

EML 4534 - COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING II
Common Course Syllabus

Catalog Data: 3 credits. Review of MATLAB language, numerical methods utilized in solving mechanical engineering problems, projects related to solid body mechanics and thermal systems.

Prerequisites:

1. Computer Applications in Engineering I – EGN 2213
2. Engineering Mathematics I – MAP 3305
or Differential Equations I – MAP 2302

Topics:

1. Introduction – Why numerical methods?
2. Review of MATLAB concepts (6 hrs)
3. Simulation of dynamic systems (9 hrs)
 - a. Laplace transform and transfer function
 - b. Simulation using Simulink
4. Solution of differential equation (3 hrs)
 - a. Runge – Kutta method for a system of ordinary differential equations
 - b. Use of MATLAB *ode45* function
5. Optimization (12 hrs)
 - a. Unconstrained optimization
Method of deepest descent
 - b. Constrained optimization
Lagrange multipliers
 - c. Using Matlab *Fmincon* optimization function
6. Solutions (Roots) of nonlinear equations (3 hrs)
7. Numerical integration (6 hrs)
 - a. Simpson's rule
 - b. Improper integrals
 - c. MATLAB *quadl* function

Course Projects:

Six to seven projects in MATLAB utilizing the concepts above will be given during the semester.

Course Outcomes: (numbers in parentheses indicate correlation of the outcome with the appropriate ABET program outcomes 1-7)

1. Students should be capable of programming engineering type problems in MATLAB. (1,2,6)
2. Students should be able to utilize built in solvers in MATLAB. (1,2,6)
3. Students should be capable of simulating dynamic systems. (1,2,6)
4. Students should be able to use different optimization techniques. (1,2,6)

updated 5/18