ECE 7022 (Approved): Advanced RF Integrated Circuits

Course Description

Advanced topics on RF and mm-wave circuits. Frequency synthesizers, transmitter linearization techniques (e.g. polar circuits), MIMO and phase array circuits, power D/As.

Prior Course Number: 694.02
Transcript Abbreviation: Advanced RFIC
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Graduate
Student Ranks: Masters, Doctoral
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Odd 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: 5022 (620), or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.
Exclusions: Not open to students with credit for 694K or 694.02.
Cross-Listings:

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

Course Goals

Learn principles of Integer and Frac-N Frequency Synthesizers
Learn beamforming techniques such as MIMO and phase array circuits
Learn concepts of power D/As for ultra wideband transmission circuits (e.g. Software Definer Radio)
Power amplifier linearization concepts

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Frequency synthesizers (phase detectors, charge pumps, multi-modulus dividers and voltage controlled oscillators, integer and frac-N synthesizers)	10.0							

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
All-digital phase lock loops	4.0							
Direct Digital Frequency Synthesis (DDS)	5.0							
Software defined transmitters and power D/As	4.0							
Transmitter linearization techniques	7.0							
Beamforming circuits	8.0							

Representative Assignments

Design projects
Design Reports
Computer Aided Simulation
Oral presentation of design projects

Grades

Aspect	Percent
Homework (Design Projects)	60%
Final Design Project	40%

Representative Textbooks and Other Course Materials

Title	Author
The Design of CMOS Radio-Frequency Integrated Circuits	T. Lee

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

Updated course description, prereqs, exclusions, goals, and topics to match university format. Deleted representative text Integrated Circuit Design John Rogers and Calvin Plett, since Lee will be th official text.

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