ECE 8250: Continous Time Optimal Control

Course Description

Embraces the three historical trends in dynamic optimization: Calculus of Variations, Pontryagin's Minimum Principle, and Bellman's Principle of Optimality. Not only mathematical aspects of the three principles will be taught, but also their strengths and weaknesses - it is often less important to know how to apply a given principle than to know when.

Transcript Abbreviation: Optimal Control
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Graduate
Student Ranks: Doctoral
Course Offerings: Spring
Flex Scheduled Course: Never
Course Frequency: Even Years
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Prereq: 5551 or MechEng 5372, or permission of instructor.
Exclusions: Not open to students with credit for MechEng 8220.
Cross-Listings: Cross-listed in MechEng 8220.

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001
Subsidy Level: Doctoral Course

General Information

The topics to be covered include the three principles of optimality along with their application to minimization of time, energy, fuel and maximization of flight distance problems for continuous-time systems.

Course Goals

The objective of the course is to give students background in the main mathematical principles for designing optimal control systems.
Demonstrate the basic concepts of the conventional calculus of variations and their application for dynamic optimization.
Demonstrate why the conventional calculus of variations is not applicable for designing optimal control for the processes of modern technology.
Demonstrate the new mathematical methods intended for systems with different types of constraints

Teach students to apply the methods of optimal control theory for such well known problems as minimization of transient time and fuel consumption, maximization of flight distance for air and space crafts etc.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Linear optimal systems	4.0							
Calculus of variation (CV)	4.0							
CV for optimal control	4.0							
Minimum principle	4.0							
Dynamic programming	4.0							
Singular problems	4.0							
Applications of optimal control	4.0							

Grades

Aspect	Percent
Final Examination	40%
Midterms	30%
Homework	30%

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
**	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
*	c	An ability to design a system, component, or process to meet desired needs.
	d	An ability to function on multi-disciplinary teams.
***	e	An ability to identify, formulate, and solve engineering problems.
*	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
***	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
*	j	A knowledge of contemporary issues.
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Additional Notes or Comments

Make consistent with university version 2/21/14

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