Louisiana State University
Division of Electrical and Computer Engineering
EE 2810 Tools in Electrical and Computer Engineering

Some items (such as grading) may differ slightly depending on course instructor

Catalog Data: EE 2810 Tools in Electrical and Computer Engineering (2) Prereq.: CSC 1253 and credit or registration in EE 2130 and 2231. Contemporary tools in the area of electrical and computer engineering.

Textbook: John Okyere Attia, Pspice and Matlab for Electronics – An integrated Approach, 2nd edition CRC Press, 2010

For EE 2810, it is possible that the LSU Libraries' collection includes an e-book of the required textbook: PSPICE and MATLAB for Electronics. This e-book is free for students (and faculty) and can be used by the entire class at once. All chapters can be downloaded, saved, and printed for use now or after the class. Access is available from this direct link:

http://libezp.lib.lsu.edu/login?url=http://www.crcnetbase.com/isbn/9781420086591

or from the e-textbook webpage: www.lib.lsu.edu/ebooks.

Prerequisite by Topic: Linear circuits, Linear algebra, elements of programming

Goals/Instructional Objectives: This course is intended to provide students with a basic knowledge of contemporary software tools such as PSpice, Matlab, Simulink, and Eagle PCB to solve problems and for analysis and design in the field of electrical and computer engineering. Specifically, students will understand and learn how to apply these tools for different applications. The course will prepare students for more advanced courses in the EE and EEC programs that use these tools.

Course Learning Outcomes: At the end of the course, the students will be able to:

(a) Create Matlab based graphics, functions, time responses
(b) Write programs in Matlab in various settings - typical to electrical and computer engineering applications
(c) Create GUIs and Simulink simulations
(d) Analyze dc, steady - state ac and transient response of linear circuits using PSpice
(e) Analyze circuits in the time domain and frequency domain using PSpice

Grading:	Homework/Classwork	30%
	Projects	40%
	Tests (Three)	30%

Grading Scale: Note the interval notation.

A+(∞,97]	C+(80,77]
A(97,93]	C(77,73]
A-(93,90]	C-(73,70]
B+(90,87]	D+(70,67]
B(87,83]	D(67,63]
B-(83,80]	D-(63,60]
	F(60,0]

Classroom Dynamics:

Each class period an assignment will be due. I will assign students to watch videos for homework that will prepare them for the assignment. Students can re-watch videos and use notes for reference. However if you do not watch the videos before class it will be difficult to complete the assignment. I recommend students watch the videos at home while using the software. If students do not have their own version of the software, it is available in the EE lab. Tests will be done on the computer once it has been determined that the classroom is operational. Otherwise the tests will be completed on paper.

Documentation requirements:

Any document submitted for grading must be self-sustaining. In this context, the document should contain any and all information necessary so that no other materials are necessary for completely understanding the document's contents. Points will be deducted for improper documentation. Reports must include all proper aspects of a technical document.

Analysis:

This course requires a significant amount of analysis. Students will be introduced to many tools for analyzing content. However in the reports, quantitative and qualitative analysis is required.

Here is a useful resource for writing reports. Using simulation software is similar to executing a laboratory experiment.

http://www.sussex.ac.uk/ei/internal/forstudents/engineeringdesign/studyguides/labwriting

Missed exams and assignments:

Make-up tests will be given only for excused absences (according to PS-22). Students must notify me PRIOR to a test via email or call to the ECE main office 578-5241. Test 1 must be made up before test 2. Test 2 must be made up before the final exam. No late work will be accepted.

Academic Dishonesty:

Academic dishonesty of any kind will not be tolerated. Anyone suspected of cheating will be reported to the Dean of Students. Homework done outside of class can be done in small groups (less than 5), but borrowing or copying work is not allowed. Projects CANNOT be done in groups. Students can ask questions to each other how to use the software, but no concepts or work related to the project can be discussed. Students cannot seek help from anyone not affiliated with this course outside of the class for any projects unless approved by the course instructor BEFORE an appointment is made.

Attendance and Tardiness:

There will be no attendance or tardiness policies for this class. However, some in class work will be assigned for a grade. There will be no opportunities for make up if in class work is missed. Opportunities will arise for one or more of these assignments to be dropped to accommodate the occasional excused absence.

Classroom Decorum (Professionalism): The rationale behind this classroom decorum is to teach skills and prepare you for the requirements of the engineering profession.

