DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	**B.TECH. METALLURGICAL AND MATERIALS ENGINEERING**		
Course Title	**Transport Phenomena**		
Course Code	**MTPC16**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**Nil**		
Session	**Jan 2022**	**Section (if, applicable)**	**NA**
Name of Faculty	**Dr. V. Karthik**	**Department**	**MME**
Email	**karthikv@nitt.edu**	**Telephone No.**	**9788444987**
Name of Course Coordinator(s) (if, applicable)	**NA**		
E-mail		**Telephone No.**	
Course Type	**Core course**		

Syllabus (approved in BoS)

Fluid Flow - Viscosity – differential mass and momentum balances –overall momentum balance – mechanical energy balance – applications

Heat Transfer – heat conduction equation – applications – steady and transient heat conduction. Two dimensional heat conduction

Convective heat transfer –concept of heat transfer coefficient – forced and free convection; Radiation – view factor - radiative heat exchange between surfaces

Mass Transfer - Diffusion: Diffusivity in gases, liquids, solids – convective mass transfer –concept of mass transfer coefficient

Dimensionless analysis – Rayleigh's method, Buckingham method – use of differential equations – similarity criteria – applications in physical modeling

COURSE OBJECTIVES

To understand basic concepts related to heat flow, fluid flow, mass transfer, in the context of metallurgical processes; to become familiar with the mathematical treatment and equations related to above transport phenomena; to comprehend the science behind process modelling.

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
At the end of the course student will be able to:	

1. Solve mass and energy balance calculations involved in fluid flow	**1,2,3,4,12**
2. Use the heat conduction equations in solving 1D and 2D heat transfer in real time situations	**1,2,3,5,12**
3. Differentiate the forced and free convection and perform calculations on convective and radiative heat transfer	**1,2,3,4,5,12**
4. Understand the concepts of diffusion, diffusivity in different materials and mass transfer coefficient	**1,2,4,12**
5. Model any processes by converting actual (descriptive) processes into appropriate equations and then attempt to solve the same	**3,4,5,11,12**

COURSE PLAN – PART II

COURSE OVERVIEW

The course discuss in detail about the transport of momentum, heat and mass with relevance to the metallurgical and materials engineering. Importance of dimensional analysis of process modeling of metallurgical processes.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	I-III	Fluid flow; mass, momentum and energy balance in fluid flow	Chalk and talk, Online lectures + animated/real videos
2	IV-VI	Heat transport; modes of heat transfer; numerical problems on heat conduction	
3	VII-IX	Convective and radiative heat transfer, numerical problems	
4	X-XI	Mass transport; Ficks laws; convective mass transfer, metallurgical examples	
5	XII-XIII	Dimensional analysis; different methods; applications	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Technical Presentation	IV-V	15	10
2	Mid semester exam	VII	60	20
3	Quiz	X	20	15
4	Assignment	XI	--	15
5	Video podcast	XII	5	10
CPA	Compensation Assessment	XIII	60 / 20	20 / 15
6	Final Assessment	XV	120	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 XIII week for those who are absent on genuine grounds for mid semester exam 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 also contact him at any time through whatsapp or phone call or by mail.

FOR APPROVAL

Course Faculty	CC-Chairperson	HOD
Dr. V. Karthik	Dr. V. Karthik	Prof. B. Ravisankar