Winter 2005

CEG 416-01: Matrix Computations

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Wright State University - Main Campus

CEG/MTH 416/616 Matrix Computations

Section 1 - Winter 2005 MW 4:10-5:25 p.m., MM 171
Last Updated: January 1, 2005 at 12:40 p.m.

Description: This course is a survey of numerical methods in linear algebra for application to problems in engineering and the sciences. Emphasis is on using modern software tools on high performance computing systems. This course covers the mathematics of linear equations, eigenvalue problems, singular value decomposition, and least squares. Material covered will be relevant to applications areas such as structural analysis, heat transfer, neural networks, mechanical vibrations, and image processing in biomedical engineering. A student should familiarize himself/herself with Matlab. All programming assignments will be done in Matlab. A basic knowledge of matrix algebra is required. Prerequisite: MTH 253 or 355; and CS 142 or 241. 4 credit hours.

Instructor: Dr. Daniel C. Lee, RC 353, 775-5061, dclee@cs.wright.edu, 2:00 - 3:00 p.m. MW (other times by appointment)

Textbooks:

(1)	Numerical Linear Algebra, Biswa Datta, Brooks/Cole Publishing Company, 1995, ISBN 0-534-17466-3
(1,3)	Matrix Operations, Richard Bronson, Schaum's Outline, McGraw-Hill, 1998, ISBN 0-07-007978-1.

References:

(1)	Matlab: An Introduction With Applications, Amos Gilat, Wiley, 2004, ISBN 0-471-43997-5
	Matlab Guide, Desmond J. Higham and Nicholas J. Higham, SIAM Press, 2000.
(2)	Matrix Computations, Third Edition, Gene H. Golub and Charles F. Van Loan, Johns Hopkins, 1996, ISBN 0-8018-5414-8.
	Fundamentals of Matrix Computations, Second Edition, David S. Watkins, Wiley Interscience, 2002, ISBN 0-471-21394-2.
(4)	Matrix Algorithms, Volume I: Basic Decompositions and Volume II: Eigensystems, G. W. Stewart, SIAM Press, 1998. (QA188.S714 1998)
	Scientific Computing - An Introduction with Parallel Computing, Gene H. Golub and James M. Ortega, Academic Press, 1993.
(2)	Numerical Linear Algebra, Lloyd N. Trefethen and David Bau, SIAM Press, 1997.
(4)	Introduction to Linear Algebra, Third Edition, Gilbert Strang, Wellesley-Cambridge Press, 2003. (QA184.S77 2003)
	Linear Algebra and Its Applications, Second Edition, David C. Lay, Addison-Wesley, 2000.
(4)	Matrix Theory - A Second Course, James M. Ortega, Plenum Press, 1987. (QA188.O78 1987)

Note (1) – Available in WSU Bookstore. Note (2) – Dunbar Library (editions may vary). Note (3) - Available as E-book through Dunbar Library web site. Note (4) - Requested as Course Reserve through Dunbar Library.

Course Home Page: http://www.cs.wright.edu/~dclee/ceg416. Students are responsible for accessing the home page and printing copies of resource materials.

Programming: Writing and using numerical programs is an important part of this course. Programming assignments should be done in Matlab. Matlab is available on a number of Wright State systems (e.g. Russ 141, 152). Matlab is very useful, and you may want to consider purchasing the Student Edition if you have a PC that can support it. It is expected that students will spend a minimum of 2 hours per week working in a computer lab or equivalent environment enhancing their programming skills and completing programming assignments for this course.

Computers and Computing Accounts: You must have a WSU Student Campus Computing Account, e-mail, and be able to access the Web. Get familiar with the use of the PCs in Russ Center 152C or the Library Annex. You should be able to use TELNET and FTP. It is useful to have an elementary understanding of UNIX commands plus be able to use a simple UNIX editor such as Pico. These topics will be covered in class and handouts given as needed. Be sure to review computing information at http://www.wright.edu/cats/help/guides/students/index.html as well as the College of Engineering and Computer Science information at: http://www.cs.wright.edu/help/local_comp_resources/default.html

Grading: Grading Scale: A: 100-90%, B: 89-80%, C: 79-70, D: 69-60:, F: Below 60. One mid-term exam – 30% each. One comprehensive final – 40%. Homework/Project assignments – 30%. Students registered at the graduate level (i.e. CEG616 or MTH 616) will be required to complete extra problems, programs and/or special projects as part of the Homework/Project component of this course. Expect about seven major Homework/Project assignments. At least one week will be given to prepare these assignments. Smaller homework problems/investigations may be due the next class period. Follow the Homework Standards handout unless otherwise stated.

Class Policies: Attendance at lecture is not a component of your grade. However, students are expected to attend all lectures and to participate in class discussion. Attendance will be taken in the course to better get to know students. In cases of infrequent attendance, lower homework and exam grades will inevitably result since a significant portion of lecture material is not covered in the text. No late exams unless verifiable emergency. All homework/project assignments are due in class on the date specified. Grades on late assignments will be reduced by 10% per day up to two days maximum. Submittals more than two days late will not be graded - "zero" grade assigned. Exceptions to the late policy may be made unusual circumstances when documentation is provided in writing -- otherwise expect strict enforcement of the late policy. All work must be your own unless group assignments are made by the instructor; sharing of program code will result in a grade of "zero" for all involved. University procedures for plagiarism will be strictly followed. Sharing ideas and general mathematical and computer skills with others outside of class is encouraged. Students are expected to read and follow the University Academic Integrity Policy at:

http://www.wright.edu/students/judicial/stu_integrity.html

Schedule: Topics may vary. Exams dates are firm.

Week	**Topic/Tests etc.**
1	Review of Linear Algebra and Introduction to Matrix Computations and Matlab
2	Solving Linear Equations by Direct Methods
3	Solving Linear Equations by Iteration
4	Linear Equations: Software and Applications
5	Introduction to Eigenvalue Problems (**Mid-Term Exam - Monday February 2**)
6	Eigenvalue and Eigenvector Problems:
7	Eigenvalue and Eigenvector Problems: Software and Applications
8	Singular Value Decomposition and Applications
9	Orthogonalization and Least Squares
10	Special Topics and Parallel Computations (if time permits)
Finals	**Comprehensive Final - Monday March 14, 5:45-7:45 p.m.**