



**#5542 Engr 215 – Fundamentals of Electrical Engineering**

Spring 2007

12:30 -2:20 p.m. – Monday, Wednesday, Friday

Building 14, Room 8

5 credits

**Instructor**

Rebecca N. Sliger, Ph.D.  
Building 22, Room 6  
Office Hours: Mon., Tues., Wed., Thurs., 11:30- 12:20 p.m.  
Wed. 4:00 – 4:50 p.m.

**Contact Info**

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email: [rsliger@tacomacc.edu](mailto:rsliger@tacomacc.edu)

Note: Emails and phone calls will be returned within 24 hours during the business week. Although I sometimes check email over the weekend, emails sent on the weekend or late Friday may not be returned until Monday.

**Catalog Description**

An introduction to electrical engineering through basic circuit and system concepts. Topics include: resistors, sources, capacitors, inductors, operational amplifiers, node and mesh analysis, Thevenin and Norton equivalents and RLC circuits. Solution of first and second order linear differential equations associated with basic circuit forms will be used. Students will use basic breadboard kits to investigate some of the principles learned in class.

**Prerequisites:** Math 238 (may be taken concurrently) and Physics 122

**College Wide Learning Outcomes**

Tacoma Community College has identified six college-wide learning outcomes that form the foundation of our educational emphasis:

- 1) communication **(COM)**,
- 2) critical thinking **(CRT)**,
- 3) responsibility **(RSP)**,
- 4) information & information technology **(IIT)**,
- 5) living and working cooperatively **(LWC)**, and
- 6) core of knowledge **(COK)**.

**Course Learning Objectives**

Upon successful completion of this course, the student should be able to:

- Use effective techniques to define problems, gather information, analyze data, perform critical evaluations, implement solutions and communicate the results. (COK, CRT, IIT, COM)
- Use appropriate mathematical sketching and modeling skills to describe concepts and systems. (COK, CRT)
- Analyze situations and apply appropriate techniques to develop solutions. (COK, CRT)
- Apply Kirchhoff's Laws (COK, CRT)
- Simplify a set of resistors in series and parallel, as well as more complicated configurations using delta-to-wye equivalencies. (COK, CRT)
- Solve more complicated resistor and source circuits using node voltage and mesh current analysis techniques. (COK, CRT)
- Simplify a set of sources and resistors into a Thevenin or Norton equivalent. (COK, CRT)
- Understand the terminal behavior of an ideal operational amplifier using a black box approach and apply this understanding in circuit analysis. (COK, CRT)
- Understand the basic laws of capacitors and inductors and apply this knowledge to solving basic RC and RL circuits. (COK, CRT)
- Analyze RLC circuits using simple differential equations. (COK, CRT)
- Solve first order switched circuits. (COK, CRT)
- Use current technology to gather, evaluate, and analyze information. (IIT)
- Solve and submit electric circuits problems in a timely, complete and understandable fashion. (RSP, COM, COK).

**Textbook**

Electric Circuits, 7<sup>th</sup> Edition  
Nisnon and Riedel, Prentice Hall, 2005

**Supplies**

Engineering Paper – Write on plain side only.  
Scientific Calculator  
Ruler or straight edge for sketching

**Technology**

Your TCC email account has automatically been added to a class list. Announcements about the class, scholarships and other engineering related opportunities will be posted. You can also post to the list. Click on the "To" button. In "Display name" type "Spring ENGR215-5542". Please limit your posts to those related to class or engineering topics. Computer access is available in the computer lab and library.

**Evaluation  
Criteria**

Course grades will be weighted as follows:

Homework	15%
Labs	15%
Best three of four tests	15% each
Final Exam	25%

The weighted course percentage will then be converted to a letter grade:

Grade	Minimum %
A	95
A-	90
B+	85
B	80
B-	75
C+	70
C	65
C-	60
D+	55
D	50
D-	45
E	Less than 45

Since test difficulty can vary, the instructor may adjust the required percentages at the end of the quarter. This would only be used to raise grades, not lower them.

**Homework**

Textbook homework is assigned on a weekly basis. The assignments and due dates are listed at the end of the syllabus. You are encouraged to study with your classmates and discuss homework problems; however, homework assignments will be turned in by each individual and should represent individual effort.

Homework problems should be neat, organized and easy to follow. Assignments which do not meet homework presentation expectations will be designated with a red star. After receiving three red stars, future homework from that student will not be accepted.

Homework may be graded by the instructor or a fellow classmate. Peer grading offers students the opportunity to see diverse solutions to a single problem. It can also be an eye-opener about the importance of presenting solutions in a clear and logical presentation.