Students are expected to conduct themselves in accordance with accepted standards of classroom behavior. This means arriving in class on time, being respectful to your fellow students, remaining in class for the full time, listening attentively to class instructions and discussion, and refraining from carrying on personal conversations, unless specified to do so. Cell phones and other electronic devices should be silenced while in the classroom. Laptops are welcome in the class provided they are used for class-related purposes. Class-related purposes DO NOT include assignments, unless specified permission is given. Their misuse, like the use of cell phones and other electronic devices, will hurt your CLE grade. Failure to adhere to good classroom decorum, as described above, disrupts class and limits everyone's participation.

Disabilities :

The University is committed to making reasonable efforts to assist individuals with disabilities in their efforts to avail themselves of services and programs offered by the University. To this end, Louisiana State University will provide reasonable accommodations for persons with documented qualifying disabilities. If you have a disability and feel you need accommodations in this course, you must present a letter to me from Disability Services in 115 Johnston Hall, indicating the existence of a disability and the suggested accommodations

Topics:

(a) <u>Topics in Matlab</u>

(i) Basic Topics

Matrices, Arrays and their mathematics
Graphics – Plotting 2D, 3D; Plot labels, log, semilog; sub plots
Programming - .m files; Matlab functions
Vectors – vector algebra (convolution)
Creating Functions – Traditional functions, Inline functions
Linear algebra – matrices
Complex numbers – Complex vectors, Mag(), angle() functions
Complex models – Tf, zpk, Itimodels
Time responses – Step, impulse, initial, lsim, Itiview
Solving transforms using Matlab – Residue (partial function exapansion);
Tf2pz should be tf2zp; Px2tf should be pz2tf; Bode plots, bode, sisotool
Importing data into Matlab using .csv files and the csvread() function

(ii) Advanced Topics

GUIs, Simulink (Examples from Electrical and Computer Engineering)

(iii) (Test - 1)

(b) PSpice

(i) Introduction: Description of SPICE, Types of SPICE, Types of Analysis, Limitations of SPICE
Circuit Description: Introduction, Element Values, Nodes, Circuit Elements, Sources, Types of Analysis, Output Variables, PSPICE Output Commands, Format of Circuit Files, format of Output Files, Examples of PSPICE simulations, Graphical Input Files

(ii) D.C. Circuit Analysis: Introduction, Resistors, Modeling of Elements, Operating Temperature, Independent Sources, Dependent Sources, DC Output Variables, Types of Output, Types of DC Analysis, Examples of PSPICE Simulations

(iii) Transient Analysis: Introduction, Capacitors, Inductors, Diodes, and Transistors, Modeling of Transient Sources, Transient Sources; transient Output Variables, Transient Output Commands, Transient response, Switches (Voltage-Controlled Switch, Current-Controlled Switch), Examples of PSPICE Simulations

(iv) A.C. Circuit Analysis: Introduction, AC Output Variables, Independent AC Sources, Magnetic Elements, Transmission Lines, Multiple Analysis, Examples of PSPICE Simulations

(v) Circuit Simulations Using PSPICE for DC and Transient Analysis during class hours with remote login to PSPICE.

(vii) Circuit Simulations Using PSPICE for AC Circuit Analysis during class hours with remote login to PSPICE.
Interfacing Spice to Matlab

(c) Printed Circuit Board Design (4 lectures, 2 lecture/project, 1 Test)

(i) Getting started with OrCAD Capture, Building a simple schematic, Processing a design

(ii) Building a multi-sheet schematic, Editing properties

(iii) Creating parts and symbols, Building a hierarchical design

(iv) Preparing a design for Layout

(v) (lecture/project) Circuit assembly on a PCB design using PCB boards) and soldering iron

(vi) (lecture/project) Circuit assembly on a PCB design using PCB boards and soldering iron.

Relationship of Course to ABET Student Outcomes:

The course contributes to these ABET outcomes:	How?
#1. An ability to apply knowledge of mathematics, science and engineering	Students will use engineering specific software to obtain solutions to electrical and computer systems
#5 an ability to identify, formulate and solve engineering problems	The course provides a basic understanding of the operation of different software packages and their applications so that students are prepared for advanced courses and engineering practice
#9 a recognition for the need for adequate preparation for continued professional growth and life-long learning	Software packages are update often. Industry leaders also change. It is necessary for engineers keep up with these packages. Engineers must also be prepared to use industry specific or proprietary software once they enter the workplace.
#11 an ability to use techniques, skills, and modern engineering tools necessary for engineering practice	Students learn to use software for analysis simulation and design of electrical and computer systems

Prepared by: John Scalzo December 2016