

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



COURSE OUTLINE

COURSE TITLE: Electronic Fundamentals

CODE NO. : ELN100

SEMESTER: ONE

PROGRAM: Electrical Engineering Technician

- Process Automation
- Process Automation & Trades
- Power Generation

AUTHOR: Ed Sowka

DATE: September 2016

PREVIOUS OUTLINE DATED:

September 2015
June/16

APPROVED:

Corey Meunier
CHAIR

DATE

TOTAL CREDITS: FIVE

PREREQUISITE(S): N/A

HOURS/WEEK: FIVE

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I. COURSE DESCRIPTION

This course introduces the student to foundational electronic theory, electronic devices and circuit applications as well as common electronic test equipment. Diodes (Rectifier, Zener, Light-Emitting), Resistors, Capacitors, Transformers and their applications in Linear DC Power Supplies will be studied in detail. Hands on skills will be developed in the practical component of this course, which includes device testing, circuit assembly, analysis and troubleshooting. A final project consisting of proto-typing, testing and constructing a Linear Adjustable DC Power Supply, will enhance skills in the use of common test equipment, constructions/assembly techniques, as well as technical documentation/reporting.

II. LEARNING OUTCOMES AND ELEMENTS OF PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. Accurately communicate the key elements of atomic theory as it relates to the formation and operation of a P-N Junction.

Potential elements of the performance:

- Describe the makeup of the atom.
- State the relationship between the number of valence electrons and the conductivity of the element.
- Contrast/Compare between trivalent and pentavalent elements
- List the similarities and differences between n-type and p-type semiconductors.
- Explain how a pn junction is formed.
- Define “bias” and describe the different methods of forward and reverse biasing a pn junction.

2. Describe diode characteristics and operation.

Potential elements of the performance:

- Describe the construction of a diode.
- Compare Silicon and Germanium diodes characteristics and operational requirements.
- Correctly identify the terminals of a diode and be able to draw and analyze the schematic diagram of a simple diode circuit.
- Describe and Demonstrate how to test a diode in and out of circuit with an analog or digital meter.
- Using a specification sheet, list and define the parameters and operating characteristics of different diodes.

- Discuss and compare the basic operating principles of rectifier diodes, zener diodes and light- emitting diodes.(LEDs).
- Calculate Diode Voltage and Current as well as circuit voltages and currents in electric circuits implementing Silicon or Germanium diodes, Zener Diodes and Light-Emitting Diodes.

3. Describe the operation of common diode applications.

Potential elements of the performance:

- Draw the block diagram of a Linear DC power supply and describe the function of each circuit it contains.
- Describe the operation of the half-wave, full-wave and bridge rectifiers.
- Recall the equations used to solve for rectifier circuits.
- Calculate Load Voltage and Load Current of the three types of rectifiers.
- Explain the effects that filtering has on the output of a rectifier.
- Identify and describe various types of power supply filters.
- Calculate Load Voltage and Load Current of Filtered rectifiers.
- Describe different voltage and current regulators including Zener Regulators and Integrated Circuit Regulators.
- Perform calculations to justify proper operation of the power supply.
- Assemble and test power supply circuits using proper test equipment.
- Troubleshoot various linear power supplies in a safe and proper manner.

4. Fabricate and Test a Complete Linear DC Power Supply.

Potential elements of the performance:

- Prototype a complete Linear DC Power Supply (Construct and Test)
- Perform all required Calculations and Measurement prior to final assembly.
- Properly solder all required components.
- Correctly assemble all components implementing common shop practices and assembly techniques.
- Accurately produce a Technical Report as per criteria provided by instructor.

III. TOPICS TO BE COVERED:

1. Atomic theory and the P-N Junction
2. Junction Diodes, Zener Diodes, Light Emitting Diodes characteristics and applications
3. Linear DC Power Supplies

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

- Text - Introductory Electronic Devices and Circuits – 7th or newer Edition Author - Robert T. Paynter (Available in Campus Shop)
This is known as a PEARSON CUSTOM ELECTRONICS TECHNOLOGY publishing.
- 1st Year Electronic Parts Package
- Digital Multimeter

Availability of the Parts Package and Digital Multimeter will be indicated in the first scheduled Laboratory Class and will be purchased from the Electrical Club.

