

Course Organization

- 3h of Frontal Lectures (Tue 9:15-10, Wed 9:15-10, Wed 10:10-10:55)
- 1h of Exercises (Tue 8:15-9)

!! WEEK 1: 4h Lectures, no Exercises !!

- **Please attend in person.** Lectures will be organized to be best engaging in class. I will provide live streaming but I will be writing on the blackboard, NOT on the tablet.
- The lectures will **NOT** be recorded live.
- **PAST recordings** of the Lectures are available and the link is provided in Moodle after the classes.
- Slides will be posted on Moodle before the class.

- Exercises are assigned weekly
- Solutions are available before the weekend
- TAs can respond to questions on the **NEXT Tuesday**.

This **gives you a full week to think about the problems and connect them with the theory**; unresolved questions can be addressed with the TAs and eventually further clarified in the class the week after.

Weekly Course Plan

	Week Topic	H1 (Tue 8-9)	H2 (Tue 9-10)		H3 (Wed 9-10)	H4 (Wed 10-11)
Week 1	Intro + Steady State Heat Conduction	W1L1 - Intro	W1L2 - Heat diffusion equation		W1L3 - Boundary Conditions; 1D planar & cylindrical solutions	W1L4 - Concept of Thermal Resistance; Bi Number; Intro to Thermal Circuits
Week 2	Steady State Heat Conduction wth/without Sources	exercises - HW 1	W2L1 - Thermal Circuits and Overall Heat Transfer Coefficient		W2L2 - 1D steady-state Heat Conduction With Heat Sources;	W2L3 - Problems on 1D Steady State with Heat sources; 2D Conduction
Week 3	Fins	exercises - HW 2	W3L1 - Fins : Introduction to Extended surfaces concept		W3L2 - Fins : Boundary Conditions, Fin temperature Profiles, Heat transfer from a Fin; solved exercises	W3L3 - Fins: Fin Performance and Fin Arrays
Week 4	Transient Heat Conduction	exercises - HW 3	W4L1 - Transient Heat: Lumped capacitance Model		W4L2 - Transient Heat: Generalized Solution for Planar/ Radial/ Spherical Geometries	W4L3 - Transient Heat: Infinite Solid; Periodic Heating
Week 5	Intro to Convection +Forced External Flow	exercises - HW 4	W5L1 - Intro Convection; Recap of Fluid Dynamics; Thermal boundary layer concept, Nu and the problem of convection		W5L2 - thermal boundary Layer Eqns; dimensionless numbers; problem of physical properties	W5L3 - External forced convection: flat horizontal plate (local and aerge values); Other Correlations; General Methodology for Convection (Example)
Week 6	Forced Internal Convection	exercises - HW 5	W6L1 - Forced Internal Convection: fluidynamics and thermodynamics aspects		W6L2 - Temperature and Heat flow in internal convection; Laminar Flow In Circular Tubes;	W6L3 - Correlations for Internal forced convection; circular VS non-circular pipes; a note on the entrance; RECAP and Questions
Week 7	Natural Convection	exercises - HW 6	W7L1 - Intro Free convection; Governing Equations; Gr and Ra numbers		W7L2 - Free COnvection over a Vertical Plate and other correlations	Dr. Narmada Gopal - COMSOL LECTURE 1 (natural convection)

	Week Topic	H1 (Tue 8-9)	H2 (Tue 9-10)		H3 (Wed 9-10)	H4 (Wed 10-11)
Week 8	Boiling	exercises - HW 7	W8L1 - Intro to Boiling and Condensation; Boiling Modes and Curve for Saturated Pool Boiling		W8L2 - Correlations for Nucleate and Film Pool Boiling; Exercises	W8L3 - Forced Boiling (external and Internal)
Week 9	Condensation	exercises - HW 8	W9L1 - Introduction to Condensation; Equation of Condensation on a Vertical Plate		W9L2 - Correlations for Condensation and RECAP of Boiling and Condensation	W9L3 - Introduction to Heat Exchangers; The problem of the overall Heat Transfer Coefficient; recap of critical concepts
Easter break						
Week 10	Heat Exchanger 1	exercises - HW 9	W10L1 - Fouling; Calculation of the Overall Heat Transfer Coefficient		W10L2 - Parallel & Counter Flow Heat Exchanger; Temperature Profile and Heat Transfer	W10L3 - Special Operating Conditions; Exercises
Week 11	Heat Exchanger 2	exercises - HW 10	W11L1 - Effectiveness-NTU Method		W11L2 - Exercises on Heat Exchanger Design	W11L3 - Introduction to Radiation
Week 12	Radiation	exercises - HW 11	W12L1 - Emission of Thermal Radiation		W12L2 - Interaction of Thermal Radiation with Matter; Black Body; Real Surfaces (Kirchoff's laws etc.)	W12L3 (previous W3L2) - Radiation Exchange between Surfaces - view Factors
Week 13	Radiation	exercises - HW 12	Dr. Narmada Gopal - COMSOL LECTURE 2		W13L2 (previously W12:3) - Video Recording Exercises on Radiation	W13L3 - Video Recording Net radiation exchange at a surface and in a 2-surface enclosure - Electrical Analogy
Week 14	RECAP	exercises - HW 13	W14L1 - Q&A on prior Week; Radiation Exchange on a Multi-surface Enclosure		W14L2 - RECAP Radiation; General Q&A about the course	W14L3 - RECAP Exercises