Scheme for B. Tech. in Chemical Engineering 1st Year

II Semester:

S. No.	Course Code	Course Title	Category	Type	Credit	L	T	P
1.		Mathematics II	IC	Theory	3	2	1	-
2.		Physics (IC bucket*)	IC	Theory	3	2	1	-
3.		Python Programming and Lab (IC bucket*)	IC	Lab	3	2	-	2
4.		Environmental Science	IC	Theory	1	1	-	-
5.		Soft Skills Foundational Lab	IC	Lab	1	-	-	2
6.		Ethics And Human Values	IC	Theory	1	1	-	-
7.		Physics Lab (IC Lab bucket*)	IC	Lab	1	-	-	2
8.		Engg. Drawing and Sketching Lab (IC Lab bucket*)	IC	Lab	1	-	-	2
9.	26CHT151	Chemical Engineering Thermodynamics-I	PC	Theory	3	2	1	0
10.	26CHT152	Chemical Process Calculations	PC	Theory	4	3	1	0
Total					**21**	**13**	**4**	**8**

Malaviya National Institute of Technology Jaipur
Department of Chemical Engineering

Course Details
Chemical Engineering Thermodynamics-I | 26CHT151 | 2 1 0 0

PREREQUISITE:
NIL

COURSE OBJECTIVE(S):
To learn the principles of work and energy and understand the laws of thermodynamics to apply in industries.

COURSE OUTCOMES:

CO1 : To understand the basic concepts and first law of thermodynamics.
CO2 : To understand the PVT behaviour of fluids.
CO3 : To understand the heat effects.
CO4 : To understand the second law of thermodynamics.
CO5 : To understand the concepts of statistical thermodynamics.

SYLLABUS:

UNIT I (7 Lectures): Introduction to Thermodynamics First Law of Thermodynamics: First law analysis of control mass and control volume, steady state, and transient processes.

UNIT II (7 Lectures): PVT behavior of pure substances, virial equation and cubic equations of states for gases and liquids.

UNIT III (7 Lectures): Sensible and latent heat effects, standard heats of reaction, formation and combustion, effect of temperature on the standard heat of reaction.

UNIT IV (7 Lectures): Limitation of 1st law, Kelvin-Planck and Clausius Statements, reversible and irreversible processes, entropy, 2nd law analysis of control volume processes.

EVALUATION
Final grades will be weighted average of performance in

Continuous Assessment	20%
Midterm Exam	30%
Endterm Exam	50%

depending on the institute's academic policy.

Textbook(s):

1. Smith, J. M., Van Ness, H. C. and Abbott, M. M., "Introduction to Chemical Engineering Thermodynamics", 8th Ed., McGraw-Hill. 2019.
2. Rao, Y. V. C., "An Introduction to Thermodynamics," University Press. 2004.

Reference book(s):

1. Cengel, Y.A., "Thermodynamics: An Engineering Approach," 9th Ed., McGraw-Hill. 2019.
2. Nag, P.K., "Engineering Thermodynamics", 6thEd., McGraw-Hill. 2017.

Online/E-Resourses:

Malaviya National Institute of Technology Jaipur
Department of Chemical Engineering

Course Details
Chemical Process Calculations | 26CHT152 | 3 1 0 0

PREREQUISITE:
NIL

COURSE OBJECTIVE(S):
To introduce to the fundamental principles of chemical process analysis.

COURSE OUTCOMES:

CO1 : Correlate between different Unit systems and their conversions for various process variables.
CO2 : Learn how to perform materials balance in any chemical processes with or without chemical reactions.
CO3 : Apply the gas laws to solve problems related to ideal gases and mixtures.
CO4 : Apply the energy balance to solve particular problems with and without chemical reactions.
CO5 : Solve de-coupled and coupled equations of mass and energy balance numerically and computationally.

SYLLABUS:

UNIT I (10 Lectures): Conversion of Units, dimensional consistency and data analysis, significant figures, precision and accuracy, concepts of molarity, molality, normality, ppm, weight fraction, mole fraction and volume fraction, density and specific gravity, process variables and principles of stoichiometry.

UNIT II (10 Lectures): Flowchart, mole and mass balance for multi-component systems under: steady and unsteady state, single-phase and multiphase, material balances in processes including recycle, bypass and purge, Steady state material balances for reactions: species and elemental balances, combustion reactions, concept of limiting, excess reactants, fractional conversion and percentage of conversion, yield, ultimate and proximate analysis of fuels, excess air, air-fuel ratio calculations.

UNIT III (10 Lectures): Vapor-liquid equilibrium: Ideal and real gas, equation of state, Bubble point, dew point calculations, Phase diagram, Gibbs phase rule, Antoine equation, phase equilibria of vapour-liquid, solid-liquid and immiscible liquid-liquid systems.

UNIT IV (10 Lectures): De-Coupled and coupled mass and energy balances, calculation of enthalpy changes, steady state mass and energy balance with and without reactions, heats of solution and mixing, Use of Psychometric chart, and steam table, thermochemistry, Hess's law of summation- heat of formation, Hesss Law and heats of combustion, Unsteady state material and energy balances, isothermal and adiabatic processes, Numerical and computation approach to solve problems with simultaneous mass and energy balance.

EVALUATION
Final grades will be weighted average of performance in

Continuous Assessment	20%
Midterm Exam	30%
Endterm Exam	50%

depending on the institute's academic policy.

Textbook(s):

1. Himmelblau, D., Riggs, J., "Basic Principles and Calculations in Chemical Engineering", 8thEd., Pearson. 2012.
2. Hougen, O.A, Watson, K.M and Ragatz R.A, "Chemical Process Principles: Part .1 (Chemical Process Principles: Material and Energy Balances)", 2ndEd., CBS. 2014.

Reference book(s):

1. Bhatt B.I, and Vora S.M, "Stoichiometry", 4thEd., McGraw-Hill. 2004.
2. Felder, R.M., Rousseau, R.W., and Bullard, L.G., "Elementary Principles of Chemical Processes", 4thEd., John Wiley and Sons. 2016.

3. Narayanan, K.V., and Lakshmikutty, B., “Stoichiometry & Process Calculations”, 2nd Ed., Prentice Hall Publishing. 2016.
4. Chopey, N., Hicks, T., “Handbook of Chemical Engineering Calculations”, 4thEd., McGraw-Hill Education. 2014.

Online/E-Resourses: