OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)

COURSE IMPLEMENTATION DATE:	September 2012
COURSE REVISED IMPLEMENTATION DATE:	
COURSE TO BE REVIEWED: *(six years after UEC approval)*	February 2018 *(month, year)*

OFFICIAL UNDERGRADUATE 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 – see course syllabus available from instructor

PHYS 392	Physics	3
COURSE NAME/NUMBER	FACULTY/DEPARTMENT	UFV CREDITS

Interfacing and Virtual Instrumentation

COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

In this course students will learn how to create computerized control and analysis equipment for experimental work. This includes interfacing a computer or microcontroller, such as the Arduino microcontroller, to various instruments for data acquisition and instrument control using a state-of-the-art software platform such as National Instrument's LabVIEW. Emphasis is on the practical aspects of interfacing a computer or microcontroller to various instruments including timing issues, real-time data acquisition and instrument control, instrument status, and acquisition speed.

PREREQUISITES: PHYS 232; or COMP 256, MATH 125, and one of (PHYS 105, PHYS 112, PHYS 093 or Physics 12)

COREQUISITES:

PRE or COREQUISITES:

SYNONYMOUS COURSE(S):

(a) Replaces:

(b) Cross-listed with:

(c) Cannot take: for further credit.

SERVICE COURSE TO: *(department/program)*

TOTAL HOURS PER TERM: **60**

STRUCTURE OF HOURS:

Lectures:		Hrs
Seminar:		Hrs
Laboratory:	**60**	Hrs
Field experience:		Hrs
Student directed learning:		Hrs
Other (specify):		Hrs

TRAINING DAY-BASED INSTRUCTION:

Length of course:

Hours per day:

OTHER:

Maximum enrolment: **24**

Expected frequency of course offerings: Every 2 or 3 years

(every semester, annually, every other year, etc.)

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

Course designer(s):	**Joss Ives**		
Department Head:	**Norm Taylor**	Date approved:	**November 16, 2011**
Supporting area consultation (Pre-UEC)		Date of meeting:	**December 2, 2011**
Curriculum Committee chair:	**Norm Taylor**	Date approved:	**December 16, 2011**
Dean/Associate VP:	**Ora Steyn**	Date approved:	**January 13, 2012**
Undergraduate Education Committee (UEC) approval:		Date of meeting:	**February 3, 2012**

LEARNING OUTCOMES:

Upon successful completion of this course, students will be able to:

- Create an outline of an algorithm to solve a problem in experimental control, monitoring, data acquisition, data display, data processing or data analysis.
- Write a program for the computer or microcontroller (using LabVIEW, Python, Arduino sketches, or other suitable programming environment) that solves a problem in experimental control, monitoring, data acquisition, data display, data processing or data analysis.
- Design and build analog and digital circuits to perform basic signal processing, and input/output tasks. This includes interfacing with probes, sensors, indicators, computer controlled data acquisition devices or microcontrollers.

METHODS: *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Students will work in a laboratory setting through exercises and experiments designed to help them develop proficiency performing tasks such as controlling experiments, acquiring data, processing data, and displaying data using a computer or microcontroller. There will also be student-designed projects. Occasional short oral presentations will be made by the instructor when needed.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

☐ Examination(s) ☐ Portfolio assessment ☐ Interview(s)

☒ Other (specify): Evidence of industrial or related experience with sufficient overlap of the course material.

☐ PLAR cannot be awarded for this course for the following reason(s):

TEXTBOOKS, REFERENCES, MATERIALS: *[Textbook selection varies by instructor. Examples for this course might be:]*

John Essick, Hands On Introduction to LabVIEW for Scientist and Engineers, 1ed, Oxford University Press (2008).

Travis and Kring, LabVIEW for Everyone, 1ed, Prentice Hall (2006).

Margolis, Arduino Cookbook,1ed, O'Reilly (2011).

SUPPLIES / MATERIALS:

A lab with analog electronics, digital electronics and electronics interfacing equipment, as well as access to computers with the LabVIEW program.

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

Homework based on experimental work	30%
Lab reports based on experimental work	30%
Project	40%

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

LabVIEW: Loops and Graphing
LabVIEW: The Mathscript Node
LabVIEW: Data Acquisition
LabVIEW: Data Files
LabVIEW: Shift Registers, Case Structure, Sequence Structure
LabVIEW: Curve Fitting, Fast Fourier Transform, and other Built-In Analysis VIs
Analog electronics components
Digital electronics components & Boolean algebra
Digital-to-Analog and Analog-to-Digital conversions
Interfacing Protocols and Standards
PID control
Sampling
Microcontroller basics
Interfacing with sensors and probes