

ACM270

*Title: Data-Driven Modeling of Dynamical Systems*

*Instructor: Stepaniants, George*

*Course Description:*

*Dynamical systems are a ubiquitous tool for modeling time-dependent processes in science and engineering. Progress in machine learning methods in the past two decades has been tremendous, giving rise to the field of scientific machine learning which combines data-driven methods with physical modeling techniques. This course will cover some of the pivotal data-driven algorithms and model architectures that have influenced the field of dynamical systems, enabling more accurate model inference, forecasting, and analysis of dynamical data. Special focus will be given to partially observed systems resulting from incomplete measurements of the system state or scale separation. Topics may include but are not limited to: system identification, Koopman theory, sparse model inference, neural ODEs, signature transforms, autoregressive models, Volterra equations, Mori-Zwanzig formalism, and higher-order models.*