

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

**CIRCUITS II W/ LAB
ECE 2020**

Class Hours: 3.0

Credit Hours: 4.0

Laboratory Hours: 3.0

Revised: Spring 07

NOTE: This course is intended for University Parallel Transfer.

Catalog Course Description:

Average, complex, real, and imaginary power; effective value of voltage and current; three-phase circuits: delta and wye connections, power measurement using two wattmeters; complex frequency: sinusoidal forcing functions and natural response; resonance: general case, special cases in series and parallel circuits; scaling: magnitude and frequency; mutual inductance and transformers as circuit elements; linear and ideal transformers; admittance, impedance and hybrid parameters; trigonometric and complex Fourier series.

Entry Level Standards:

Students must be able to follow a logical trail leading from definition through explanation, description, illustration, and numerical example, to problem-solving ability. Students must be proficient in DC circuit theory, single- and double-energy storage transients, single-phase AC circuits by phasor method, trigonometry, differentiation calculus and integration calculus.

Prerequisite: ECE 2010

Corequisites: MATH 2120 and PHYS 2120

Textbook(s) and Other Course Materials:

William H. Hayt, Jr., Jack E. Kemmerly. *Engineering Circuit Analysis*. Latest ed. New York, NY. McGraw-Hill, Inc., 2002.

I. Week/Unit/Topic Basis:

Week	Topic
1	Sinusoidal Steady-state response
2-3	Average power and RMS values
4-5	Polyphase circuits
6-7	Magnetically coupled circuits
8-9	Frequency response and resonance
10-11	Complex frequency
12	Two-port networks

13-14 Fourier series

15 Final Exam

II. Course Objectives*:

- A. Effective communication with technical and scientific community in the "common language" of electrical definitions, units, and relationships. I, VII
- B. Analyze circuits containing independent and dependent voltage and current sources, impedance, admittance, capacitance and inductance using basic analytical techniques developed from fundamental laws, theorems, and elementary network topology. V, VI
- C. Perform steady-state analysis of DC and AC circuits. V, VI
- D. Understand the complex-frequency concept and its use in relating the forced response and the natural response of circuits. V, VI
- E. Know two-port network analysis and linear modeling of various electronic devices. V, VI
- F. Analyze periodic functions in both the time and frequency domains. V, VI

*Roman numerals after course objectives reference TBR's general education goals.

III. Instructional Processes*:

Students will:

1. Participate in classroom discussions which challenge their abilities to think creatively and visualize complex spatial and mathematical relationships to solve problems. *Mathematical Outcome, Technological Literacy Outcome*
2. Work in teams to conduct laboratory experiments and also to solve special problem assignments. These activities are designed to foster interpersonal skills in teamwork and develop and enhance leadership skills, students' abilities to express ideas, and students' abilities to reach consensus solutions for the team through negotiation. *Communication Outcome, Active Learning Strategy*
3. Use electronic test equipment to test electrical circuits constructed from schematics in the laboratory and acquire data. Use computers with applications software to simulate, analyze, and predict the behavior of electrical circuits. Compare expected responses to experimental responses of electrical circuits. Use the internet for special assignments such as locating data sheets on electronic components. Use computers with word processing software to prepare reports. *Technological Literacy Outcome, Mathematical Outcome*
4. Prepare reports on laboratory experiments which include methodology, mathematical analyses of electrical circuit models, a comprehensive comparison of calculated results with experimental results, and conclusions. *Mathematical Outcome, Technological Literacy Outcome, Communication Outcome*
5. Discuss the importance of personal qualities such as personal responsibility, time management principles, self-esteem, sociability, self-management, integrity and honesty in school and in the workplace, and dynamics of change in the workplace. *Social / Behavioral Sciences Outcome, Transitional Strategy Outcome*

*Strategies and outcomes listed after instructional processes reference TBR's goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging

students to take active and responsible roles in the educational process.

