MIE 1242 : Applied Thermal Management:
Applications in Electric Vehicles, Electronic Systems, and Datacenters

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Week	Lecture Topic (Fall 2022)
1	Introduction to thermal management a. what is involved - thermal design is a part of thermal management b. Why it is important c. Examples i. Electric Vehicles ii. Autonomous systems iii. Consumer Electronics iv. Datacenters and supercomputers
2	Process of Product Design in Thermal Systems a. Concept b. Architecture c. Life Cycle Assessment d. Design and optimization e. Validation f. Manufacturing g. Quality Control
3	A review of Fundamentals of Heat Transfer a. Conduction i. Steady state ii. Transient iii. Spreading resistance iv. Non Fourier heat Transfer b. Convection c. Radiation d. Compact modelling e. Thermal network and 1D modelling
4	Different types of cooling solutions 1. environment (no heatsink) 2. passive 3. Active a. air cooled b. liquid cooled i. single phase 1. Closed loop 2. Immersion ii. Two phase 1. Closed loop 2. Immersion

5	Heat Transfer enhancement a. Fin enhancement b. Heatpipe c. Vapor Chambers d. 3D vapor chambers e. Thermosyphon f. Heat spreaders (Graphite, Graphene, CNTs, …) g. Thermoelectric cooling
6	Review of cooling in Electrics Vehicle
7	Thermal Interface Materials a. Why needed and how used b. Thermal contact resistance c. Different types d. Characterization e. Reliability
8	Hands on session - tear down of industrial samples
9	Considerations in Datacenter cooling Review of Final Projects
10	Reliability of Thermal Management Systems a. Reliability concepts b. Typical reliability tests c. DFMEA
11	Control and Acoustics in engineering systems a. General introduction b. Sounds Measurement c. Sound quality d. Live demonstration
12	Manufacturing and mechanical Considerations a. Common manufacturing methods for cooling solutions b. Tolerance Analysis
13	Presentation on Final Project