CDS 270-2, Dynamics and Control of Walking Robots.

Time and Location: WF, 10:30am-12pm, 135 Gates-Thomas.

Units: 9 (with the possibility of 3 units in special cases)

Description: This course will explore the dynamics and control of walking robots, both from a foundational level together with a view toward application. In particular, the course will first build the necessary mathematical framework in which to understand dynamic robotic systems, including: Lypuanov functions for nonlinear systems, periodic orbits, and stabilization of nonlinear control systems via control Lyapunov functions. Hybrid dynamical systems will be introduced as means to model walking robots, and the extension of continuous nonlinear dynamic and control concepts to a hybrid setting will be discussed. Finally, the formal concepts will be utilized to discuss control synthesis via optimization based methods, both offline (for walking gait generation) and online (for multi-objective safety-critical control). The concepts presented throughout the course will be motivated by their realization on physical bipedal and humanoid robots.