**Some homework assignments are due the class period before an exam. I suggest that you photocopy your homework so that you can compare it to the solution to study for the exam.**

**Homework is to be turned in at the beginning of class on the due date. LATE HOMEWORK IS GENERALLY NOT ACCEPTED.**

<b>Labs</b>	We have the opportunity to do our labs at the University of Washington-Tacoma. Dr. Larry Crum will run the lab sessions. A van will run between TCC and UWT to take you to the labs. Alternately, you may drive yourself to the labs, but you will need to pay for parking at UWT. Dr. Sliger will be out of town on April 27 and May 18. Please provide your own transportation on those days. (Carpools encouraged.) <b>Late labs will be accepted at a penalty of 10% per day.</b>
<b>Tests</b>	Tests will be given on April 18, May 9, May 23 and June 6. The lowest midterm test grade will be dropped. Each of the other three midterms will count as 15% of the course grade. Since one test may be dropped, no make-up tests will be given unless the student has made PRIOR arrangements with the instructor.
<b>Final Exam</b>	The final exam will be on Wednesday, June 13 from 12:30- 2:30 p.m. in the regular classroom. It will be comprehensive.
<b>Academic Dishonesty</b>	<p>As stated in the TCC catalog, ‘Students are expected to be honest and forthright in their academic endeavors. Cheating, plagiarism, fabrication or other forms of academic dishonesty corrupt the learning process and threaten the educational environment for all students.’ The complete Administrative Process for Academic Dishonesty is available on the TCC website at:  <a href="http://www.tacomacc.edu/stuonline/policies/Academic_Dishonesty_Final_Feb_04.shtm">http://www.tacomacc.edu/stuonline/policies/Academic_Dishonesty_Final_Feb_04.shtm</a></p> <p>In this course, sanctions for academic dishonesty will be as follows:  First offense may result in a zero on the assignment or test. Cheating on a test earns a zero without the opportunity to drop that test score. Second offenses result in an E for the class. All offenses will be reported to the Associate Vice President of Student Services.</p>
<b>Accommodation</b>	<b>Students with Special Needs.</b> All students are responsible for all requirements of the class, but the way they meet these requirements may vary. If you need specific auxiliary aids or services due to a disability, please contact the Access Services office in Building 18 (253-566-5328). They will require you to present formal, written documentation of your disability from an appropriate professional. When this step has been completed, arrangements will be made for you to receive reasonable auxiliary aids or services. The disability accommodation documentation prepared by Access Services must be given to me before the accommodation is needed so that appropriate arrangements can be made.
<b>Course Calendar</b>	The attached course calendar is tentative. Topics may be covered at a slightly different pace, depending on the needs of the class.

**Attendance**

Attendance is not considered in calculating your grade; however, regular attendance is generally essential to success. Students are responsible for all assignments and information given in class.

**Etiquette for Resolution of Classroom Disputes**

If you have questions or concerns about this class or me, please come to talk with me about your concerns. If we are unable to resolve your concerns, you may talk next with the Chair of the Department, Keith King, Building 22, Room 6. The Chair can assist with information about additional steps, if needed.

**Withdrawal Policy**

April 13 is the last day to drop a class without an entry appearing on your transcript. (Submit form to Registration and Records)

May 25 is the last day to withdraw from a class. A grade of “W” will appear on your transcript. “W” grades are not included in calculating your GPA, but may have negative effects on your financial aide, time to completion and admission into competitive programs at universities. (Submit form to Registration and Records)

**Caveats**

This syllabus and schedule are subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent.

Note: Some statements in this syllabus are Tacoma Community College policies and are taken verbatim from policy manuals.



**Engr 215 – Fundamentals of Electrical Engineering  
Spring 2007 – Tentative Course Calendar**

Please read assigned sections **BEFORE** coming to class!

	Monday	Wednesday	Friday
<b>A</b>	2 Chapt 1 Introduction Passive/Active and Definitions	4 Chapt 2 Sources Kirchoff's Current and Voltage	6 Introduction to Lab @ UWT
	9 Chapt 2 & 3 Kirchoff's Current and Voltage Series and Parallel Resistors	11 Chapt 3 Simple Resistive Circuits HW #1 due	13 Lab #1 @ UWT
	16 Chapt 3 Delta to Wye conversions Review HW #2 due	18 Test #1	20 Professional Development Day No Class
	23 Chapt 4 Circuit Analysis Node-Voltage Method	25 Chapt 4 HW #3 due Supernodes	27 Lab #2 @ UWT Dr. Sliger out of town. Carpool to UWT.
<b>M</b>	30 Chapt 4 Circuit Analysis Mesh Current Method	2 Chapt 4 Supermeshes Source Transformations	4 Lab #3 @ UWT
	7 Chapt 4 Thevenin and Norton Review HW #4 due	9 Test #2	11 Lab #4 @UWT
	14 Chapt 4 & 5 Superposition & Op Amps HW #5 due	16 Chapt. 5 Operational Amplifiers Lab #2 due	18 Lab #5 @UWT Dr. Sliger out of town. Carpool to UWT.
	21 Chapt. 6 Inductance Review HW #6 due	23 Test #3	25 Chapt. 6 Capacitance
	28 Memorial Day No Class	30 Chapt 7 First order RL and RC circuits HW #7 due	1 Lab #6 @UWT
<b>J</b>	4 Chapt 8 RLC Circuits HW #8 due	6 Test #4	8 Chapt 8 RLC Circuits
	11 Review HW #9 due	13 FINAL 12:30 – 2:30	15

Note: We will probably also cover some new material after completing the tests on test days.

