Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: ENSC203 **Year: 2024-2025**

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

I. 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: PHSC 212; prior completion or concurrent enrollment in ENGL100 and MATH206. 4 Cr. (3 Lec.,3 Lab.) Spring semester.

II. Additional Course Information:

1. 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.
2. 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.
3. Computers and calculators will also be used to analyze circuits. A TI-85, TI –86, or TI-89 calculator or equivalent is required. Calculator must be able to solve a system of linear equations with complex numbers.

III. Student Learning Outcomes

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

1. Apply electrical and magnetic theories that pertain to electric circuits.
2. Recognize the patterns of behavior of specific component types (sources, resistors, capacitors, inductors) and the circuit theories that govern the way those interact.
3. Predict the behavior of electrical circuits using electrical theories and mathematical techniques.
4. 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.
5. State laboratory processes and results in clear, precise written reports and in oral presentations.

IV. Tompkins Cortland Institutional Learning Outcomes; Program Learning Outcomes; SUNY General Education Competencies and Knowledge and Skills Areas

Tompkins Cortland ILOs

Complete this section for “service” courses only (e.g., courses that are required of all students; courses that are not program specific but satisfy liberal arts requirements; or commonly used in multiple academic programs to meet non-

program-specific requirements). Check only Institutional Learning Outcomes (ILOs) that are meaningfully developed and assessed in this course. For each ILO chosen, include the SLO to which it aligns.

Students will:

☐ Communicate effectively, in oral and written forms, taking into consideration audience and purpose.

☐ Apply principles and methods of scientific inquiry and quantitative reasoning appropriate to their discipline.

☐ Use information, critical thinking, and the creative process to solve problems and reach conclusions.

☐ Use technology appropriate to their discipline.

☐ Describe the ways in which social, economic, or environmental sustainability depends on their own and the collective contributions of a diversity of ideas and people.

Program Learning Outcomes

Complete this section for program-specific courses (e.g., those that share the same discipline code as the academic program or satisfy requirements in related programs). List the academic program(s) here and note which Student Learning Outcomes align to specific Programmatic Learning Outcomes. Please see the MCS Instructions for more details.

Specify the Academic Program: Engineering Science A.S.

PLO #1 Apply mathematical, scientific, computing, and engineering principles to solve engineering problems and design engineering components.

SLO #3 Predict the behavior of electrical circuits using electrical theories and mathematical techniques

PLO #2 Conduct scientific experiments, gather accurate data, interpret the relationships among variables, and use engineering judgment to draw appropriate conclusions as a result of that analysis.

SLO #4 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

PLO #3 State laboratory processes and results in clear and precise written reports and oral presentations.

SLO #5 State laboratory processes and results in clear, precise written reports and in oral presentations

PLO #4 Use technology appropriate to current engineering practices.

SLO #4 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

SLO #5 State laboratory processes and results in clear, precise written reports and in oral presentations

PLO#5 Recognize ethical and professional responsibilities in engineering situations and make informed judgments that consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

SUNY General Education Competencies

If this course assesses a SUNY GEN ED Competency, check all that apply and indicate which course outcome(s) address each checked item:

☐ CRITICAL THINKING & REASONING- Students will:

a. clearly articulate an issue or problem;
b. identify, analyze, and evaluate ideas, data, and arguments as they occur in their own or others' work; acknowledge limitations such as perspective and bias; and
c. develop well-reasoned (logical) arguments to form judgments and/or draw conclusions.

Course SLO(s):

☐ INFORMATION LITERACY - Students will:

a. locate information effectively using tools appropriate to their need and discipline; evaluate information with an awareness of authority, validity, and bias; and demonstrate an understanding of the ethical dimensions of information use, creation, and dissemination.

