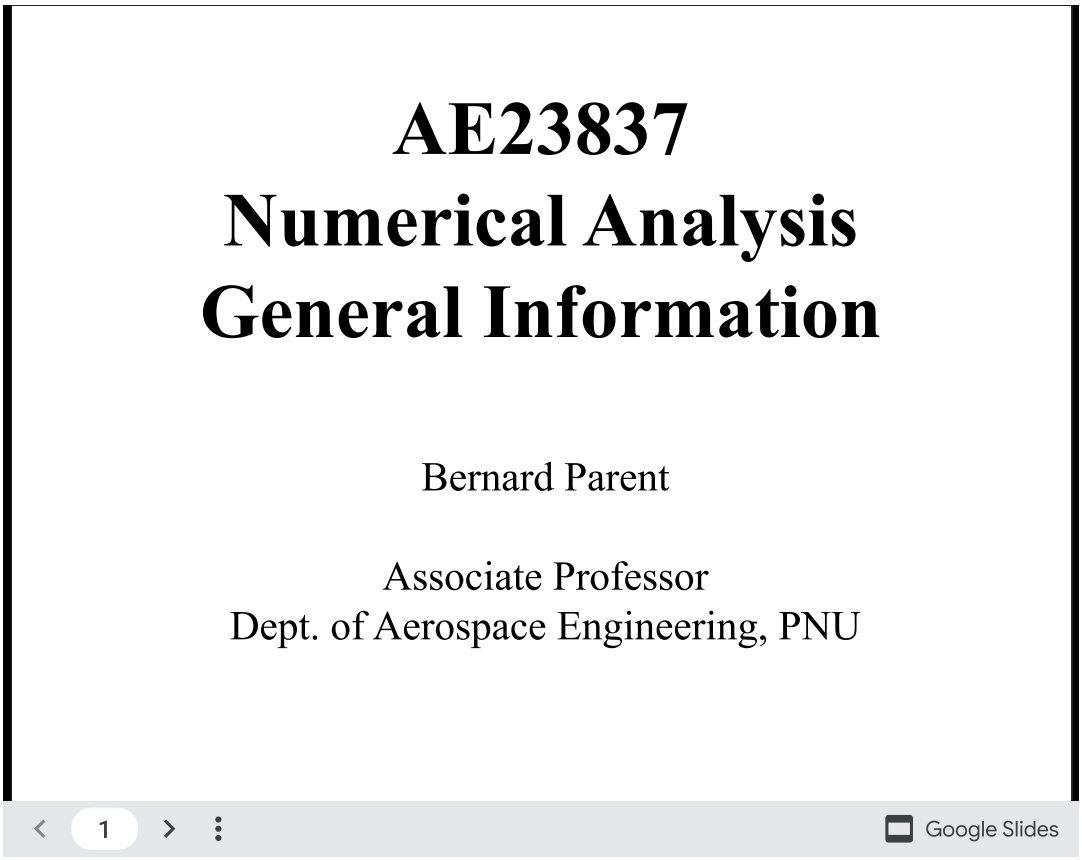
Numerical Analysis Syllabus

Course Objectives, Policies, and Grading



Courses Calendar — Weekly Schedule

1. Importance of numerical analysis in engineering. Introduction to IEEE arithmetics: signed and unsigned integers, IEEE single and double precision format.
2. Largest and smallest possible numbers in IEEE single and double precision formats. Subnormal numbers, machine precision, round-off error. Root finding with the bisection method.
3. Root finding with Newton's method and with the secant's method. Rate of convergence and order of convergence of root finders.
4. Solution of linear systems of equations. Analytical matrix inversion. Gaussian Elimination.
5. Linear systems of equations: Lower-upper decomposition.
6. Row permutation and partial pivoting within Gaussian elimination. Solution of non-linear systems of equations.
7. Midterm break. Midterm exam.

8. Polynomial interpolation: Vandermonde, Lagrange and Newton polynomials. Cubic Spline interpolation. Multidimensional interpolation.
9. Least-square approximation: curve fitting with a straight line and with a linear combination of functions.
10. Numerical integration through the mid-point rule, the trapezoidal rule, the Simpson rule. Local versus global error.
11. Initial value problem: Euler method, Runge-Kutta methods. System of differential equations.
12. Boundary value problem: finite difference method, shooting method.
13. Eigenvalue value problem: finite difference method, shooting method.
14. Example problems and review for final exam.
15. Final exam.