Dr. Kody Powell, University of Utah
Fundamentals of Smart Systems Ch En 5960 / 6960
Video and Reading Schedule

Assignment	Video/Reading Title	Where to Find It
Assignment 1: Dynamic modeling of a CSTR	Introduction to Process Modeling	https://www.youtube.com/watch?v=_7wJkTgTsHw
	Development of a simple dynamic gravity-drained tank model	https://www.youtube.com/watch?v=hf8xE1SEY-s
	Implementing a simple, dynamic gravity-drained tank model in Simulink	https://www.youtube.com/watch?v=epRgqDKFZVs
	Dynamic Model of an Isothermal CSTR	https://www.youtube.com/watch?v=2g3XSc5jzOQ
	Dynamic Simulation of CSTR in Simulink	https://www.youtube.com/watch?v=C6z4UisMjZY
Assignment 2: Developing an automation scheme for a plant	Solving a first-order lag equation in Simulink	https://www.youtube.com/watch?v=eSyKReXmBuw
	Modeling a linear valve with first order dynamics	https://www.youtube.com/watch?v=KgEbG3h4uv4
	Introduction to the concept of proportional and integral control	https://www.youtube.com/watch?v=1iwSYBjoBHw
	Controller tuning and controller saturation/ windup	https://www.youtube.com/watch?v=hQoOMyNqFDU
	Creating a subsystem in Simulink	https://www.youtube.com/watch?v=FwqWv0DbQWM
	Introduction to cascade control	https://www.youtube.com/watch?v=HZgO6SLH2bk
	Introduction to override control	https://www.youtube.com/watch?v=gpZudY6TH78
	Override control and custom logic	https://www.youtube.com/watch?v=HQ6YtMq4wes
	Static Feedforward controller (optional)	https://www.youtube.com/watch?v=j8kYi1NQlVQ

	Feedforward control example (optional)	https://www.youtube.com/watch?v=Ba6EyCYSEYM
Assignment 3: Developing a batch control sequence for product tanks	How to program an on/off controller and use custom logic to implement hysteresis	https://www.youtube.com/watch?v=CrRq4GKENr8
Assignment 4: Empirical Modeling using Multiple Least Squares	Mathematical derivation of multiple least squares	https://www.youtube.com/watch?v=oLwLFdy8sv4
	Application of multiple least squares in Matlab	https://www.youtube.com/watch?v=-Hh50-KGvlY
	How to export data from Simulink to Matlab	https://www.youtube.com/watch?v=mCJNuH5PdoU
	Mathematical derivation of least squares	https://isites.harvard.edu/fs/docs/icb.topic515975.files/OLSDerivation.pdf
Assignment 5: Quadratic Programming (QP) and Real-Time Optimization (RTO)	Introduction to Optimization	https://www.youtube.com/watch?v=I1JqGiG_P_w
	Overview of Quadratic Programming	https://www.youtube.com/watch?v=GZb9647X8sg
	How to solve a Quadratic Program in Matlab	https://www.youtube.com/watch?v=2LbNIDwla_c
	Overview of Real-Time Optimization	Placeholder for next year
Assignment 6: Nonlinear Programming (NLP) and RTO	Overview of Nonlinear Programming	https://www.youtube.com/watch?v=K7eHfL4dYN8
	Application of Nonlinear Programming in Matlab	https://www.youtube.com/watch?v=qTJDNXRfcsc

Assignment 7: Machine Learning Using Artificial Neural Networks	Overview of Artificial Neural Networks (ANNs)	**https://www.youtube.com/watch?v=v2tKoymKIuE**
	Application of Artificial Neural Networks Using Matlab	**https://www.youtube.com/watch?v=DCaSedfnMbk**