1512 D-Honor Calculus II (Fall 2006)

MATH 1512 *Instructor*
Jean Bellissard
Professor of Mathematics and Physics
School of Math, Skiles 132 ,
Physics Howey W511
Phone: (404) 385-2179 (Math),
(404) 385-2509 (Phys)
Fax: (404) 894-4409
e-mail: jeanbel@math.gatech.edu

Lectures Skiles 169 Tuesday-Thursday 9:35-10:55AM
Recitations:: Monday-Wednesday 10:05-10:55am Skiles 153

Teaching Assistant	***Room***	***Office hours***
Yongfen Li	Skiles 144	Tuesday 8:30-9:30 am 11:00-12:00 am

Office Hours: Skiles 132 Tuesday 1:30-2:30pm & 5-6pm

Dates: August 21st *till* December 7th, 2006

Final exam

Training exercises

Honor Calculus is intended to introduce Mathematics as a Science in itself, rather than just giving rules of calculus for practical purposes.
Honor Calculus II will emphasis on reasoning, use of abstraction and proofs as much as learning practical rules of Calculus.

Course Outline

Topic	Text Sections	# of Lectures
Approximation byPolynomials Functions I II	20 in Spivak	2
Infinite Sequences I II III	22 in Spivak.	3
Infinite Series I II III	23 in Spivak	3
Uniform Convergence and Power Series I II	24 in Spivak	2
Review: Analysis	20-24 in Spivak	1
Introduction to Vectors and Matrices I II III IV	1.1-1.6 in C^2	4
Systems of Linear Equations & Row Reduction I II	2.1-2.4 in C^2	2
Kernel, Image, Subspaces, & Least Squares I II III	3.1-3.4 in C^2	3
Review Algebra Part I	Chap.1-3.3 in C^2	1
Orthogonal Projections, Gram-Schmidt I II	3.5-3.8 in C^2	2
Determinants & Cross Product I II	4.1-4.3 in C^2	2
Eigenvectors & Applications I II III IV V	5.1-5.6 in C^2	5

- Spivak, *Calculus*, Chapter IV sections 20-24

Textbooks

- Spivak, *Calculus*, Chapter IV sections 20-24
  (The book used in 1502 is Calculus, by Salas, Hille and Etgen, 9th edition, Sections 8 & 10-11)
- Eric Carlen, Maria Conceição Carvalho, *Beginning with Linear Algebra, (called C^2 here)*
  Solutions Manual for Linear Algebra from the Beginning

Homework & Quizzes

Students are required to do the homework every week. The weekly quiz on Wednesday will be a test based on the homework of the week. The homework will NOT be graded, but students needing some feedback are advised to turn it in at the Monday recitation class and to ask the TA to grade it. There will be 12 quizzes during the Fall semester but only the 10 best ones will be counted in the final grade. An absence on a quiz will be graded 0 (zero)
(so that only if a student is absent less than twice, it will not affect his final grade).

1-Hour Test

There will be twice a 1-Hour test (50') during the Fall semester.
The first one on ***Wednesday September 27th*** after the end of the Analysis course,
The other one on ***Wednesday November 1st*** in the middle of the Algebra course

Final Exam

Thursday December 14th 2006, 8:00-10:50

Final Grade		*Grade Distribution:*
Quizzes	25%	90% for an A
One Hour	35%	80% for a B
Tests	40%	70% for a C
Final		60% for a D

Calendar *(to be updated)*

Preliminary test: *click here (pdf-file) (ps-file)*

- August 22rd & 24th: Approximation by polynomials, *Spivak Chapter 20* *(back to Course Outline)*

Reading: *Spivak Chapter 20*
Brook Taylor was an English Mathematician (1685-1731)
Joseph-Louis Lagrange was an Italian-French mathematician (1736-1813)
who proposed to consider Taylor's expansion as the basic principle of Calculus.

Homework 1 : Spivak p. 427-433, Problems 1, 2, 3, 6, 8, 10, 16, 19
Due date : Monday August 28th, 10:00AM
Quiz 1 : Wednesday August 30th, 15-20 minutes, during the recitation 10:00AM

- August 29th & 31st: Infinite Sequences I, *Spivak Chapter 22* *(back to Course Outline)*

Reading: *Spivak Chapter 21 & 22*

Homework 2 : Spivak p. 453-462, Problems 1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 14, 20, 27, 30
Due date : Tuesday September 5th, 9:35AM *(Sept. 4th is a school holiday)*
Quiz 2 : Wednesday September 6th, 15-20 minutes, during the recitation 10:00AM

