# Heat Transfer - Video course

## COURSE OUTLINE

The course will introduce the fundamental concepts of various modes of heat transfer.

It will further elaborate these concepts with theories and applications to the solutions of practically relevant problems.

Some aspects of process design principles of various heat transfer equipment will be taken up in the later part of this course.

Finally, to present a physical picture of the convection process, heat transfer in boundary layer flows will be addressed.

Even though the course is primarily designed to meet the requirements of an undergraduate course on heat transfer, it will be useful for the practicing engineers to refresh with fundamental and technical information.

**Contents:**

Introduction to conductive, convective and radiation heat transfer; steady and unsteady state conduction in one dimension; forced and free convection heat transfer.

Heat transfer analysis for boundary layer flows; condensation; boiling; evaporation; black and gray body radiation heat transfer with radiation network; radiation shield.

## COURSE DETAIL

| S.No | Topics | No. of Hours |
|---|---|---|
| 1 | Introduction to conductive, convective, and radiation heat transfer; heat transfer coefficient. | 2 |
| 2 | One dimensional steady state conduction: plane wall, cylinder and sphere with and without heat generation; extended surface heat transfer. | 4 |
| 3 | One dimensional unsteady state conduction: applicability of lumped-capacity analysis and Heisler charts. | 4 |
| 4 | Convection: forced convection heat transfer in laminar and turbulent boundary layer flow; empirical and practical relations for forced convection. | 8 |
| 5 | Free convection: free convection heat transfer from vertical, horizontal and inclined surfaces; combined free and forced convection heat transfer. | 3 |

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Chemical Engineering

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| 6 | Condensation and boiling heat transfer. | 6 |
| 7 | Evaporation: types of evaporators; single-effect and multi-effect evaporator calculations. | 4 |
| 8 | Heat Exchanger: types of heat exchangers; effectiveness-NTU method of heat exchanger analysis; design procedures for double pipe and shell and tube heat exchangers. | 6 |
| 9 | Radiation heat transfer: view factor; black and gray body radiation; radiation network; radiation shield. | 7 |
| | **Total** | 44 |

**References:**


1. Holman J. P., "Heat Transfer", Mc Graw-Hill, 9th . Ed., 2002.
2. Dutta B. K., "Heat Transfer: Principles and Applications", PHI, 2001.
3. Kern D. Q., "Process Heat Transfer", Tata Mc Graw-Hill Edition, 1997.
4. McCabe, W. L; Smith, J. C; and Harriott, P. "Unit Operations of Chemical Engineering", McGraw-Hill, 6th. Ed., 2001.