

## EEE 4373 and EEL 5934 Radio Frequency Electronics Syllabus Fall 2017

TA: Lisdelys Garcia, lg24728@ufl.edu, Office Hours TBA

### **Course Outline:**

Weekly Date, (No. of Classes) Class topics, Readings, In Class Notes in pdf form.

08/22 (3) [Syllabus](#), [Permission and Survey](#), [Intro to RF Technology](#), [Agilent ADS PC Installation](#), [ADS on the 2n Floor of NEB](#), [MOS Transistor Review](#), [CMOS Amplifiers](#)

[Homework 1: Due: August 31, 2017](#)

[Apple iPhone breakdown RF Sections](#)

Please install ADS on a PC or use ADS in the 2nd Floor NEB, you can use VMware to get office campus access to the NEB PCs too.

Good starting ADS Tutorial lecture, Click the

link: [http://rfmw.em.keysight.com/flash/eesof/ADS\\_QuickStart\\_2012\\_for\\_NEWUSERS/player.html](http://rfmw.em.keysight.com/flash/eesof/ADS_QuickStart_2012_for_NEWUSERS/player.html) (Links to an external site.)Links to an external site.

You can also view the Video "Basics of ADS" on Youtube

<https://www.youtube.com/watch?v=ChZcUpH0rmk> (Links to an external site.)Links to an external site.

Other videos on youtube are at

<https://www.youtube.com/c/keysighteesofeda> (Links to an external site.)Links to an external site.

If you register for an account on the online Keysight EEsof and EDA knowledge center there are many documents and files you can use for learning about Advanced Design system

<http://edadocs.software.keysight.com/display/support/Knowledge+Center> (Links to an external site.)Links to an external site.

Read Chapter 1, Sections 2.1 and 2.2

[In Class Notes Lecture 1](#), [In Class Notes Lecture 2](#), [In Class Notes Lecture 3](#),

[Audio Lecture 1](#), [Audio Lecture 2](#), [Audio Lecture 3](#)

08/29 (3) [MOS Amp Practice Problem Solution](#), [Amplifier Design Strategy](#), [CMOS CE, CB and Cascode Amplifier Circuits](#), [MOS Differential Circuits](#), [Basic RF concepts](#), [RF Microelectronics Errata](#) ,

[Homework 2: Due Sept 7, 2017](#)

[Zigbee 3.0 White paper](#)

Read Sections 2.2, and 2.3

[In Class Notes Lecture 4](#), [In Class Notes Lecture 5](#), [In Class Notes 6](#)

[Audio Lecture 4](#), [Audio Lecture5](#), [Audio Lecture 6](#)

09/5 (3) Labor Day Holiday Sept. 4, 2017, [Nonlinearity](#), [Noise](#)

Read Sections 2.3 and 2.4

[Homework 3 Assigned](#)

[Homework 1 Solution](#)

[In Class Notes Lecture 7](#), [In Class Notes Lecture 8](#), [In Class Notes Lecture 9](#)

[Audio Lecture 7](#), [Audio Lecture 8](#), [Audio Lecture 9](#)

09/12 (3) [Noise](#), [Noise Calculations](#), [Second Noise Calculation Examples](#), [Example 2.18 noise calculation](#)

[Nonlinearity Problem worked out.](#)

[Homework 4 Assigned](#)

Read Sections 2.5, and 2.6

[In Class Notes Lecture 10](#), [In Class Lecture 11](#), [In Class Notes Lecture 12](#),

[Audio Lecture 10](#), [Audio Lecture 11](#), [Audio Lecture 12](#),

09/19 (3) [Basic S-parameter Analysis](#), [MOS Amps and S-parameters Notes](#), [Sensitivity and Dynamic Range](#), [S-parameter Supplemental Calculations](#), [Transformers](#), [Capacitive Transformers](#), [Series to Parallel Conversions in Amplifiers](#),

[Homework 2 Solution](#)

[Homework 5 Assigned](#)

Read Sections 3.2, 4.2.1,

[In Class Lecture 13](#), [In Class Lecture 14](#), [In Class Lecture 15](#)

[Audio Lecture 13](#), [Audio Lecture 14](#), [Audio Lecture 15](#)

09/26 (3) [Analog Modulation](#), [Digital Modulation](#), [Basic Heterodyne Receivers](#) [Modern Receivers](#)

[Exam 1 Solution 2016a](#)

[Exam 1 Solution 2016b](#)

[Homework 3 Solution](#)

Read Sections 4.1, to 4.2.3 page 186.