V. EVALUATION PROCESS/GRADING SYSTEM:

The final grade will be derived as follows:

- Theory - Tests (2) and Quizzes = 50%
- Lab - Practical tests and reports ** = 40%
- Final Project / Report ** = 10%
- TOTAL = 100%
- **** See Special Notes Section VI for further details affecting final grade.**

The following semester grades will be assigned to students in postsecondary courses:

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
Grade	<u>Definition</u>	<u>Grade Point Equivalent</u>
A+	90 – 100%	4.00
A	80 – 89%	
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	Below 50%	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field /clinical placement or non-graded subject area.	

U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR	Grade not reported to Registrar's office.
W	Student has withdrawn from the course without academic penalty.

If a faculty member determines that a student is at risk of not being successful in their academic pursuits and has exhausted all strategies available to faculty, student contact information may be confidentially provided to Student Services in an effort to offer even more assistance with options for success. Any student wishing to restrict the sharing of such information should make their wishes known to the coordinator or faculty member.

VI. SPECIAL NOTES:

Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

It is the departmental policy that once the classroom door has been closed and the professor has started the lesson, the learning process has begun. Late arrivers will not be granted admission to the room. Refer to Student Rights and Responsibilities documentation for sanctions.

Additional Criteria:

- **Attendance** to lab activities is compulsory, unless discussed with the instructor in advance of the absence and the absence is for a medical or family emergency. A **deduction of 1% per missed Lab** will be imposed on the final lab mark. Your attendance to all classes and your final grade are directly related and as such, it is strongly recommended to attend all scheduled Theory Classes / Tutorials. Theory tests/quizzes will be based not only on what is contained in the textbook, but also what is being discussed / described in the classroom.

- **ALL LAB's MUST BE COMPLETED AND ALL LAB REPORTS MUST BE COMPLETED AND SUBMITTED WITHIN THE SPECIFIED DEADLINES. FAILING TO DO SO WILL RESULT IN A FINAL "F" GRADE BEING ASSIGNED AS A FINAL MARK REGARDLESS OF ALL OTHER MARKS RECEIVED DURING THE SEMESTER.**
- **Laboratory Reports** shall be subject to the handout and/or criteria provided at the start of the semester by the Professor. All Lab Reports are due **before** the start of the following weeks Scheduled Lab Class (or alternate indicated deadline) unless otherwise stipulated by the instructor. A **deduction of 10%** will be assessed for late submissions within the first 24 hour period following the deadline. A **deduction of 50%** will be assessed if submitted after this initial 24 hours, but before 48 hours. Reports submitted after 48 hours of the specified deadline will be considered as Not Completed and will be graded as 0%. (Weekends included in all deadline requirements).
- **Lab Reports** are graded based on the following:
 1. Ability to follow instructions (written and verbal)
 2. Ability to follow specific technical procedures
 3. Ability to use test equipment to obtain data
 4. Accuracy and completeness of data
 5. Ability to use required software
 6. Ability to adhere to established deadlines
 7. Ability to work within established time limitations
 8. Ability to adapt to changes in requirements/processes.
 9. Ability to draw conclusions based on objectives
 10. Ability to produce a technical report as specified

It should be noted that these are essential skills as indicated in the Provincial Program Standards.

- **All Lab Reports must be submitted/bound in a Duo-Tang cover (No Binders) and must have the students name on the exterior cover unless otherwise noted. Reports not in a Duo-Tang will not be accepted and as such will be graded 0%.**
- **Incomplete Lab Report submissions** will be returned to the student and will not be graded until such a time as they are completed. The maximum mark that can be obtained for incomplete labs re-submitted will be 50%. Incomplete reports must be completed and resubmitted within 5 calendar days of being returned to the students (not when the student obtains the returned reports), otherwise it will be considered Not Completed.
- The Final Project Technical Report **MUST** be submitted (according to criteria established by the Professor), in order to obtain an overall passing grade. **Failing to submit the Final Project Technical Report, will result in a Final Grade of 'F', regardless of other marks obtained.**
- Practical Tests are individual evaluations of a students' ability to perform essential tasks in a safe and timely manner as outlined in provincial program standards.

