Robot Locomotion Control: ECE 594D

ENROLL CODE:	**13276**	**4 units**
TIME:	TR 12-1:50 PM	
PLACE:	PHELPS 1431	
INSTRUCTOR:	Prof. Katie Byl (katiebyl@ece.ucsb.edu)	

Above: RoboSimian (JPL/UCSB), LittleDog (Boston Dyn./MIT), Hopper C (UCSB), Microrobotic Fly (Harvard), and Atlas (DARPA).

Course Description: Robot locomotion often involves nonlinear, underactuated dynamics, which can in turn make control quite challenging. At present, roboticists often address this by limiting their approach to conservative motion planning, but this generally limits speed, agility and energetic efficiency. This course covers methods for analyzing and developing control policies relevant for dynamic robot locomotion.

Topics: Course topics include

- nonlinear and hybrid dynamics (impact dynamics, return maps, Lagrangian method)
- locomotion models (walking, running, hopping, fixed- and flapping-wing flight)
- underactuation (definition of, partial feedback linearization, ZMP planning)
- motion planning (rapidly-exploring randomized trees [RRTs], A*, D*, Dijkstra's)
- dynamic programming and value iteration
- local optimization (gradient descent)

Prerequisites: A strong (undergrad) background in both **System Dynamics** and **Controls**.

Required Text/Readings: There is no text for this course. Instead, we will be reading a combination of course notes and recent academic publications.

Grading: [Tentative] 3-4 Homework assignments (30%), a midterm exam (30%), and a final project (short paper and in-class presentation) in simulation and control (40%).

For more information, contact Prof. Katie Byl via email: **katiebyl@ece.ucsb.edu**