~~CURRICULUM REVIEW - 2014~~
~~Part IV - Course Outline~~

Asian Institute of Technology
School of Engineering and Technology

AT74. ~~02~~10 Control Theory 3(3-0)
Semester: August

Course Objective: The objective of this course is to provide an understanding of classical control theory, digital control theory, state-space control theory, optimal control theory. This course also familiarizes with the computer aided analysis tool, MATLAB, for control system analysis.

Learning Outcomes: Upon completion of this course, the students should be able to:

- Analyze behaviors of dynamics of electrical and mechanical systems
- Select an appropriate control algorithm to improve behaviors of dynamics system
- Determine gains and parameters in order to achieve the desired behaviors.
- Design and implement classical controller on real system

Prerequisite: None

Course Outline:

I. Overview of Classical Control Theory
1. System Modeling
2. Transfer Function
3. Stability of Dynamics System
4. Transient and Steady-State Responses
5. Frequency Response
6. Graphical Methods
7. PID Control
8. Lead-Log Control
9. System Identification

II. Digital Control Theory
1. Data Sampling
2. Discrete-Time Modeling
3. Zero-Order Hold Circuit
4. Pulse Transfer Function
5. Response Analysis
6. Position and Velocity Algorithms
7. Direct Design of Digital Control Algorithm

III. State-Space Control Theory
1. State-Space Modeling
2. State-Space Representation
3. Transfer Function
4. Stability of State-Space System
5. Controllability and Observability
6. Regulator Design
7. Observer Design
8. Compensator Design by the Separation Principle

IV. Optimal Control Theory
1. Linear Quadratic Regulator
2. Random Processes
3. Kalman Filters
4. Linear Quadratic Gaussian Control

Textbook: No designated textbook, but class notes and handouts will be provided.

Reference Books:

1. V.N. Afanasev, V.B. Kolmanovskii, and V.R. Nosov: Mathematical Theory of Control Systems Design, Kluwer Academic, 1996.
2. W.L. Brogan: Modern Control Theory, Prentice Hall International Edition, 1991.
3. J.J. D'Azzo, and C.H. Houpis: Linear Control System Analysis and Design, Conventional and Modern, McGraw-Hill College, 1995.
4. R.C. Dorf: Time-Domain Analysis and Design of Control Systems, Addison-Wesley, 1995.
5. B. Friedland: Control System Design, An Introduction to State-Space Methods, McGraw Hill, 1987.
6. W.J. Palm, III: Control Systems Engineering, Wiley, 1986.
7. B. Shahian, and M. Hassul: Control System Design Using MATLAB, Prentice Hall International Edition, 1993.
8. S.M. Shinners: Modern Control System Theory and Application, Addison-Wesley, 1972.
9. R.J. Vaccaro: Digital Control, A State-Space Approach, McGraw-Hill, 1995.
10. W.A. Wolovich: Automatic Control Systems, Basic Analysis and Design, Harcourt Brace College, 1994.

Kommentar [M1]: Reference Books are still not updated. Pls. provided updated versions.

Kommentar [MP2R1]: Already updated to the latest edition before submission. These are the latest edition obtained from internet.

Journals and Magazines:

1. IEEE/ASME Transactions on Mechatronics, IEEE
2. IEEE Transactions on Robotics and Automation, IEEE
3. Mechatronics, Elsevier

Teaching and Learning Methods: Methods used are lectures and class tutorials.

School Recommendation: _____ ADRC Approval: _____

Academic Senate Approval: _____

Time Distribution and Study Load:
Lectures: 40 hours
Tutorials: 10 hours
Self study: 135 hours

Evaluation Scheme: Mid semester examination(40%), final examination (40%) (both are opened book), and tutorials (20%).

In the evaluation, an "A" will be awarded if a student demonstrates an excellent level of understanding of the principles and demonstrates excellent capabilities in control related applications.
"B" will be awarded if a student demonstrates an average level of understanding of the principles and demonstrates average capabilities in control related applications.
"C" will be given if a student demonstrates below average level of understanding of the principles and demonstrates below average level of capabilities in control related applications.

Instructor(s): Dr. Manukid Parnichkun