ADVANCED HEAT AND MASS TRANSFER –REFERENCES

Suggested book: "A heat transfer textbook" by John H. Lienhard IV & V

We do remember that the following is just a list of what it's treated at the course's lessons (often in a different approach but always valid). Please refer to this file as a further or alternative study material.

FIRST PART OF THE COURSE

●Unit one: "Introduction" – Paragraphs of the book suggested:

1.1 Heat Transfer **- 1.2** Relation of Heat transfer to Thermodynamics - **1.3** Modes of Heat Transfer (pages 11-20, 26-34)[1]

●Unit two: "Review on Thermodynamics" (only slide)[2]

●Unit three: "Thermophysical and transport properties" (only slide) [3]

●Unit four: "Dimensionless Numbers"

4.3 Dimensional analysis **- 4.4** Illustrative use of dimensional analysis **(In these pages we deal with the approach of dimensionless analysis; for "all "the useful dimensionless numbers see slides)** (pages 150-159)

●Unit Five: "Conduction heat transfer-The Heat Equation"

2.1 The heat conduction equation **-2.2**Steady heat conduction in a slab **-2.3**Thermal resistance and the electrical analogy **-2.4**Overall heat transfer coefficient U**-2.5** Summary (from page 49 up to 86)

●Unit Six: "Steady state conduction in special conditions and geometries"

[1] Some of the arguments in chapter 1 will be treated later on the course.
[2] For further basis on thermodynamics see "Heat and mass transfer" by Y.A. Cengel.
[3] For further basis on thermodynamics see "Heat and mass transfer" by Y.A. Cengel.

Energy generation (on slides)- **4.5** Fin design (pages 163-183)

●Unit Seven: "Transient Heat Conduction"

5.1 Introduction-**5.2** Lumped capacity solutions[4]**-5.3** Transient conduction in a one-dimensional slab **-5.6** Transient heat conduction to a semi-infinite region (220-222) +slide support

●Unit Eight: "Numerical analysis of Heat Conduction"

5.7 (pages 235-247) + slide for the rest of the arguments (especially transient energy balance approach: explicit and implicit)

●Unit Nine: "General conservation equations: Mass"

6.2 Conservation of mass-the continuity equation (278-281) + slides

●Unit Ten: "General conservation equations: Momentum"

6.2 Conservation of momentum (pages 281-284) + slides

●Unit Eleven: ""General conservation equations: Energy"

6.3 The energy equation (pages 293-298) + slides

●Unit Twelve: "Convection Transfer: Boundary layers"

6.1 Some introductory ideas (pages 271-277) **– 6.**4 The Prandtl number and the boundary layer thicknesses (pages 298-302)**-6.5** Heat transfer coefficient for laminar, incompressible flow over a flat surface[5]**-6.6** The Reynolds-Colburn analogy

●Unit Thirteen: "External flows"

Only slides

[4] See also chapter 1 page 21-22-23;

[5] This paragraph has been inserted just to show some useful empirical correlations.

●Unit Fourteen: “Internal flows: friction and heat transfer coefficients”

7.1 Introduction **-7.2** Heat transfer to or from laminar flows in pipes (pages 350-356/359-362) +slides

●Unit fifteen: “Turbulent Flow”

6.7 Turbulent boundary layer (pages 315-320)

●Unit Sixteen: “Natural convection”

8.1-8.2 The nature of the problems of natural convection **-8.3** Laminar natural convection on a vertical isothermal surface**-8.4** Natural convection in other situations

●Unit Seventeen: “Radiation Heat Transfer”

10.1 The problem of radiative exchange**-10.2** Kirchhoff’s law **-10.3** Radiant heat exchange between two finite black bodies **-10.4** Heat transfer among gray bodies **-10.5** Gaseous radiation **10.6** Solar energy

●Unit Eighteen and Nineteen: “Heat exchangers”

3.1 Function and configuration of heat exchangers-**3.2** Evaluation of the mean temperature difference in a heat exchanger: LMTD-**3.3** Heat exchanger effectiveness: ε-NTU method-**3.4** Heat exchanger design

ATTENTION!!

Paragraphs marked in red refer to some of the arguments treated in class but with a very different approach so they might be just a different way of presenting them.