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 |

<table>
<thead>
<tr>
<th>PHYS 392</th>
<th>Physics</th>
<th>3</th>
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<tbody>
<tr>
<td>COURSE NAME/NUMBER</td>
<td>FACULTY/DEPARTMENT</td>
<td>UFV CREDITS</td>
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<tr>
<td>Interfacing and Virtual Instrumentation</td>
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<tr>
<td>COURSE DESCRIPTIVE TITLE</td>
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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)

SYNONYMOUS COURSE(S):

(a) Replaces: 

(b) Cross-listed with: 

(c) Cannot take: for further credit.

TOTAL HOURS PER TERM: 60

TRAINING DAY-BASED INSTRUCTION:

<table>
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<tr>
<th>Lectures:</th>
<th>Hrs</th>
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<tr>
<td>Seminar:</td>
<td>Hrs</td>
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<td>Laboratory:</td>
<td>Hrs</td>
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<td>Field experience:</td>
<td>Hrs</td>
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<tr>
<td>Student directed learning:</td>
<td>Hrs</td>
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<tr>
<td>Other (specify):</td>
<td>Hrs</td>
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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

Date approved: November 16, 2011

Department Head: Norm Taylor

Date of meeting: December 2, 2011

Supporting area consultation (Pre-UEC) Date approved: December 16, 2011

Curriculum Committee chair: Norm Taylor

Date of meeting: January 13, 2012

Dean/Associate VP: Ora Steyn

Date approved: November 16, 2011

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:]
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