



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Diploma Engineering College
Semester 4 (Diploma)

Subject: Chemical Engineering Thermodynamics – DETCH14209

Type of course: Major

Prerequisite: Basic knowledge of Thermodynamics

Rationale: The rationale behind Chemical Engineering Thermodynamics is to understand and predict the behavior of chemical processes. It provides the fundamental framework for analyzing energy transfer, phase changes, chemical reactions, and equilibrium conditions in chemical systems.

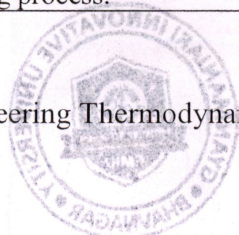
Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
3	1	0	4	60	30	10	00	50	150

Legends: CI - Class Room Instructions; T - Tutorial; P - Practical; C - Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V - Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

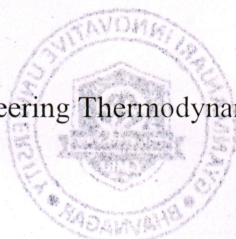
Sr. No.	Course content	Hrs	Weightage
1	Basic Concepts: Microscopic & macroscopic point of view, Thermodynamic system and control volume, Thermodynamic properties, processes and cycles, Thermodynamic equilibrium, Quasi-static process.	08	15%
2	First law of Thermodynamics: First law for a closed system undergoing a cycle and change of state, energy, PMM1, First law of thermodynamics for steady flow process, Steady flow energy equation applied to nozzle, diffuser, boiler, turbine, compressor, pump, heat exchanger and throttling process, filling and emptying process.	08	20%



3	<p>Second law of thermodynamics:</p> <p>Limitations of first law of thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, causes of irreversibility, Carnot theorem, corollary of Carnot theorem, thermodynamic temperature scale.</p>	08	20%
4	<p>Entropy:</p> <p>Clausius theorem, property of entropy, Inequality of Clausius, Entropy change in an irreversible process, Principle of increase of entropy, Third law of thermodynamics.</p> <p>Energy:</p> <p>Energy of a heat input in a cycle, Energy destruction in heat transfer process, Energy of finite heat capacity body, Energy of closed and steady flow system.</p>	13	25%
5	<p>Application of Thermodynamics in Electrochemistry</p> <p>Basic concepts, charge, current, voltage, conductors, Types of electrochemical cell, galvanic and electrolytic cells, Thermodynamics in electrochemistry, Gibbs free energy and cell.</p> <p>Chemical Equilibrium</p> <p>Introduction to chemical equilibrium, The equilibrium constant (K), Le Chatelier's principle.</p>	08	20%

Continuous Assessment:

Sr. No.	Active Learning Activities	Marks
1.	<p>Thermodynamics in day to day life:</p> <p>Students have to list out various day to day activities where there is some application of thermodynamics. Students have to prepare a report describing the processes and upload on GMIU web portal.</p>	10
2.	<p>Energy crisis scenario:</p> <p>Students in groups will be given a case study related to energy crisis in the current era by the faculty. Students have to understand the problem and suggested probable solution in the form of a report. Students have to upload the report on GMIU web portal.</p>	10
3.	<p>Review of Research Article:</p> <p>Each student has to search a research article related to Thermodynamics and prepare a summary study and upload on GMIU portal.</p>	10
4.	<p>Industrial Application:</p> <p>Each student will be allotted a chemical plant by the faculty. The student has to identify and explain the application of this subject in that plant. Students have to upload a report on GMIU web portal.</p>	10
5.	<p>Problem Solving:</p> <p>5 IMPs of each unit will be given to students by the faculty and students need to solve them and upload on GMIU web portal.</p>	10

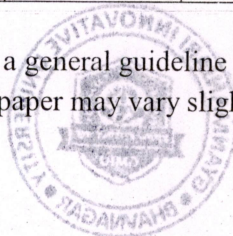


Total	50
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Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	20%	25%	15%	20%	00

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.



Course Outcome:

After learning the course the students should be able to:	
CO1	Understand the importance of Thermodynamics in unit operations and processes.
CO2	Apply theoretical calculations in industrial processes.
CO3	Relate the knowledge of Thermodynamics with Chemical Engineering.
CO4	Demonstrate the flow of energy and change in entropy in various systems.
CO5	Explain different types of Heat energy and enthalpy in chemical industry.

Instructional Method:

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.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.



Reference Books:

- [1] Introduction to Chemical Engineering Thermodynamics, J. M. Smith, H. C. Van Ness, M. M. Abbott, The McGraw-Hill Companies, Inc.
- [2] Chemical, Biochemical and Engineering Thermodynamics, S.I. Sandler, Wiley India Edition.
- [3] A text book of Chemical Engineering Thermodynamics, K. V. Narayanan, Prentice-Hall of India Pvt. Ltd.
- [4] Chemical and Process Thermodynamics, B.G. Kyle, Prentice-Hall Inc.
- [5] Introduction to Thermodynamics, Y.V.C. Rao, 2nd Edition, Wiley Eastern Limited.

