Course title: Nonlinear and Stochastic Dynamics of Optical Systems

Course contents:

Lectures 1 and 2: Noise and Chaos in Light and Nature
Probabilistic vs. deterministic dynamics
Ordinary differential equation models for simple deterministic systems: Lorenz system and the Laser Model
Stochastic differential equations for noise-driven systems: Brownian motion, laser phase and amplitude noise
Delay equations: Ikeda Model and Laser Dynamics

Lecture 3: Discerning Noise from Chaos: Measures and Measurements for laser light
Power spectra, basic ideas of time delay embedding, Poincare sections, estimates of dimensionality, fractal dimensions, Lyapunov exponents

Lectures 4 and 5: Coupled Systems and Synchrony in Optical Devices and Systems
Synchronization of dynamical systems
Huygens' clocks and the Millenium Bridge: Laser mode-locking and beam combination
Synchronized lasers and secret messages
Fiber and Semiconductor laser synchronization
Optoelectronic feedback loops and synchronization