COURSE ORGANIZATION
CBE 162 Fall 2016
Process Dynamics and Control

Department of Chemical Engineering, University of California, Berkeley

Instructor: Nitash P. Balsara, 2-8973 (email: nbalsara@berkeley.edu)
GSIs: Deep Shah and Samuel Leung

Textbook:
Process Control (Modeling, Design, and Simulation)
Wayne Bequette, Publisher: Prentice Hall

Web Site: BCourses (https://bcourses.berkeley.edu/),

Matlab should be available on all university computers in computer labs campus wide. We will specifically need the Simulink, Control Toolbox, Symbolic Toolbox packages within Matlab.

Location: Lectures 9:00 am – 10:00 am MWF in 180 Tan
Lab, meets weekly Tue, Wed: 1-3 pm in 1535 Tolman

For access to Matlab in 1535 Tolman
login: !tmfcheme162
password: c@1control

Homeworks: Homework will be assigned every Friday and due 1 week after they are assigned. Homework must be turned in by the time class starts on Fridays (9:10 AM). Late homework will not be accepted.

Labs: You must submit lab report at the end of the lab.

Grading:
Labs: 20 %
Homework + Quizzes: 25 %
Mid-term: 20 % xxx (Time and Location TBD)
Final: 35 % xxx (Location TBD)

The lowest homework and lowest lab score for each student will be dropped at the end of the semester.

Nitash's office hours:
201 C Gilman Hall – Monday 11-12 am, Tuesday 10-11 am

Please talk to me during office hours or before/after class rather than send emails.

GSI office hours:
Deep: Hildebrand Library 100F – Wednesday 12-1pm
Sam: Hildebrand Library 100E – Thursday 4-5pm

Syllabus:

Chapters 1-9, 10, 13, 14 will be covered
1. Definition of process, inputs, outputs, block diagrams, and control loops (Week 1).
2. Review of momentum, mass and energy balance. Emphasis on unsteady state, lumped models, linearization (Week 1, 2).
3. Time-dependent behavior of linear systems, linear state-space models, Laplace transforms, transfer functions, first-order systems, integrating systems, second-order systems, lead-lag behavior, poles and zeros, dead time (Week 3, 4).
4. Empirical models for systems where physical models are too difficult to solve (Week 5).
5. Feedback control, controller transfer function, block diagrams in Laplace domain, offset (Week 6).

Midterm

6. PID control, Routh stability criterion, open loop unstable systems, Simulink block diagrams (Week 7).
7. Tuning PID controllers, Zeigler-Nichols method, Cohen-Coon parameters, direct synthesis (Week 8).
8. Frequency-response analysis, Bode and Nyquist plots, stability and robustness (Week 9).
9. Internal model control (Week 10).
10. Internal model control-based PID (Week 11).
11. Cascade and feed forward control (Week 12).
12. Control-loop interactions (Week 12, 13).
13. Multivariate Control (Week 14).
14. Non-Linear processes (Week 14).

Comprehensive Final