

**ECE DEPARTMENT
THE COLLEGE OF NEW JERSEY
FALL 2016**

ENG-214 CIRCUIT ANALYSIS LABORATORY

2016-2017 COURSE DESCRIPTION:

A practical laboratory experience designing, simulating, breadboarding, and testing electrical circuits to complement the theory in ENG-212.

Textbook: Engineering Circuits Analysis Lab Manual, A. Katz, TCNJ 2014

Instructor: Dr. Allen Katz, akatz@ieee.org, x2666, 149 Armstrong Hall

Office Hours: Monday 3:00 to 3:30 PM, Wednesday 5:00 to 5:30 PM, Thursday 3:00 to 3:30 PM and 5:30 to 6:50 PM.

COURSE OUTLINE

| WEEK | LABORATORY |
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| 1 | Introduction to the Lab. Report Requirements/Grading Safety Concerns Lab Groups Tools required |
| 2 | Lab 1 – Basic Electrical Measurements and Modeling |
| 3 | Lab 1 Continued |
| 4 | Lab 2 – Dc Circuit Analysis with Spice |
| 5 | Lab 3 – Introduction to Electrical Measurements Using the Oscilloscope (Including RMS and Transformers) |
| 6 | Lab 3 Continued |

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| 7 | Lab 3 Continued |
| 8 | Lab 4 – RC and Opamp Transient Circuit Analysis |
| 9 | Lab 4 Continued |
| 10 | Lab 5 - Low pass filter networks and Impedance |
| 11 | Lab 5 Continued |
| 12 | Lab 6 – Filter Design Project |
| 13 | Lab 6 Continued |
| 14 | Oral Presentations |

FINAL GRADE: Average of all lab grades

The technical reports are due to the instructor one (1) week after they are completed.

The technical reports will be group reports, i.e. only one (1) report per group per technical investigation is required, for five of the technical investigations. The entire group will be responsible for the report and will receive the grade. The group will make a presentation at the end of the semester on the last technical investigation. No written report will be required except for the presentation visuals.

COURSE OBJECTIVES:

Objective 1: To develop the student's ability to collect, analyze, and interpret laboratory data in the area of electrical circuit analysis.

Objective 2: To teach students the basic principles of electric circuit analysis.

Objective 3: To give students the ability to identify, formulate and solve electric circuit problems involving dc, steady state ac, and transient excitation.

Objective 4: To introduce elements of circuit design in a laboratory environment.

EDUCATIONAL OBJECTIVES:

(What TCNJ engineers should be able to accomplish during the first few years after graduation) The School of Engineering at The College of New Jersey seeks to prepare its graduates:

- To contribute to the economic development of New Jersey and the nation through the ethical practice of engineering;
- To become successful in their chosen career path, whether it is in the practice of engineering, in advanced studies in engineering or science, or in other complementary disciplines;
- To assume leadership roles in industry or public service through engineering ability, communication skills, teamwork, understanding of contemporary global and socio-economic issues, and use of modern engineering tools;
- To maintain career skills through life-long learning and be on the way towards achieving professional licensure.

Electrical and Computer Engineering Student Outcomes

(What TCNJ Electrical and Computer Engineering students are expected to know and be able to do at graduation. What knowledge, abilities, tools and skills the program gives the graduates to enable them to accomplish the Educational Objectives)

The student outcomes listed below are expected of all graduates of the Electrical or Computer Engineering Program.

ECE graduates will have:

- a. **an ability to apply knowledge of mathematics, science and engineering;**
- b. **an ability to design and conduct experiments, as well as to analyze and interpret data;**
- c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
- d. **an ability to function in multidisciplinary teams;**
- e. **an ability to identify, formulate and solve engineering problems;**
- f. **an understanding of professional and ethical responsibility;**
- g. **an ability to communicate effectively;**
- h. the broad education necessary to understand the impact of engineering solutions in a global and societal context;
- i. a recognition of the need for, and an ability to engage in life-long learning;
- j. a knowledge of contemporary issues;

- k. **an ability to use the techniques, skills and modern engineering tools necessary for engineering practice;**
- l. an ability to analyze and design complex electrical and electronic devices;
- m. an ability to analyze and design software and systems containing hardware and software components.

The bolded outcomes apply directly to this course ENG 214, Circuit Analysis Laboratory.

The educational objective "a" is met as we use math, science and engineering during each laboratory assignment.

The educational objective "b" is met as we as the primary purpose of this course is to conduct experiments and to analyze and interpret data.

The educational objective "d" is met as you will be randomly assigned in groups of two so that your partner might be an electrical, mechanical or biomedical engineer.

The educational objective "e" is met in a number of the experiments such as the "Battery Model" where you are required to determine a suitable model for a size AA battery.

