

Hanson: Spectroscopy and Laser Diagnostics

June 2015: Short Course Content

Day	Lecture #	Chapter / Topic
Monday	1	Overview & Introduction Course organization, role of quantum mechanics, Planck's Law, Beer's Law, Boltzmann distribution
	2	Diatomic Molecular Spectra Rotational Spectra (Microwaves) Vibration-Rotation (Rovibrational) Spectra (Infrared)
	3	Diatomic Molecular Spectra Electronic (Rovibronic) Spectra (UV, Visible)
Tuesday	4	Polyatomic Molecular Spectra Rotational Spectra (Microwaves) Vibrational Bands, Rovibrational Spectra
	5	Quantitative Emission/ Absorption Spectral absorptivity, Eqn. of Radiative Transfer Einstein coefficients/theory, radiative lifetime, line strength
	6	Spectral Lineshapes Doppler, Natural, Collisional and Stark broadening, Voigt profiles
Wednesday	7	Electronic Spectra of Diatomics Term symbols, molecular models: rigid rotor, symmetric top, Hund's cases, quantitative absorption
	8	Case Studies of Molecular Spectra Ultraviolet: OH
	9	Tunable Diode Laser Absorption Spectroscopy (TDLAS) Fundamentals and applications in aer propulsion
Thursday	10	TDLAS Applications in Energy Conversion Tunable diode laser applications in IC engines Coal-fired combustion
	11	Shock Tube Techniques What is a Shock Tube? Recent advances, ignition delay times
	12	Shock Tube Applications - with Lasers Multi-Species Time Histories Elementary Reactions
Friday	13	Laser-Induced Fluorescence (LIF) Two-level model, more complex models,
	14	Laser-Induced Fluorescence: Applications (Part 1) Diagnostic applications (T, V, species), PLIF for small molecules
	15	Laser-Induced Fluorescence: Applications (Part 2) Diagnostic applications (T, V, species), PLIF for large molecules The Future