UNIVERSITY OF MICHIGAN
Department of Civil and Environmental Engineering
Computational Methods
CEE 303 – WINTER 2011

Instructor:

Nikolaos D. Katopodes
Lecture: TuTh 11:30-1:00, 1504 GG Brown
Office Hours: TuTh 1:30-2:30; Office: 121 EWRE;
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Graduate Student Instructor:

Meredith Neely (meredite@umich.edu)
Lab Section 1: Tuesday 2:30-5:30, 3358 A & B, Duderstadt Center
Lab Section 2: Wednesday 2:30-5:30, 3358 A, Duderstadt Center
Lab Section 3: Thursday 2:30-5:30, 3358 A & B, Duderstadt Center
Office Hours: TBA

Instructional aides:

Arie Reath; email: arireath@umich.edu
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Xingzhi Qiu; email: kainqiu@umich.edu
Office Hours: TBA

Web Page: https://ctools.umich.edu/

Text: *Numerical Methods for Engineers*, by S. C. Chapra and R. P. Canale, 6th Edition, McGraw-Hill, 2009

Grading: Computer Projects 40%; Homework 10%; mid-term 20%, Final 30%.

Course Objectives:

1. Learn the fundamental concepts of modeling and FORTRAN programming.
2. Learn how to set up initial and boundary - value problems.
3. Learn how to solve numerically ordinary and partial differential equations.
4. Learn how to solve large systems of equations.
5. Learn how to design a computer program to solve an engineering problem.
6. Learn how to perform an uncertainty analysis due to variable parameters.

Rules and Regulations:

The honor code will be strictly observed in both homework and examinations. The honor code is based on integrity, a characteristic that is built into the profession. It is reflected in the original and reliable work of all good engineers. When students accept the honor code, they acknowledge that it is dishonorable to receive credit for work that is not the result of their own efforts. For CEE 303 specifically, *no student may provide, either on purpose or inadvertently, his or her code to any other student.*

Computer projects and homework sets are due **at the beginning** of the lab or lecture period, on the announced due day. Late projects and homework will be penalized 20% for each day they are overdue.

There will be an email group for all class participants, so check your messages frequently. You will be responsible for monitoring announcements, assignments and reading material posted on the class web page. Bookmark the page, and set up a reminder of your choice to check for new postings.

Attendance of lecture and laboratories is strongly recommended. Although the text covers most of the required class material, special topics that are not in the book will be covered during lectures. Also, most exam questions will be developed around in-class examples. Finally, different topics will be stressed in lecture than in the reading assignments, which will be important in studying for examinations.

COURSE OUTLINE AND ASSIGNMENTS

DATE		TOPIC	Reading	Homework*	Project*
January	6	Basic Concepts	1-77		
	11	Taylor Series; Finite Differences	78-111		
	13	Catenary Cable Design - Bisection	113-141		
	18	Newton - Raphson iteration	142-173		
	20	Initial-Value Problems for ODE's - Design of Slender Towers under Wind Loading	697-706		
	25	Euler's Method	707-719		
	27	Predictor-Corrector methods	719-727		
February	1	Runge-Kutta Methods	727-737		
	3	Systems of ODE's	737-751		
	8	Interpolation of Computed Data	488-500, 509-519		
	10	Integration of Computed Data	601-625, 640-648		
	15	Boundary-Value Problems	778-786		
	17	Beam Bending			
	22	Review and Problem Solving			
	24	**Mid -Term Exam**			
March	1	**Spring Break**			
	3	**Spring Break**			
	8	Linear Systems- Gauss Elimination	227-254		
	10	Pivoting and Scaling	254-266		
	15	LU-Decomposition of Systems of Equations	274-293		
	17	Tri-diagonal Solvers	296-298		
	22	Partial Differential Equations	843-849		
	24	Torsion of Non-Circular Sections	850-857		
	29	Essential and Natural Boundary Conditions	858-864		
	31	Gauss-Seidel Method for Sparse Systems	300-307		
April	5	Heat Conduction and Diffusion	871-872		
	7	Explicit Finite-Difference Method	873-876		
	12	Implicit Finite-Difference Method	877-882		
	14	Two-Dimensional Propagation Problems	883-886		
	19	The Finite Element method	888-902		
	22	**Final Exam 1:30 - 3:30 pm**			

*Assignments and dates to be determined