The educational objective "f" is met as we will discuss as required in class the meaning of ethical responsibility such as using falsified data in a technical report.

The educational objective "g" is met in two ways. The first is that you are required to produce at least 9 technical reports communicating your results to a technical audience such as your supervisor if you were in Industry. The second way is that you and your partner will be required to produce and give an oral presentation with slides, on one of the technical assignments, to a technical audience.

The educational objective "k" is met by introducing you to modern engineering tool such as a multi-meter and multi channel oscilloscope. You will also be required to use such modern tool as P-Spice in most of the technical reports. Excel and Math-Lab are also required as needed in a number of the technical reports.

WRITING INTENSIVE COURSES

Since ENG-214 is designated as writing intensive course as determined by the College and the School of Engineering, you will be required to produce 5 technical reports describing in detail the technical investigations assigned in class. These reports will be graded in accordance with the attached instructions and most will be group reports. The equivalent of at least one report will be written on an individual basis. Reports will be accepted by your instructor as a

draft, reviewed and marked with comments regarding grammar, use of English and technical content. You will then incorporate these comments into your final report. You will turn in the marked up draft and final version to your instructor when it is required. Your instructor may at his/hers discretion again return this report for further editing, if it is deemed not acceptable. The instructor at his/hers discretion will spend time with each group during the semester reviewing their reports and indicating to the students how they may improve the technical reports. This review should include both help for the technical aspects of the reports and their readability and their English and grammar. At all times remember that your audience is technically astute, but probably is not really knowledgeable regarding your technical investigations. It should be directed to your supervisor as if you were in industry.

SELECTED TCNJ POLICIES

TCNJ's final examination policy is available on the web:

<http://www.tcnj.edu/~academic/policy/finalevaluations.htm>

Attendance

Every student is expected to participate in each of his/her courses through regular attendance at lecture and laboratory sessions. It is further expected that every student will be present, on time, and prepared to participate when scheduled class sessions begin. At the first class meeting of a semester, instructors are expected to distribute in writing the attendance policies which apply to their courses. While attendance itself is not used as a criterion for academic evaluations, grading is frequently based on participation in class discussion, laboratory work, performance, studio practice, field experience, or other activities which may take place during class sessions. If these areas for evaluation make class attendance essential, the student may be penalized for failure to perform satisfactorily in the required activities. Students who must miss classes due to participation in a field trip, athletic event, or other official college function should arrange with their instructors for such class absences well in advance. The Office of Academic Affairs will verify, upon request, the dates of and participation in such college functions. In every instance, however, the student has the responsibility to initiate arrangements for make-up work.

Students are expected to attend class and complete assignments as scheduled, to avoid outside conflicts (if possible), and to enroll only in those classes that they can expect to attend on a regular basis. Absences from class are handled between students and instructors. The instructor may require documentation to substantiate the reason for the absence. The instructor should provide make-up opportunities for student absences caused by illness, injury, death in the family, observance of religious holidays, and similarly compelling personal reasons including physical disabilities. For lengthy absences, make-up opportunities might not be feasible and are at the discretion of the instructor. The Office of Academic Affairs will notify the faculty of the dates of religious holidays on which large numbers of students are likely to be absent and are, therefore, unsuitable for the scheduling of examinations. Students have the responsibility of notifying

the instructors in advance of expected absences. In cases of absence for a week or more, students are to notify their instructors immediately. If they are unable to do so they may contact the Office of Records and Registration. The Office of Records and Registration will notify the instructor of the student's absence. The notification is not an excuse but simply a service provided by the Office of Records and Registration. Notifications cannot be acted upon if received after an absence. In every instance the student has the responsibility to initiate arrangements for make-up work.

TCNJ's attendance policy is available on the web:

<http://www.tcnj.edu/~recreg/policies/attendance.html>

Academic Integrity Policy

Academic dishonesty is any attempt by the student to gain academic advantage through dishonest means, to submit, as his or her own, work which has not been done by him/her or to give improper aid to another student in the completion of an assignment. Such dishonesty would include, but is not limited to: submitting as his/her own a project, paper, report, test, or speech copied from, partially copied, or paraphrased from the work of another (whether the source is printed, under copyright, or in manuscript form). Credit must be given for words quoted or paraphrased. The rules apply to any academic dishonesty, whether the work is graded or ungraded, group or individual, written or oral.

TCNJ's academic integrity policy is available on the web:

<http://www.tcnj.edu/~academic/policy/integrity.html>.

Americans with Disabilities Act (ADA) Policy

Any student who has a documented disability and is in need of academic accommodations should notify the professor of this course and contact the Office of Differing Abilities Services (609-771-2571). Accommodations are individualized and in accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1992.

TCNJ's Americans with Disabilities Act (ADA) policy is available on the web:

<http://www.tcnj.edu/~affirm/ada.html>