**Exam 2 – ChE 310 Study Topics (Spring 2019)**

* Root finding
  + Graphical
  + Bracketed methods
    - Bisection
    - False position
  + Open methods
    - Fixed point iteration (successive substitution)
    - Newton Raphson method
    - Secant method
  + Matlab tools
    - fzero
    - roots
  + Excel solver
* Optimization (root finding)
  + Global vs. local
  + Golden search
  + fminbnd
  + fminsearch
  + fmincon
* Systems of linear equations and matrix math
  + Setting up system of equations from conservation type problems
  + Condition and determinant
  + Gauss elimination
  + Partial pivoting
  + LU factorization
  + \ command
  + Gauss seidel method
  + Sparse (banded) matrix
    - Setting up from finite element problems
    - tridiag function
* Matrix inverse and other matrix measures
  + Calculating the inverse
  + Stimulus response problems
  + Norm of matrix
  + Condition number
* Systems of Non-linear Equations
  + Graphical
  + Multidimensional Newton Raphson
  + newtmult algorithm with Jacobian
  + fsolve
* Curve Fitting: Basic linear regression
  + Regression vs. interpolation – when to use each method
  + Residual
  + Sum of squares of residuals
  + Quantification of error
    - Coefficient of determination
      * What does it mean?
  + polyfit
  + fit
  + plotting with confidence intervals
* Curve Fitting: Non-linear regression
  + How linear least squares problems are reduced to a system of linear equations using ‘normal’ equations (15.1-15.2)
  + General linear least squares (15.3)
  + polyfit
  + fit
  + Curve Fitting Toolbox (cftool)
  + Automating fits
    - Extracting goodness of fit measures
    - Extracting coefficients
    - Extracting confidence intervals