

## **Spring 2019 - Syllabus**

### **EENG 3411 Engineering Electromagnetics Laboratory**

#### **Lab meetings**

Discovery Park B288, Thursday 5:30 pm – 8:20 pm

**Description:** Introduction to the basic Radiofrequency measurement equipment, lab experiments illustrating the basic principles of electromagnetics.

**Prerequisite(s):** EENG 2610, MATH 3310 or consent. **Co-requisite:** EENG 3410

**Class/Lab Schedule:** 3 lab hours every week

**Text Book and Other Required Materials:** Notes and laboratory manual would be provided during the lab. A lab report is due in the following week Monday before the lab session.

#### **Labs:**

Lab 1: Introduction to ADS software

Lab 2: Tuning and Optimization in ADS

Lab 3: Harmonic Balance Simulation using ADS

Lab 4: Matching and Optimization in ADS

Lab 5: Planer EM Simulation in ADS: Microstrip Bandpass filter

Lab 6: Planer EM Simulation in ADS: Microstrip Patch Antenna

Lab 7: Planer EM Simulation in ADS: EM/Circuit Co-simulation

Lab 8: Introduction to the Spectrum Analyzer (SA)

Lab 9: Introduction to the Vector Network Analyzer (VNA)

Lab 10: Antenna design in HFSS: Part 1

Lab 11: Altium board layout generation

Lab 12: Propagation loss through different media (simulation)

Lab 13: Dielectric constant measurement

Lab 14: Antenna Measurements using VNA and other measurements

#### **Course Learning Outcomes (CLO):**

Upon successful completion of this course, the students will be able to:

1. Perform electromagnetic lab experiments including using bench-top instruments such as a Vector Network Analyzer, Spectrum Analyzer and RF Signal Generator.
2. Write technical lab reports, analyze and summarize results.
3. Learn advanced design software to perform electromagnetic simulation and characterization of microwave circuits and antenna.
4. Use ADS and HFSS software as a tool to solve for electric and magnetic fields from charges and currents.

#### **ABET Student Learning Outcomes (SO)**

SO-1 An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

SO-2 An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

SO-3 An ability to communicate effectively with a range of audiences.

SO-4 An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

SO-5 An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

SO-6 An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

SO-7 An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

CLO	ABET Student Outcomes						
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	SO-7
1						X	
2	X		X				
3	X					X	X
4	X					X	

### Teaching Assistant

Jose A. Martinez, Office B210, Email [josearrequinmartinez@my.unt.edu](mailto:josearrequinmartinez@my.unt.edu), Office hours: Tuesday and Thursday 3 – 4 pm or by appointment.

### Grade

Attendance: 10%

Lab Reports: 90%

### Policies

A. **Academic Integrity Standards and Consequences.** According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University. See full policy at <https://policy.unt.edu/sites/default/files/06.003.pdf>.

B. **ADA Accommodation Statement.** UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at [disability.unt.edu](http://disability.unt.edu).

**C. Course Safety Procedures (for Laboratory Courses).** Students enrolled in [insert class name] are required to use proper safety procedures and guidelines as outlined in UNT Policy 06.038 Safety in Instructional Activities. While working in laboratory sessions, students are expected and required to identify and use proper safety guidelines in all activities requiring lifting, climbing, walking on slippery surfaces, using equipment and tools, handling chemical solutions and hot and cold products. Students should be aware that the UNT is not liable for injuries incurred while students are participating in class activities. All students are encouraged to secure adequate insurance coverage in the event of accidental injury. Students who do not have insurance coverage should consider Standard Syllabus Statements Related Policy 06.049 Course Syllabi Requirements obtaining Student Health Insurance. Brochures for student insurance are available in the UNT Student Health and Wellness Center. Students who are injured during class activities may seek medical attention at the Student Health and Wellness Center at rates that are reduced compared to other medical facilities. If students have an insurance plan other than Student Health Insurance at UNT, they should be sure that the plan covers treatment at this facility. If students choose not to go to the UNT Student Health and Wellness Center, they may be transported to an emergency room at a local hospital. Students are responsible for expenses incurred there.

**D. Emergency Notification & Procedures.** UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Blackboard for contingency plans for covering course materials.

**E. Student Evaluation Administration Dates.** Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 of the long semesters to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the SPOT website at [www.spot.unt.edu](http://www.spot.unt.edu) or email [spot@unt.edu](mailto:spot@unt.edu).