

ECE 5207: Real-Time Digital Signal Processing Laboratory

Course Description

Real-time signal processing of acoustic signals and video images; finite impulse response filters; adaptive filtering; array processing; fast Fourier transform.

Prior Course Number: 609

Transcript Abbreviation: Real-Time DSP Lab

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad, Graduate

Student Ranks: Junior, Senior, Masters, Doctoral

Course Offerings: Spring

Flex Scheduled Course: Never

Course Frequency: Every Year

Course Length: 7 Week

Credits: 0.5

Repeatable: No

Time Distribution: 3.0 hr Lab

Expected out-of-class hours per week: 0.0

Graded Component: Laboratory

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: Prereq or concur: 5200 (600), and enrollment in ECE major or Grad standing in ECE.

Exclusions: Not open to students with credit for 4207 or 609.

Cross-Listings:

Course Rationale: Change 4207 to 5207 so that graduate students can take it, thereby helping with their graduate projects/theses.

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

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

General Information

Class meeting pattern: seven 3-hour laboratory sessions
Additional exercises are available in the online laboratory manual; instructors may select from these as alternatives for labs 4 through 7.

Course Goals

Students learn to use a software tool chain for implementing signal processing algorithms on real-time hardware.
Students apply signals and systems concepts for real-time processing of both acoustic and image signals.
Students learn to design, simulate, and deploy a real-time application of adaptive signal processing.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction: familiarity with tool chain			3.0					
Image processing: real-time processing with camera			3.0					
Angle of arrival: array processing with sound card			3.0					
Sound effects processing			3.0					
Vocoder			3.0					
Adaptive filtering for system identification			3.0					
Adaptive filtering for interference cancellation			3.0					

Grades

Aspect	Percent
Laboratory reports	75%
Laboratory demonstrations	25%

Representative Textbooks and Other Course Materials

Title	Author
<i>Real-time Digital Signal Processing: Laboratory Exercises Using Simulink Support for the Raspberry Pi (available via course page)</i>	A. Rich, L. Potter, and M. Riedl

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.

CpE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
***	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
*	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
	3	an ability to communicate effectively with a range of audiences
	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
***	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
***	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
*	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

EE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
**	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
	3	an ability to communicate effectively with a range of audiences
	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
***	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
***	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
*	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Additional Notes or Comments

Change course number from 4207.

Changed text. 3/25/15. CED

Lab course redesigned for SP 2015 offering; area's last Q2S revision in a stage effort of curriculum development.

Changed course description, topics, goals, and grading 6/16/16 BLA

Fixed course topics 6/4/17 BLA

edited text info, 5/10/17, CED

New ABET outcomes 6/5/ 2019 BLA

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