical and actual flame temperatures.

UNIT-V (10 Lectures)

Introduction calorific value of fuels, various Fuels (Qualitative Analysis), combustion calculations, Orsat Analysis. Numerical simulation of material balance equations-Simultaneous and sequential modular approaches: Learning how to arrange equations and solve them using both techniques.

TEXTBOOKS:

1. Hougen O A, Watson K.M. and Ragatz R.A., "*Chemical process principles, Part -I, Material and Energy Balance*", 2nd Ed. John Wiley and Sons Inc, New York, 1963.
2. Himmelblau D.H. "*Basic principles and calculation in chemical engineering*", 5th Edition. PHI, 2001.

REFERENCES:

1. Bhatt B.I. and Vora S.M, "*Stoichiometry*", (3rd Ed.) Tata McGraw Hill publishing company, Ltd., New Delhi (1996).
2. Richard M.Felder, Ronald W.Rousseau, "*Elementary Principles of Chemical Processes*", 3rd Edition, Wiley, 2000.