IV. Expectations for Student Performance*:

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

1. Compute correct circuit equations for a broad spectrum of circuits, solve circuit problems with reasonable proficiency, and understand the solutions. A,B,C,D,E
2. Defend and use the concepts of instantaneous power, average power, RMS values of voltage and current, apparent power, power factor, and complex power in circuit analysis. A,B,C
3. Analyze polyphase circuits involving three-phase wye connections and delta connections. B,C
4. Analyze single-phase three-wire circuits. B,C
5. Demonstrate use of the wattmeter for power measurement in three-phase systems. B,C
6. Describe the concept of complex frequency and apply it to circuit problem solving. B,C,D
7. Compare sinusoidal forcing functions and compute natural responses of circuits. B,D
8. Define impedance and admittance parameters and describe their relationships to the application of Kirchhoff's laws to the complex forcing functions and complex forced responses. B,D
9. Determine the frequency response of a circuit as a function of the neper frequency. D
10. Determine graphically the behavior of a circuit by use of the complex frequency plane. B,D
11. Demonstrate proficiency in the determination of the frequency response of circuits and the responses related to series resonance, parallel resonance, and other resonant forms. B,D
12. Describe magnitude and frequency scaling. B,D
13. Describe mutual inductance and energy considerations associated with magnetically coupled circuits. A,B,C
14. Describe the linear transformer and ideal transformer concepts and apply to model transformer behavior and analyze circuits involving transformers. B,C,E
15. Appraise the methods of analysis for one-port networks. B,C,E
16. Appraise methods of analysis for two-port networks. B,C,E
17. Define admittance, impedance, and hybrid parameters and use them in simplifying and systematizing linear two-port network analysis. B,C,E
18. Describe two-port networks and their use as equivalent circuits for electronic devices to facilitate circuit analysis. B,C,E
19. Define the trigonometric form of the Fourier series and defend the use of symmetry. F
20. Use the Fourier series as a tool for finding the complete response of circuits to periodic forcing functions. B,C,F
21. Determine the complex form of the Fourier series for a periodic function and appreciate its conciseness in circuit analysis. A,F

*Letters after performance expectations reference the course objectives listed above.

V. Evaluation:

A. Testing Procedures:

The evaluation in the classroom will be determined by a combination of chapter tests, homework, and a final exam. The percentage that each of these factors count and the frequency of tests and homework is left to the discretion of the instructor, but the following is offered as a guide:

Chapter Tests:	60%
Homework and Quizzes	10%
Lab	10%
Final Exam	20%

B. Laboratory Expectations:

The laboratories for all EET courses are an essential part of conveying the concepts to the student.

The labs may vary at the discretion of the instructor, but will closely follow the classes in content and in time of presentation so that the student is actually verifying these concepts for himself or herself. The student will be able to apply the theory learned in class. Use of the English language will be evaluated when reviewing the lab reports.

Week	Lab Exercise
1	Introduction to Laboratory Equipment: Mesh Analysis and Thevenin's Theorem
2	Transient response of an RC circuit
3	AC Circuits
4	AC Phasor circuit analysis
5	Polyphase Circuits
6	Computer Usage
7	Magnetic Circuits
8	Computer usage
9	Response of an RLC circuit
10	Tuned circuits
11	Frequency response of RC circuits
12	Computer usage
13	Admittance parameters
14	Computer usage

The laboratory grade will be determined by a combination of performance within the lab and the quality and demonstrated comprehension of the lab report. The laboratory grade will not appear on the student's transcript, but will be included in the grade for the course. There will be at least twelve labs during the semester which have the same instructional objectives as the course. The following is offered as a guide for the instructor:

Performance in labs (subjective)	20%
Lab Reports (neatness and content)	60%
Computer Program	10%

Laboratory Test

10%

C. Field Work: Computer Usage

Students are assigned specific problems to be solved using Multi-Sim on PCs available in the EET department labs or open labs.

D. Grading Scale:

93 - 100	A
88 - 92	B+
83 - 87	B
78 - 82	C+
70 - 77	C
60 - 69	D
Below 60	F

VI. Policies:

A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of Academic and Student Affairs, may have requirements that are more stringent.

B. Academic Misconduct:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices: Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments. In addition to other possible disciplinary sanctions that may be imposed as a result of academic misconduct, the instructor has the authority to assign either (1) an F or zero for the assignment or (2) an F for the course.

C. Accommodations for Disabilities:

If you need accommodations because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please inform the instructor immediately. Please see the instructor privately after class or in his/her office. Students must present a current accommodation plan from a staff member in Services for Students with Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 127 or 131 or by phone: 694-6751(Voice/TTY) or 539-7153.

Posted: [March 23, 2007](#)