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PH2501 -- Photonics
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Study Guide 3

Week 3 11/5 – 11/9	Homework due 11/13 (Tues)

READINGS: Quimby, Chapters 5 and 6

Ch. 5: We now consider the extent to which light is lost as it propagates along an optical fiber or waveguide. This loss is quantitatively characterized by the *attenuation coefficient*, which can also be expressed as a dB loss per unit length. The three types of loss, *absorption, scattering*, and *bending loss*, are discussed separately. The most important scattering mechanism in fiber is usually *Rayleigh scattering*, but *Brillouin* and *Raman scattering* are important for certain applications, especially when the light intensity is very high. When a fiber or waveguide is bent, light can be lost from the waveguide, or coupled into different modes.

Ch. 6: In this chapter, the manner in which light spreads out as it propagates (dispersion) is examined in more detail. An important distinction is between *intermodal dispersion* (dispersion between different modes) and *intramodal dispersion* (dispersion within one mode). The former can be eliminated by the use of *graded index fiber*, or by reducing the diameter of the fiber core. Even when only one mode can propagate, there is still intramodal dispersion. The different types of intramodal dispersion that we will consider are *material dispersion, waveguide dispersion*, and *polarization-mode dispersion*. Special fiber types (*dispersion-shifted, dispersion-flattened*) have been developed to optimize the dispersion properties of fibers for telecommunications.

PROBLEMS: Ch. 5: problems 2, 3, 6, 9, 12

Ch. 6: problems 1, 2, 3, 4, 7, 10