

Department	Electrical and Computer Engineering
Course Number	EELE 321
Course Title	Intro To Feedback Controls
Total Credit Hours and Format	3 Credits. (3 Lec) S
Catalog Description	<p>PREREQUISITE: EELE 308 or EMEC 303 or consent of instructor</p> <p>Classical continuous-time, transfer function approach to feedback control systems engineering. Approximations, linearization, and time response. Design and analysis via root-locus, Nyquist, and Bode methods. Proportional, dominant pole, lead, lag, PID, and minor loop compensation. Describing functions and nonlinear system behavior.</p>
Faculty Coordinator	Dr. Steven R. Shaw
Course Designation	Required
Textbook	Control Systems Engineering, 7 th edition, by Norman Nise, Wiley, 2015.
Course Learning Outcomes	<p>At the conclusion of EELE 321, students are expected to be able to:</p> <ol style="list-style-type: none"> 1. model linear electrical and mechanical systems using transfer functions and block diagrams 2. manipulate block diagrams 3. determine step-response of first and second order systems by inspection; make dominant pole approximations 4. determine all of the transfer functions associated with a feedback system 5. use root locus to analyze the poles as a function of a gain in the loop 6. use root locus to design series compensators to achieve stability and dominant pole characteristics 7. use Nyquist and Bode techniques to analyze feedback systems, including performance and relative stability 8. use Nyquist and Bode techniques to design series compensators to meet performance and stability requirements 9. use Bode techniques to select, design, and analyze minor loop compensation 10. use describing functions to predict the existence of limit cycle behavior for feedback systems incorporating static nonlinearities 11. use modern computation tools, e.g. Matlab, to analyze feedback control systems

Program Outcomes	<p>EELE321 supports the following program outcomes :</p> <ul style="list-style-type: none"> a. an ability to apply knowledge of mathematics and engineering a. an ability to design a system, component, or process to meet a need e. an ability to identify, formulate, and solve engineering problems g. an ability to communicate effectively k. an ability to use the techniques and capabilities provided by modern engineering tools
Topics Covered	<ol style="list-style-type: none"> 1. Concepts of feedback control, role of controls in modern engineered systems. 2. modeling of electrical and mechanical systems, block diagrams and manipulation 3. dominant poles, system response, and stability 4. root-locus analysis, simple series compensators, root-locus design 5. principle of the argument, Nyquist analysis, relative stability 6. Bode analysis, the Bode obstacle course, Bode design, compensation revisited, minor loop. 7. introduction to behavior and control of nonlinear plants, describing functions and gain scheduling
Prepared by	Dr. Steven R. Shaw (4/26/2015)