UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE:	May 1994
COURSE REVISED IMPLEMENTATION DATE:	September 2001
COURSE TO BE REVIEWED:	September 2005
(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: **PHYSICS**

PHYSICS 462		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Digital Electronics and Comp. Interfacing
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

Physics 462 is an introductory digital electronic course with emphasis on understanding how digital electronics is used in personal computers. Topics include:

- gates and Boolean algebra, Karnaugh maps, flip flops, registers, counters and memories
- digital components, microprocessor functions and architecture, instruction sets
- addressing modes and programming the popular microprocessors.

Physics 472, the laboratory portion of this course must be taken concurrently. This course is designed to provide practical experience with the basic digital logic chips and how digital circuits can be interfaced with microprocessors.

PREREQUISITES: **PHYS 332**
COREQUISITES: **PRE- or COREQUISITES: PHYS 472**

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: Art Last *(Curriculum Committee)*
Department Head: Tim Cooper
Dean: Wayne Welsh, Ph.D.
PAC Approval in Principle Date:
PAC Final Approval Date: December 13, 2000

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

This course is designed to provide students with:
1. the theory needed to understand the purpose and how digital devices function;
2. an understanding and an appreciation of how a digital computer functions;
3. the ability to design, construct and test simple digital logic circuits;
4. an ability to program the common microprocessors;
5. how information can be transferred to and from computers.

METHODS:

This course will be presented using lectures, demonstrations, experiments, and computer simulations. Computer simulations will be used to design and to check the digital logic circuits. The laboratory portion of the course will provide the actual experience and the practice needed to confirm the digital logic theory studied in the lecture portion of the course. This unique combination of classroom theory, computer simulation, and practical experience should provide the students with the necessary knowledge and experience to design circuits to perform specific tasks. Students after successfully completing this course will have a good understanding of basic digital electronics, microprocessors, computer architecture, computer interfacing, and computers can be used to model and 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/Brown, Digital Computer Electronics, 3rd 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 & Schuster, 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%

COURSE CONTENT:

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

PART 1: DIGITAL PRINCIPLES
Week 1: Number Systems and Codes
- a. binary, octal, decimal, and hexadecimal numbers and operations
- b. Microprocessors and ASCII code

Week 2/3: Gates
- a. Inverters
- b. OR AND Gates
- c. Boolean Algebra
- d. NOR, NAND, Exclusive OR Gates
- e. DeMorgan's First and Second Theorem
- f. TTL circuits
- g. 7400 devices

Week 4: Boolean Algebra and Karnaugh Maps

a. Sum and Products
b. Karnaugh Maps
c. Pairs, Quads, Octets
d. CE amplifier
e. binary Mathematics
f. Adders

Week 5/6: Flips Flops, Registers, and Counters

a. RS and D Latches
b. Flip Flops
c. Registers (Buffers, Shift, Controlled)
d. Counters (Ripple, Synchronous, Ring, etc.)
e. Bus-organized computers
f. Memories
g. ROMs, PROMs, EPROMs, RAMs

PART 2

Week 7: Computers

a. architecture
b. instruction sets
c. fetch and execution cycle
d. instructions (memory reference, registers, jump, call, logic)

Week 8: Programming

a. models
b. arithmetic instructions
c. increments, decrements, and rotates
d. logic instructions
e. jump and indirect instructions
f. extended register instructions

PART 3

Week 9: Introduction to the Microprocessor

a. computer hardware
b. common uses of a microprocessor
c. access to microprocessors

Week 10: Languages

a. digital electronics and programming
b. flowcharts
c. assembly language

Week 11/12: System Overview

a. computer architecture
b. microprocessor families
c. data transfer and CPU instructions
d. data transfer and specific microprocessors
e. addressing modes
f. flags and their instructions
g. logical instructions
h. shift and rotate instructions
i. addressing modes

Week 13/14: Branching and Looping

a. conditional and unconditional branching
b. compare and test
c. increment and decrement
d. loops
e. stacks and pointers
f. pushing and popping registers