MATH 373 – Applied Numerical Analysis
Course Objectives

1. Students will be able to write **finite approximations** of the first and second derivatives.
2. Students will able to explain the **Mean Value Theorem** and its relationship to error estimation.
3. Students will be able to derive the **Heat Equation** in rectilinear, cylindrical, and spherical coordinates with a generation term.
4. Students will be able to solve by the preferred/specified computational engine
   - **1D SS HT problems**
     Explicitly
   - **1D USS HT problems**
     Explicitly, by Saul'yev, by Frankel-DuFort, and by Crank-Nicolson all with fixed, zero-flux, gradient, and convection BC's.
   - **2D SS HT problems**
     Explicitly by relaxation with fixed, zero flux, gradient, and convection BC's.
   - **2D USS HT problems**
     Explicitly and Implicitly by ADI methods with fixed, zero flux, gradient, and convection BC's.
5. Students will be able to perform numerical integration by
   - **Rectilinear Rule**
   - **Trapezoid Rule**
   - **Simpson's 1/3 and 3/8 Rules**
   - **Gaussian Quadrature**
6. Students will be able to solve a system of Ordinary Differential Equation of any order by **Runge-Kutta Methods** including the Fourth Order form by hand and by using MathCad.
7. Students will be able to find roots by the following methods
   - **Interval Halving**
   - **False Position**
   - **Secant**
   - **Newton-Raphson**
   - **One-point Iteration**
8. Students will be able to construct objective functions necessary for **LP** and **Data Adjustment** problem solutions solved.
9. Students will submit a written **project report** and orally present the numerical solution to an engineering problem.