<table>
<thead>
<tr>
<th>CRN</th>
<th>Title</th>
<th>Units</th>
<th>Instructor</th>
<th>Days/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>22111</td>
<td>EEC 289K - Hi Frequency Phenomena &amp; Development</td>
<td>3</td>
<td>Jane Gu</td>
<td>MW 4:40-6:00pm</td>
</tr>
<tr>
<td>44525</td>
<td>EEC 289K - Linearization Techniques in RF Amplifier Design</td>
<td>3</td>
<td>Pham</td>
<td>TTH 10:30-11:50am</td>
</tr>
<tr>
<td>44196</td>
<td>EEC 289Q - Modern Parallel Computing</td>
<td>3</td>
<td>Owens</td>
<td>TTH 10:30-11:50am</td>
</tr>
<tr>
<td>44541</td>
<td>EEC 289T - Advanced Treatment of Electromagnetics Focusing on Applications to Radiation and Antennas</td>
<td>3</td>
<td>Branner</td>
<td>MW 6:10-7:00pm</td>
</tr>
</tbody>
</table>
EEC 289K- Integrated Circuits for Wireless Communications

3 units – Winter 2016

**Prerequisite:** EEC 132A and EEC 112 or equivalent

**Grading:** Letter

**Time and location:** MW 04:40 PM-06:00 PM, Olson Hall 263

**Office hour:** MW 3:30-4:20PM, 2041 Kemper Hall

**Evaluation:** The final grade will be based on homework assignments (10%), a mid-term exam (30%), final exam (40%), 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 2 weeks): 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
EEC 289 Linearization Techniques in RF Power Amplifier Design (3 Units)  
Winter 2016

Time: 10:30-11:50am TTH
Location: BAINER 1128

Instructor: Anh-Vu Pham  
3141 Kemper Hall  
Phone: 752-7472  
Email: pham@ece.ucdavis.edu

Office Hours: TTH 12:00pm – 1:00pm

Course Description: non-linearity in RF power amplifiers; feedback linearization techniques; predistortion techniques; feedforward linearization techniques; device-level and second harmonic linearization techniques.

Course Goals Students will gain the fundamentals of nonlinear circuits and be familiarized with several techniques to linearize microwave power amplifiers.

Expanded Course Description

I. Topics in power amplifier nonlinearity  
   A. Review of two-carrier characterization  
   B. Error vectors  
   C. Memory and intermodulation asymmetry

II. Feedback linearization techniques for RF power amplifiers (RFPA)  
   A. Amplitude enveloped feedback: configuration and analysis  
   B. Vector Envelope feedback

III. Predistortion Techniques  
   A. Predistortion analysis and model  
   B. Analog predistortion  
   C. Digital predistortion

IV. Feedforward power amplifier linearization techniques  
   A. Analysis of the generalized feedforward loop  
   B. Design of components and feedforward loop linearization circuits  
   C. Effects of AM-PM and gain compression adjustment

V. Other linearization techniques  
   A. Device level linearization techniques  
   B. Second harmonic linearization techniques
Text Book

Reading Materials

Grading (Letter)
Projects (3) 60%
Final Exam 40%

CAD Tools:  Agilent Advanced Design System and Microwave Office
EEC 289 Q Modern Parallel Computing (3 Units)
Winter 2016

Time: 10:30-11:50am TTH
Location: Wellman Hall 27
Instructor: John Owens

Prerequisites: We assume that students who take the course will have experience using the C/C++ programming language; prior experience in any of computer architecture, computer graphics, algorithms, and data structures will also be useful. All assignments will use C/C++.

Course Description: This course focuses on modern parallel computing and for this particular offering of the course, GPU computing. We will explore using the programmable GPU as a parallel computer, primarily using the CUDA programming language (an extension to C/C++). We will cover the architecture of the GPU and its programming model; the CUDA programming language; fundamental data structures and algorithms on the GPU; numerous application domains and how they can be expressed on the GPU; programming models and high-level languages for GPU computing; and current research challenges in GPU computing. We expect that students who successfully complete this course will be ready to use GPU computing in their own projects and research, and/or be ready to conduct GPU-computing research on their own.

Grading (Letter)
EEC 289 T

3 units - Winter quarter 2016
Instructor: Branner, G.R
Lecture: 3 hours
Prerequisite: 132A or equivalent
Co requisite: 132B
Grading: Letter; Homework 20%, Exam 30%, Lab 50%

Catalog Description:
An advanced treatment of electromagnetics focusing on applications to radiation and antennas.

Expanded Course Description:

I. Fundamental Concepts
   A. Basic equations
   B. The generalized current concept
   C. Singularities of the field
II. Waves
   A. Intrinsic wave constants
   B. Radiation
   C. On Waves in General
III. Some Theorems and Concepts
   A. The source concept
   B. Duality
   C. Image theory
   D. The equivalence principle
   E. The Induction Theorem
   F. Reciprocity
   G. Green’s Functions
   H. Construction of solutions
IV. Plane Wave Functions
   A. Alternative mode sets
   B. Apertures in ground planes
V. Radiation and Antennas
   A. Retarded Potentials
   B. Linear Antennas
   C. Antenna Arrays
   D. Aperture Antennas
   E. Horn Antennas
   F. Reflector Antennas

Textbook: Balanis "Antenna Theory"
            Silver "Microwave Antenna Theory and Design"

Abet Category: Engineering Science 3 credits