COURSE:	Math 421, Numerical Analysis I
TEXT:	Burden & Faires, *Numerical Analysis* 8th ed.
CALCULATOR:	HP 49G+
INSTRUCTOR:	Dr. Mervin E. Newton
OFFICE HOURS:	T Th 12:30 - 1:00 and 2:30 - 3:00 I will hold my scheduled office hours in the west end on the first on the first floor of the library Or by appointment. Call Mrs. Cindy McClelland at 2160 for appointment. Appointments will be in my office on the second floor or Roth Hall.

LEARNING OUTCOMES: At the conclusion of this course students will be able to:

1. Program simple to moderate algorithms into the calculator.
2. Know the most common limitations and potential pitfalls of using finite digit arithmetic inherent in all digital computing devises.
3. Be able to find a numerical solution to an equation using any one of the following methods: Bisection Method, Newton's Method, Secant Method, Method of False Position, and the Modified Newton's Method. They will be able to do this in two ways: using appropriate programs and manually with a calculator. When appropriate be able to give an error bound for their solution.
4. Be able to explain the advantages and disadvantages of each of the methods mentioned in 3.
5. Give an equations be able to choose the best of the methods to use mentioned in 3 for solving that equation and be able to explain their reason for their choice.
6. Given an appropriate set of data be able to construct a Lagrange interpolating polynomial for that data either with software or manually on the calculator and be able to establish an error bound for the polynomial.
7. Be able to explain the potential problems associated with high order Lagrange polynomials and why these problem occur.
8. Be able to compute a numerical approximation to the derivative of a function at a given point either with software or manually on a calculator using forward difference, backward difference and central difference methods and be able to establish an error bound for their solution.
9. Be able to explain why all numerical methods for approximating derivatives are inherently unstable.
10. Be able to approximate the integral of a function over a give interval by the Romberg Method and by the Adaptive Quadrature Method using software or manually on a calculator.
11. Be able to explain the conditions under which each of the methods of 10 should be chosen.

All of the learning objectives mentioned above will be assessed by homework assignments, class discussions and/or test questions.

GRADING:	HOMEWORK	20%
	CLASS DISCUSSION	20%
	TEST 1 (Oct 11)	30%
	TEST 2 (Dec 15 1:00 PM)	30%

It is the policy of Thiel College and its educational programs not to discriminate against qualified students with documented disabilities. Students desiring accommodation for a disability are responsible for providing evidence from a qualified professional confirming the disability and identifying appropriate interventions. This evidence should be taken to the Office for Special Needs AC-126 as early as possible in the semester. The Coordinator of the Office of Special Needs will develop a letter of accommodation to be sent to course instructors and other appropriate offices.

If documentation is already on file, the students with disabilities are responsible for visiting the Office for Special Needs to set up accommodations for EACH semester. They are also responsible for talking to their professors about their needs as early as possible for EACH semester.

HOMEWORK: Homework is due at the beginning of the period on the day indicated. If you do it without help, it will be graded on the basis of 10 points per problem. If you need more time for some of the problems, they will be accepted at the beginning of the next period but will be considered late. Problems for which you received help or which are turned in late will be graded on a basis of 8 points. You are expected to adhere to Thiel's honor code and clearly mark such problems as being 8 point problems.

Every programming assignment consist of two parts; the program and a Word document that explains to the user what the program will do and how to use it. In other words, you will put yourself in the place of the person who is writing the user's manual for your program. You will turn in the program by copying it to my calculator. You will turn in the instructions as hard copy.

CLASS DISCUSSION You are expected to do the reading assignments for each day before class and be prepared to discuss it.

In the assignments listed below "P" refers to assignments from the Web page, which can be found on the Useful Links page on the Department of Mathematics and Computer Science Web site:

An Introduction to Programming HP Graphing Calculators.

Date	Read Section	Problems
8/28	P 1	1, 2, 3 (Due 8/30)
8/30	P 2 P 3	1, 2, 3 (Due 9/4)

Date	Read Section	Problems

9/4	1.1	2(a, b), 6 (Hint: See # 5), 8 (Due 9/6)
	P 4	1, 2, 3 (Due 9/11)
	P 5	1 (Due 9/18), 2, 3 (Due 9/13), 4 (Due 9/18)
9/6	1.2	1(a, b), 2(a), 4, 10, 12 (Hint: For # 10 use the Equation Writer and $\sum$. You will find the factorial function under **LS MTH > NXT > F1-PROB F3-!**) (Due 9/13)
	P 6	1, 2 (Due 9/18)
9/11	1.3	2, 6(d), 8, 10 (Hint for # 6: Use log properties and Taylor's series to show that $1+\frac{1}{n} < e^{\frac{1}{n}}$.) (Due 9/18)
	P 7	1 (Due 9/20)
	P 8	1 (Due 9/20)
9/13	P 9	1 (Due 9/25)
	P 10	1 (Due 9/27)

NOTE: When programming any of the algorithms from Chapter 2 into the calculator, include the number of iterations required for convergence as part of the output. Also make the output of the result of each iteration an option.

9/18	2.1	2 (by hand on calculator due 9/25), Program Algorithm 2.1 into the calculator and use it to do problems 9, 10, 13 Hint: For 13 see Problem 12. (Due 10/2)
9/20	2.2	1, 2, 4, 6 (Due 9/27)
9/25	2.3	Program Algorithm 2.3 into the calculator and use it to do Problem 6. (Due 10/4)
9/27	P & P	
10/2	Complex Solutions	

Date	Read Section	Problems

10/4	P & P	
10/9	Review	
10/11	Test 1	
10/18	2.4	Write an algorithm to use the modified Newton method described in equation (2.11) and program it into the calculator. Use the indicated programs to do problems 1, 3, 5, 10 and 12. (Due 10/30)
10/23	2.5	Program Algorithm 2.6 into the calculator. Do Problem 7. (Due 11/6)
10/25	3.1	Code the algorithm provided in class to do Langrange interpolation on the calculator. Do problems 5(b, d), 9(b, d), 21. (Due 10/8)
10/30	4.1	2b, 4b, 6c, 8c (Due 11/1)
11/1	4.2	1(a, c), 2(a, c), 3(a, c), 4(a, c). (Due 11/6)
11/6	P & P	
11/8	4.3	2(a, b), 4(a, b), 6(a, b), 8(a, b). (Due 11/13)
11/13	4.4	2(a, b), 4(a, b), Implement Algorithm 4.1 and use it to do problem 8(b). Do problem 11(b) then use your program to find the approximation to the integral. (Due 11/20)
11/15	4.5	Implement Algorithm 4.2 (use pseudocode provided in class) on the calculator and use it to do problem 5. (Due 11/29)
11/20	P & P	
11/27	4.6	Implement our modified version of Algorithm 4.3 that was discussed in class. Use it and Algorithm 4.2 to approximate $\int_{0.1}^{2} \cos(x)dx$ to three decimal places. Count and compare the number of function evaluations required in each case. (Due 12/6)
11/29	P & P	
Date	Read Section	Problems
12/4	P & P	

12/6	Review
12/15	Test 2 (1:00 PM)

Go To: Course Calendar Dr. Newton's home page.