University of California, Berkeley
Department of Mechanical Engineering
Department of Electrical Engineering and Computer Sciences

ME C231A: Experiential Advanced Control Design I **(3 units)**
EECS C220B: Experiential Advanced Control Design I **(3 units)**

Graduate Course

Syllabus

CATALOG DESCRIPTION

Experience-based learning in the design of SISO and MIMO feedback controllers for linear systems. The student will master skills needed to apply linear control design and analysis tools to classical and modern control problems. In particular, the participant will be exposed to and develop expertise in two key control design technologies: frequency-domain control synthesis and time-domain optimization-based approach.

COURSE PREREQUISITES

ME 132 or ME C134/EE C128

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

Will vary from semester to semester.

COURSE OBJECTIVES

After a review of basic loopshaping, the first part of this course introduces the loopshaping design methodology of McFarlane and Glover, and learn how to use it effectively for SISO systems. The second part of this course is an introduction to multi-input and multi-output (MIMO) feedback control design fundamentals generalizing the results of the first part. The third part of this course provides and introduction to basic convex optimization techniques that are used in many modern advanced control systems design and analysis tools. The fourth part of this course provides instruction on the use of model predictive control. The course emphasizes the use of computer aided design techniques through case studies and design tasks.

DESIRED COURSE OUTCOMES

Experience-based learning in the design of SISO and MIMO feedback controllers for linear systems. The student will master skills needed to apply linear control design and analysis tools to classical and modern control problems. In particular, the participant will be exposed to and develop expertise in two key control design technologies: frequency-domain control synthesis and time-domain optimization-based approach.

TOPICS COVERED

1. Basics on loopshaping design
2. Methodology of McFarlane and Glover for SISO systems
3. Loopshaping for MIMO systems

4. Basic convex optimization
5. Introduction to Model Predictive Control

CLASS/LABORATORY SCHEDULE

3 hours lecture per week, 2 hour computer practice lab

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

Advanced software tools will be used throughout the course for the design and analysis of linear SISO and MIMO controllers. In addition, the course will help the student in understanding how a given control technology fits in the larger process of control design. This includes strategies to define performance metrics, develop control-oriented process model, assess appropriate control structure and validate the controlled system performance.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

20% - Homework
40% - 2 midterms (20% each)
40% - Final Exam

PERSON(S) WHO PREPARED THIS DESCRIPTION

Francesco Borrelli
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ABBREVIATED TRANSCRIPT TITLE (19 SPACES MAXIMUM): Experiental Control
TIE CODE: LECT
GRADING: Letter
SEMESTER OFFERED: Spring
COURSES THAT WILL RESTRICT CREDIT:
INSTRUCTORS: Borrelli, Hedrick, Horowitz, Packard, Poolla, Tomizuka
DURATION OF COURSE: 15 weeks
EST. TOTAL NUMBER OF REQUIRED HRS OF STUDENT WORK PER WEEK: 9
IS COURSE REPEATABLE FOR CREDIT? No
CROSSLIST: EECS C220B