UNIVERSITY OF THE FRASER VALLEY

UPAC FORM #2 (Page 1)

COURSE IMPLEMENTATION DATE:	May 1994
COURSE REVISED IMPLEMENTATION DATE:	January 2010
COURSE TO BE REVIEWED:	October 2013
(Four years after UPAC final approval 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: **Faculty of Science, Health & Human Services/ Physics**

PHYS 362	**PHYS 462**	**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Digital Electronics and Computer Interfacing

COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This course emphasizes elementary digital electronics and interfaces. Topics include gates and Boolean algebra, Karnaugh maps, flip flops, registers, counters and memories, digital components, microprocessor functions and architecture, instruction sets, D/A and A/D converters, and waveshaping. PHYS 372, 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.

Note: Students with credit for PHYS 462 cannot take this course for further credit.

PREREQUISITES: **PHYS 222**
COREQUISITES:
PRE or CO-REQUISITES: **PHYS 372**

SYNONYMOUS COURSE(S)
(a) Replaces: **PHYS 462** *(Course #)*
(b) Cannot take: **n/a** *(Course #)* for further credit.

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

TOTAL HOURS PER TERM: **75**

STRUCTURE OF HOURS:

Lectures:	**75**	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: **24**
EXPECTED FREQUENCY OF COURSE OFFERINGS: **Once every 2 or 3 years**

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; revised P. Mulhern
Chairperson: Gillian Mimmack *(Curriculum Committee)*
Department Head: Norm Taylor
Dean: **September 1, 2009** Jackie Snodgrass
UPAC Approval in Principle Date: May 22, 2009
UPAC Final Approval Date: October 2, 2009

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:

Please see the Physics PLAR policy on the department's webpage

TEXTBOOKS, REFERENCES, MATERIALS:

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

TEXTS: Roden and Carpenter, Electronic Design, Discovery Press (1997)
Palmer and Perlman, Introduction to Digital Systems, McGraw Hill (1993)
Borgart, Introduction to Digital Circuits (1992)

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
5. Bogart Jr, T.F. Introduction to Digital Circuits

STUDENT EVALUATION:

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

Assignments	25%
Mid-term	25%
Final	50%

COURSE CONTENT:

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

(Chapters refer to Bogart)

Introduction; Digital vs. Analog; Elements of Design
Chap 3: Logic Gates
Chap 4: Boolean Algebra
Chap 4: Karnaugh Maps; Chap 5: Practical Considerations
Chap 6: Pulse and Digital Circuits
Physics of semiconductors; Analog – diodes
Analog – transistors and op-amps
Chap 7: Waveshaping and Waveform Analysis
Appendix 1: Spice

Chap 7: Comparators and Schmitt Triggers; Sensors
Chap 8: Multivibrators and 555 Clock
Chap 9: Basics of Internal Gate Structure
Chap 10: Logic Families
Chap 11: RS and D Flip-Flops
Chap 11: JK Flip-Flops and applications: bus structure
Chap 12: Registers; Chap 15 Multiplexers
Chap 13: Encoders and Decoders
Chap 2: Binary and Hexadecimal
Chap 14: Counters – Asynchronous
Chap 14: Counters – Synchronous
Midterm: Chapters 3 – 11
Chap 15: Adders
Chap 12: Registers: Logical Comparators
Computers: Turing machine, Von Neuman cycle, architecture
Virtual Machines: Bus Architecture
Chap 16: Memories
Chap 17: D/A
Chap 17: A/D and other interfacing
Game Port; Software interrupts
RS – 232 Interface
IEEE – 488 Interface
PLA and 8253/8255 chips
Mechanical Interfaces; Stepper Motors