**Hashemite University**
**College of Engineering**
**Department of Mechatronics**
**Automatic Control**
**(3 Credit Hours)**

**Instructor**

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|---|---|
| Name | Dr. Asma Al-Tamimi |
| Email: | altamimi@hotmail.com |
| Office: | E3131 |
| Office hours: | (10-11 )Sun, Tue, Th |

**Grading info**

| | |
|---|---|
| Test 1 | 30 |
| Test 2 | 30 |
| | |
| Final | 40 |

**Class Info**

| | | |
|---|---|---|
| Days | S,,T,Th | **M,W** |
| Time | 11-12 | 12:30-1400 |
| Location | 2023 | 2023 |

**Course**

| | |
|---|---|
| Course Number: | 110405331 |
| Prerequisite: | (0404201 or 0409220) or (0409200 and 0409202) |
| Textbook: | Richard C. Dorf, and Robert H. Bishop "Modern Control Systems," 12th Ed., Pearson Education Inc., 2011. |
| Course Description (as in the catalog): | This course aims to provide students with the principles of control systems and understanding of control concepts. Modeling of physical systems: electrical/mechanical systems. System representations: block diagrams, transfer function, signal flow graph, state-variable models. Feedback control system characteristics. Performance of feedback control systems. Routh-Hurwitz stability. Root locus method, and PID controllers. |
| Specific Outcomes of Instruction (Course Outcomes): | 1.Analyze linear system using Laplace transforms. (Outcomes A )<br>2.Construct a transfer function model for electromechanical systems involving linear or rotating motion. (Outcome A and E)<br>3.Construct a detailed block diagram model for a feedback control system. (Outcome A, and D)<br>4.Write performance specifications for a control system in terms of its transient response, steady-state error, and disturbance response. (Outcomes A, D, and E)<br>5.Determine the stability of a feedback system using the Routh-Hurwitz stability tests. (Outcome A, E, and K)<br>6.Construct Root Locus to analyze a feedback control systems. (Outcomes A, E, and K) |

**Major Topics Covered and Schedule in Weeks:**

| Topic | # Weeks | # Contact hours |
|---|---|---|
| 1. Introduction (Chapter 1) | 1 | 3 |
| 2. Systems Modeling (Chapter 2) | 2,3 | 6 |
| 3. Laplace Transform and Transfer Functions (Chapter 2) | 4 | 3 |
| 4. Block Diagrams (Chapter 2) | 5 | 3 |
| 5. Signal Flow Graph (Chapter 2) | 6 | 2 |
| 6. First Exam | 6 | 1 |
| 7. State Variable Models (Chapter 3) | 7,8 | 4 |
| 8. Feedback Control Systems Characteristics (Chapter 4) | 8,9 | 5 |
| 9. Performance of Feedback Control Systems (Chapter 5) | 10,11,12 | 7 |
| 10. Second Exam | 12 | 1 |
| 11. Stability of Linear Systems – Routh-Hurwitz (Chapter 6) | 12,13 | 3 |
| 12. Root Locus and PID Control (Chapter 7) | 13,14 ,15 | 7 |
| Total | **15** | **45** |

**Course Policy**

- Attendance is mandatory, absence is allowed up to 15% of the total classes
- First exam: 17 Feb,2019
- Second exam: 1st April,2019

**Student Outcomes (SO) Addressed by the Course:**

| # | *Outcome Description* | *Contribution* |
|---|---|---|
| (a) | an ability to apply knowledge of mathematics, science, and engineering | ***H*** |
| (b) | an ability to design and conduct experiments, as well as to analyze and interpret data | |
| (c) | an ability to design a system, component, or process to meet desired needs within realistic constraints | |
| (d) | an ability to function on multidisciplinary teams | ***L*** |
| (e) | an ability to identify, formulate, and solve engineering problems | ***H*** |
| (f) | an understanding of professional and ethical responsibility | |
| (g) | an ability to communicate effectively | |
| (h) | the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context | |
| (i) | a recognition of the need for, and an ability to engage in life-long learning | |
| (j) | a knowledge of contemporary issues | |
| (k) | an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice | ***L*** |

**H**=High, **M**= Medium, **L**=Low