

**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**

**SAULT STE. MARIE, ONTARIO**



**SAULT  
COLLEGE**

**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 2011 **PREVIOUS OUTLINE DATED:** September 2010

**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. Understand atomic theory and 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. Understand diode principles, 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. Understand 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 – 7<sup>th</sup> or newer Edition Author - Robert T. Paynter (Available in Campus Shop)
- 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 or 3 ) 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>
<b>Grade</b>	<b>Definition</b>	<b>Grade Point Equivalent</b>
A+	90 – 100%	4.00
A	80 – 89%	3.00
B	70 - 79%	2.00
C	60 - 69%	1.00
D	50 – 59%	0.00
F (Fail)	Below 50%	
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.

## 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, the learning process has begun. Late arrivers will not be granted admission to the room.***

## VII. COURSE OUTLINE ADDENDUM:

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

**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.
- **Laboratory Reports** shall be subject to the handout and or criteria given 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 graded as 0% (Weekends included in all deadline requirements).

- **Lab Reports** are graded based on the following:

1) Ability to follow instructions, 2) Ability to follow specific technical procedures, 3) Ability to use test equipment to obtain data, 4) Accuracy of data, 5) Ability to use required software, 6) Ability to adhere to established deadlines, 7) Ability to draw conclusions based on objectives, 8) Ability to produce a technical report as specified.

- **All Lab Reports must be submitted in a Duo-Tang cover (No Binders) unless otherwise noted. No loose papers will be accepted and as such will be graded 0%.**
- 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.**
- **Incomplete 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 handed in after the last scheduled class, will be graded 0%.
- 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 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.

***Theory Tests will not be returned.  
Students will be given the opportunity to review / correct the test material.***