

Fall 2013

ECE9412 Nonlinear Control (3 s.h.)

Catalog Data: This course covers two important areas on advanced control theory: analysis and design of nonlinear systems, and stochastic systems. For the nonlinear control, the course material will include mathematical fundamentals and various methods for analysis and design of nonlinear control systems, such as phase plane method, describing function method, Lyapunov theory, feedback linearization, and sliding mode control. For stochastic systems, emphasis will be on stability analysis of stochastic systems and control design. Various examples from engineering applications will be considered.

Instructor: Saroj K. Biswas, 215-204-8403, sbiswas@temple.edu, Room 712

Textbook: Slotine, J.-J. E. and W. Li. *Applied Nonlinear Control*, Prentice Hall, Englewood Cliffs, NJ.

References: Sastry, S. *Nonlinear Systems: Analysis, Stability, and Control*, Springer, New York, NY.

Khalil, H. K. *Nonlinear Systems, 3rd Edition*, Prentice Hall, Upper Saddle River, NJ, 2002.

Nijmeijer, H. and A. van der Schaft. *Nonlinear Dynamical Control Systems*, Springer, New York, NY.

Isidori, A. *Nonlinear Control Systems*, Springer, New York, NY.

Course Topics:

1. Nonlinear phenomena. Examples of nonlinear dynamics
2. Mathematical fundamentals
3. Phase plane method
4. Describing function method
5. Lyapunov stability
6. Feedback linearization
7. Sliding mode control
8. Stochastic systems: mathematical foundation
9. Lyapunov stability

Schedule: The course meets for Lecture three hours per week for the semester.

Evaluation:

Projects	70%
Article review and presentation	30%

Computer Usage: The use of Matlab is required for course activities. There will be several projects that will require numerical work using Matlab and/or other software.

Academic Rights and Responsibilities:

Freedom to teach and freedom to learn are inseparable facets of academic freedom. The freedom to learn depends upon appropriate opportunities and conditions in the classroom, on the campus, and in the larger community. The university and the faculty have a responsibility to provide students with opportunities and protections that promote the learning process in all its aspects. Students similarly should exercise their freedom with responsibility.

<http://policies.temple.edu/PDF/99.pdf>

Accessibility: Any student who has a need for accommodation based on the impact of a disability should contact me privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services at (215) 204-1280 in 100 Ritter Annex to coordinate reasonable accommodations for students with documented disabilities.

Academic Integrity:

Temple University believes strongly in academic honesty and integrity. Plagiarism and academic cheating are, therefore, prohibited. Essential to intellectual growth is the development of independent thought and a respect for the thoughts of others. The prohibition against plagiarism and cheating is intended to foster this independence and respect. Three common types of academic dishonesty are: *Plagiarism, Violating the Guidelines of an Assignment, and Cheating on Exams.*

http://www.temple.edu/bulletin/Responsibilities_rights/responsibilities/responsibilities.shtm