## SEMESTER – VI

## HEAT TRANSFER ME – 6006

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| Course Code | **ME – 6006** | Credits: 4 | L-3, T-1, P-0 |
| Name of the Course | **HEAT TRANSFER** | | |
| Lectures to be delivered | **52 (1 Hr Each) (L = 39, T = 13 for each semester)** | | |
| Semester End Examination | **Max. Time: 3 hrs.** | **Max. Marks: 100** | **Min. Pass Marks: 40** |
| Continuous Assessment (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%) | | **Max. Marks: 50** | |

**Instructions**

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

**Section – A**

Steady State Heat Conduction: Introduction, I-D heat conduction thorugh a plane wall, long hollow cylinder, hollow sphere, Conduction equation in Cartesian, polar and spherical co-ordiante systems.

Steady State Conduction with Heat Generation: Introduction, 1 – D heat conduction with heat sources, Extended surfaces (fins), Fin effectiveness 2-D heat conduction.

**Section – B**

Transient Heat Conduction: Systems with negligible internal resistance, Transient heat conduction in plane wall, cylinders, spheres with convective boundry conditions, Chart solution, Relaxation Method, Numericals.
Convection: Forced convection – Thermal and hydro-dynamic boundry layers, Equation of continuity, Momentum and energy equations, some results for flow over a flat plate and flow through tube, Fluid friction and heat transfer (Colburn analogy), Free convection from a vertical flat plate, Empirical relations for free convection from vertical and horizontal of planes and cylinders.

**Section – C**

Thermal Radiation: The Stephen – Boltzmann law, The black body radiation, Shape factors and their relationships, Heat exchange between non black bodies, Electrical network for radiative exchange in an enclosure of two or three gray bodies, Radiation shields.

**Section – D**

Heat Exchangers: Classification, Performance variables, Analysis of a parallel/counter flow heat exchanger, Heat exchanger effectiveness.
Heat Transfer with change of Phase: Laminar film condensation on a vertical plate, Drop-wise condensation, Boiling regimes, Free convective, Nucleate and film boiling.

**Text Books:**


1. Heat Transfer – J.P.Holman, John Wiley & Sons, New York.
2. Fundamentals of Heat and Mass Transfer – Incropera, F.P. & Dewill, D.P.-John Willey & Sons, New York.
3. Heat Transfer – D.S.Kumar, Kataria & Sons, Delhi.


**Reference Books:**


1. Conduction of Heat in Solids – Carslow, H.S. and J.C.Jaeger – oxford Univ. Press.
2. Conduction Heat Transfer – Arpasi, V.S. – Addison – Wesley.
3. Engg. Heat Transfer – C.P.Gupa Nem Chand & Brothers, Roorkee.
4. Compact Heat Exchangers – W.M.Keys & A.L.Landon,Mc. Graw hill.
5. Thermal Radiation Heat Transfer – Siegel, R. and J.R.Howell, Mc.Gaw Hill.
6. Heat Transmission – W.M., Mc. Adams, Mc Graw Hill.
   Heat Mass Transfer – Domkundwar.


**Note**: The paper setter will be required to mention in the note in the question paper that the Use of steam table charts, graphical plots is permitted.