- September 5th : Infinite Sequences II, *Spivak Chapter 22 and* *(back to Course Outline)*
- September 7th : Infinite Series I, *Spivak Chapter 23* *(back to Course Outline)*

Reading: *Spivak Chapter 23*

Homework 3 : Spivak p. 482-490, Problems 1, 2, 3, 4, 5, 7, 9, 10, 12, 13, 15, 18, 21, 25, 26, 27
Due date : Monday September 11th, 10:00AM
Quiz 3 : Wednesday September 13th, 15-20 minutes, during the recitation 10:00AM , on homeworks #2 & 3
(The quiz will treat the parts of the homework related to the courses taught on Sept 5-7)

- September 12th & 14th: Infinite Series II, *Spivak Chapter 23* *(back to Course Outline)*

Reading: *Spivak Chapter 23*

Homework 4 : Spivak p. 482-490, Problems 6, 8, 11, 14, 15, 17, 19, 20, 22, 24, 25 (again)
Due date : Monday September 18th, 10:00AM
Quiz 4 : Wednesday September 20th, 15-20 minutes, during the recitation 10:00AM , on homework #4
(The quiz will treat the parts of the homework related to the courses taught on Sept 12-14)

- September 19th & 21st: Uniform Convergence and Power Series, *Spivak Chapter 24* *(back to Course Outline)*

Reading: *Spivak Chapter 24*

Homework 5 : Spivak p. 508-516, Problems 1, 2, 3, 4, 5, 6, 9, 10, 12, 13, 15, 19, 21, 25, 27, 31
Due date : Monday September 25th, 10:00AM

- September 26th: Reviewing *Chapters 20-24 in Spivak's book* *(back to Course Outline)*

Wednesday September 27th, during the recitation 10:00AM, on Spivak Chapters 20-24
(back 1-Hour Test)

- September 28th: Introduction to Vectors and Matrices I, C2 *Chapter 1 Sections 1 & 2* *(back to Course Outline)*

Reading: *C2 Chapter 1 Sections 1 & 2*

Homework 6 : C2 p.13 Exercises: *1.1 to 1.14 and*
p.28-33 Exercises: *2.1, 2.2, 2.3, 2.4, 2.6, 2.7, 2.10, 2.11,2.12, 2.13, 2.14, 2.16, 2.19, 2.22, 2.28, 2.29, 2.32,*
Due date : Monday October 2nd, 10:05AM
Quiz 5 : Wednesday October 4th, 15-20 minutes, during the recitation 10:00AM , on

Quiz 5 : Wednesday October 4th, 15-20 minutes, during the recitation 10:00AM , on homework #6

- October 3rd & 5th*:* Introduction to Vectors and Matrices II-III, C2 *Chapter 1 Sections 3-4-5 (back to Course Outline)*

Reading: *C2 Chapter 1 Sections 3-4-5*

Homework 7 : C2 p.44-49 Exercises*: 3.1, 3.2, 3.3, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18, 3.19, 3.20,*
p.58-61 Exercises*: 4.4, 4.5 4.6, 4.8, 4.9, 4.14*
p.70-73 Exercises*: 5.4, 5.6, 5.10, 5.11, 5.14, 5.17, 5.20, 5.25, 5.26*

Due date : Monday October 9th, 10:05AM

Quiz 6 : Wednesday October 11th, , 15-20 minutes, during the recitation 10:00AM , on homework #7

- October 10th*:* Introduction to Vectors and Matrices IV, C2 *Chapter 1 Sections 5-6 (back to Course Outline)*
- October 12th*:* Systems of Linear Equations & Row Reduction I, C2 *Chapter 2 Sections 1-2 (back to Course Outline)*

Reading: C2 *Chapter 1 Sections 5-6 & Chapter 2 Sections 1-2*

Homework 8 : C2 p.83-84 Exercises *6.2, 6.3, 6.5, 6.6, 6.7,*
p.94-98 Exercises *1.2, 1.3, 1.5, 1.8, 1.10, 1.11, 1.13, 1.17, 1.18, 1.22, 1.24, 1.27*
p.104-105 Exercises *2.1, 2.2, 2.3, 2.4*

Due date : Wednesday October 18th, 10:05AM

Quiz 7 : Thursday October 19th, 15 minutes, during the lecture 9:35AM on homeworks #8
(Due to the Fall recess the quiz #7 will take place on Thursday instead of Wednesday)

- October 19th (*Fall recess Oct 16-17*): Systems of Linear Equations & Row Reduction II, *(back to Course Outline)*

C2 *Chapter 2 Sections 3-4*

Reading: C2 *Chapter 2 Sections 3-4*

Homework 9 : C2 p.116-118 Exercises *from 3.1 to 3.15*
p.134-135 Exercises *4.1 to 4.11*

