DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	**M.TECH. MATERIALS SCIENCE and ENGINEERING**		
Course Title	**Thermodynamics and Kinetics**		
Course Code	**MT 653**	**No. of Credits**	**4**
Course Code of Pre-requisite subject(s)	**Nil**		
Session	**Aug. 2021**	**Section (if, applicable)**	**NA**
Name of Faculty	**Dr. -Ing Prince Gideon Kubendran Amos**	**Department**	**MME**
Email	**prince@nitt.edu**	**Telephone No.**	**9843550816**
Name of Course Coordinator(s) (if, applicable)			
E-mail		**Telephone No.**	
Course Type	■ **Core course**	☐ **Elective course**	

Syllabus (approved in BoS)

Introduction to thermodynamics and kinetics – different approaches – emphasis on metallurgical thermodynamics, transport phenomena and applications

Laws of thermodynamics and related applications – concepts of free energy and entropy – criteria for spontaneity

Introduction to solutions – partial molar entities – Gibbs Duhem relations - thermodynamic aspects of metallic solutions and salt melts – Raoult's Law and Henry's Law - regular and quasi chemical models

Thermodynamic aspects of phase diagrams – similarity in thermodynamic approach towards different classes of materials – thermodynamic aspects of defect formation in metals and ceramics – approaches used in chemical modeling

Principles of metallurgical kinetics – reaction rates and reaction mechanisms – overviewof mass transfer, heat transfer and fluid flow – related applications in metallurgical processes – role of transport phenomena in mathematical and physical modeling

COURSE OBJECTIVES

To introduce the principles of thermodynamics and kinetics and illustrate their applications in the design of alloy systems.

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
At the end of the course student will be able to:	
1. Understand the terminology associated with engineering thermodynamics and have knowledge of contemporary issues related to metallurgical thermodynamics.	**1,2,3**
2. Knowledge of phase equilibria in two-component and multi-component systems	**1,2,3**
3. Estimate thermodynamic properties of an alloy in solid or liquid state of ideal and real mixture	**1,2,4**
4. Predict the phase transformations in an alloy system with an understanding of phase diagrams.	**1,2,3**

COURSE PLAN – PART II

COURSE OVERVIEW

Gainig a convincing understand of the principles of themodynamics and kinetics.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery**
1	I -II	General Introduction	Online classes
2	III - V	Second law	
3	VI-VII	Third law	
4	VII-VIII	Phase Equilibria	
5	IX-XI	Thermodynamics of solution	
6	XI-XII	Kinetics	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	**Mode of Assessment**	**Week**	**Duration (Hours)**	**% Weightage**
1	Assignment	3rd week Oct	7 (Days)	25
2	Mid - Semester	3rd week Nov	1	25
3	Presentation and Report	1nd week Dec	0.25	20
CPA	Compensation Assessment	2nd week Dec	1	25

4	Final Assessment	4rd week Dec	2	30

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

The exit survey will be assessed based on the questionnaire prepared by the class teacher and expected attainment is 75% on 1-10 scale basis

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

Email/Mobile/Whatsapp

COMPENSATION ASSESSMENT POLICY

It will be given during XI week for those who are absent on genuine grounds for the Mid semester examination or quiz.

ATTENDANCE POLICY

- Institute guidelines will be followed for attendance.

ADDITIONAL INFORMATION

The Course faculty is available for consultation at any time. Students can contact the faculty at any time through whatsapp or phone call or by mail.

FOR APPROVAL

Course Faculty

CC-Chairperson

HOD