

Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: ELEC 102

Year: 2023-2024

Course Title: Introduction to Electrical Engineering Applications

Credit Hours: 4

I. Course Description: Designed for students with interest in Electrical Engineering Technology, the course focuses on establishing basic mathematical and programming concepts needed to successfully complete academic and lab work in the field, as well as providing an overview of hardware and software used in the industry. Topics covered include mathematical concepts, logic, logic circuits, print reading for electronics, basic programming techniques, problem solving, troubleshooting of electronics equipment, programmable Arduino boards, S4A, and data manipulation applications. Additional topics explored include soldering, macros in Excel, and introduction to electrical engineering software. Prerequisites: Prior completion of, or concurrent enrollment in, ESL 120, ESL 121, and ESL 122 or ENGL 100. 4 Cr. (3 Lec., 3 Lab.). Fall semesters.

II. Additional Course Information:

1. This course is an introductory course for students in the Electrical Engineering Technology track of the Applied Science and Technology A.A.S.
2. This course satisfies a technical elective requirement for the Applied Science and Technology A.A.S.
3. A lab fee of \$30 or more will be charged for this course.
4. The lab component requires handling sensitive electronic equipment and fine motor skills.
5. Multisim, Prologix, LabView, and other engineering software are used in this course.
6. This course is a prerequisite for ELEC128
7. This course consists of at least 150 minutes of lecture and 150 minutes of lab work each week for the fifteen-week semester.

III. Student Learning Outcomes

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

1. Describe the requirements of electronics equipment operation and safety; read and explain schematics of electronic circuits; identify all parts of a circuit.
2. Identify and measure current and voltage in electric circuits; explain mathematical and physics concepts like degrees, units of measure, frequency, analog and digital signals; perform unit conversions.
3. Construct logic statements and build the corresponding logic circuits; perform Boolean algebra operations, graph Boolean quantities, and combine graphs of Boolean variables.
4. Assemble and program Arduino electronic boards to complete real-life applications using S4A and compare to Arduino IDE.

IV. Tompkins Cortland Institutional Learning Outcomes; Program Learning Outcomes; SUNY General Education Outcomes

Tompkins Cortland ILOs N/A

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 4 letter designation 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

Applied Science and Technology A.A.S.

List the PLO or PLOs that are meaningfully developed and assessed in this course. For Each PLO, list the specific SLO through which the development and assessment will occur.

Upon successful completion of this program, a student should be able to demonstrate:

PLO 1. An understanding of skills necessary in any technical profession;

SLOs:

1. Describe the requirements of electronics equipment operation and safety; read and explain schematics of electronic circuits; identify all parts of a circuit.
4. Assemble and program Arduino electronic boards to complete real-life applications using S4A and compare to Arduino IDE.

PLO 2. The application of standard laboratory procedures and protocols within the basic sciences;

SLOs:

1. Describe the requirements of electronics equipment operation and safety; read and explain schematics of electronic circuits; identify all parts of a circuit.

PLO 5. Practice of professional skills as applied to a technical area of expertise

SLOs:

1. Describe the requirements of electronics equipment operation and safety; read and explain schematics of electronic circuits; identify all parts of a circuit.
2. Identify and measure current and voltage in electric circuits; explain mathematical and physics concepts like degrees, units of measure, frequency, analog and digital signals; perform unit conversions.
3. Construct logic statements and build the corresponding logic circuits; perform Boolean algebra operations, graph Boolean quantities, and combine graphs of Boolean variables.
4. Assemble and program Arduino electronic boards to complete real-life applications using S4A and compare to Arduino IDE.

SUNY General Education Outcomes N/A

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

CRITICAL THINKING - Students will:

- a. identify, analyze, and evaluate arguments as they occur in their own or others' work; and
- b. develop well-reasoned arguments.

INFORMATION MANAGEMENT - Students will:

- a. perform the basic operations of personal computer use;
- b. understand and use basic research techniques; and
- c. locate, evaluate and synthesize information from a variety of sources.

GENERAL EDUCATION CATEGORY - Area(s):

For courses that are approved to meet one (or more) of the ten SUNY General Education categories, indicate which category the course fulfills, and which outcome(s) are aligned with the SUNY outcomes for that category:

This course does not address any of the above Tompkins Cortland ILOs, PLOs, or SUNY General Education Outcomes.

V. Essential Topics/Themes

1. Logic and Logic Circuits
2. Boolean Algebra and Graphs of Boolean Variables: Boolean arithmetic
3. Unit Denominations and Unit Conversions
4. Circuits, Units of Measure, Frequency, Analog & Digital Signals
5. Ohm's Law; Algebra of Proportional and Inversely Proportional Quantities
6. Schematics of Electronic Circuits; Introduction to Multisim
7. Arduino Boards and Programming
8. Exploration of Advanced Engineering Hardware and Software such as Raspberry Pi and Labview, Prologix, and others
9. Exploration of Excel Functions and Macros

VI. Methods of Assessment/Evaluation

Method	% Course Grade
1. Quizzes	25-50%
2. Final Exam or Final Project	20-30%
3. Lab Reports and Lab Performance	30-50%
4. Assignments	0-20%

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

1. OER Course Materials are used for parts of this course.
2. <i>Mathematics for Electricity and Electronics</i> . 4 th Edition, Arthur Kramer, Delmar Cengage Learning
3. <i>The Basic Soldering Guide Handbook: Learn to Solder Electronics Successfully</i> . Alan Winstanley, Antex Electronics Limited.

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

VIII. Bibliography of Supplemental Materials

1. <i>Mathematics for Machine Technology</i> . 8 th Ed., Peterson & Smith, Cengage
2. <i>Quality Hand Soldering and Circuit Board Repair</i> . 5 th Ed., H. Ted Smith, Delmar Cengage Learning
3. Arduino Education, https://www.arduino.cc/en/Tutorial/HomePage
4. S4A, http://s4a.cat/

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

IX. Other Learning Resources

Audiovisual: None specified
Electronic: Arduino Education, https://www.arduino.cc/en/Tutorial/HomePage S4A, http://s4a.cat/
Other: MS Excel

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 his or her 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 his or her own. If the student uses the words or ideas of someone else, he or she 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.