FLORIDA ATLANTIC UNIVERSITY

COURSE CHANGE REQUEST
Undergraduate Programs

Department Electrical Engineering and Computer Science

College Engineering and Computer Science

UUPC Approval 3/25/24
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

***Current* Course Prefix and Number**	EEL 4421C	***Current* Course Title** RF Devices and Circuits

*Syllabus must be attached for **ANY** changes to current course details. See Template. Please consult and list departments that may be affected by the changes; attach documentation.*

Change title to:

Change prefix

From: **To:**

Change course number

From: **To:**

Change credits*

From: **To:**

Change grading

From: **To:**

Change WAC/Gordon Rule status**

Add ☐ **Remove** ☐

Change General Education Requirements***

Add ☐ **Remove** ☐

*See Definition of a Credit Hour.

**WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to this form. See WAC Guidelines.

***GE criteria must be indicated in syllabus and approval attached to this form. See Intellectual Foundations Guidelines.

Change description to:

Change prerequisites/minimum grades to:

EEL 3470 with a minimum grade of C

Change corequisites to:

Change registration controls to:

Please list existing and new pre/corequisites, specify AND or OR and include minimum passing grade (default is D-).

Effective Term/Year for Changes:	Fall 2024	**Terminate course? Effective Term/Year for Termination:**

Faculty Contact/Email/Phone Michael DeGiorgio / mdegiorg@fau.edu / 561-297-0003

Approved by		***Date***
Department Chair	Hai Kalva	3/11/2024
College Curriculum Chair	Hongbo Su	3/12/24
College Dean		3/12/24
UUPC Chair	Korey Sorge	3/25/24
Undergraduate Studies Dean	Dan Macroff	3/25/24
UFS President		
Provost		

Email this form and syllabus to mjenning@fau.edu seven business days before the UUPC meeting.

FLORIDA ATLANTIC UNIVERSITY

EEL 4421C
RF Devices and Circuits

Date:
Building: Room:
3 Credit(s)

Instructor Information

TBD
Email:
Office:
Office Hours:
Phone:

TA Name: TBD, Will be announced on Canvas when details become available
Office:
Office Hours:
Telephone: Email:

Course Description

RF filter design, active RF components and component modeling, matching and biasing networks, RF oscillators, mixers and frequency synthesizers, use of RF CAD software for system simulation.

Prerequisites

EEL 3470 with a minimum grade of C

Instructional Method

In-Person

This course may be offered in in-person, hybrid, or fully online modes

Required Texts/Materials

RF Circuit Design: Theory and Applications, 2nd ed., R. Ludwig and G. Bogdanov, Prentice Hall, 2015.

Course Objectives/Student Learning Outcomes

To introduce students to modern computer-aided RF design procedures for RF communication devices and circuits, enabling them to enter the field of RF design in industry and research.

Faculty Rights and Responsibilities

Florida Atlantic University respects the rights of instructors to teach and students to learn. Maintenance of these rights requires classroom conditions that do not impede their exercise. To ensure these rights, faculty members have the prerogative to:

• Establish and implement academic standards.

• Establish and enforce reasonable behavior standards in each class.

• Recommend disciplinary action for students whose behavior may be judged as disruptive under the Student Code of Conduct University Regulation 4.007.

Disability Policy

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/.

Course Evaluation Method

Projects -	20 %
Homework -	10 %
Tests: -	2 at 20 % each
Final Exam:	30 %

Code of Academic Integrity

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001.

Attendance Policy Statement

Students are expected to attend all their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations, or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances, and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

Religious Accommodation Policy Statement

In accordance with the rules of the Florida Board of Education and Florida law, students have the right to reasonable accommodations from the University in order to observe religious practices and beliefs regarding admissions, registration, class attendance, and the scheduling of examinations and work assignments. University Regulation 2.007, Religious Observances, sets forth this policy for FAU and

may be accessed on the FAU website at www.fau.edu/regulations.

Any student who feels aggrieved regarding religious accommodations may present a grievance to the executive director of The Office of Civil Rights and Title IX. Any such grievances will follow Florida Atlantic University's established grievance procedure regarding alleged discrimination.

