



Department of Biotechnology	LP: BT 18401 Rev. No: 02 Date: 07.02.2023
B.E/B.Tech/M.E/M.Tech : Biotechnology PG Specialisation : NA Sub.Code/Sub.Name : BT 18401/ FLUID MECHANICS AND HEAT TRANSFER Unit : I	Regulation:2018A

UNIT I CONDUCTION, CONVECTION & RADIATION HEAT TRANSFER 10+3

Conduction: Fourier's law, Heat conduction through plane and composite walls, Cylinders. Critical radius of insulation, Overall heat transfer coefficient, Extended surfaces, Types of fins, Fin efficiency, Fin effectiveness. Convection: Combined conduction and convection, Forced and free convection, Boiling and condensation, Radiation: Absorptivity, Reflectivity and Transmissivity, Black, white and grey body, Emissive power and emissivity, Laws of radiation – Planck law, Stefan-Boltzmann law, Wein's displacement law, Kirchhoff's law. Shape factor, radiation shield.

OBJECTIVE: To introduce the basis of heat transfer mechanisms and learn about conduction, convection, radiation in detail.

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Introduction to Heat Transfer, Fourier's law	T1-(235-240)	LCD
2.	Conduction Heat Transfer-Conduction through plane and composite walls, Hollow cylinder	T1-(236-244)	LCD
3.	Critical radius of insulation	T1-(330-334)	BB
4.	Overall heat transfer coefficient, Extended surfaces	T1-(244-246)	BB/GCR
5.	Types of fins, Fin efficiency, Fin effectiveness	T1-(249-251,357-361)	LCD
6.	Convection: Combined conduction and convection	T1-(249-251)	LCD
7.	Forced and free convection, Boiling and condensation	T1-(283-291) R1-(10.1-10.5)	LCD
8.	Radiation: Absorptivity, Reflectivity and Transmissivity, Black, white and grey body, Emissive power and emissivity	T1-(296-299)	LCD
9.	Laws of radiation – Planck law, Stefan-Boltzmann law, Wein's displacement law, Kirchhoff's law	T1-(534-544)	BB
10.	Shape factor, radiation shield.	T1-(534-544)	LCD
11.	Problems- Conduction	T1-(236-244)	BB
12.	Problems- Convection	T1-(249-251)	BB
13.	Problems- Radiation	T1-(534-544)	BB

Content beyond syllabus covered (if any):

The importance and mechanism of heat transfer in Bioreactors

* Session duration: 50 minutes

