BIOS6643 HW5 Due Friday, October 26, 2018, 5pm

1. Remember the global temperature data? We previously fit the data using a simple linear trend for time, and the AR(1) structure for the errors. The residual plot that accounted for correlated errors suggested that the model was consistent with the data. Now, let’s consider building a more elaborate mean function for time and see what happens to the errors. Specifically, do you still need an AR(1) structure for the errors? Or if we account for the different patterns for time, will a simple error structure suffice? So to complete this, look at the data and get an idea of what might be needed. A polynomial function? Piecewise splines? (If you go with piecewise splines, try to limit the number of knots.) Also, I don’t want you to use any canned spline regression software, please create the spline terms in a data step so that you can see what is going on. Charlie’s idea was to add the knots at (apparent) points of inflection. You could try that or something else. There is not a right or wrong answer for this and I actually have not fit the data myself. Once you get a mean function you like, see if the AR(1) error structure is still necessary or something simpler (e.g., iid error?). Write a paragraph summarizing your findings.
2. Write a 1-page summary of how we estimate the fixed-effect coefficients (i.e., Betas) in the following models, as well as how the variance of the Beta is determined. (I may need to help you a bit more for the variance part for some of the models; we’ll discuss a bit more in class.)
   1. LMM (ML and REML estimation)
   2. GzLM/GEE (quasilikelihood estimation)
   3. GzLMM, quadrature (maximum likelihood estimation)
   4. GzLMM, linearization (pseudo-likelihood estimation)