The University of Jordan
School of Engineering
Department of Electrical Engineering

Course Title: Linear Systems, 0933741   (3 Cr. Hrs.)

Instructor: **Dr. O. El-Ghezawi**
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Catalog Data: Linear Spaces and Operators. Mathematical Description of Systems: State-Space, and Input/ Output Description. Stability. Controllability, Observability, Duality, and Observers. Some Properties of Rational Matrices. Matrix Functions. Identification And Estimation. Composite Systems. Minimal Realization. Feedback Controllers. Model Matching.

Prerequisites by Course: None

Prerequisites By Topic: Students are assumed to have a background of the following topics:
- Solution of Differential Equations, and the Laplace Transform.
- State Space Representation, and Matrix Theory.

Textbook: Notes provided by the instructor together with
Chen C. T. Linear System Theory and Design. 4th ed. Oxford University Press.

References:
- Brogan . "Modern Control Theory". Quantum Publishing.
- 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:
- Vector spaces, and operators.
- Linear Algebra Methodology in System Analysis and Design.
- State-Space, and Input/ Output Description.
- Stability.

- Structural Properties: Controllability, Observability, Duality, and Observers.
- Rational Matrices. Composite Systems. Minimal Realization. Identification and Estimation.
- Feedback Controllers.
- Model Matching.

Course Learning Outcomes and Relation to Program Learning Outcomes:

Upon successful completion of this course, a student should gain knowledge in :
- Vector spaces, operators, Linear Algebra Methodology. [i, ii]
- State-Space, and Input/Output Description. Stability. [i, ii]
- Structural Properties: Controllability, Observability, Duality, and Observers. [i, ii]
- Rational Matrices. Composite Systems. Minimal Realization. Identification and Estimation. [i, ii]
- Feedback Controllers. [i, ii]
- Model Matching. [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
Vector spaces, operators, Linear Algebra Methodology.	8
State-Space, and Input/Output Description.	5
Stability.	2
Controllability, Observability, Duality, and Observers.	8
Rational Matrices. Composite Systems. Minimal Realization. Identification And Estimation.	8
Feedback Controllers.	5
Model Matching.	2

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