The University of Jordan
School of Engineering
Department of Electrical Engineering

Course Title: Advanced Control Systems, 0923742 (3 Cr. Hrs.)

Instructor:
Dr. O. El-Ghezawi
Telephone: 5355000 ext. 22854, Room: EE316. *Email*: ghezawi@ju.edu.jo

Course Website: http://fetweb.ju.edu.jo/staff/EE/ghezawi/ACD.html

Catalog Data:
Simulation Methods: Labview, Matlab, and Simulink. Review of linear Conventional Control. Nonlinear Control Systems with Layapunov Stability. Introduction to Optimal Control. Decoupled Control. Adaptive Model Reference Control Systems using Variable Structure Systems. Intelligent Control Methods: Fuzzy Control, Artificial Neural Networks, Genetic Algorithms, and Variable Structure Systems. Hybrid Intelligent Control Methods.

Prerequisites by Course:
None

Prerequisites By Topic:
Students are assumed to have a background of the following topics:
- Concepts of Classical Feedback Control Systems, and Stability.
- State Space Representation, and Matrix Theory.

Textbook:
Notes provided by the instructor together with Ponce-Cruz P. , Ramírez Fernando D. Intelligent Control Systems with LabVIEW.Springer nger Ve London, 2010.

References:

- Brogan . "Modern Control Theory". Quantum Publishing.
- Chen C. T. Linear system theory and Design. 4th ed. Oxford University Press.
- D'azzo J. and Houpis C. "Linear control systems: Analysis and design". Mcgraw-Hill.
- Distefano J. J, Stubberud A. R and Williams I. I. "Feedback and control systems". Mcgraw-Hill.
- Dorf R.C. and Bishop R. "Modern Control Systems" 12th Ed. Pearson, Prentice Hall.
- Friedland B. "Control System Design".
- Friedland B. " Advanced Control System Design"
- Kailath . " Linear Systems".
- Nagrath I. J and Gopal M. "Control System Engineering". Wiley Eastern Limited.
- Ogata K. "Modern control engineering". Prentice Hall.
- Richards R. J. "An introduction to dynamics and control". Longman.
- Schwarzenbach J and Gill K. F. "System modeling and control" Edward Arnold.

Schedule & Duration:
16 Weeks, 30 contact lectures (75 minutes each) including exams.

Minimum Student Material:
Textbook, class handouts, scientific calculator, and an access to a personal computer.

Minimum College Facilities:
Classroom with whiteboard and projection display facilities, library, computational facilities: Labview, Matlab and Simulink.

Course Objectives:
The following are the main objectives of this course:
- Better understanding of Feedback and Stability.

- Use of Labview, Matlab, and Simulink in System Analysis and Design.
- Linear Algebra Methodology in System Analysis and Design.
- Introduction to Optimal Control, Model-Refrence Adaptive Control, and Decoupling.
- Exposing the Role of Intelligent Control Paradigms in System Design and Analysis, such as Fuzzy Control, Artificial Neural Networks, Genetic Algorithms, Variable Structure Systems, and Hybrid Intelligent Control Methods.

Course Learning Outcomes and Relation to Program Learning Outcomes:

Upon successful completion of this course, a student should gain knowledge in:

Simulation using Labview, Matlab and Simulink. [i, iii]
Linear Algebra and Matrix Theory. [i, ii]
Stability of linear and Nonlinear System. [i, ii]
Optimal Control, Model-Reference Adaptive Control, and Decoupling. [i, ii]
Intelligent Control Methods: Fuzzy Control, Artificial Neural Networks, Genetic Algorithms, and Variable Structure Systems. Hybridization of methods. [i, ii, iii]

Program learning outcomes

i	Demonstate a sound, in-depth and up-to-date technical knowledge in the field of specialization.
ii	Ability to identify and solve engineering problems in their chosen field of study.
iii	Acquir the skills for continued professional development and independent self-study.
iv	Demonstrate the ability to communicate technical informatiom effectively and professionally both orally and in writing..

Course Topics:

Topic Description	Hrs
Simulation using Labview, Matlab and Simulink.	**6**
Review of Linear System Theory, and Matrix Theory.	**6**
Nonlinear Control Systems with Layapunov Stability.	**6**
Optimal Control, Model-Reference Adaptive Control, and Decoupling	**9**
Fuzzy Control, Artificial Neural Networks, Genetic Algorithms, and Variable Structure Systems. Hybridization of methods.	**17**

Ground Rules:

Attendance is required and highly encouraged. To that end, attendance will be taken every lecture. All exams (including the final exam) should be considered cumulative. Exams are in closed book form. Students are held responsible for all reading material taught and assigned.

Assessments:

Exams, Quizzes, Projects, and Assignments.

Grading policy:

Semester Work	**60 %**
Final Exam	**40 %**
Total	**100%**

Last Updated:

April , 2017