SYLLABUS

MAE 316 – ANALYSIS OF ENGINEERING SYSTEMS

Fall 2006, WVU

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(see attached references for additional supporting books/publications)

Course description: This is a three-credit hour undergraduate course on analytical, numerical, and computational techniques used to solve mechanical and aerospace engineering problems which involve one or more of the following: roots of non-linear equations, systems of algebraic equations, curve fitting, regression analysis, interpolation, numerical differentiation and integration, and differential equations. Some aspects of these problems may require utilization of statistics for their solution. The goal is to provide the students with a set of numerical and analytical tools. Upon completion of this course these tools will enable the students:

(a) To understand the basis of general engineering guidelines to set-up a mathematical model for a certain engineering problem.

(b) To reconfigure a given mathematical model such that it is suitable for application/implementation of a numerical solution algorithm.

(c) To select an appropriate numerical solution technique for relatively simple but representative problems of engineering discipline in general, and mechanical engineering in particular.

(d) To acquire computational tools, such as spread sheets, MATLAB, and/or a computer language, e.g., FORTRAN, C, C++, which can be used to implement the numerical algorithms selected in part (c). The students are expected to acquire knowledge of such tools on their own.

(e) To use computers along with computational tools to produce solutions and assess the numerical accuracy of that solution without knowing the analytical (or exact) solution of the problem.

(f) To calculate the basic statistical parameters for the outcomes of a random process and/or an experiment including mean, variance, and confidence intervals for estimated mean and variance.

(g) To combine (a)-(e) and perform design analysis for a few typical engineering problems.
MAE 316 Syllabus (continued)

Course Content:
1. Mathematical models for typical physical systems and solution strategies.
2. Introduction to computers, approximations, and errors.
3. Roots of nonlinear algebraic equations
4. Systems of linear algebraic equations
5. Regression analysis, curve fitting, and interpolation
6. Statistical analysis: preliminaries
8. Ordinary differential equations (ODE’s)

Grading: Homework(15%), Quizzes(20%), Test-1(20%), Test-2(20%), Final(25%).

Important Notes: The final exam will be comprehensive. During the class hours quizzes will be given. Quizzes are usually not announced. Homework and quizzes will be graded selectively. Homework is due in class first thing at the start of the class period. No late homework will be accepted. The lowest homework grade and the lowest quiz grade will be dropped at the end of the semester thus allowing each student effectively to miss a quiz and a homework without penalty. In this course homework is treated as laboratory assignment. All homework must be typed and professionally prepared, stating the problem, objective, solution methodology, results, and discussion. Calculations must be done using computers unless otherwise indicated. Exam dates will be announced in the class. No make-up will be allowed for any of the above except under very unusual circumstances. The instructor must be informed in advance of these unusual events. Material outside of the textbook will be presented. The grades may be curved hence the usual ranges for letter grades may be shifted; usually the average/median score represents the middle of the range for a "C" grade. Attendance to the class is expected and perceived as the duty of each student. Each student is responsible for taking notes of things covered in the class verbally or in writing. It is the responsibility of the student to acquire this information if he/she misses a lecture.

Motto: ‘Do not believe any solution that is generated by a computer.’

Study hard, do good work, and be happy!

Good luck to you all!
ADDITIONAL REFERENCES:


