Material to be Covered in ME 400/500 (F 2015) and ME 404/504 (S 2016)

Instructor: H.L. Schreyer schreyer@unm.edu

The emphasis of the course will be on understanding thoroughly basic terminology and concepts and illustrated with elementary one-dimensional problems in engineering. The majority of the credit for the course will be based on writing programs that illustrate these concepts clearly and comprehensively. Two examples are the ideas associated with error and rate of convergence. After these courses, students are well grounded to continue on to more advanced computational and numerical analysis courses from engineering and math departments.

I will be using a draft of my book for a text that will be provided in a PDF format at no cost.

FALL SEMESTER

The first course ME 400/500 will cover material (not all) from the following Sections (and not necessarily in this order):

Sect. 1.2 Heat conduction
Sect. 2.2 Transient Heat Conduction
Ch.3. Linear Algebra
Ch. 4 The Eigenproblem
Ch. 5. The Finite Difference Method; Application to Steady-State Heat Conduction
Ch. 8. Time Integration of a Single-Degree-of-Freedom First-Order System
Sect. 9.6 Transient Heat Conduction
Appendix: Classification of Functions, Taylor Series, Numerical Quadrature, Fundamental Theorem of Continuum Mechanics, One-Dimensional divergence theorem.

SPRING SEMESTER

For the second course, ME 404/504, it is assumed students know the material covered in ME 400/500 and covers material from the following sections (again not necessarily in the order listed):

Appendix: Fundamental Theorem of Continuum Mechanics and Lemma of the Calculus of Variations, Integration by Parts, One-Dimensional divergence theorem, generalized functions

Sects. 1.3 and 1.4 Stress Analysis for Bars and Beams
Sects. 2.3 &2.4 Transient Motion of Bars and Beams
Ch. 6 The Symmetric Weak Formulation and Galerkin's Method
Ch. 7 The Finite Element Method
Ch. 10 Time Integration of a Single-Degree-of-Freedom Second-Order System
Ch. 11 Transient Motion of a Bar
Ch. 12 Static and Dynamic Response of Beams
Ch. 12 The Nodal Force or Mixed Method

If time permits – The FE Method in Two Dimensions

Course Credit: 60% based on HW; 40% based on Exams

Exams: One Mid term, One near end of semester and Final

HW: For each assignment (credit based on length): 40% based on written part that includes a summary of the relevant theory, a description of your program, and conclusions you can draw based on your results. 60% based on the technical part involving analytical and numerical solutions based on programs written by you.

If your assignment is handed in late there is an immediate deduction of 1/5. Then there is a further deduction based linearly on periods late over the number of periods remaining in the semester. Therefore you always get credit for late assignments unless you hand material in the last day of class.

It is always best to hand in what you have on the due date (you should always be able to write up the relevant theory for the problem). Suppose I give you 50%. Now the above formula kicks in for the remainder. There is a 1/5 deduction of the remaining 50% for being late so if you pass in a perfect result the next period, you get an additional 40% for the assignment.

Some students ask about getting an A. This bothers me because the primary focus should be on learning new material and doing the best you can. There is no rigid specification of a final composite score that specifies a particular grade since I choose the scores for particular grades based on class standing and how well I think the class as a whole has performed. Roughly speaking, if you average 85% for your HW and rank in the top half in exam scores you will get an A.