Optical spectroscopy of correlated electron systems

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This is a tutorial lecture for beginners in optical spectroscopy. I shall present the fundamental physics about optical properties of solids. This includes the relations between different optical constants, the Kramers-Kronig transformation of reflectance spectrum, the Drude and Lorentz model and its application in the data analysis. I shall explain the difference in optical responses between simple metals and correlated electron systems, and illustrate how to extract the underlying Bosonic spectral function and other information from conductivity spectra. I shall also compare the information yielded by optical spectroscopy with other spectroscopic techniques, for example, the ARPES.