Zewail City for Science and Technology

Nanotechnology and Nanoelectronics Program

Course Project

NANENG 512

Applied Digital Control and Drives

FALL 2020

Course Project

Phase 1

Project Idea\Groups Deadline: November 28, 2020 (11:59 PM)

Phase 1 Deadline: December 17, 2020 (03:29 PM)

I. By the end of the project, you should make a proposal that contains:

Project idea, and a rough plan of the project that follows these design steps:

- The open loop system model [some systems have already known models, or you will use software to predict your model]. Which path will you take? Explain.
- Model characteristics [Transient response; Rise time, Overshoot, Settling time, Delay time, Steady-state error].
- Control system and parameters tuning for your closed-loop system [based on the desired output]. Talk about how you will use PID.
- Transfer to digital control and system simulation.
- Complete and working hardware implementation.

II. Based on the Idea you are required to deliver the following in phase 1:

- Extract/Derive the open loop transfer function (TF) of your system without control by applying, e.g., a step input to the system.
- Use software to obtain a mathematical approximation of the open loop TF. Compare using MATLAB (or any appropriate software) between the actual open loop TF and the derived mathematical model.
- Identify the hardware system components along with links to the datasheets of each component if applicable.

III. Grading:

Whole course project has 15% from final grade, distributed as follows:

- Phase 1: 5%
- Phase 2; prototype implementation: 6%
- Presentation and discussion: 4%

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IV. Deliverables

Provide a report that contains:

- Your detailed design, you can use solidworks
- The system transfer function derivation
- The model and software used to verify the model of TF
- Comparison between derived TF response and actual system response

V. Some simple ideas:

- Line follower robot
- R-PI Segway (inverted pendulum)
- Single/double pendulum
- Ground vehicle indoor navigation
- Water tank level controller
- IoT based control and automation of smart irrigation system
- Smart water metering using IoT
- IoT based smart waste management system using R-PI
- Predictive based IoT equipment maintenance

VI. Course Project Rules

- Make a team of 2 at most [larger numbers will need approval].
- Write your code so that it can be readable by others. Define your variables clearly (not abbreviated). Use comments as much as you want.
- The figures that you are going to show must be well presented. They must have clear labels, titles, and maybe legends.
- Your answers to the questions in the previous section must be appropriately enumerated.
- Any COPIED reports even one single part will take a **ZERO**.