Due date : Monday October 23th, 10:05AM

Quiz 8 : Wednesday October 25th, 15-20 minutes, during the recitation 10:05AMon homeworks #9

- October 24th& 26th Kernel, Image, Subspaces, & Least Squares I & II, C2 *Chapter 3 Section 1-2-3 (back to Course Outline)*

Reading: C2 *Chapter 3 Section 1-2-3*

Homework 10 : C2 p.157 Exercises *1.2, 1.3, 1.5, 1.7, 1.8, 1.10, 1.11, 1.12*
p.174-175 Exercises *2.1, 2.2, 2.3, 2.5, 2.6, 2.8*
p.185-187 Exercises *3.2, 3.5, 3.8, 3.10, 3.13, 3.15*

Due date : Monday October 30th, 10:05AM

Due date : Monday October 30th, 10:05AM

- October 31st : Reviewing *Chapters 1 & 2 & 3.1-3.3* *(back to Course Outline)*

Wednesday November 1st, during the recitation 10:00AM, on C^2 Chapters 1 & 2 & 3.1-3.3

(back 1-Hour Test)

- November 2nd: Kernel, Image, Subspaces, & Least Squares III, C2 *Chapter 3 Section 4-5* *(back to Course Outline)*

Reading: C2 *Chapter 3 Section 4-5*

Homework 11 : C2 p.196-198 Exercises *4.2, 4.3, 4.6, 4.9, 4.11, 4.14, 4.19, 4.20*
p.207 Exercises *5.1, 5.2, 5.3, 5.5, 5.6, 5.7,*
Due date : Monday November 6th, 10:05AM
Quiz 9 : Wednesday November 8th, 15-20 minutes, during the recitation 10:05AM on homeworks #11

- November 7th & 9th: Orthogonal Projections, Gram-Schmidt I & II, C2 *Chapter 3 Section 5-6-8* *(back to Course Outline)*

Reading: C2 *Chapter 3 Section 5-6-7-8 (read also section 7, even if it is not taught in class).*

Homework 12 : C2 p.219 Exercises *6.1 to 6.13*
p.232 Exercises *8.1 to 8.7*
Due date : Monday November 13th, 10:05AM
Quiz 10 : Wednesday November 15th, 15 minutes, during the recitation 10:05AM on Section 3.3-3.4-3.5

- November 14th & 16th: Determinants C2 I & II *Chapter 4 Section 1-2-3-4* *(back to Course Outline)*

Reading: C2 *Chapter 4 Section 1-2-3-4*

Homework 13 : C2 p.247-248 Exercises *from 1.1 to 1.5*
p.259-260 Exercises *2.1, 2.2, 2.3, 2.4, 2.5*
p.270-271 Exercices *3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.9*
p.281 Exercices *4.1 to 4.3*
Due date : Monday November 20th, 10:05AM
Quiz 11 : Tuesday November 21st, 15 minutes, during the lecture 9:35AM on homeworks #13

- November 21th: (*Thanksgiving is on the 23th*)

Eigenvalues, Eigenvectors I C2 *Chapter 5 Section 1* *(back to Course Outline)*
Reading: C2 *Chapter 5 Section 1*

Homework 14 : C2 p.293-296 Exercices *1.1 to 1.22*

Homework 14 : C2 p.293-296 Exercices *1.1 to 1.22*
Due date : Monday November 27th, 10:05AM
Quiz 12 : Wednesday November 29th, 15 minutes, during the recitation 10:05AM on homeworks #14

- November 28th & 30th: Eigenvalues, Eigenvectors II & III C2 *Chapter 5 Section 2-3* *(back to Course Outline)*

Reading: C2 *Chapter 5 Section 2-3*

Homework 15 : C2 p.301-303 Exercices *2.1, 2.2, 2.3, 2.6, 2.7, 2.11*
p.313-315 Exercices *3.1, 3.2, 3.3, 3.9, 3.10*
Due date : Monday December 4th, 10:05AM
Quiz : *No quiz*

- December 5th & 7tht: Eigenvalues, Eigenvectors IV&V C2 *Chapter 5 Section 4-5* *(back to Course Outline)*

Reading: C2 *Chapter 5 Section 4-5*

Homework 16 : C2 p.325-327 Exercices *4.1 to 4.12*
p.342-343 Exercices *5.1, 5.2, 5.3, 5.5, 5.7, 5.10*

: *Thursday December 14th, 2006 8:00-10:50am* (see Calendar)

Training exercises click here (back)

