Fall 2017 Special Topics

CRN	Title	Units	Instructor	Days/Time
63771	289A – An Introduction of Reinforcement Learning	3	Cui	TR 10:30-11:50am
41194	289K – Integrated Circuits for Wireless Communications	4	Gu	TR 4:40-6:00pm

An Introduction of Reinforcement Learning

Shuguang Cui

Course description: This course focuses on the introduction of one important subject of machine learning: reinforcement learning, which is considered the core for artificial intelligence. Topics include fundamentals of reinforcement learning, bandit problems, Markov decision processes, dynamic programming, Monte Carlo methods, temporal-difference learning, on-policy vs. off-policy learning, learning vs. planning, approximation methods, eligibility trace, policy gradient methods, and critic-actor methods.

Other ECE faculties to cover this course: None.

Overlapping with other courses: No overlapping is found with other courses.

An Introduction of Reinforcement Learning

Instructor: Prof. Shuguang (Robert) Cui
Office: 3131 Kemper Hall
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Course description: This course focuses on the introduction of reinforcement learning. Topics include fundamentals of reinforcement learning, bandit problems, Markov decision processes, dynamic programming, Monte Carlo methods, temporal-difference learning, learning vs. planning, approximation methods, eligibility trace, and policy gradient methods.

Number of Units: 3
Hours per week: 3
Class number: EEC 289A

Topics:

- Fundamentals of reinforcement learning
- Bandit problems
- Markov decision process
- Dynamic programming
- Monte Carlo methods
- Temporal-difference learning: TD(0)
- N-step TD
- Learning vs. planning
- Approximation methods
- Eligibility trace
- Policy gradient methods

Recommended Texts:

Reinforcement Learning: An Introduction

Richard S. Sutton and Andrew G. Barto

http://incompleteideas.net/sutton/book/the-book-2nd.html

Grading Structure

10 Homework sets, 20pts/each, in average worth 20 points
One midterm, worth 30 points
Class participation (quizzes and class attendance), in average worth 10 points
Final Project, worth 40 points

EEC 289K- Integrated Circuits for Wireless Communications

4 units – Fall 2017

Prerequisite: EEC 132A and EEC 112 or equivalent

Grading: Letter

Time and location: TBD

Office hour: TBD, 2041 Kemper Hall

Evaluation: The final grade will be based on a mid-term exam (30%), final exam (50%), and design project (20%).

Tentative Course Description

Part 1 (about 1~2 weeks): Analyze key circuit and system specifications, such as noise figure, linearity etc. This part will cover the key design specification definition and analysis and use real circuit examples to analyze these key specs and link to the design parameters, such as circuit structure, device size, and bias condition. Both CMOS and bipolar devices will be used for comparison.

Part 2(about 1 week): Review and wrap up of different transceiver architectures: heterodyne, homodyne, digital-IF. This part will review the major differences and system specification concerns for different transceiver architectures and use existing circuit and system examples for practical analysis.

Part 3 (about 2~3 weeks): Analyze and design amplifiers. This part will majorly cover LNA design, including the detail analysis of each LNA structure, such as common source, common gate, and source follower in transistor level. It will also use both bipolar and CMOS to demonstrate the design difference. Impedance matching network will also be covered.

Part 4 (about 2weeks): Analyze and design frequency conversion circuits, majorly focusing on down conversion and up conversion mixers. This part will cover the design details of mixers and analyze mixer performance with frequency conversion scenarios, as well as practical design considerations.

Part 5 (about 3 weeks): Analyze and design synthesizer circuits. This part will cover the analysis of different synthesizer architectures, design of individual components in synthesizers, including VCO, divider, charge pump, PFD etc.

A design project on CMOS in this course will be included

Textbooks:
"RF Microelectronics" Behzad Razavi
"The Design of CMOS Radio-Frequency Integrated Circuits" Thomas Lee

Instructor: Jane Gu