

**COMMONWEALTH GRADUATE ENGINEERING PROGRAM
DISTANCE LEARNING COURSE PLANNING SHEET
UNIVERSITY OF VIRGINIA**

Course: ECE 6851
Semester: Fall 2009
Instructor: Gang Tao
Phone No.: 434-924-4586
Office Address: University of Virginia; Electrical & Computer Engineering; Thornton Hall E311;
351 McCormick Road; Charlottesville, VA 22903
E-Mail Address: gt9s@virginia.edu

Textbook(s): (Student to purchase)

G. F. Franklin, J. D. Powell and A. Emami-Naeini, Feedback Control of Dynamic Systems, 5th ed., Pearson Prentice Hall, Upper Saddle River, NJ, 2006 (ISBN 0-13-149930-0).

Gang Tao, ECE 6851 Lecture Notes, UVa Bookstore, Fall 2009

Reference(s): Limit 4

1. R. C. Dorf, Modern Control Systems, Addison Wesley, 9th ed., 2001.
2. B. C. Kuo, Automatic Control Systems, Prentice Hall, 7th ed., 1995.

or their newer editions.

Computer Needs:

Computer Capability:

Software required: Control systems toolbox in Matlab

Provided? Remote students with a UVA computer id and the associated .virginia.edu email address can download and use Matlab from UVA computing sources. See attached documentation for instructions.

Other:

See attached syllabus.

School of Engineering and Applied Science
Department of Electrical and Computer Engineering

ECE 6851 (MAE 6610) – Linear Automatic Control Systems (Fall 2009, 3 credits)

Objective:

Study the theory and techniques for design and analysis of linear feedback control systems.

Description:

This course is to explore modeling of linear dynamic systems (using input-output representations and state space representations described by differential equations and transfer functions), to analyze control systems in both time and frequency domains, to study properties of feedback control systems, to investigate system stability using the Routh-Hurwitz criterion, Nyquist criterion, root-locus and Bode plots, and to design PID, lead, lag and state feedback controllers to improve system performance.

Prerequisites:

ECE 3750 (Signals and Systems) or equivalent.

Instructor:

Dr. Gang Tao, Thornton Hall, room E311, (403) 924-4586, gt9s@virginia.edu.

Lecture hours:

3:30 - 4:45, Tuesdays and Thursdays.

Textbook:

G. F. Franklin, J. D. Powell and A. Emani-Naeini, *Feedback Control of Dynamic Systems*, 5th ed., Pearson Prentice Hall, Upper Saddle River, NJ, 2006 (ISBN 0-13-149930-0).

Gang Tao, *ECE 6851 Lecture Notes*, UVa Bookstore, Fall 2009.

Topics:

1. Mathematical models of control systems (2 lectures)
2. Transfer functions and block diagrams (2 lectures)
3. Time-domain responses (2 lectures)
4. The Routh-Hurwitz stability criterion (2 lectures)
5. Feedback control systems (2 lectures)
6. Root-locus techniques (3 lectures)
7. Bode plot techniques (2 lectures)
8. The Nyquist stability criterion (2 lectures)
9. Dynamic compensation in frequency-domain (3 lectures)
10. State space analysis and pole placement design (4 lectures).
11. State observer based feedback control (2 lectures).

References:

1. R. C. Dorf, *Modern Control Systems*, Addison Wesley, 9th ed., 2001.
 2. B. C. Kuo, *Automatic Control Systems*, Prentice Hall, 7th ed., 1995.
- (Their newer editions are also good choices).

Grading:

1. Homeworks: 20 %;
2. Test 1: 30 %;
3. Project: 20%;
4. Test 2: 30 %.

MATLAB Software at UVA

(www.itc.virginia.edu/research/matlab/)

GETTING MATLAB:

Faculty, staff, and students connected to the UVA network may use MATLAB. MATLAB 2008A (VERSION 7.6) CDs are available for three day check-out from the Scholars Lab, Alderman Library (243-8800) or the Research Computing Lab, Brown Science & Engineering Library, Clark Hall (243-8799). Questions regarding Matlab installation and basic usage can also be addressed to these labs.

As an alternative to borrowing the MATLAB CDs, MATLAB users at UVA can download and install MATLAB and licensed Toolboxes directly from the MathWorks website (www.itc.virginia.edu/research/matlab/download.html).

If you are using MATLAB from off-Grounds, you will have to go through an authentication process to connect to the MATLAB license manager with the UVAAnywhere VPN client (www.itc.virginia.edu/network/vpn/).

MATLAB can be used in the Public computer labs by following the sequence /Start/Programs/Computational Science/Matlab

GETTING STARTED:

MATLAB tutorial information can be accessed from within MATLAB by choosing Help/Product Help menu, and then MATLAB/Getting Started from the Contents of the Help browser. This tutorial is also available on the web at www.mathworks.com/access/helpdesk/help/techdoc/

Matlab video tutorials can be accessed at, www.mathworks.com/academia/student_center/tutorials/launchpad.html Specifically, watch the three "Getting Started Tutorial Videos", then read through the "Getting Started with MATLAB" PDF document while trying the examples in an open MATLAB session.

Pre-recorded webinars on various aspects of MATLAB are accessible at www.mathworks.com/company/events/webinars/index.html?id=&language=en&by=mostrecent .

Finally, support for the general MATLAB user community, including a newsgroup, blogs, and file exchange, can be found at www.mathworks.com/matlabcentral/ .