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EET 234T.01: Automatic Controls

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Computers & Electronics TECHNOLOGY

AUTOMATIC CONTROLS, EET 234T

INSTRUCTOR: STEVE D. RICE

GRADING:

End of Chapter Test	90%
Quizzes	10%

GRADING SCALE

93 TO 100	= A
85 TO 92	= B
70 TO 84	= C
60 TO 69	= D
59 & Below	= F

ATTENDANCE

Students wishing to obtain their best grade for the course make sure that they attend each class and work session.

DO NOT MISS END OF CHAPTER TEST

End of chapter test and final exam will be graded with no provision for partial credit.

A 20 point penalty will be assessed for make-up test.

Quizzes maybe written or in a lab format.

ASSIGNED HOMEWORK

Homework problems must be completed on standard paper available at The University of Montana Bookstore, with an assignment cover sheet stapled to the front of each assignment.

Eligible students with disabilities will receive appropriate accommodations in this course when requested in a timely way. Please speak with me after class or in my office. Please be prepared to provide a letter from your DSS Coordinator

COURSE OBJECTIVES:

1. To present the fundamentals of the methods of analysis and design of automatic control of industrial machines and processes.
2. To present concepts of measurement, manipulation, and control of automatic controls in the industrial setting.

TEXT: Introduction to Control System Technology

AUTHOR: Bateson

COURSE OUTLINE:

- I. Basic Concepts and Terminology
 - A. Block diagrams and transfer functions
 - B. Open loop control
 - C. Closed loop control: feedback
 - D. Control systems drawings
 - E. Nonlinearities
 - F. Benefits of automatic controls
 - G. Load changes
 - H. Damping and instability
 - I. Objectives of a control system
 - J. Criteria of good control
- II. Types of Control
 - A. Analog and digital control
 - B. Regulator and follow-up systems
 - C. Process control
 - D. Servomechanisms
 - E. Sequential control

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- F. Numerical control
 - G. Robotics
 - H. The evolution of control system configuration
- III. Digital Fundamentals
 - A. Number systems and conversions
 - B. Logic elements
 - C. Codes, encoders, and decoders
 - D. Boolean algebra
 - E. Analysis and design of logic circuits
 - F. Digital computers
- IV. The Common Elements of System Components

- A. Electrical elements
 - B. Liquid flow elements
 - C. Gas flow elements
 - D. Thermal elements
 - E. Mechanical elements
- V. Laplace Transforms and Transfer Functions
- A. Input/output relationships
 - B. Logarithms: a transformation
 - C. Laplace transforms
 - D. Inverse laplace transforms
 - E. Transfer function
 - F. Frequency response: bode plots
- VI. Measuring Instrument Characteristics
- A. Statistics
 - B. Operating characteristics
 - C. Static characteristics
 - D. Dynamic characteristics
 - E. Selection criteria
- VII. Signal Conditioning
- A. The operational amplifier
 - B. Op-amp circuits
 - C. Signal conditioning
- VIII. Microprocessors and Communication
- A. Microprocessors
 - B. Board-level buses
 - C. Communication interfaces
 - D. Local area networks
 - E. Communication protocols
- IX. Position, Motion, and Force Sensors
- A. Position and displacement measurement

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- B. Velocity measurement
 - C. Acceleration measurement
 - D. Force measurement
- X. Process Variable Sensors
- A. Temperature measurement
 - B. Flow rate measurement
 - C. Pressure measurement
 - D. Liquid level measurement
- XI. Switches, Actuators, Valves, and Heaters
- A. Mechanical switching
 - B. Solid-state switching

- C. Hydraulic and pneumatic valves and actuators
 - D. Control valves
 - E. Electric heating elements
- XII. Electric Motors
- A. AC motors
 - B. DC motors
 - C. Stepper motors
 - D. AC adjustable-speed drives
 - E. DC motor amplifiers and drives
- XIII. Control of Discrete Processes
- A. Time-driven sequential processes
 - B. Event-driven sequential processes
 - C. Time/event-driven sequential processes
 - D. Programmable controllers
- XIV. Control of Continuous Processes
- A. Modes of control
 - B. Electronic analog controllers
 - C. Digital controllers
 - D. Advance control
- XV. Process Characteristics
- A. The integral or ramp process
 - B. The first order lag process

- C. The second order lag process
- D. The dead-time process
- E. The first order lag plus dead time process

ELECTRONICS DEPARTMENT ATTENDANCE POLICY

Students wishing to obtain their best grade for the course will make sure that they attend each class and work session.

If you are going to be absent for any reason notify the instructor at 243-7670 before the class starts.

If you miss a test without notifying the instructor you will receive a ZERO for that test. Make-up tests any penalty will be at the discretion of the instructor.

If you miss five days or less the lowest end of chapter test will be dropped, excluding zeros.

If you miss ten days or more the final course grade will be dropped one letter grade.

Cell phone ringers will be turned off during lecture.

Monitors will be turned off during lecture.

The University of Montana
College of Technology – West Campus
Information Sheet

1. Welcome to the West Campus, if you have any questions and/or concerns please communicate with us. **WE ARE HERE TO HELP.** West campus office number is 243-7640, Administrative Assistant – Sandi Shook, office hours are 7:30 AM – 4:00 PM.
2. Courtesy phone located in student lounge.
3. Computer/Study lab is located through the COT West Campus office; hours are 7:30 AM – 4:00 PM.
4. Computer lab in TT06 may be used by students when class is not in session.
5. If you have questions and/or need information from the East Campus, check with our office first.
6. Students should check mailboxes regularly, mailboxes located in student lounge.
7. Dining Services is available from 9:00 AM – 1:30 PM.
8. There are two microwaves available for student use.
9. **Everyone** must wear eye protection in the designated areas.
10. Students must work in the assigned area during the assigned time with instructor supervision. No work will be done after school hours, weekends, or vacations.
11. Chewing tobacco, eating, or drinking is not allowed in the labs or classrooms.
12. **Smoking is not allowed** in any College of Technology facility.
13. No smoking within 25 feet of building, and please use the receptacles.
14. Students please play hacky sack on the asphalt, not on the lawn.
15. Student parking is provided in the main lot, a place for motorcycles and bicycles are also provided.
16. Students are encouraged to become active in student government activities.