WASHINGTON STATE UNIVERSITY
VANCOUVER
World Class. Face to Face.

School of Engineering and Computer Science

Mech 304: Instrumentation and Measurement

Catalog Data:	**Mech 304 Instrumentation and Measurement**; 3 credits (2-3) Introduction to basic DC and AC circuits, analog electronic components, digital circuits, computer data acquisition, and engineering measurements.
Class Schedule:	One 100-minute lecture per week, for one semester.
Laboratory Schedule:	One 3-hour lab session per week, for one semester
Prerequisites by Course:	CS 251, Math 220 or c//, Math 315 or c//, Phys 202
Prerequisites by Topic:	1. Calculus, linear algebra, differential equations, 2. Understanding of voltage, current, charge concepts, 3. Basic understanding of computer programming
Texts:	1. R.S.Figliola, D.E. Beasley, *Theory and Design for Mechanical Measurements*, Third Edition, John Wiley and Sons, 2000. *2.* Robert H. Bishop, *Learning with LabView 7 Express (with CD)*, Prentice Hall, 2004. 3. OMEGA Catalogs, (available online and in the laboratory).
Course Coordinator:	Dr. Hakan Gurocak
Course Objectives:	1. Familiarity with the basic concepts of Ohm's Law and Kirchoff's Voltage and Current Laws 2. Understanding and the ability to apply basic circuit analysis 3. Understanding of basic electronic component models and practical knowledge of basic electronic circuit construction 4. Familiarity with different types of measurement systems/devices for engineering measurements 5. General knowledge and hands-on experience using transducers for measurement of force, strain, position, velocity, and temperature 6. Capability to handle different types of measurement signals and utilize this capability to obtain reliable measurement results 7. Ability and practice in engineering report writing, including assessment and manipulation of data, and drawing conclusions from that data 8. Development of team working skills, organization, and task management
Topics Covered:	1. Introduction to circuit theory, Ohm's law, Kirchoff's law 2. Node-voltage and loop-current 3. RC, RL, RLC circuits 4. Transient and steady-state response analysis 5. Diodes and transistors 6. Operational amplifiers 7. Basic digital electronic circuits, logic states, gates 8. A/D and D/A converters and data acquisition using a PC 9. Digital and analog I/O, computer interfacing 10. Analysis of component tolerances and measurement errors 11. Measuring temperature, strain, stress, position, and velocity 12. LabView Programming

Lab Experiments and Activities:	1. Familiarization with the lab hardware/software, safety orientation 2. Working with oscilloscopes, programmable power supplies, multimeters, and function generators 3. Breadboard assembly of circuits, measurement of voltage, and current at test points 4. Construction of RC and RLC circuits and mathematical model verification using measurements 5. LabView tutorials and experience using and programming LabView 6. Analog and digital signal interfacing to a PC data acquisition system 7. Measurement of temperature 8. Measurement of strain, stress 9. Digital measurement of angular position and velocity 10. Investigations of measurement technologies and presentation of results.		
Course Outcomes:	Students will be able to: A-2. Choose appropriate model equations to determine the responses of basic electronic circuits. A-3. Demonstrate basic understanding of the physics of basic electronic devices and various transducers. B-2. Use a variety of equipment and techniques to measure voltage, current, frequency characteristics, temperature, strain, rotational position. B-4. Validate experimental circuit responses with respect to assumptions, constraints and theory. E-3. Apply analytical and experimental methods to make measurements and to find and correct defects in measurement systems. G-1. Produce reports describing lab experiments. G-2. Deliver a presentation describing measurement technology research results. I-1. Find and evaluate sources of information about measurement technologies. K-1. Operate basic electronics lab instruments and to use National SC-2345 and SCC-xxxx interface modules. K-2. Build interface hardware and use DAQ Assistant to interface PC to National SC-2345 and various transducers. K-3. Use G programming and create basic programs in LabView.		
Required or Elective Course:	Required		
Contribution to Professional Component:	Engineering Topics		
Relationship of Course to Program:	Meets: Educational Objectives 1, 2, 4 Program Outcomes A, B, E, G, I, K		
Prepared by:	Dr. Hakan Gurocak	Date:	November 1, 2006
Approved by CAC:			