Cleveland State University  
Department of Electrical Engineering and Computer Science  

EEC 314: Electronics II  

Catalog Description:  
EEC 314 Electronics II (3-0-3).  
Pre-requisites: EEC 311, EEC 313.  
Co-requisite: EEC 315.  
Operational amplifiers and op-amp applications, active filters, oscillator circuits, and amplifier frequency response.  

Textbook:  

References:  

Coordinator:  
Dr. Lili Dong,  
Associate Professor of Electrical Engineering and Computer Science  

Course Objectives:  
This course is designed to:  
1. Introduce students to the concepts of ideal and non-ideal operational amplifiers;  
2. Expose students to the theoretical foundations of negative feedback and stability analysis;  
3. Introduce students to frequency response analyses of amplifier circuits;  
4. Explain the specifications of operational amplifiers;  
5. Train students to develop the application circuits of amplifiers such as summation and subtraction circuits, voltage and current source circuits, and low-pass, and high-pass filters.  

Expected Outcomes:  
Upon completion of this course, students should be able to:  
1. Understand the concepts of ideal and non-ideal operational amplifiers and calculate closed-loop amplification gains;  
2. Design the application circuits of amplifiers;  
3. Conduct frequency response analyses of operational amplifier circuits;  
4. Recognize and interpret the specifications of amplifiers;  
5. Choose an amplifier to satisfy specifications;  
6. Use PSPICE to simulate amplifier circuits and to observe the outputs of the circuits.  

Fulfills the Following Electrical Engineering Program Objectives and Outcomes:  

Objectives:  
1. Practice electrical engineering in one or more of the following areas: communications, computers, controls, power electronics, and power systems.  
2. Define and diagnose problems, and provide and implement electrical engineering solutions in an industrial environment.
Outcomes:
1. An ability to apply knowledge of mathematics, science, and engineering to general electrical engineering;
2. An ability to design a system, component, or process to meet desired needs;
3. An ability to identify, formulate, and solve electrical engineering problems;
4. An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.

Contribution of Course to Meeting the Professional Component:
Math & Basic Science: 0 credits;
Engineering Topics: 4 credits;
General Education: 0 credits

Prerequisites by Topics:
1. Laplace transforms
2. Kirchhoff's circuit laws
3. Complex numbers

Topics:
1. Characteristics of ideal amplifiers and inverting and non-inverting amp. circuits
2. Application circuits of ideal amplifiers including summation, subtraction, and current and voltage source circuits
3. Frequency responses of low-pass, high-pass, and for open-loop amp. circuits
4. Characteristics of closed-loop practical amp. circuits including, closed-loop input and output resistances and closed-loop gains
5. Frequency responses of closed-loop amp. circuits
6. Specifications of practical amplifiers including bandwidth, rise time, slew rate, common mode rejection ratio, offset current and offset voltage, and signal to noise ratio.
7. Application circuits of practical amplifiers including integration and differentiation circuits, and instrumentation amplifiers.

Tests (2 one-hour quizzes and a two-hour final exam) 4
Total 45

Computer Usage:
Students are expected to use PSPICE software to design and simulate amplifier circuits and observe amplifier outputs.

Design Projects:
Students are expected to design an op-amp signal conditioning circuit for a temperature sensor and an audio amplifier circuit.

Prepared by: Dr. Lili Dong
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