ME 322 Automated Controls

Spring 2001                                    Dr. Vikram Kapila
Monday 4:00-6:00 P.M.                        Office: RH 508
Wednesday 5:00-6:00 P.M.                 Hours: Tu, Th 10:30-11:30 A.M.


Recommended Readings:
6. Matlab tutorial (see a listing @: http://mechanical.poly.edu/faculty/vkapila/matlabtutor.htm).

Topics

• Introduction to control systems (1.1-1.12)
• Dynamic system modeling (2.1-2.12)
  ⇒ ODE models
  ⇒ Linearization
  ⇒ Laplace transform
  ⇒ Transfer function models
  ⇒ Block and signal flow diagrams
• State variable models (3.1-3.3, 3.6, 3.10)
  ⇒ State variables
  ⇒ State differential equation
  ⇒ SS2TF
  ⇒ System Response
• System characteristics (4.1-4.11)
  ⇒ Open/closed-loop
  ⇒ Sensitivity
  ⇒ Transient/steady-state response
• System performance (5.1-5.8, 5.11-5.14)
  ⇒ Test signals
  ⇒ Second-order system
  ⇒ Damping ratio estimation
  ⇒ Pole location and transient response
  ⇒ Steady state error
• System stability (6.1-6.8)
  ⇒ R-H criterion
  ⇒ Relative stability
Stability of state variable system

- Root locus (7.1-7.12)
  - Concept and procedure
  - Parameter design
  - PID control

- Frequency response (8.1-8.10)
  - Bode diagram
  - FR measurement
  - Performance specs in frequency domain

- Stability in frequency domain (9.1-9.12)
  - Nyquist criterion
  - Converting time domain performance specs to frequency domain
  - Bandwidth

- Design of feedback control systems (10.1-10.16)
  - PID control
  - Lead /lag control

**Grading Policy:**

Two midterms: 25% each
Homework: 10%
Computer projects: 10%
Final Exam: 30%

**Homework/project submission and other policies:**

- You are responsible for reading the listed sections before each lecture.
- Late submission of homework/projects will not be accepted.
- Before beginning to solve assigned problems, restate the problem and list the data given. Also, list the important concepts and formulae used to arrive at the final solution.
- Submit all detailed work to arrive at final solutions.
- Illegible work will not be graded.
- Do not turn in loose sheets.
- Keep a copy of the assignment for yourself.
- Instructor will grade arbitrarily selected problems from each homework/project.
- You must complete all assignments on your own. You may consult other students while formulating your solution strategy, however, you are not to collaborate with any one in working out the details of assignments nor should you compare your solutions with others. Violation of these rules will be reported to the appropriate university committee.
- If you cannot attend an exam due to a medical condition, certified by a doctor, you must notify the instructor prior to the exam. When you miss an exam due to a medical condition, no makeup exam will be offered to you. Instead, the weight of the missed exam will be added to the following exam (if there is one remaining).
- Unexcused absence from an exam will result in a grade of 0 for that exam.

**Course web site:** It is your responsibility to regularly check the following web site for course related material and announcements (e.g., homework assignment, solutions, schedules, reading material, etc.).

http://mechanical.poly.edu/faculty/vkapila/me322.htm