ECE 312: Fundamentals of Electronics and Machines

Required Course

2003-2005 Catalog Data: Fundamentals of operation, characteristics, ratings, and applications of electronic and magnetic devices such as diodes, transistors, digital logic devices, transformers and motors. Laboratory provides experience with actual hardware. This is the second in a two-course sequence for non-electrical engineering majors.
Credit: 3 hours (2 hours lecture, 3 hours laboratory)
Prerequisite: ECE 212

Textbook and Required Materials:

Reference Materials:

Course Coordinator:
Dr. John L. Mason, Associate Professor, ECE

Instructor (Spring 2005):
Ms. Deborah Dawson, Adjunct Assistant Professor, ECE

Prerequisites by Topic:
1. DC circuit analysis
2. AC circuit analysis
3. Transients in linear circuits
4. Frequency response
5. Operational amplifier circuits

Course Objectives and Learning Outcomes:
This course develops the students’ ability: (objectives include listing of relevant ECE Department undergraduate learning outcomes)
1. to analyze and model electrical and electronic devices through the use of equivalent circuits, and to experimentally validate the circuits (a,b,e);
2. to analyze and to experimentally validate circuits and system components utilizing frequency response techniques (a,b,e);
3. to analyze and experimentally validate the effects of impedance in meter loading or when system components are connected together (a,b,e);
4. to analyze and experimentally validate non-linear components and circuits (a,b,e);
5. to analyze and experimentally validate logic circuits (a,b,e);
6. to analyze and experimentally validate sequential circuits (a,b,e);
7. to understand transformer, motor, and generator principles and basic analysis (a,b,e);
8. to understand and use nameplate data and component ratings (a,b,e);
9. to use electronic instrumentation to test and evaluate electrical and electronic circuits and components (k);
10. to prepare effective written technical communications (g);
11. to thoroughly and accurately document laboratory work using a laboratory notebook (b,g); and
12. to function as an effective engineering team member (d).
Topics:
1. Logic and Sequential Devices and Circuits (3 classes)
2. Diodes and Rectifiers (3 classes)
3. Diode Regulators and Switches (2 classes)
4. Transistors (3 classes)
5. Transformers and Impedance Matching (2 classes)
6. Three-Phase Circuits (1 class)
7. Electromechanical Devices (2 classes)
8. Motors (3 classes)

Evaluation:
1. Examinations (65%)  2. Short Quizzes (10%)  3. Homework (5%)  4. Laboratory (20%)

Laboratory Projects and Learning Outcomes (a,b,d,e,i,k)
1. Laboratory Safety; Graphical Presentation of Data (1 week)
2. Equipment Familiarization (1 week)
3. Combinational and Sequential Logic (1 week)
4. Rectifiers and Regulators (1 week)
5. Frequency Response of a Passive Filter (1 week)
6. Transients (1 week)
7. Transistor Switching Circuits (1 week)
8. Impedance Matching (with single phase transformer, 1 week)
9. Operational Amplifier Circuits (1 week)
10. Induction Motor Load Test (1 week)
11. Motor Control Circuit (with relays and programmable controllers, 1 week)

Communication Skills:
Students are required to keep laboratory notebooks in a neat, orderly and readable manner. Homework must be submitted in a specified format.

Contribution to Professional Component:
ABET professional component as estimated by faculty member who prepared this course description:
Engineering Science: 3 credits or 100%

Relation of Course to Program Outcomes:
EE program objectives: 2,3 and
ECE expected learning outcomes: a,b,d,e,g,i,k

Person who prepared this description and the date of preparation:
Prepared by: John L. Mason       Date: July 26, 2004