

# ME131 Vehicle Dynamics and Control

## Lab 5: Longitudinal Dynamics: Adaptive Cruise Control

Assigned: 3/6/2018 Due: 3/13/2018, 11:59pm (On bCourses)

Please submit your homework solutions on bCourses as a single PDF of your solutions. When videos are required, please only submit the link as part of the solution PDF document. Late homeworks will be penalized.

### Problem 1 Lab Deliverables (35pt)

- 1.1 (5pt) The closed-loop transfer function  $G_{r \rightarrow v}$  from Task 3.1.
- 1.2 (5pt) The gains  $K_p$  and  $K_i$  required to set your closed-loop eigenvalues corresponding to the control objective ( $\omega_n = 1.8, \xi = 1.5$ ) from Task 3.2.
- 1.3 (5pt) A screenshot of your Simulink model from Task 4.1.
- 1.4 (5pt) Your plots of (a) your controller's calculated motor PWM values over time, (b) your disturbance step inputs, and (b) the actual speed and the reference speed on the same graph, from Task 4.3.
- 1.5 (5pt) A plot of the BARC's velocity compared with the reference speed as a function of time from Task 5.6.
- 1.6 (5pt) A link to your video of a successful experiment from Task 5.6.
- 1.7 (5pt) The controller parameters you tuned in Simulink are very different from those you tuned using the BARC vehicle. What are some possible explanations for this inconsistency? From Task 5.7.