



Faculty of Engineering and the Built Environment

Department of Electrical Engineering

EEE3094S – Control Systems Engineering: Project Brief 2019.

Due Date and Time: Check course planner

Project Description:

Given an individualized simulation of the vertical motion of a helicopter that is actuated by an external voltage that sets the angle of the main rotor blades, the students are expected to: (a) SYSTEM IDENTIFICATION. Apply the techniques of control engineering to establish the form of model needed for the problem, determine the model (continuous and/or discrete) parameter values and validate the model. (b) PROCEDURAL DESIGN. Use root locus and its extended versions and frequency methods to produce a control system to attain and hold its altitude at a given setpoint. (c) HARDWARE/SOFTWARE REALIZATION. Implement the design in electronics and/or software --- *OpAmp circuits and Programs*. (d) COMMISSIONING. Demonstrate that their circuits and/or software perform as designed --- *The handover test*. Extensive use is made of the following design concepts: "Design and Performance Specifications", "Design Concepts", "Decision variables", "Cost/Objective functions" and "Visualization".

Specifications:

1. Steady state error in tracking fixed altitude:
 - a. Worst case 5% error steady state tracking error.
 - b. Steady state disturbance and noise response should also be within 5% of setpoint.
2. Good disturbance rejection and noise attenuation.
 - a. Less than 20% peak over/undershoot in transient tracking and disturbance responses.
 - b. Assume step disturbances on both input and output.
3. Your closed loop should not be slower than $\frac{1}{2}$ of the plant.

Relaxation of the provided specifications during design is allowed but will be heavily penalized if not properly motivated.

General Information:

The project marks are computed as follows: 50% report and 50% demonstration (you will be quizzed on your report and project understanding).

Academic dishonesty: Plagiarism is a very serious offence and usually leads to disciplinary action that could include expulsion from the university. Therefore, recognise the work of others in any submission. Details of referencing methods are widely available on the Web: <https://www.uct.ac.za/about/policies/>