

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ON

COURSE OUTLINE

COURSE TITLE: FUNDAMENTALS OF ELECTRONICS

CODE NO.: ELN112-5

SEMESTER: TWO (2)

PROGRAM: COMPUTER ENGINEERING TECHNOLOGY

AUTHOR: A. GOODERHAM

DATE: JANUARY 1992

PREVIOUS OUTLINE DATED: JANUARY 1987

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APPROVED:

DEAN

L P Choquette

DATE

Jan 8, 1992

COURSE NAME: FUNDAMENTALS OF ELECTRONICS

CODE NO.: ELN112-5

TOTAL CREDIT HOURS: 5

PREREQUISITE(S): ELN106

I. PHILOSOPHY/GOALS:

This course is intended to provide the student with a solid background in electronic analog devices, circuits and their applications.

The course will cover audio amplifiers, switching and pulse circuits, industrial control circuits that the computer may interface with.

The practical work will further develop the student's design, testing and troubleshooting skills using various test equipment.

II. STUDENT PERFORMANCE OBJECTIVES:

Upon successful completion of this course the student will:

- 1) Have a fundamental knowledge of transistors and operational amplifiers.
- 2) Be able to simplify and analyze basic amplifier circuits and describe characteristics of each type.
- 3) Be able to analyze and describe pulse circuit operations and their associated wave forms.
- 4) Have a fundamental knowledge of industrial electronics, including relay, timing circuits, optoelectronic devices and solid state trigger and thyristor control devices.

III. TOPICS TO BE COVERED:

FUNDAMENTALS OF ELECTRONICS

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BLOCK I - Electronic Devices & Amplifiers

A) TRANSISTOR (BJT) AMPLIFIERS

1. Transistor Characteristics
 - BJT
 - Biasing
 - Applications (Amplifiers and Switches)
2. Multi-stage Amplifiers
 - AC/DC Analysis
3. Direct Coupled Amps
4. Power Amps

B) OPERATIONAL AMPLIFIERS (OPAMPS)

1. Differential Amp
2. Symbol Diagram, Operation and Characteristics
3. OPAMP Circuits
 - Inverting Amp
 - Non-Inverting Amp
 - Comparator
 - Adder/Subtractor
 - I/V, V/I Convertors
 - A/D, D/A Convertors

C) FIELD EFFECT TRANSISTORS

1. JFET
 - Symbol, Characteristics, Operation
 - JFET Amplifiers
2. MOSFET'S
 - Symbol, Characteristics, Operation and Applications

BLOCK II - PULSE CIRCUITS

A) PULSE WAVEFORM ANALYSIS

1. Ideal Pulse
2. RC Waveshaping Circuits
 - Integrator
 - Differentiator

B) SWITCHING AND SIGNAL CONDITIONING CIRCUITS

1. Diode and Transistor Switches
2. Clippers and Limiters
3. Schmitt Trigger

C) PULSE/SWEEP GENERATING CIRCUITS

1. VJT Oscillator
2. Multivibrators
3. Sweep Generators

BLOCK III - INDUSTRIAL ELECTRONICS

A) TIMING, RELAY AND DIGITAL CIRCUITS

1. RC Time Delay Circuits
2. Relay Operation and SSR's
3. Relay, Solid-State and Digital Logic Circuits
4. Operation, Application, Testing, Analysis and Troubleshooting of Industrial Control Circuits

B) OPTOELECTRONICS

1. Photoelectric Devices
 - Photovoltaic Cell
 - Photoconductor
 - Photoemissive Tube
2. Photoconductive Sensors
 - Photo Diode
 - Photo Transistors
 - Photo IC's
3. LIGHT - EMITTERS - LED'S, LCD'S
4. Photocouplers
5. Fibre Optics
6. Applications of Optoelectronics Devices in Industrial Control

C) SOLID STATE TRIGGER DEVICES

1. Operation, Characteristics, Specifications, Testing and Application
 - Four Layer Diode
 - Unijunction Transistor (UJT)
 - DIAC
2. UJT Relaxation Oscillator
3. The 555 Timer - Operation and Application

D) THYRISTOR (PNPN) CONTROL DEVICES

1. Latching Devices
2. Silicon Controlled Rectifier (SCR)
 - Theory and Operation
 - Gate Characteristics and Control Circuits
 - AC/DC Load Control (Half & Full Wave)
 - UJT/SCR Control Circuits
3. Triacs
 - Theory, Operation, Characteristics and Application
4. Other Thyristor Devices
 - LASCR, GCS, SCS, GTO
5. DC Motor Speed Control Systems

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V. **EVALUATION METHODS:** (INCLUDES ASSIGNMENTS, ATTENDANCE REQUIREMENTS, ETC.)

TESTING

- a) Written tests based upon theory objectives will occur following the completion of each theory block. Students will be given advance notice of test dates (1 week minimum). Quizzes (worth a maximum of 5%) may be given without notice. There will be no rewrites for students missing quizzes.
- b) Testing of lab objectives will occur concurrent with specific lab activity. this will include evaluation of lab reports submitted an lab performance.
- c) If a student misses a test he/she must have a valid reason (medical or family emergency). In addition the school must be notified before the scheduled test sitting. The student should contact the instructor involved. If the instructor cannot be reached leave a message with the Dean's office or the college switchboard. If this procedure is not followed the student will receive a mark of zero on the test with no rewrite option.

GRADING

- a) Grading is done using the following definitions:

| | |
|--|--------------------|
| - Consistently outstanding performance | A+ - (90 - 100%) |
| - Outstanding performance | A - (80 - 89%) |
| - Above average performance | B - (66 - 79%) |
| - Satisfactory performance | C - (55 - 65%) |
| - Repeat course | R -(less than 55%) |

- b) Lab reports are due one week after the experiment was scheduled to be completed. Late reports are penalized 5% per day.
- c) The grading weight will be 30% for the lab and 70% for the theory.
- d) A final overall accumulated mark of 55% is the minimum requirement for course credit with the added restriction that neither the theory or the lab part of the course can be less than 55%.

UPGRADING

Rewrite tests and X-grades will not normally be given except under exceptional circumstances.

ATTENDANCE

Attendance for the laboratory classes is compulsory.

VI. REQUIRED STUDENT RESOURCES

ELECTRONICS FUNDAMENTALS - Floyd, 2nd Edition

(Reference material will be referred to throughout the course)

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

Book Section (TITLE, PUBLISHER, EDITION, DATE, LIBRARY CALL NUMBER IF APPLICABLE - SEE ATTACHED EXAMPLE)

Periodical Section (MAGAZINES, ARTICLES)

Audiovisual Section (FILMS, FILMSTRIPS, TRANSPARENCIES)

VIII. SPECIAL NOTES

Students with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.