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Week 1
Intention
Goal: What do you want to achieve at the end of Chapter 2? To get a better understanding on heat transfer with a more in-depth explanation on specific scenarios compared to vague concepts.
Desired Outcomes—learning outcomes I want to achieve in MECH 3228
Based on Chapter 2 learning outcomes presented in the lecture, discuss the topics that are the most interesting to you and what you want to achieve. I'm interested in the application of differential equations in the heat transfer types and see how to it is applied with other course we've been taught.
Self-Understanding—strengths that I can build on and development needs I can address to be successful in MECH 3228
Strengths: My strengths are notetaking and concentrating in class, which will both be very helpful when studying later for tests/assignments. Development Needs: Time management outside of class and organizing it so everything is studied as need be.

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LECTURE CONTENT
What is the difference between transient and steady state heat transfer? Which term in the general differential equation reflects the time dependency? Steady state heat transfer has a heat generation, the differential equation equals zero. The transient heat transfer does not have heat generation and the time dependency is on temperature.
What is the difference between 1-D, 2-D and 3-D heat transfer analysis? In general, is heat transfer 1-D, 2-D or 3-D? Why? 1D means temperature varies only on 1D majority of heat transfer. 2D means heat transfers goes through cross section and no variation takes place on the third dimension. 3D is more generalized cases through temperature varies as it is a heat flux.
What are the different forms of heat generation presented in class? Which form do we encounter most in Mechanical Engineering? Electric energy is being converted to heat at a rate of I^2R. Fuel elements of nuclear reactor. Exothermic chemical reactions. Most common in mechanical is in chemical reactions.
What is the difference between natural and forced convection? Which would have a higher heat transfer rate and why? Forced convection is forced flow over the surface by external means while natural convection is caused by buoyancy forces that are induced by density differences due to the variation of temperature fluids. The forced convection is higher because by moving fluids in the same period of time, more heat is absorbed by the fluid so it can be forced away from source.
What does it mean “heat generation is a volumetric phenomenon”? Since heat transfer operates on the rate of heat transfer depends upon the area and length. Heat transfer does not depend upon mass in any mode of heat transfer which makes the heat generation a volumetric phenomenon.

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The general equation in a plane wall is given by the following equation:

$$\frac{\partial}{\partial x}\left(k\frac{\partial T}{\partial x}\right)+\frac{\partial}{\partial y}\left(k\frac{\partial T}{\partial y}\right)+\frac{\partial}{\partial z}\left(k\frac{\partial T}{\partial z}\right)+\dot{e}_{gen}=\rho c_p\frac{\partial T}{\partial t}$$

Write all the assumptions needed to simplify the above equation to Laplace equation?

Thermal conductivity remains constant over the range of temperatures.

Uniform specific heat, perfect insulation, not internal heat sources.

In steady state, alpha is zero. In transient with no heat generation, meaning no heat generation. Steady state, with no heat generation is with alpha as zero too.