EASTERN MEDITERRANEAN UNIVERSITY Department of Mechanical Engineering			
Course Code MENG 345	**Course Title** **Heat Transfer**	**Prepared by:** **I. Sezai**	**Credit Hours** (4,1) 4

I. Catalogue Description:
Introduction;Conservation laws. Introduction to conduction; One dimensional steady state conduction; thermal generation and extended surfaces. Two-dimensional and transient conduction. Introduction to convection; external flow; internal flow. Free convection. Boiling and condensation. Heat exchangers. Thermal radiation; Absoption,reflection and transmission; radiation exchange Mass transfer.

II.Prerequisite by Topic:
The student will be expected to have a good background in

1. First law of thermodynamics
2. Solution of first order linear differential equations and

Fluid dynamics.

III. Textbook :
Yunus A. Çengel, "*Heat Transfer, A Practical Approach*" Mc Graw Hill, 2003

References:
1. "Fundamentals of Heat and Mass Transfer" F. P. Incropera, D. P. DeWitt

IV. Course Objectives:

1. To introduce the basic principles of heat transfer
2. To develop methodologies which facilitate the application of the subject to practical problems

V.Course Outline:

Week 1	**Basic Concepts of Thermodynamics and heat transfer:** Thermodynamics and heat transfer. The first law of thermodynamics. Heat transfer mechanisms.
Week 2	**Heat conduction equation:** A brief review of differential equations. One dimensional heat conduction equation. General heat conduction equation. Heat generation in a solid. Variable thermal conductivity.
Week 3-4	**Steady heat conduction:** Steady heat conduction in plane walls, cylinders and spheres. Generalized thermal resistance networks. Thermal insulation. Fins.
Week 5	**Transient heat conduction:** Lumped system analysis. Transient heat conduction in plane walls, long cylinders, spheres semi-infinite solids and multidimensional systems.
Week 6	**Numerical methods in heat conduction:** Finite difference formulation of differential equations. Numerical solution of one and two-dimensional steady and unsteady conduction problems.
Week 7	**Midterm Examination**
Week 8-9	**Forced convection:** Velocity boundary layer. Thermal boundary layer. Flow over flat plates. Flow across cylinders and spheres. Flow in tubes.
Week 10	**Natural convection:** Physical mechanisms. Natural convection over suffaces. Natural convection inside enclosures. Natural convection from finned surfaces. Combined natural and forced convection.
Week 11	**Boiling and condensation:** Boiling heat transfer. Pool boiling. Flow boiling. Condensation heat transfer. Film condensation. Dropwise condensation.
Week 12	**Heat exchangers:** Types of heat exchangers. The overall heat transfer coefficient. The log mean temperature difference method. The effectiveness-NTU method.
Week 13-14	**Radiation heat transfer:** Thermal radiation. Blackbody radiation. Radiation properties. Atmospheric and solar radiation. The view factor. Radiation from black surfaces. Radiation from diffuse and gray surfaces.

VI. Class/Laboratory Schedule:
Four 50 minutes lectures per week and one hour laboratory or recitations when needed.
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VII. Homework/Quizzes/Reports/Projects:

Regular homeworks are assigned. Individual reports are submitted for labs. One quiz is offered per chapter. A term project is assigned for the design of a heat transfer application.

VIII. Computer Usage:
Students are encouraged to use the EES software supplied with the textbook.

IX. Relation of Course Objectives to Program Objectives:

Course Objective	Program Objectives						
	Math & Basic Sciences	Mech. Eng. Principles (Thermal/Fluid Sc, Mat.Sc, Mechanics, Machine design, Production eng.)	Define & Solve Eng. Problems	Selection & Design	Exper. Data Analysis & Interpret.	Team Work	Soc. Issues & Ethics
1	X	X	X				
2		X	X		X		
3							

X. Evaluation of Outcomes:

Quiz	15%	(No make-ups given for the quizzes)
Homeworks	5%	
Mid-term Examinations	25%	
Lab	15%	
Project	5%	
Final Examination	35%	