- **August 25 2004 (15min quiz)**
- **September 1 2004 (15min quiz)**
- **September 8 2004 (15min quiz)**
- **September 21 2005 (15 min quiz)**
- **September 28 2005 (50 min test)**
- **September 22 2004 (1/2 hour test)**

Georgia Institute of Technology

Math 1512 - Honors Calculus II – Fall 2010

	Room	Days/Time
Lecture (K1,K2)	Skiles 271	TR 1:35pm – 2:55pm
Recitation (K1)	Skiles 271	MW 11:05am – 11:55am
Recitation (K2)	Skiles 268	MW 11:05am – 11:55am

Instructor: Anton Leykin, see webpage for office hours
Office: Skiles 220
Phone: (404) 894-2710
Email: leykin@math.gatech.edu
Webpage: http://people.math.gatech.edu/∼aleykin3/math1512fall10

Teaching Assistants:

Section K1:	Jim Krysiak	jkrysiak@math.gatech.edu
Section K2:	Kai Ni	kni@math.gatech.edu

Texts:
Tom M. Apostol, *Linear Algebra, a first course with applications to differential equations*, Salas, Hille, and Etgen, *Calculus* (10^{th} edition).

Description: While few single variable calculus topics are covered, the main emphasis of the course is on linear algebra and its applications to difference and differential equations.

Prerequisite: AP Calculus BC score of 5

Attendance and make-up exams: Attendance is required for all lectures. The student who misses a class meeting is responsible for any assignments and/or announcements made. *In the event of an absence due to travel representing Georgia Tech, such as an intercollegiate sports competition, you must notify the professor at least two weeks in advance to arrange an early test or other alternative.* Otherwise, such absences will be treated as personal.

Homework: This course will have daily homework assignments, which should be done before the next class. Homework will be collected every Wednesday at the beginning of the recitation (except the weeks of exams, first week, and the final week). *Do not include problems assigned in the current week (Tuesday lecture), but turn in all assignments of the previous week.* A randomly selected subset of problems will be graded.

Exams: This course will have 2 mid-term exams, and a comprehensive final exam. The exams for the course will take place on:

Exam 1	Sep 28 (Tue)
Exam 2	Nov 2 (Tue)
Final Exam	Dec 14 (Tue) 2:50pm - 5:40pm

Calculators: By default calculators are not allowed.

Learning Disabilities: It is the right of any student with a certified learning disability to request necessary accommodation. Such requests must be made well in advance of the time that the accommodation is required and a letter of documentation from the ADAPTS office must be presented at the time of any request.

Academic Honesty: It is expected that all students are aware of their individual responsibilities under the Georgia Tech Academic Honor Code, which will be strictly adhered to in this class.

Additional Resources: In addition to the textbook, lectures, and office hours there are other resources available that might be of use for you during the course. All Georgia Tech students are eligible for 1-on-1 tutoring, see the website associated with the Office of Success Programs. There is also the Math Lab in the School of Mathematics where tutoring services are provided. Links to more resources are posted on the webpage.

Grades: The usual ten-point scale will be used (A: 90-100%, B: 80-89%, C: 70-79%, D: 60-69%, F: 0-59%), however, if necessary, adjustments will be made to arrive at a standard grade distribution. Total scores will be computed using the following formula:

$$\textbf{Homework} + \textbf{Exam}_1 + \textbf{Exam}_2 + 2 \times \textbf{Final},$$

where the maximal value of each item is equal to 100. (Each homework set is 10 points, 10 best scores count.)

Tentative list of topics:

- *Linear algebra:* Methods for solving systems of linear equations, geometry in $\mathbf{R}^n$, vector spaces, linear independence, bases and dimension, the Gram-Schmidt process, orthogonal projections, the method of least squares for solving over-determined systems, linear transformations and their matrix representations, change-of-basis formulas, the rank-nullity theorem, determinants, eigenvalues and eigenvectors, triangularization and diagonalization, the characteristic polynomial, the Cayley-Hamilton theorem, and diagonalization of symmetric operators.
- *Univariate calculus and Series:* Taylor polynomials and Taylor series, convergence tests for infinite series, power series, L'Hôpital's rule, and the exponential of a matrix.
- *Differential equations:* Solving systems of linear ODE's via matrix exponentials, existence and uniqueness theorems, variation of parameters, and power series solutions.

Important Dates for Fall 2010:

Aug 23	First day of classes
Aug 27	Last day to register
Sep 6	No class
Oct 15	Last day to drop individual courses with a grade of "W" by 4:00 pm ET
Oct 18-19	No classes
Oct 31	Last day to withdraw from school with "W" grades in all courses by 4:00 pm ET
Nov 25-26	No classes
Dec 10	Last day of classes