Course Learning Objectives - CBE 301

Application of Statistical and Numerical Techniques (3)

At the conclusion of this course, the student should be able to:

1. Solve systems of linear algebraic equations as they appear in chemical engineering applications.
2. Know how to compute the determinant, the inverse, the norm, and the condition number of a matrix.
3. Solve nonlinear algebraic equations common in chemical engineering.
4. Explain the concept of discrete, continuous, and joint probability distributions.
5. State the significance of the Central Limit Theorem and its relationship to the Normal Distribution.
6. Calculate confidence intervals for population mean, variance, difference between means, and proportion from sampling results under a variety of conditions.
7. Test a hypothesis for population mean, variance, difference between means, and ratio of variances using sampling results.
8. Perform linear regression providing confidence intervals.
9. Use the trapezoidal and Simpson's rules to numerically integrate a function.
10. Perform numerical differentiation.
11. Solve ordinary differential equations with applications in chemical reaction kinetics and flow control, using Euler’s and Runge-Kutta methods.
12. Determine the stability and stiffness of differential equations.
13. Know how to apply numerical techniques for boundary-value problems.
14. Solve partial differential equations with applications in heat transfer.
15. Identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.