[Homework 4 Solution](#)

[In Class Lecture 16](#), [In Class Lecture 17](#), [In Class Lecture 18](#)

[Audio Lecture 16](#), [Audio Lecture 17](#), [Audio Lecture 18](#)

10/2 (3) [Basic Filter Analysis](#), Exam 1,

[Homework 6 Assigned](#)

[Homework 5 Solution](#)

Read Sections 5.1 and 5.2

[In Class Lecture 19](#),

[Audio Lecture 19](#),

10/10 (3) [LNA Considerations](#), [Introduction to LNAs](#), [Time Constant Analysis](#)

Read Section 5.2

[Solution to Exam 1](#)

[In Class Lecture 20](#), [In Class Lecture 21](#), [In Class Lecture 22](#)

[Audio Lecture 20](#), [Audio Lecture 21](#), [Audio Lecture 22](#)

10/17 (3) [Time Constant Analysis](#), [Time Constant Analysis MOS](#), [LNA Topologies](#),

[Using ADS Slides from David Munzer Lecture](#)

[ADS Design Project Assigned to Students Due December 6](#)

[Agilent ADS PC Installation,](#)

[ADS on the 2nd Floor of NEB](#)

[ADS Tutorial Kim.pdf](#)

[tsmc25d.scs](#)

[Homework 6 Solution](#)

[Homework 7 Assigned](#)

[Exam 2 Solution 2016,](#)

[Exam II Study Topics](#)

Read Section 5.2

[In Class Lecture 23,](#) [In Class Lecture 24](#)

[Audio Lecture 23,](#) [Audio Lecture 24](#)

10/24 (3), [LNA Design CS and CG,](#) [Series to Parallel Conversion Example,](#) [Transformers and Examples,](#) [Capacitive Transformer](#)

Read Sections 5.2 and 5.3

[In Class Lecture 25,](#) [In Class Lecture 26,](#) [In Class Lecture 27](#)

[Audio Lecture 25,](#) [Audio Lecture 26,](#) [Audio Lecture 27,](#)

10/31 (3) [LNA Design CS and CG,](#) [Passive RF Circuits](#)

[Exam II Study Guide](#)

[Exam 2 Solution 2016a](#)

[Exam 2 Solution 2016b,](#)

[RLC QUIZ 2007,](#) [RLC QUIZ 2008,](#) [RLC QUIZ 2010,](#) [RLC QUIZ 2011](#) These are bipolar circuits but show how to calculate transformer circuit response.

[Solution to Homework 6](#)

[Solution to Homework 7](#)

[Homework 8 Not Assigned for study](#)

[Homework 8 Not Assigned Solution](#)

Read Section 5.3, 6.1 and 6.2

[Lecture 28 Recorded Video Lecture for Microsoft Ones](#) Play back with Microsoft One notes

[In Class Lecture 28](#), [In Class Lecture 29](#), [In Class Lecture 30](#)

Lecture 27 Audio in One Notes File above, [Audio Lecture 29](#) , [Audio Lecture 30](#)

11/7 (3) [Passive RF Circuits Inductor Calculation Example 2](#), Exam II,

Read Section 6.1, 6.2, 6.3 and 6.4

[In Class Lecture 31](#),

[Audio Lecture 31](#)

11/14 (3) [Passive RF Circuits Inductor Calculation Example 2](#), [Inductor Calculation Example](#)

[Exam II Solution 2016 Fall](#)

Read Sections 7.2 and 7.3

[In Class Lecture 32](#), [In Class Lecture 33](#), [In Class Lecture 34](#)

[Audio Lecture 32](#), [Audio Lecture 33](#), [Audio Lecture 34](#)

011/21 (1) [Passive RF Circuits](#) Look at Varactors and inductor capacitance calculations,  
Thanksgiving Holiday

[Study Guide for Exam III](#)

[Exam III Solution 2016a](#),

[Exam III Solution 2016b](#)

Read Chapter 8

[In Class Lecture 35,](#)

[Audio Lecture 35,](#)

11/28 (3) [Introduction to Mixers, Mixers Passive and Active, Example Mixer problems,](#) Exam 3,

Read Chapter 8

[In Class Lecture 36,](#)

[Audio Lecture 36,](#)

12/5 (1) [Oscillators,](#) Design project due

There will be NO Final Exam.