- Any student that is absent for any test (for a legitimate emergency) will be required to provide a doctors' note immediately upon returning. Failing to do so will result in a grade of 0% being assigned to the missed test. It is the students' responsibility to contact the college and/or Professor. Test dates will be provided to the students, a minimum of 2 weeks in advance of the test.
- Tests, quizzes and other activities will not be scheduled on an individual basis, unless it is for a medical or family emergency.
- Quizzes can and will be given without notice, and are designed to determine whether or not the student has been performing the requirements up to that point in time for the specific theory/concept being taught (homework/assignments etc.). Missed quizzes will be assigned a mark of 0%.
- Disruptions to theory classes, such as lateness, are not acceptable and will be dealt with on an individual basis. Students exhibiting chronic lateness, disruptiveness or absenteeism will be required to meet with the department Chairperson, and will be placed on academic probation. Refer to Student rights and Responsibilities for additional sanctions.
- The use of Cell Phones and other technology devices (exception is a stand-alone calculator) during scheduled classes is prohibited. Turn off all Cell Phones prior to attending class. Anyone found using a cell phone during class, will have the phone confiscated and returned only after the end of the scheduled class. If you are expecting an important/emergency call, you must inform the instructor prior to the start of the class, and the phone must be in silent/vibrate mode only. Multiple infractions will result in sanctions.

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located in D2L and on the portal form part of this course outline.



COURSE OUTLINE ADDENDUM

1. Course Outline Amendments:

The professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

2. Retention of Course Outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

3. Prior Learning Assessment:

Students who wish to apply for advance credit transfer (advanced standing) should obtain an Application for Advance Credit from the program coordinator (or the course coordinator regarding a general education transfer request) or academic assistant. Students will be required to provide an unofficial transcript and course outline related to the course in question. Please refer to the Student Academic Calendar of Events for the deadline date by which application must be made for advance standing.

Credit for prior learning will also be given upon successful completion of a challenge exam or portfolio. Student Services, located in E1101, can provide information regarding the Prior Learning Assessment and Recognition policy or it can be viewed on the student portal.

Substitute course information is available in the Registrar's office.

4. Student Portal:

The Sault College portal allows you to view all your student information in one place.

mysaultcollege gives you personalized access to online resources seven days a week from your home or school computer. Single log-in access allows you to see your personal and financial information, timetable, grades, records of achievement, unofficial transcript, and outstanding obligations, in addition to announcements, news, academic calendar of events, class cancellations, your learning management system (LMS), and much more. Go to <https://my.saultcollege.ca>.

5. Communication:

The College considers ***Desire2Learn (D2L)*** as the primary channel of communication for each course. Regularly checking this software platform is critical as it will keep you directly connected with faculty and current course information. Success in this course may be directly related to your willingness to take advantage of this Learning Management System (LMS) communication tool.

6. Accessibility Services:

If you are a student with a disability (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with the Accessibility Services office. Visit Room E1101, call Ext. 2703 or email studentsupport@saultcollege.ca so that support services can be arranged for you.

7. Audio and Video Recording Devices in the Classroom:

Students who wish to use electronic devices in the classroom will seek permission of the faculty member before proceeding to record instruction. Students with disabilities who require audio or visual recording devices in the classroom as an accommodation will receive approval from their counsellor once the Audio and Video Recording Devices in the Classroom Policy has been reviewed by the student. Recorded classroom instruction will be used only for individual academic use and will not be used for any other purpose. Recordings may only be used for individual study of materials presented during class and may not be published or distributed. Intentional misuse of audio and video recordings or intentional misrepresentation when requesting the use of a device for recording shall constitute a violation of this policy and laws protecting intellectual property.

8. Academic Dishonesty:

Students should refer to the definition of “academic dishonesty” in the *Student Code of Conduct*. Students who engage in academic dishonesty will be issued a sanction under the Student Code of Conduct which could lead to and include expulsion from the course/program. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, students must use a documentation format for referencing source material.

9. Tuition Default:

Students who have defaulted on the payment of tuition (tuition has not been paid in full, payments were not deferred or payment plan not honoured) as of the first week of November (fall semester courses), first week of March (winter semester courses) or first week of June (summer semester courses) will be removed from placement and clinical activities due to liability issues. This may result in loss of mandatory hours or incomplete course work. Sault College will not be responsible for incomplete hours or outcomes that are not achieved or any other academic requirement not met as of the result of tuition default. Students are encouraged to communicate with Financial Services with regard to the status of their tuition prior to this deadline to ensure that their financial status does not interfere with academic progress.

