DEPARTMENT OF CHEMICAL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	**CHEMICAL ENGINEERING THERMODYNAMICS**		
Course Code	CLPC17	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	CLPC15		
Session	**Jan 2018**	**Section (if, applicable)**	**NA**
Name of Faculty	**Dr.K.N.Sheeba**	**Department**	**Chemical Engineering**
Email	**sheeba@nitt.edu**	**Telephone No.**	**0431 2503113**
Name of Course Coordinator(s) (if, applicable)	**NA**		
E-mail	**NA**	**Telephone No.**	
Course Type	[√] **Core course**	[ ] **Elective course**	

Syllabus (approved in BoS)

Introduction to Basic laws and Terminologies in Thermodynamics- Statement of First law, P-V-T behavior of pure fluids - Heat effects accompanying chemical Reactions - Statements of second law- Clausius Inequality-Mathematical Statement of Second law-Third Law of Thermodynamics.

Applications to Laws of Thermodynamics - Flow processes: Flow in pipes, Flow through nozzles, Compression- Refrigeration

Thermodynamic Properties of Pure Fluids- Classification of Thermodynamic properties -Work function and Gibb's Free energy-Fundamental Property relations-Maxwell's equations-Clapyeron equation- Entropy Heat capacity relationship-Differential equations of Entropy-Relationship between Cp and Cv-Effect of pressure and volume on Cp and Cv- Gibb's Helmholtz Equation-Properties of Jacobians-Thermodynamic Relations through method of jacobians

Thermodynamic Properties of Solutions - Introduction to fugacity and activity, Activity coefficients-Partial molar properties-Chemical potential as a partial molar property-Lewis randall rule-Roults and henry's law-Gibbs Duhem Equation

Phase Equilibria and Chemical Reaction Equilibria - Criteria for phase equilibrium, Criterion of stability, Phase equilibria in single and multiple component systems, Duhem's theorem, VLE for Ideal solutions, Calculation of activity coefficients- Reaction stoichiometry-Equilibrium constant- Feasibility of reaction- Effect of temperature, pressure, volume and other factors-Simultaneous Reactions

COURSE OBJECTIVES

To understand and appreciate thermodynamics as applied to various Chemical Engineering Processes.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Fundamentals of thermodynamics as applied to various processes	PO1, PO3, PO4, PO5,PO7,PO11, PO12
2. Properties as applied to ideal and real gases	PO1, PO3, PO4,PO8, PO9, PO10
3. Determination of equilibrium states for mixture of gases, phases and chemical reaction	PO1, PO3, PO4, PO5, PO6, PO7, PO8, PO10, PO11

COURSE PLAN – PART II

COURSE OVERVIEW

This course will impart the principles of chemical engineering thermodynamics and their application to various chemical processes. Fundamentals of thermodynamics, laws/postulates, application of laws to various processes, thermodynamic relations, solution thermodynamics, phase equilibria and chemical reaction equilibria are the various topics covered in the syllabus.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	1st Week-6th Week (18 contact hours) 5th Week 7th Week	Introduction to Basic laws and Terminologies in Thermodynamics- Statement of First law, P-V-T behavior of pure fluids - Heat effects accompanying chemical Reactions - Statements of second law- Clausius Inequality-Mathematical Statement of Second law-Third Law of Thermodynamics- Applications to Laws of Thermodynamics - Flow processes-Compression- Refrigeration Assessment I Assignment/Seminar I	Chalk & Talk
2.	7th week-8th week (9 contact hours)	Thermodynamic Properties of Pure Fluids- Classification -Work function and Gibb's Free energy-Fundamental Property relations-Maxwell's equations- Clapyeron equation-Entropy Heat capacity relationship-Differential equations of Entropy-Relationship between Cp and Cv-Effect of pressure and volume on Cp,Cv- Gibb's Helmholtz Equation-Properties of Jacobians-Thermodynamic Relations through method of jacobians	Chalk & Talk

3.	9th week-11th week (9 contact hours) 10th week	Thermodynamic Properties of Solutions - Introduction to fugacity and activity, Activity coefficients-Partial molar properties-Chemical potential as a partial molar property-Lewis randall rule-Roults and henry's law-Gibbs Duhem Equation Assessment II	Chalk & Talk
4.	13th week 12th week-15th week (12 contact hours)	Assignment/Seminar II Phase Equilibria and Chemical Reaction Equilibria - Criteria for phase equilibrium, Criterion of stability, Phase equilibria in single and multiple component systems, Duhem's theorem, VLE for Ideal solutions, Calculation of activity coefficients- Reaction stoichiometry-Equilibrium constant- Feasibility of reaction- Effect of temperature, pressure, volume and other factors-Simultaneous Reactions	Chalk&Talk
5.	15th week End of semester	Compensation Assessment(CPA) Final Assessment	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment I	5th week	1 hour	30
2	Assignment/Seminar I	7th week	10 minutes	5
3	Assessment II	10th week	1 hour	30
4	Assignment/Seminar II	13th week	10 minutes	5
CPA	Compensation Assessment*	15th week	1 hour	30
6	Final Assessment *	End of semester	1 hour	30

COURSE EXIT SURVEY
(mention the ways in which the feedback about the course shall be assessed)

Feedback from students during class committee meetings.
Feedback during end semester examinations

COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, , academic honesty and plagiarism etc.)

MODE OF CORRESPONDENCE (email/ phone etc): The Course Coordinator is available for consultation the Department. Queries may also be emailed to the Course Coordinator directly at sheeba@nitt.edu

ATTENDANCE

Attendance will be taken by the faculty during the contact hours.

Attendance is a "MUST" for all the contact hours. Every student is required to maintain atleast 75% attendance to appear for the end semester examinations.

Any student who maintains attendance in the range of 50-75%, needs to appear for a compensation assessment test (CPA) and score minimum 30% of the total marks of CPA to appear for the end semester examinations failing which the student has to redo the course.

Students who maintain attendance less than 50% in the subject should redo the course.

COMPENSATION ASSESSMENT

All the assessments are compulsory.If a student fails to attend any one assessment due to genuine reasons, he/she will be permitted to appear for CPA. CPA may not be considered as an improvement test

Grading and passing minimum are as prescribed by the regulations of the institute.

ACADEMIC HONESTY & PLAGIARISM

Students are expected to follow academic ethics and refrain themselves from activities such as plagiarism, copying assignments, copying in exams etc. Such activities if found will attract suitable penalty for the student.

ADDITIONAL INFORMATION (Textbooks, reference books Website addresses, journals, etc)

1. J.M. Smith, Hendrick Van Ness, Michael M. Abbott, Introduction to Engineering Thermodynamics, McGraw Hill, New York, 2005.
2. S. Sundaram, Chemical Engineering Thermodynamics, Ahuja Publishers, New Delhi, 2001.
3. K.V.Narayanan, A Textbook of Chemical Engineering Thermodynamics, PHI Learning, 2004.
4. B.F. Dodge, Chemical Engineering Thermodynamics, McGraw Hill, New York, 1971.

Course Faculty	CC-Chairperson	HOD
(Dr.K.N.Sheeba)	(Dr.S.Saravanan)	(Dr.P.Sivashanmugam)

9/1/2018