SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO


Sault College

COURSE OUTLINE

COURSE TITLE: ELECTRONIC CIRCUITS 1

CODE NO. : ELN109 **SEMESTER:** TWO

PROGRAM: ELECTRICAL/ELECTRONICS/INSTRUMENTATION POWER GENERATION/

AUTHOR: ED SOWKA

DATE: JAN. 2008 **PREVIOUS OUTLINE DATED:** JAN. 2007

APPROVED:

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CHAIR **DATE**

TOTAL CREDITS: 5

PREREQUISITE(S): ELN100

HOURS/WEEK: 5

I. COURSE DESCRIPTION:

This course is a detailed study BJTs, JFETs, MOSFETs and OPAMPs as well as applications of these devices including transistor amplification, switching, timing circuits and OPAMP applications. This course will focus on operational analysis and troubleshooting of circuits employing these devices. Hands on skills will be reinforced in the laboratory component of this course, which includes device testing, circuit assembly, testing and troubleshooting.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. Understand the construction and operation of a Bipolar Junction Transistor (BJT)

   Potential Elements of the Performance:

   - Describe the construction of a bipolar junction transistor (BJT) and the difference between the npn and pnp transistors.
   - Describe the operation of a transistor in the active, cutoff and saturation regions and how to bias the transistor accordingly.
   - Describe the transistor as a current-controlled device and state the relationship among the three terminal currents.
   - Define beta and use it in transistor current calculations.
   - Using a specification sheet, list the parameters and operating characteristics of different transistors.
   - Describe how to test transistors in and out of circuit with an analog or digital meter.

2. Analyze, assemble, test and troubleshoot various BJT biasing configurations.

   Potential Elements of the Performance:

   - State the purpose of dc biasing for transistor circuits.
   - Identify and analyze common transistor biasing circuits.
   - Plot the dc load line for an amplifier and explain what the Q-point represents.
   - Define and Calculate the Q-Point, Saturation and Cutoff.
   - Describe, analyze and calculate the operation of a base-bias circuit, and explain why this bias is used when you require the transistor to act as a switch.
   - Describe, analyze and calculate the operation of an emitter-feedback bias circuit.
   - Describe, analyze and calculate the operation of a voltage-divider biasing circuit.
   - Assemble and test biasing circuits using proper test

equipment.
- Correctly use common test equipment in the analysis and troubleshooting of transistor circuits.
- Analyze, test and troubleshoot, transistor switching circuits and amplifiers.
- Identify and understand the operation of other transistor configurations including Darlington

3. Understand the operation of basic transistor amplifiers.

Potential Elements of the Performance:

- Identify and compare various Amplifier classes.
- List the fundamental ac properties of amplifiers.
- Derive the ac equivalent for a class A amplifier.
- Explain and Calculate the effects of input and output impedance on voltage gain.
- Perform a complete mathematical dc and ac analysis of a voltage divider bias class A amplifier.
- Assemble and test a single stage amplifier for proper dc and ac voltages.
- Troubleshoot a multi-stage amplifier in a safe and proper manner.

4. Understand the characteristics, operation, biasing, and testing of JFETs and MOSFETs.

Potential Elements of the Performance

- Identify the two types of JFETs and describe the construction and operation of each.
- Describe and analyse the different types of JFET biasing circuits.
- Compare FET characteristics, advantages and disadvantages with BJT's
- Identify the two types of MOSFETs and describe the construction and operation of each.
- Describe and analyse the different types of MOSFET biasing circuits
- Assemble, test and troubleshoot different JFET and MOSFET circuits.

5. Understand the operation, characteristics and applications of Operational Amplifiers (OPAMPS)

Potential Elements of the Performance:

- Describe the operational amplifier.
- Explain IC identification of an OPAMP.
- Explain the term differential amplifier.
- Describe the operation of a discrete differential amplifier.
- Using a specification sheet, list and understand the operating and electrical characteristics of OPAMPS.
- Describe, analyse and calculate the operation of common OPAMP circuits including Inverting, Non-Inverting, Follower, Comparator, Schmitt Trigger.
- Assemble, test and troubleshoot common OPAMP circuits.

III. TOPICS:

1. Bipolar Junction Transistors and Circuits.

2. JFETs, MOSFETs and their applications.

3. Operational amplifiers and their applications

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

- Introductory Electronic Devices and Circuits (Conventional Flow Version) Seventh Edition – Robert T. Paynter – Prentice Hall.
- 1st Year Parts Package / DMM
- Assorted handouts as required
- Internet Resources

V. EVALUATION PROCESS/GRADING SYSTEM:

The final grade will be derived as follows:

- Theory - Tests (3 or 4) and Quizzes = 50%
- Lab - Practical tests and reports = 40%
- Attendance and work ethics = 10%
- TOTAL =100%

- **See Special Notes Section VI for further details affecting final grade.**

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

Grade	**Definition**	*Grade Point Equivalent*
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)	49% and below	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.

VI. SPECIAL NOTES:

Special Needs:
If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your instructor and/or the Special Needs office. Visit Room E1101 or call Extension 2703 so that support services can be arranged for you.

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.

Communication:
The College considers ***WebCT/LMS*** 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 the ***Learning Management System*** communication tool.

Plagiarism:
Students should refer to the definition of "academic dishonesty" in *Student Rights and Responsibilities*. Students who engage in "academic dishonesty" will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

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.

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

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 2% per Lab missed*** will be imposed on the final mark.
- Your attendance to all classes, and your final grade are directly related. A ***deduction of 1% per theory hour missed***, will be imposed on the final mark.
- Any student that is absent for a test 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 instructor.
- Tests, quizzes and other activities, will not be scheduled on an individual basis, unless it is for a medical or family emergency.
- Disruptions to theory classes, such as lateness, are not acceptable and will be dealt with on an individual basis. Students exhibiting chronic lateness or absenteeism will be required to meet with the Dean, and will be placed on academic probation.
- The use of Electronic Recording Devices is prohibited unless individual permission is obtained from the instructor. The use of Cell Phones during scheduled classes is prohibited. Turn off all Cell Phones before attending class.

Laboratory Reports shall be subject to the handout and or criteria given at the start of the semester by the instructor.
All Lab Reports are due ***before*** the start of the following weeks Lab Class unless otherwise stipulated by the instructor. A ***penalty of 10% per day*** will be assessed for late submissions (Weekends included).

Any submissions that are incomplete 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%.

All Lab Reports must be submitted in a Duo-Tang cover unless otherwise noted.

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

VIII. DIRECT CREDIT TRANSFERS:

Students who wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide a transcript and course outline related to the course in question.