Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: ENSC 203 **Year: 2023-2024**

Course Title: Electrical Science **Credit Hours: 4**

Attendance Policy: *To maintain good grades, regular attendance in class is necessary. Absence from class is considered a serious matter and absence never excuses a student from class work. It is the responsibility of all instructors to distribute reasonable attendance policies in writing during the first week of class. Students are required to comply with the attendance policy set by each of their instructors. Students are not penalized if they are unable to attend classes or participate in exams on particular days because of religious beliefs, in accordance with Chapter 161, Section 224-a of the Education Law of the State of New York. Students who plan to be absent from classroom activity for religious reasons should discuss the absence in advance with their instructors. See college catalog for more information.*

Services for Students with Disabilities: *It is the College's policy to provide, on an individual basis, appropriate academic adjustments for students with disabilities, which may affect their ability to fully participate in program or course activities or to meet course requirements. Students with disabilities should contact the Coordinator of Access and Equity Services, to discuss their particular need for accommodations. All course materials are available in alternate formats upon request.*

Course Description

DC and AC circuits are analyzed using standard network theorems, differential equations, and phasor operations. The laboratory exercises include work with basic components and with diodes, operational amplifiers, transistors and digital logic gates. Prerequisites: MATH 206; PHSC 212; RDNG 116 if required by placement testing; prior completion or concurrent enrollment in ENGL 101. 4 Cr. (3 Lec., 3 Lab.) Spring semester.

Course Context/Audience

This is a fourth-semester course in the engineering science program. It is intended for all engineering majors, regardless of future field of specialization. The course builds on concepts learned in the physics sequence and the mathematics sequence, which all engineering science majors take. The concepts of electricity and magnetism as applied to circuits are stressed, along with mathematical techniques of circuit analysis, including algebra, calculus, differential equations and complex number algebra.

In the laboratory portion of the course, students will learn about the circuits studied in class, as well as diodes, operational amplifiers, transistors, and digital logic gates. Computers and calculators will also be used to analyze circuits.

Basic Skills/Entry Level Expectations

Writing:	WC	College level writing skills are required. See course co-requisites or pre-requisites.
Math:	MC	College level math skills – Course requires college level math skills. See course description for co-requisite and/or prerequisite requirement(s).
Reading:	R4	Before taking this course, students must satisfactorily complete RDNG 116 or have assessment indicating that no reading course was required.

Course Goals

By successfully completing this course, the student will become familiar with the electrical and magnetic theories that pertain to electric circuits. In addition, the student will learn the patterns of behavior of specific component types (sources, resistors, capacitors, inductors) and the circuit theories that govern the way they interact. Informed by the above mentioned theories, and armed with mathematical techniques, students will predict the behavior of electrical circuits.

The student will successfully build electrical circuits and measure appropriate variables in those circuits in order to test the theories and techniques studied in the lecture part of the class.

Course Objectives/Topics

Objective/Topic	% Course
Students will learn the basic rules that dictate the behavior of specific electrical components (voltage and current sources, resistors, capacitors, inductors).	12%
Students will become adept at analyzing resistor networks using series—parallel simplification rules and delta-wye formulas	10%
Students will use advanced circuit analysis techniques (mesh, nodal, superposition, Thevenin, Norton) to make predictions about complex resistor networks.	15%
Students will learn how to predict the dc transient behavior and the steady-state behavior of RL, RC, and RLC circuits.	25%
Students will be able to build the circuits studied in class, and make measurements that demonstrate whether or not the experiment supports the theories studied.	10%
Students will test the behavior of diodes, transistors, op amps, and digital logic gates in the laboratory.	8%
Students will use phasors and complex number algebra to predict the steady-state behavior of ac sinusoidal circuits.	10%
Students will be able to calculate power consumed in ac circuits, and understand how these calculations differ from calculations of power in dc circuits.	5%
Students will be able to predict the frequency at which a sinusoidal RLC ac circuit will resonate, along with its bandwidth and quality factor.	5%

General Education Goals - Critical Thinking & Social/Global Awareness

CRITICAL THINKING OUTCOMES	**HOW DOES THE COURSE ADDRESS THE OUTCOMES** (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
Students will be able to ➢ develop meaningful questions to address problems or issues. ➢ gather, interpret, and evaluate relevant sources of information. ➢ reach informed conclusions and solutions. ➢ consider analytically the viewpoints of self and others.	Because of the mathematical nature of the course, students need to develop meaningful questions to design algorithms that solve the problems based on data they gather from datasheets, textbooks and the internet. Assignments dealing with complex algorithms that are a slight variation on those presented in class. Assign labs that require research on the specifications of modern semiconductors used in industry today. Cooperation amongst students is imperative to succeed in this career path. This course encourages students to work in teams during lecture help sessions and labs. Encourage students to share solutions and strategies during homework preparation and lab circuit design and implementation.
SOCIAL/GLOBAL AWARENESS OUTCOMES	**HOW DOES THE COURSE ADDRESS THE OUTCOMES** (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
➢ Students will begin to understand how their lives are shaped by the complex world in which they live. Students will understand that their actions have social, economic and environmental consequences.	Not addressed

Instructional Methods
Traditional lecture works very well in presenting the concepts and techniques of the course. Discussion of homework problems in each class, with some time set aside for students to try new problems, is also effective. The use of a View-Screen display for the graphing calculator is of great value. This allows the student to learn the nuts and bolts of calculator use most efficiently, leaving more mental energy for the learning of concepts and techniques of circuit analysis. In the lab sessions, it helps to spend five to twenty minutes at the beginning to explain how the circuits to be built that day will demonstrate some theory or technique that was already presented in lecture. If students work with partners in lab, they seem to learn quite a bit from each other. Computer software and calculators provide a wonderful reinforcement of topics studied in lecture or lab.

The most effective sequence of topics is that given by the chapter order in the textbook listed below.

Methods of Assessment/Evaluation

Method	% Course Grade
Quizzes (there should be six or more of these)	= or > 30%
Final Exam (must be comprehensive)	= or > 20%
Lab Reports (at least two should be formal reports)	= or > 20%
Lab performance (checkups)	= or > 10%

Text(s)
Electric Circuits, James W. Nilsson and Susan A. Riedel, 9th edition, © 2011 Prentice-Hall. (Required)

Bibliography
The Art of Electronics, 2nd edition, by Paul Horowitz and Winfield Hill. (New York: Cambridge University Press, 1990, © 1989)

Encyclopedia of electronics, Stan Gibilisco, Neil Sclater. Blue Ridge Summit, PA: Tab Professional and Reference Books, © 1990.

Electronics fundamentals: circuits, devices, and applications, Thomas L. Floyd. Englewood Cliffs, N.J.: Prentice Hall, © 1995.

Wiley Electrical and Electronics Engineering Dictionary, Steven M. Kaplan. IEEE Press; Hoboken, N.J.: Wiley-Interscience, © 2004.

Other Learning Resources

Audiovisual: No resources specified
Electronic: HTTP://EDUCATION.TI.COM for information about how to make the most of the graphing calculator.
Other: Equipment manuals and data books, available in the Electronics Lab (room 290). MULTISIM circuit simulation software, already installed on the ET lab computers.