**Segway Robot Control (Labs 8 & 9) – Report Guidelines**

**Title**

Name(s)

Section

# Introduction (10 Points)

* Topic, problem definition and purpose of report explained in context of system.

# Modeling and Control Methods (20 Points)

* Introduce the physics behind the inverted pendulum system and dynamic modeling of such system.
* Control strategies – PD, PID & Full State Feedback– what do they mean, when are they typically used, and general characteristics.

# Simulation (20 Points)

* Explain the methodology used to design and simulate the controllers explored in both Lab 8 and Lab 9, explain how tuning and/or optimization was performed.
* Controller transfer functions and/or gain values and appropriate root locus plots to justify selection of values.
* Bode plots of systems.
* Simulated step responses.

# Experimental Results (20 Points)

* Final tuned controller designs for each type of controller.
* Description of actual robot behaviors.
* Graphs showing captured waveforms.

# Discussion (20 Points)

* Ability of each system to follow the tested setpoints, comparison between performances of different controllers.
* What factors could contribute to the mismatch between the model and the actual system?
* Which is the best controller for the Segway robot?
* How could you further tune/improve the control system you have designed?

# Format and Style (10 Points):

# Correct formatting of Tables, Figures, etc. (5 Points)

* Data should be presented in tables, numbered with titles at the top of the table.
* Figures should be captioned with numbers, at the bottom of the figure.
* Equations should be typeset, not handwritten.
* Size of figures is sufficient such that important details are easily visible, important points are labelled. Axis labelled where appropriate.

# Writing Style, Presentation (5 Points)

* Scientific report style, i.e., meaning expressed clearly, passive voice and impersonal sentence structure used, focus on work, no contractions, etc.
* Report should appear cohesive, and use a consistent formatting and layout. Single spacing with a font size 10 – 12 pt for the body text. Title page contains required information.
* Length of report is at most 10 pages.