Engr 215 Homework Assignments – Chapter Problems not Assessing Objectives Exercises		
HW	Due Date	Assignment
#1	Wed., April 11	1.9 $q(t) = 4 \sin 5000t$ mC 1.12 a) 300. W A to B c) 200. W B toA 1.20 $P_{\max} = 0.5$ W $W = 2$ mJ 1.28 2.6 Valid $P = 200$ W 2.10 Not valid - you show why 2.14 $i_a = 0.4$ A $v_0 = 120$ V
#2	Mon., April 16	2.16 $i_g = 6$ A $v_o = 240$ V $P_{\text{dev}} = 1440$ W 2.18 $P_{230} = 5750$ W $P_{260} = 5200$ W 2.28 $i_1 = -0.15$ A $i_2 = -0.45$ A 3.7 a) 38 ohms b) 2 kohms 3.8 a) 20 ohms b) 30 ohms c) 10 ohms 3.11 $v_o = 10$ V $P_{15\text{ohm}} = 60$ W $P_{120\text{V}} = 2.4$ kW 3.13 b) $P_{R1} = 0.800$ W $P_{R2} = 0.200$ W 3.28 $i_o = 0.24$ A $P_{90\text{ohm}} = 14.4$ W 3.32 -0.349%
#3	Wed., April 25	3.50 $i_d = 1.25$ mA 3.51 $P = 300$ mW 3.57 $R_{ab} = 10$ ohms 3.59 $P_{\text{del}} = 220$ mW 4.6 $v_0 = -5$ V 4.11 $P_{\text{dev}} = P_{\text{dis}} = 3.46$ kW 4.17 $P_{\text{dev}} = P_{\text{dis}} = 60.8$ W 4.21 $v_0 = 10$ V
#4	Wed., May 7	4.32 $P_{\text{dev}} = P_{\text{dis}} = 17.9$ kW 4.33 $P = 259$ W 4.36 $v_0 = 8.00$ V 4.41 55.1%
#5	Wed., May 14	4.57 $v_0 = 400$ V 4.61 $v_{\text{Th}} = 425$ V $R_{\text{Th}} = 7.5$ ohms 4.62 $i_N = 1$ mA $R_N = 3.75$ kohms 4.74 $v_{\text{Th}} = 8.8$ V $R_{\text{Th}} = 8.8$ ohms 4.77 $R_0 = 5$ ohms $P_{\text{max}} = 957$ microwatts
#6	Wed., May 21	4.91 $v_0 = 270$ V $i_0 = 2.55$ A 5.3 $i_0 = -1.00$ mA 5.14 $i_a = 5.70$ mA $v = -213$ mV 5.23 $v_0 = 10.5$ V $-4.55\text{V} \leq v_g \leq 4.55$ V
#7	Wed., May 30	6.4 b) $-59.3\mu\text{W}$ e) $W_{\text{max}} = 11.0$ $\mu\text{J}$ 6.8 b) $29.2$ $\mu\text{s}$ 6.19 b) $A_1 = 18 \times 10^5$ V/s $A_2 = 50$ V 6.20 8 H 6.22 d) 36 J f) 18J 6.25 $6\mu\text{F}$ 6.27 d) $100\mu\text{J}$ e) $132$ $\mu\text{J}$
#8	Wed., June 4	7.1 7.3 7.21 7.28 7.34
#9	Fri., June 11	8.2 $L = 40$ H $i_L = 0.8e^{-250t} - 0.8e^{-1000t}$ mA 8.16 $v_0 = 5e^{-2000t} + 10e^{-8000t}$ V 8.17 $v_0 = 15e^{-2500t}\cos 3122.5t + 7.21e^{-2500t}\sin 3122.5t$ V 8.18 $v_0 = 15e^{-4000t}$ V 8.43 $v_0 = 80 - 80e^{-4000t}\cos 2000t - 160e^{-4000t}\sin 2000t$ V

## **Homework expectations:**

Communicating your solution is important. In professional situations, people make assumptions about your competence based on presentation as well as content. Clear presentation will also help you to find your errors and to develop solutions. For this class, please do the following:

- 1) ***Use engineering paper.*** Do not write on the back of the paper.
- 2) ***Space your problems out.*** Generally, use a fresh sheet of paper for each problem. No more than 2 problems per page. Put problems in order. Staple the assignment.
- 3) ***Significant figures.*** In most of my classes, we make a 3 significant digit assumption. We will be casual about significant digits here. (Not good practice in real life.) Please don't report answers to more than 3 significant digits. Keep all numbers when calculating.
- 4) ***Use a Given, Find, Solution layout.***
  - Given:*** Draw a sketch of the problem. Write down information from the problem.
  - Find:*** List the items that have been asked for.
  - Solution:*** Write out any assumptions that you are making.  
Write formulas in algebraic form. Keep things algebraic as long as possible.  
Keep track of your units.  
Write explanations in English for any steps that you think may be confusing.  
Box your answer.

Remember that I am reading your solution like a novel: left to right and top to bottom. Present your solution in a linear fashion. Don't go back up and plug in numbers that you didn't know at the time. I will spend time trying to figure out where that number came from. The better I understand your solution, the more likely I am to give partial credit.