Design and Control of an Inverted Pendulum

Inverted pendulum is a classic control problem with applications as diverse as walking robots or robotic welding machines.

Your task is to design and build a prototype inverted pendulum and implement a control system to control it.
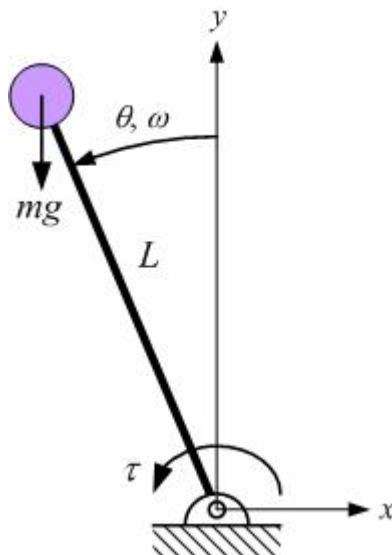
You will be provided with a number of components but the overall mechanical design of the setup is your responsibility. The list of parts provided to you is at the end of this document.

While you can use one or two specific parts from systems like Lego or Meccano, your entire design cannot be based on these parts. Please consult with me first.

L: 8-10 inches, m= 50-100 gr (will be provided)

Milestones:

Milestone 1	Labview program for controlling the motor position and direction, (demo) ,flow chart for the overall control system (detailed)	Friday October 23	10%
Milestone 2	Finished mechanical construction	Friday November 6	20%
Milestone 3	Final report including analysis of the performance of the system.	Monday November 30	30%
Milestone 4	Demonstration	Tuesday December 1	40%

List of Components Provided

1) 25 gm of ABS plastic for use in 3D printer. Max size for printing is 5x5x5 inches. Designs must be in STL format, minimum wall thickness is 0.03 inches. This plastic is for fabrication of custom parts for the project.

2) 47 × 35 mm (1.84 × 1.37") solderless breadboard. This board is for mounting the motor amplifier and allowing connections for the sensor and motor amplifier to the Labview IO interface (http://www.pololu.com/product/1490)

3) 10 pieces of The assortment of 12" (30 cm) long male/male jumper wires. These wires are for electrically connecting the motor amplifier to the binding posts of the Labview interface.

4) Motor: Tamiya 70093
http://kitkraft.com/3-Speed-Crank-Axle-Gearbox/

5) Motor driver. ModelDVR8833:
   http://www.pololu.com/catalog/product/2130
   This is a dual motor driver but only one motor will be controlled with this driver. It will be configured for plugging onto the solderless breadboard and a wiring diagram for how to connect the driver to the Labview interface will be provided at a later date.

6) 5VDC regulated power supply. This power supply will connect to the solderless breadboard so connections can be made to your motors, sensors, and drivers.

7) Potentiometer : A panel mounted pot (10k ohm 1/4 watt) with 1/4 inch wiper shaft 0.36 inches in length. Mounting is via a threaded bushing 0.375 inches diameter and 0.25 inches in length.

8) NI USB-6001, Multifunction USB DAQ
   (http://sine.ni.com/nips/cds/view/p/lang/en/nid/212383)
9) Sharp IR Sensor plug and wire assembly.
                https://www.sparkfun.com/products/8959