

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

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