Course SLO(s):

☐ SUNY GENERAL EDUCATION KNOWLEDGE AND SKILLS AREA(s): Click here to enter text.
For courses that are approved to meet one (or more) of the ten SUNY General Education Knowledge and Skills Areas, indicate which area the course fulfills, and which outcome(s) are aligned with the SUNY outcomes for that area:

Course SLO(s):

☐ This course does not address any of the above Tompkins Cortland ILOs, PLOs, or SUNY General Education Competencies or Knowledge and Skills Areas.

V. Essential Topics/Themes

1. Basic rules that dictate the behavior of specific electrical components (voltage and current sources, resistors, capacitors, inductors).
2. Analysis of resistor networks using series—parallel simplification rules and delta-wye formulas.
3. Advanced circuit analysis techniques (mesh, nodal, superposition, Thevenin, Norton) to make predictions about complex resistor networks.
4. Prediction of the dc transient behavior and the steady-state behavior of RL, RC, and RLC circuits.
5. Build the circuits studied in class, and make measurements that demonstrate whether or not the experiment supports the theories studied.
6. Behavior of diodes, transistors, op amps, and digital logic gates in the laboratory.
7. Phasors and complex number algebra to predict the steady-state behavior of ac sinusoidal circuits.
8. Power consumed in ac circuits, and how these calculations differ from calculations of power in dc circuits.
9. Prediction of the frequency at which a sinusoidal RLC AC circuit will resonate, along with its bandwidth and quality factor.

VI. Methods of Assessment/Evaluation

Method	**% Course Grade**
1. Quizzes (six or more)	30-60%
2. Final Exam (comprehensive)	15-30%
3. Lab Reports & Checkups (at least two formal reports; checkup for every lab)	35-60%
4. Participation	0-10%

VII. Texts – ☒ Required ☐ Recommended ☐ Used for more than one course (list courses)

High school instructors may consult with staff in the CollegeNow office for additional information and guidance.

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1. Electrical Circuits, 10thEdition, by James W. Nilsson and Susan A. Riedel (Prentice Hall, 2015).	☐

Editions listed are current as of date of syllabus. More recent editions may be used.

VIII. Bibliography of Supplemental Materials

1. The Art of Electronics, 2nd edition, by Paul Horowitz and Winfield Hill. (New York: Cambridge University Press, 1990, © 1989)
2. Encyclopedia of electronics, Stan Gibilisco, Neil Sclater. Blue Ridge Summit, PA: Tab Professional and Reference Books, © 1990
3. Electronics fundamentals: circuits, devices, and applications, Thomas L. Floyd. Englewood Cliffs, N.J.: Prentice Hall, © 1995.
4. Wiley Electrical and Electronics Engineering Dictionary, Steven M. Kaplan. IEEE Press; Hoboken, N.J.: Wiley-Interscience, © 2004

Editions listed are current as of date of syllabus. More recent editions may be used.

IX. 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 270). MULTISIM circuit simulation software, already installed on the ET lab computers

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 academic adjustments. All course materials are available in alternate formats upon request.*

Academic Integrity: *Every student at Tompkins Cortland Community College is expected to act in an academically honest fashion in all aspects of their academic work: in writing papers and reports, in taking examinations, in*

performing laboratory experiments and reporting the results, in clinical and cooperative learning experiences, and in attending to paperwork such as registration forms.

Any written work submitted by a student must be their own. If the student uses the words or ideas of someone else, they must cite the source by such means as a footnote. Our guiding principle is that any honest evaluation of a student's performance must be based on that student's work. Any action taken by a student that would result in misrepresentation of someone else's work or actions as the student's own — such as cheating on a test, submitting for credit a paper written by another person, or forging an advisor's signature — is intellectually dishonest and deserving of censure.

Several degree programs offer student learning opportunities (such as internships, field work, and clinical experiences) outside the standard classroom setting. As part of the learning process, students must understand and engage in conduct that adheres to principles guiding employment within the professional workplace. These behaviors include, but are not limited to, academic integrity, accountability, reliability, respect, use of appropriate language and dress, civility, professional ethics, honesty, and trustworthiness. Disciplinary action may be initiated for inappropriate conduct occurring while participating in any course-related project or event.