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Week 11
Intention
Goal: What do you want to achieve at the end of Week 11? 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
Discuss the topics that seemed most interesting to you and where you anticipate you will use them. To see the applications of heat transfer and show how closely related these topics are with all the scenarios and ways to approach the questions.
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 test/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 range of electromagnetic waves that corresponds to thermal radiation? How much of it is in the visible spectrum? What are the other two spectrums in thermal radiation? 10^-1 to 10^2 is the thermal radiation of the wavelength. Ultraviolet light starts at 10^-2 to 10^-1, while the visible spectrum is 10^-1 to 1. Infrared and ultraviolet are the other two spectrums in thermal radiation.
What is a blackbody? Describe blackbody emissive power. A black body emits the maximum amount of radiation by a surface at a given temperature. It is a perfect emitter and absorber of radiation. A blackbody is said to be a diffuse emitter since it emits radiation energy uniformly in all direction. $E_b(T) = \sigma T^4 \qquad (\mathrm{W/m^2})$ *Blackbody emissive power*
What is Planck's Law? Spectral blackbody emissive power is the amount of radiation energy emitted by a blackbody at a thermodynamic temperature T per unit time, per unit surface area, and per unit wavelength about the wavelength. $E_{b\lambda}(\lambda, T) = \dfrac{C_1}{\lambda^5[\exp(C_2/\lambda T) - 1]}$
Describe Wein's displacement law The emitted radiation is a continuous function of wavelength. As temperature increases, the curves shift to the left to the shorter wavelength region. The radiation emitted by the sun which is a blackbody at 5780K reaches its peak in the visible region of the spectrum. On the other hand, surfaces at T<800K emit almost entirely in the infrared region and thus are no visible to the eye unless they reflect light coming from other sources.
What are blackbody radiation functions? The fraction of radiation emitted from a blackbody at temperature T in the wavelength band from 0 to lambda of the wavelength. $f_\lambda(T) = \dfrac{\int_0^\lambda E_{b\lambda}(\lambda, T)\, d\lambda}{\sigma T^4}$
What is radiation intensity? Describe incident radiation. Radiation is emitted by all parts of a plance surface in all directions into the hemisphere above the surface. The directional distribution of emitted radiation is usually not uniform. We need a quantity that describes the magnitude of radiation emitted in a specified direction in space which is radiation intensity.
Describe solid angle. The three-dimensional body formed when connecting all points on the edge with the center of an object. Area of a surface on a sphere of unit radius is equivalent in magnitude to the solid angle it subtends.

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Describe radiation properties (i.e emissivity, absorptivity, reflectivity, and transmissivity).

Emissivity of a real surface varies with the temperature of the surface as well as the wavelength and the direction of the emitted radiation. As the surface is said to be diffuse if its properties are independent of direction and gray if its are properties are independent of wavelength.

Variation of absorptivity with the temperature of the source of irradiation for various common materials at room temperature. The absorptivity of a material may be quite different for radiation originating from sources at different temperatures.

$$\textit{Absorptivity:} \quad \alpha = \frac{\text{Absorbed radiation}}{\text{Incident radiation}} = \frac{G_{\text{abs}}}{G}, \qquad 0 \le \alpha \le 1$$

$$\textit{Reflectivity:} \quad \rho = \frac{\text{Reflected radiation}}{\text{Incident radiation}} = \frac{G_{\text{ref}}}{G}, \qquad 0 \le \rho \le 1$$

$$\textit{Transmissivity:} \quad \tau = \frac{\text{Transmitted radiation}}{\text{Incident radiation}} = \frac{G_{\text{tr}}}{G}, \qquad 0 \le \tau \le 1$$

What does absorptivity depend on?

Absorptivity depends on the wavelength and direction of the incident light, type of the material, chemical composition and structure of the material, state of the material and surface.