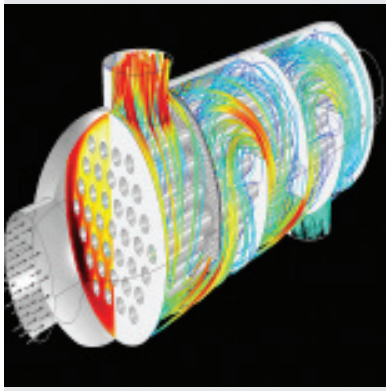
22BEAS203 HEAT AND MASS TRANSFER



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Hours Per Week :

L	T	P	C
1	2	0	2

PREREQUISITE KNOWLEDGE: Basics of heat transfer and mass transfer.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to examine different heat transfer operations occurred in food processing industries and compute overall heat transfer throughout operation. It also helps to design heat exchanger required in food processing industries to accomplish operations. It accomplishes to evaluate mass transfer permeability during food processing such as packaging.

MODULE-1

UNIT-1 **4L+8T+0P=12 Hours**

BASIC HEAT TRANSFER:

Concept, modes of heat transfer, thermal conductivity of materials, measurement. Insulation materials. Fins free and forced convection. Newton's law of cooling, heat transfer coefficient in convection.

UNIT-2 **04L+8T+0P=12 Hours**

CONDUCTION AND CONVECTION HEAT TRANSFER:

General differential equation of conduction. One dimensional steady state conduction through plane and composite walls, tubes and spheres with and without heat generation. Electrical analogy.

Critical thickness of insulation, heat transfer through fins, dimensional analysis of free and forced convection, useful non dimensional numbers, equation of laminar boundary layer on flat plate and in a tube, laminar forced convection on a flat plate and in a tube, combined free and forced convection.

MODULE-2

UNIT-1 **4L+8T+0P=12 Hours**

RADIATION HEAT TRANSFER:

Introduction, absorptivity, reflectivity and transmissivity of radiation, black body and monochromatic radiation, types of heat exchangers, fouling factor, mass transfer.

UNIT-2 **4L+8T+0P=12 Hours**

HEAT EXCHNAGER AND MASS TRANSFER:

Planck's law, Stefan- Boltzman law, Kirchoff's law, grey bodies and emissive power, solid angle, intensity of radiation, radiation exchange between black surfaces, geometric configuration factor, heat transfer analysis involving conduction, convection and radiation by networks, log mean temperature difference, heat exchanger performance, transfer units, heat exchanger analysis restricted to parallel and counter flow heat exchangers, steady state molecular diffusion in fluids at rest and in laminar flow, Fick's law, mass transfer coefficients. Reynold's analogy.

SKILLS:

- ✓ *Illustrate the basic principle of heat transfer occurs in food industry.*
- ✓ *Compute overall heat transfer to propose fins or insulating materials by examining different aspect in food processing.*
- ✓ *Compute convective heat transfer coefficient through non dimensional no in free or forced convection.*
- ✓ *Evaluate performance of different types of heat exchanger in industries.*

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Illustrate knowledge of basic heat transfer and practice at home or industry.	Apply	1	1, 2, 6, 7
2	Analyze knowledge of conductivity and convective heat transfer coefficient to compute overall heat transfer.	Analyze	1	1, 2, 3, 4, 6, 11
3	Investigate different types of flow occurred in pipe or plate during mass transfer.	Analyze	2	1, 2, 3, 4, 6, 11
4	Examine different flow in pipe or flat plate by help of non-dimensional no during heat transfer.	Evaluate	1	1, 2, 3, 4, 6, 11
5	Apply the knowledge of heat transfer to design and develop heat exchanger.	Create	2	1, 2, 3, 4, 5, 6, 11

TEXT BOOKS:

1. R. K. Rajput, 2015, “Heat and Mass Transfer”, S. Chand and Company Pvt. Ltd.,2015.
2. R. C.Sachdeva,2010, “Fundamentals of Engineering Heat and Mass Transfer”, 7th edition, New Age International

REFERENCE BOOKS:

1. S. C. Arora and S. Domkundwar,2010, “A Course in Heat & Mass Transfer”, 8th edition, DhanpatRai and Sons, Delhi.
2. C.J. Geankoplis,2003, “Transport Processes and UNIT Operations”, 4th edition, Prentice Hall of India, New Delhi.
3. P. K. Nag, 2011, “Heat and Mass Transfer”, 3rd edition, Tata McGraw Hill.