



ULTRAFAST OPTICS AND SPECTROSCOPY

PROF. ATANU BHATTACHARYA
IISc Bangalore

TYPE OF COURSE : New | Elective | PG

COURSE DURATION : 12 weeks 29 Jul'19 - 18 Oct'19

Exam Date : 17 Nov 2019

INTENDED AUDIENCE : Senior UG, MSc and PhD

INDUSTRIES APPLICABLE TO : Optic Industries and Spectrometer

COURSE OUTLINE :

Plane wave and phase velocity, Representation of short pulses in time and frequency domain, General construction of laser, Ultrafast Laser System: Oscillator and Amplifier, Gaussian Beam characteristics, Polarization and Birefringence in ultrafast optics, Pulse Measurements in frequency and time domains, Nonlinear Ultrafast Optics: second order, third order, higher order, Dispersion in Ultrafast Optics, Ultrafast Spectroscopy, Ultrafast Dynamics through Conical Intersections, Ultrafast Processes in gas, liquid, and solids

ABOUT INSTRUCTOR :

Prof. Atanu Bhattacharya received the PhD degree in Physical Chemistry from Colorado State University (USA) in 2010. His doctoral research involved the time and frequency resolved spectroscopy of energetic molecules in molecular beam under supervision of Prof. Elliot R. Bernstein. In 2013, he joined Indian Institute of Science (Bangalore, India) as assistant professor at the Department of Inorganic and Physical Chemistry. Currently, he is specializing in Attosecond Chemistry, Femtosecond Chemistry of Catalysis and Explosives and Femtosecond X-ray Spectroscopy.

COURSE PLAN :

Week 1: Introduction and Mathematical Representation of Ultrafast Pulse

Week 2: Propagation of Ultrafast Pulse, Part I: Nonlinear Optical Effects

Week 3: Propagation of Ultrafast Pulse, Part I: Nonlinear Optical Effects

Week 4: Propagation of Ultrafast Pulse, Part I: Nonlinear Optical Effects

Week 5: Propagation of Ultrafast Pulse, Part II: Dispersion Effects

Week 6: Propagation of Ultrafast Pulse, Part II: Dispersion Effects

Week 7: Construction of Ultrafast Laser

Week 8: Measurement of Ultrafast Pulses

Week 9: Ultrafast Spectroscopy, Part I: Measurement Techniques

Week 10: Ultrafast Spectroscopy, Part II: Kinetic and Quantum Model

Week 11: Ultrafast Processes, Part I: Molecular Photophysics and Photochemistry, Gas Phase Reaction Dynamics

Week 12: Ultrafast Processes, Part II: Metals, Semiconductors, Biomolecules and Transition Metal Complexes.