UNIVERSITY COLLEGE of the FRASER VALLEY



COURSE IMPLEMENTATION DATE: September 1993
COURSE REVISED IMPLEMENTATION DATE:
COURSE TO BE REVIEWED: September 1997
(Four years after implementation date) (MONTH YEAR)

## OFFICIAL COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.
Shaded headings are subject to change at the discretion of the department and the material will vary - see course syllabus available from instructor

FACULTY/DEPARTMENT: **NATURAL SCIENCES**

| **PHYSICS 332** | | **3** |
|---|---|---|
| COURSE NAME/NUMBER | FORMER COURSE NUMBER | UCFV CREDITS |

**ELECTRONICS**
COURSE DESCRIPTIVE TITLE

### CALENDAR DESCRIPTION:

Physics 332 is an introductory electronic principles and circuit analysis course. This course will cover the following topics: analysis of DC and AC circuits, diodes, bipolar transistors, field effect transistors, transistor amplifiers, operational amplifiers, power supplies, and digital logic. Students enrolling in this course must also take in the same semester, Physics 342, the accompanying lab course. A major emphasis will be placed on using the provided computers to model the circuits and the circuit devices studied in this course. Access to a home, IBM compatible computer, will assist the student in doing many of the problems and experiments.

PREREQUISITES: **Physics 222**
COREQUISITES: **Physics 342**

SYNONYMOUS COURSE(S)
(a) Replaces: _____ *(Course #)*
(b) Cannot take: _____ *(Course #)* for further credit.

SERVICE COURSE TO: _____ *(Department/Program)* _____ *(Department/Program)*

TOTAL HOURS PER TERM: **60**
STRUCTURE OF HOURS:

| | | |
|---|---|---|
| Lectures: | **60** | Hrs |
| Seminar: | | Hrs |
| Laboratory: | | Hrs |
| Field Experience: | | Hrs |
| Student Directed Learning: | | Hrs |
| Other (Specify): | | Hrs |

TRAINING DAY-BASED INSTRUCTION
LENGTH OF COURSE:
HOURS PER DAY:

MAXIMUM ENROLLMENT:
EXPECTED FREQUENCY OF COURSE OFFERINGS:

| | | |
|---|---|---|
| WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only) | ☒ Yes | ☐ No |
| WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department) | ☐ Yes | ☐ No |
| TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE: | ☐ Yes | ☐ No |

AUTHORIZATION SIGNATURES:

Course Designer(s): George McGuire
Chairperson: *(Curriculum Committee)*
Department Head: Henry Speer
Dean: J.D. Tunstall, Ph.D.
PAC Approval in Principle Date:
PAC Final Approval Date: November 24, 1993

**LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:**

This course is designed to provide students with:
1. The theory needed to understand and predict how electronic devices will function when placed in circuits;
2. The theory to design and analyze the electronic circuits;
3. The ability to design, run, and test circuits on computer simulators;
4. An appreciation of the importance electronics plays in the lives of Canadians.

**METHODS:**

This course will be presented using lectures, demonstrations, and computer simulations. The use of the computer simulators will permit the students to design and check how their circuits should function when constructed in the lab. The computer simulations will help the students understand and master the electronic principles and circuit theory, as well as provide an appreciation of how important a computer can be to a physicist. Students after successfully completing this course will have a good understanding of basic electronic devices, how computers may be used to model and test electronic circuits (active and passive devices), and the ability to design, construct, and to test circuits.

**PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):**

Credit can be awarded for this course through PLAR (Please check:) ☐ Yes ☐ No

**METHODS OF OBTAINING PLAR:**

**TEXTBOOKS, REFERENCES, MATERIALS:**

[Textbook selection varies by instructor. An example of texts for this course might be:]

TEXTS: Malvino, P., Electronic Principles, 5th Ed., McGraw Hill (1993)

REFERENCES:

1. Horowitz and Hill, The Art of Electronics, Cambridge, 1989
2. Simpson, R., Introductory Electronics for Scientists and Engineers, 2nd Ed., Simon & Shuster, 1987
3. Driscoll, F., Analysis of Electric Circuits, Prentice Hall, 1973
4. Fortney, L., Principles of Electronics, HBJ, 1987

**SUPPLIES / MATERIALS:**

**STUDENT EVALUATION:**

[An example of student evaluation for this course might be:]

| | |
|---|---|
| Assignments | 20% |
| Mid-term | 20% |
| Computer Simulations | 20% |
| Final | 40% |

**COURSE CONTENT:**

[Course content varies by instructor. An example of course content might be:]

Week 1: Semiconductors
- conductors and semiconductors
- doping a semiconductor
- diode curve: forward and reverse bias
- diode approximations
- diode circuits

Week 2: Bipolar Transistors
- Unbiased and biased transistor (PNP NPN)
- collector curves
- transistor approximations

Week 3: Transistor Fundamentals
load line, operating point, saturation points
transistor switch
LED drivers
Transistor Biasing

Week 4: AC Models
coupling and bypass capacitors
small signal operation
AC resistance of the emitter diode
CE amplifier

Week 5: Voltage Amplifiers
CE amplifier
voltage gain
analysis of voltage amplifiers
power amplifiers (AC load line, Class A operation)

Week 6: Emitter follower
CC amplifier
voltage gain
Class B operation

Week 7: Field Effect Transistors
JFET
drain curves
JFET approximations
MOSFET

Week 8: Op. Amps
integrated circuits
differential amplifier

Week 9: Op. Amps
Op-amp characteristics
small and large frequency operation
negative feedback and inverting voltage feedback
linear and non-linear op amp circuits

Week 10: Op Amps
oscillators
Schmitt triggers
phase locked loops
relaxation oscillations

Week 11: Op Amps
voltage regulators

Week 12: Digital Logic
the logic gates
flip-flops

Week 13: Digital Logic
registers and counters
buffers

Week 14; Digital Logic
digital to analog conversion/circuits
analog to digital converter circuits