COURSE # AND CREDITS: 3 (NERS444)	**COURSE TITLE: FUNDAMENTALS OF HEAT AND MASS TRANSFER**
TERMS OFFERED: Fall	**PREREQUISITES:**
TEXTBOOKS/REQUIRED MATERIAL: **Incropera et al., Fundamentals of Heat and Mass Transfer, Wiley**	**COGNIZANT FACULTY:** **Annalisa Manera**
INSTRUCTOR: Annalisa Manera	**FACULTY APPROVAL: 10/2013**
CoE BULLETIN DESCRIPTION: The objective of the course is to study the physical mechanisms underlying heat transfer modes, and the fundamental principles and laws of heat transfer. The course includes heat conduction, convective heat transfer, and heat transfer by radiation. The heat transfer principles are then applied to analyze heat transfer systems. Special phenomena relevant to heat transfer, such as Leidenfrost effect, departure from nuclear boiling, and critical heat flux are explained as well. A broad range of real-world applications is used to develop the problem-solving skills necessary to address heat transfer problems of practical relevance.	**COURSE TOPICS:** (approximate number of hours in parentheses) 1. Heat transfer mechanisms 2. Heat conduction and Fourier's law 3. Heat transfer by convection 4. Heat transfer by radiation 5. Boiling and condensation 6. Heat exchangers 7. Introduction to two-phase flows and flow regimes 8. Special phenomena (Leidenfrost effect, DNB, CHF, CCFL).
COURSE STRUCTURE/SCHEDULE: Lecture 2 per week @ 1.5 hours; Discussion: 20 mins of each lecture	Required: NERS 344 or graduate standing

COURSE OBJECTIVES Links to: [Departmental Program Educational Objectives PEOs]	Links shown in brackets are to course outcomes that satisfy these objectives. 1. Provide students with a solid understanding of heat transfer mechanisms [1,2] 2. Teach students how to apply heat transfer laws [1, 2, 3] 3. Teach students how to analyze and design heat transfer systems [1,2, 3,4] 4. Provide students with a good understanding of special mechanisms (e.g. Leidenfrost effect, departure from nuclear boiling, etc.) affecting heat transfer [1,2,3,4]
COURSE OUTCOMES Links to: (Deptarmental Course Objectives) [ABET Student Educational Objectives SEOs]	Links shown in brackets are to program educational outcomes. 1. Knowledge of fundamental concepts in heat transfer (1,8) [a,h] 2. Ability to apply balances heat conduction equation to investigate temporal evolution of temperature in solids and fluids (1,2,3) [a,e,k] 3. Ability to determine the temperature distribution in solids and fluids (1,2,3) [a,e,k] 4. Ability to design optimal piping insulation (1,2,3,4) [a, c, e, k] 5. Ability to analyze and design heat exchangers (1,2,3,4) [a, c, e, k] 6. Ability to estimate frictional pressure drops in pipes and heat exchangers with two-phase flows. (1,2,3,4) [a, c, e, k]
ASSESSMENT TOOLS	1. Homework problems 2. Written examinations

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