Time Commitment Per Credit Hour

For traditionally delivered courses, not less than one (1) hour of classroom or direct faculty instruction each week for fifteen (15) weeks per Fall or Spring semester, and a minimum of two (2) hours of out-of-class student work for each credit hour. Equivalent time and effort are required for Summer Semesters, which usually have a shortened timeframe. Fully Online courses, hybrid, shortened, intensive format courses, and other non-traditional modes of delivery will demonstrate equivalent time and effort.

Course Grading Scale

Letter Grade	Letter Grade
A	94 - 100%
A-	90 - 93%
B+	87 - 89%
B	83 - 86%
B-	80 - 82%
C+	77 - 79%
C	73 - 76%
C-	70 - 72%
D+	67 - 69%
D	63 - 66%
D-	60 - 62%
Letter Grade	**Letter Grade**
F	Below 60

Grade Appeal Process

You may request a review of the final course grade when you believe that one of the following conditions apply:

• There was a computational or recording error in the grading.

• The grading process used non-academic criteria.

• There was a gross violation of the instructor's own grading system.

University Regulation 4.002 of the University Regulations contains information on the grade appeals process

Policy on Make-up Tests, Late work, and Incompletes

Late submissions will not be accepted or graded.

No makeup exams will be offered.

Throughout the semester, multiple homework assignments will be posted via Canvas. For each homework assignment, you will have about a week to complete and submit your solution via Canvas. Allow enough time to submit your work since once the system is closed there will not be other possibilities to submit (don't send your work via email). Please note that the due date for homework assignments will not be updated after the assignment is posted.

Policy on the Recording of Lectures

Students enrolled in this course may record video or audio of class lectures for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording class activities other than class lectures, including but not limited to student presentations (whether individually or as part of a group), class discussion (except when incidental to and incorporated within a class lecture), labs, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations between students in the class or between a student and the lecturer, is prohibited. Recordings may not be used as a substitute for class participation or class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct and/or the Code of Academic Integrity.

Counseling and Psychological Services (CAPS) Center

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to http://www.fau.edu/counseling/

Student Support Services and Online Resources

- Center for Learning and Student Success (CLASS)
- Counseling and Psychological Services (CAPS)
- FAU Libraries
- Math Learning Center
- Office of Information Technology Helpdesk
- Center for Global Engagement
- Office of Undergraduate Research and Inquiry (OURI)
- Science Learning Center
- Speaking Center
- Student Accessibility Services
- Student Athlete Success Center (SASC)
- Testing and Certification
- Test Preparation
- University Academic Advising Services
- University Center for Excellence in Writing (UCEW)
- Writing Across the Curriculum (WAC)

Course Topical Outline

1. Introduction, RF behavior of passive elements (1 lecture)
2. Microstrip transmission lines (2 lectures)
3. YZ Smith chart (2 lectures)
4. Multiport parameter sets, scattering parameters (2 lectures)
5. RF filter design (10 lectures as below)

- Filter types and parameters (1 lecture)

- Butterworth and Chebyshev filters (1 lecture)
- Denormalization of prototype LPF, Richards transformation, Kuroda's identities (1 lecture)
- Coupled-line bandpass filters (1 lecture)
- Stepped-impedance LPF (1 lecture)
- Even-odd mode analysis of power dividers and couplers (1 lecture)
- Wilkinson divider (1 lecture)
- Quadrature hybrid (1 lecture)
- Coupled-line directional coupler (1 lecture)
- Lange coupler and hybrid coupler (1 lecture)

6. Active RF components (3 lectures as below)

- Schottky, PIN, varactor, IMPATT, Gunn diodes (1 lecture)
- RF BJTs (1 lecture)
- RF FETs, MOSFETs, HEMTs (1 lecture)

7. Matching and biasing networks (3 lectures as below)

- Discrete and microstrip networks (1 lecture)
- Amplifier classes and efficiency (1 lecture)
- Biasing networks for BJTs and FETs (1 lecture)

8. Oscillators and mixers (4 lectures as below)

- Oscillator models (1 lecture)
- Negative resistance and feedback oscillators (1 lecture)
- Quartz, DRO and YIG oscillators (1 lecture)
- Phase locked loops (1 lecture)