Specific Course Information

Course Name: Mechatronics Preparation Laboratory
Course Number: ME204
Instructor: Thomas Johnston
Semester: Spring, 2014
Meeting: 2 Hours, 40 Minutes
Schedule Number: 21816
Prerequisites: Math151, EE204
Units: 1

Catalog Course description
Mechatronics Laboratory. Topics include simulated and hands-on circuit experiences with Instrumentation and Data Acquisition, Sensors and Actuators. Components studied will include Transformers, Op Amps, Digital Gates, Flip Flops, Motors, Various Transducers, Sensors and Actuators.

Contact with Instructor
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Office Hours: M,W – 11:00 -12:00

Resources
Course web site: http://blackboard.sdsu.edu

Learning Environment
The class will be held in a computer laboratory environment that is set up to support Labview/NI ELVIS/Multisim systems. Work will be done individually or in groups of two. Some larger group work may be assigned for larger Labs/Projects.

Student Learning Outcomes (Original)
1. Students will be able to calibrate and use the NI ELVIS Multimeter, oscilloscope and function generator instrumentation
2. Students will be able to construct and analyze op-amp, motor, input transducers (sensors) and control circuits on the NI ELVIS prototype breadboard
3. Students will be able to construct and analyze digital logic gate, flip flop and multivibrator circuits on the NI ELVIS prototype breadboard
4. Students will be able to troubleshoot faulty circuits, locate problems and revise the circuit to proper operation
Student Learning Outcomes (Proposed)
1. Students will learn basic to intermediate Labview Programming
2. Students will review relevant circuits from EE204, create and test them Using Multisim software
3. Students will construct relevant circuits on the NI ELVIS breadboard prototype breadboard
   a. Students will be able to construct and analyze, input transducer (sensors) and actuator circuits
   b. Students will be able to calibrate and use the NI ELVIS Multimeter, oscilloscope and function generator instrumentation
   c. Students will be able to troubleshoot faulty circuits, locate problems and revise the circuit to proper operation
4. Students will be introduced to digital data acquisition and input/process/output systems using Labview and the NI ELVIS prototyping breadboard
5. Students will be introduced to basic control systems such as PID controls and their related block diagrams

Program Outcomes (ABET)
5. An ability to identify, formulate, and solve engineering problems.
7. The ability to communicate effectively.
9. A recognition of the need for, and an ability to engage in life-long learning.
11. The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Proposed Lab Content *

Introduction to Labview
Graphical programming
Front Panel/Block Diagrams
Controls/Functions/Indicators/Graphs
Labview Programming Structures
   For/While Loop, Case, Sequence
Modular Programming – Sub VI’s

Review of Electronic Circuits and Multisim
Creating circuits
Taking measurements
   DMM, Oscilloscope, Bode Plot, Etc.
Troubleshooting circuits
Review of DC and AC circuits and their components
   Resistors, Capacitors, Capacitance
Review of passive filters
   Low pass/high pass/band pass RC circuits
Review of basic Op Amp circuit applications
   Inverting, Non-Inverting and Voltage Followers
Introduction to other common Op Amp circuits
   Low pass/high pass/band pass filter circuits (one and two pole)
   Summing, Integrator and Differentiator circuits
Review and applications of Diodes/Rectifiers/Zener Diodes/LEDs
Review and applications of Bipolar Transistors and related amplifier and switching circuits

Introduction to NI ELVIS prototyping boards
Creating/breadboarding, measuring and troubleshooting many of the above circuits

Introduction to Digital Electronics and Data Acquisition
Introduction to Binary, Binary notation and Hexadecimal notation
Data Acquisition, Sampling Rates/Resolution, Signal Conditioning

**Data Acquisition and Introduction to Control Systems - Combine NI ELVIS, Multisim and Labview**

Intro to Basic Input/Process/Output Systems utilizing common sensors and indicators/actuators employing Multisim, NI ELVIS and Labview:
- Sensors: Light, Temperature, RPM, Strain
- Actuators: LEDs, Motors, Relays, Solenoids

Introduction to basic Control Systems
Introduction to PID Controls

**Introduction to Arduino Microcontrollers?**

**Supplies**
- USB Thumbdrive – For Backup of Files

**Assessment Policy:**
Final grade is based on a percentage of the total possible points (no curve).
Late assignments can be automatically lowered 50% of their total possible points and lowered 10% per class meeting after that.
A few extra points may be earned by good attendance and class participation (don’t wait until the end of the semester). No extra credit assignments.

**Class Policies**
- Prerequisites are strongly enforced.
- Short Lectures will be given at the beginning of most lab periods to explain new material and assignments.
- Assignments are due (Checked Off) at the end of the lab period.
- Students share the responsibility of checking their class scores.
- Lab assignments will be completed in groups of three partners.
- Late lab assignments must be completed with one of the lab partners.
- Late assignments can ONLY be made up with a reasonable excuse.
- Late assignments must be completed within one week of the due date.
- Points will be removed for talking during lecture.
- Contact the instructor via E-Mail if you are going to be absent.

Show Up, Keep Up, Pay Attention & Perform!

* Note
Due to the experimental nature of this course, content and lab exercises are subject to change.

**SYLLABUS STATEMENT**

**for Students with Disabilities**

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Disability Services. Your cooperation is appreciated.