Syllabus

ES205 Analysis and Design of Engineering Systems

Course description

In ES202, ES203, and ES204, we applied conservation and accounting principles to model mechanical, electrical, fluid, and thermal systems. In ES205, or "ADES", we continue this study and extend it to include systems of more than one discipline. Welcome to *system* dynamics! The three main topics of the course are modeling, analysis, and design. Modeling is the application of basic conservation and accounting principles to obtain the differential and algebraic equations that predict system behavior. Analysis involves the characterization of that behavior in the time and frequency domains. Design is the selection of system parameters to meet specified performance criteria. Course learning objectives include the use of block diagrams, methods of solving equations of motion, experimental parameter identification and model validation, and further development of skills in teaming, oral presentations, writing, and computing. Use of Matlab, Simulink, and Maple software is required. (4R-3L-5C Spring, Fall)

Instructors

Section:	01	02
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Prerequisites

ES 202 Fluid and Thermal Systems
ES 203 Electrical Systems
ES 204 Mechanical Systems
MA 222 Differential Equations and Matrix Algebra II

Textbook

No required text. Handouts are provided.

Topics

1. Mechanical systems
2. Electrical systems
3. Fluid systems
4. Heat transfer systems
5. Combination systems
6. Time and frequency responses
7. Block diagrams and simulation diagrams
8. Methods of solving equations of motion
9. Experimental identification and model validation
10. Teaming, oral presentations, and writing
11. Computing using Matlab, Simulink, and Maple.

References

These books are on reserve in the library. They are a valuable resource when you need a different perspective or more detail on course topics.

1. Palm, W., J., System Dynamics, McGraw Hill, 2005.
2. Ogata, K., *System Dynamics,* Prentice Hall, 1998.
3. Magrab, B.M, Azarm, S., Duncan, J., Herold, K., and Walsh, G., *An Engineer's Guide to Matlab,* . Prentice Hall, 200McGraw-Hill, 2001.