**Professor:** William R. Eisenstadt,

**Office:** 529 NEB

**Telephone:** (352) 392-4946

**Facsimile:** (352) 392-8381

**E-mail:** [wre@tec.ufl.edu](mailto:wre@tec.ufl.edu)

**Web:** <http://www.tec.ufl.edu/~wre/>

**Course Assistant:** TBA

**Office:**

**Telephone:**

**Facsimile:**

**E-mail:**

**Class Period and Location:** 4th period, Tuesday, 10:40am to 11:30am, 4<sup>th</sup> and 5<sup>th</sup> Period Thursday, 10:40am to 12:35pm, Room LAR 310

**Office Hours:** Tuesday and Thursday 9:30am to 10:30am, Tuesday 1:30pm to 2:30pm NEB 529.

**TA:** Lisdelys Garcia, [lg24728@ufl.edu](mailto:lg24728@ufl.edu), Office Hours TBA

**Required Texts:** Behazad Razavi, "RF Microelectronics," Second Edition, Prentice Hall, ISBN 0-13-713473-8.

**Course Goals:** To develop proficiency in analyses, design and implementation of radio frequency circuits. To develop expertise in using the Agilent ADS design system for circuit design.

**Course Materials:** I will be using the Syllabus to index of the daily class materials posted for you to review and to learn from. So, you can find most learning materials by clicking on a link from the Syllabus. I try to post all written materials and video materials used in the lectures to assist in your learning. There will be folders that contain course materials (Course Notes, Audio Recordings, In Class Notes, etc) in the Files section of Canvas (see tabs on the left of this section).

**Computer and Software Required:**

PCs with Analog Design system on campus and a link to the ECE license file server, off-campus can use X-Windows or an X-terminal on a high-speed internet link to UF Campus Computers.

All students are required to have a Gator link account and use Canvas for course handouts, grade information, course notices, etc., see [e-learning support services](#)

**Course Study Requirements:**

Students are responsible to study all in class materials including those written on the board and presented orally, all Class Handouts all assigned readings, all projects and homework. Absence from class can result in missing materials tested on exams.

**Attendance and Expectations:** There is a no wireless device policy (no cell phones, smart phones, computers, tablets, etc.) during exams.

“Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:  
[https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.](https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx)”

**Catalog Description:** Fundamental RF theory (such as resonant circuits, matching, noise and transmission lines), radio operation and design of key RF circuit blocks (such as amplifiers, mixers and oscillators).

**Make Up Exam Policy:** Students are expected to attend exams at the scheduled times. Exams can be made up if there is a genuine medical emergency with a doctor's or clinic medical note or a family emergency with some documentation. Students are NOT excused from exams for job interviews and early holiday travel home. Students with other non-emergency exam scheduling issues must obtain permission from the instructor prior to missing an exam.

**Work Requirements:**

Homework  
Computer Laboratories and projects

Quizzes:

Exams: Exam1, Exam 2 and Exam 3

**Examinations:**

Quizzes as assigned  
Exam 1: Tentatively, First week of October

Exam 2: Tentatively, Second week of November  
Exam 3: Tentatively, First week of December

There will be no final.



**Preliminary Course Grading Policy:**

**Preliminary Grading Policy:**

Undergraduate Exams, Laboratories and Homework will be less difficult than Graduate Exams, Laboratories, and Homework.

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Homework Sets	10 points each	10%
Project	20 points each part	20%
Quizzes	10 points each	10%
Exam 1	100	20%
Exam 2	100	20%
Exam 3	100	20%
		100%

Tentative Grading Policy, I will look carefully at each individual's class work accomplishments.

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**Current UF Grading Policy for assigning grade points**

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

### ***Students Requiring Accommodations***

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Software Use***

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

### ***Campus Resources:***

## *Health and Wellness*

### **U Matter, We Care:**

If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) or 352 392-1575 so that a team member can reach out to the student.

**Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

## *Academic Resources*

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.