

# eCAL Recommended Courses for Research



The Energy, Controls, and Applications Lab (eCAL) conducts research that spans across control systems, optimization, batteries, energy storage, building energy, vehicle-grid integration, and smart grids. To conduct high-quality research, a fundamental training is absolutely required through coursework. The following is a list of “eCAL recommended courses” for current & prospective eCAL graduate researchers.

The following is an aggregate list of recommended courses, and *does not* represent a comprehensive curriculum nor course requirements for a M.S. or Ph.D. degree. Your course schedule must comply with [departmental requirements](#) and the [Berkeley Graduate Division Guide to Graduate Policy](#).

THEORY		APPLICATION	
<b>Controls Group</b>		<b>Power and Energy Group</b>	
CE 295	Energy Systems and Control	EE 137A & EE 137B	Intro to Electric Power Systems: 137A = conventional grid; 137B = smart grid
EE 221A -or- ME C232	Linear Systems Theory -or- Advanced Control Systems I	CE 107 -or- ER 200	Climate Change Mitigation -or- Energy & Society
EE 222 -or- ME 237	Nonlinear Systems- Anal, Stab., Ctrl -or- Control of Nonlinear Dynamics Systems	ER 254	Electric Power Systems
ME 231A	Experiential Advanced Control Design, aka Model Predictive Control	EE 194 / EE 2900	Electric Machines, Actuators, and Drives
ME 233	Advanced Control Systems II (optimal, stochastic, & adaptive control)	ME 246	Adv Energy Conversion Principles
CE C291F	Control and Optimization of Distributed Parameter Systems	ARCH 249-002	Assessing Building Energy Use and Indoor Environmental Quality
ME 234	Multivariable Control Systems		
CE 290I	Control and Information Management		<b>Climate, Sustainability, Policy, &amp; Energy Economics</b>
EE 223	Stochastic Estimation and Control	CE 268E	Civil Systems & Environment
MATH 126 -or- MATH 222A/B	Intro to Partial Differential Equations -or- Partial Differential Equations	EEP 147 -or- MBA 212	Regulation of Energy & Environment -or- Energy & Environmental Markets
		CE 256	Transportation Sustainability
		CE 218A	Air Quality Engineering
<b>Optimization Group</b>		ER 290	Seminar in Energy & Resources
CE 191 -or- EE 127/ 227AT	CEE Systems Analysis, aka Optimization -or- Optimization Models in Engineering	Law 270.6	Energy Regulation & the Environment
EE 227BT	Convex Optimization	Law 270.65	Energy Project Develop & Finance
EE C227C	Optimization for Modern Data Analysis	Law 270.2	Environmental Law and Policy
IEOR 265	Learning and Optimization		<b>Hardware, Cyber Physical Systems, &amp; Projects</b>
<b>Statistics and Data Analysis Group</b>		CE 186	Design of Cyber Physical Systems
CE 193	Engineering Risk Analysis	CE 271	Sensors & Signals
EE 126 -or- EE 226A	Probability & Random Processes -or- Random Processes	CS194-5/ CS294-100	Internet of Everyday Things
CE 263N	Scalable Spatial Analytics	CE C289	Embedded System Design
CE 264	Behavioral Modeling for Engineering, Planning, and Policy Analysis	CE 209 -or- ME C200	Design for Sustainable Communities -or- Development Technologies
STAT 154	Stats Prediction & Machine Learning		
E 231	Mathematical Methods in Engineering		
CS 289A	Introduction to Machine Learning		
CS 281A/ STAT241A	Statistical Learning Theory		