class hours	Introduction to simulation and modeling of complex dynamical systems
	Part 0 - A quick "sneak preview" of the course
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	Part I - Assembling dynamical state space systems from typical engineering problems
1.0	I.1 - Sample problems from Electrical, Mechanical, Material, Civil & Biomedical Engineering
	I.2 - Assembling Models from Networks of Dynamical Systems
1.0	I.2.a - conservation & constitutive laws
1.0	I.2.b - node branch and nodal analysis
1.0	I.3 - Assembling dynamical system models from Partial Differential Equation solvers
	Part II - Basic numerical simulation techniques for dynamical system models
1.0	II.1.a - Steady state analysis of linear system models
1.0	II.1.b - Steady state analysis of non-linear system models
1.0	II.2 - Time domain simulation of dynamical systems models
1.0	II.3 - Important properties of physical dynamical systems (e.g. stability, passivity).
	PART III: Compression of Linear Dynamical Systems
2.0	III.1 - Compressing Linear Time Invariant (LTI) Systems
	III.1.a - Modal analysis (the eigenvalue method).
	III.1.b - Point Matching (rational function fitting).
2.0	III.2 - Compressing LTI Systems with the Projection Framework
	III.2.a - The Projection Framework
	III.2.b - Proper Orthogonal Decomposition (POD), or Karhunen-Lo`eve decomposition (KLD), or principal component analysis (PCA), or singular value decomposition (SVD).
	III.2.d - Truncated Balance Realizations (TBR).
	III.2.e - Passivity and stability preserving Moment Matching (PRIMA)
1.0	**Part IV - Compressing Non-Linear Dynamical Systems**
	IV.1 - Introduction, Examples, and Definitions
	IV.2 - Reduction of Weakly Non-Linear Dynamical Systems (Volterra Series).
	IV.3 - Trajectory Piece-Wise Linear (TPWL) + moment matching reduction
	IV.4 - Trajectory Piece-Wise Linear (TPWL) + balance realizations (TBR) reduction.
	IV.5 - Generationg of Compact Dynamical Models from Input/Output data
2.0	**PART V: Compressing Parameterized Dynamical Systems**
	V.1 - Motivations and problem classification
	V.2 - Compressing parameterized linear dynamical systems
	V.2.a - Reducing linear models with linear dependency on parameters
	V.2.b - Reducing linear models with non-linear dependency on parameters
	V.3 - Compressing non-linear models with non-linear dependency on parameters
	V.4 - Application examples employing Parameterized Compact Dynamical Modeling
	V.4.a - Solving inverse problems (photolithography monitoring, material science property
	V.4.b - Accelerating MonteCarlo-like methods for solution of stochastic PDEs with
16.0	Total class hours