Math 510
Course Information and Policies

Course web-site: [http://orion.math.iastate.edu/lhogben/math510.html](http://orion.math.iastate.edu/lhogben/math510.html)
Lectures: MWF 9-9:50 AM in Carver 290

Instructor: Leslie Hogben
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Personal web-sites: [http://orion.math.iastate.edu/lhogben/homepage.html](http://orion.math.iastate.edu/lhogben/homepage.html)
Telephone: 294-8168 (message may not be received; e-mail or in person is better or my cell)
Office: 488 Carver
Office Hours: tentatively T 12:10-1 PM, WF 10-10:50 AM, by appointment, or whenever you find me

TA: Nicole Kingsley
Office: 402 Carver
Office Hours: 11-noon T Th
Discussion/review session: tentatively 3:10 Th (first meeting 8/29 in 401 Carver)

Math 510 is the core graduate linear algebra course that prepares students to use linear algebra in their work and prepares students for part of the Algebra Qualifying Examination.

Content (See also daily updates on web-site.)
- Vector spaces: subspaces, basis, coordinate vectors, change of basis.
- Matrix arithmetic for partitioned matrices.
- Linear transformations: matrix of a transformation, kernel, range, rank, Dimension Theorem, linear functionals, dual basis.
- Determinants and their properties.
- Inner products: Cauchy-Schwartz inequality, orthonormality, Gram-Schmidt, projection, Hermitian adjoint of a matrix and transformation.
- Eigenvalues, eigenvectors, characteristic polynomial, minimal polynomial, Cayley-Hamilton Theorem, algebraic and geometric multiplicity, diagonalization.
- Unitary matrices and transformations, normal matrices and transformations, unitary diagonalization of normal matrices, Spectral Theorem, Schur's Unitary Triangularization Theorem.
- Canonical forms: Jordan canonical form, rational canonical form, invariant factors, elementary divisors, Primary Decomposition Theorem.
- Hermitian matrices, Rayleigh-Ritz Theorem, variational characterization of eigenvalues (min-max) and applications, positive-definite matrices.

Assessment
Your grade will be based on:
- 1 one hour exam: 50 points
- 1 take-home examination: 50 points (computation of canonical forms using computer)
- final examination: 100 points
- graded homework: 50 points (5 assignments, 10 points each)

See web-site for dates.

Your grade will not be worse than that obtained from an 90, 80, 70, 60 scale applied to the above total, and may be better. There is no curve in the traditional sense, in that you are not competing against each...
other, but against an objective standard- the goal is to have everyone succeed. Note that I interpret a
grade of A to mean I think you are prepared to pass the linear part of the algebra qualifer and a grade of
B to mean that you have satisfactorily completed the PhD core course requirement in linear algebra.

Discussion Homework  The discussion homework assigned in each class and listed on the web-site will
not be graded; it is intended to help you learn the material and prepare for the examinations. There will
be five graded homework assignments, clearly identified.

Collaboration and outside resources  You are encouraged to work together and/or utilize the library or
internet, using whatever method helps you learn, except that the following restrictions apply to graded
work:

- You should not use outside sources (books, internet, people not involved in this course) for any
  graded work.
- You may discuss graded homework assignments with other students enrolled in this class and/or
  with me (Leslie) but should not take any notes from these discussions and should not show your
  written solution to anyone prior to the posting of solutions. You must write up your own work
  and I should not be able to determine with whom you discussed it when I read it.
- You should not discuss your take-home test with anyone except me or Nicole.

Late graded homework policy  All assignments are given well in advance and should be
completed several days before due. Assignments may be submitted electronically in advance of
the due date (I send e-receipts- if you do not get one check with me because it probably was not
received). Homework assignments may be submitted up to 24 hours late with a 1 point (of 10)
penalty; after that they are not accepted, because solutions may be posted. In the case of a
documented excuse, such a note form a doctor documenting illness (which must cover a period
of 3 days or more), an alternate assignment may be given or other assignments may be weighted
more heavily at the discretion of the instructor.

Make-up examination policy  Permission to make up a missed examination is rare (only in case of
verifiable emergency- for foreseeable excuses notify me immediately after the date is announced and the
exam can be rescheduled); if approval is given, an excused missed mid-term examination may be made
up by giving greater weight to the final examination.

Disability Information  Iowa State University complies with the American with Disabilities Act and
Section 504 of the Rehabilitation Act. If a student has a disability that qualifies and requires
accommodations, he/she should contact the Disability Resources (DR) office for information on
appropriate policies and procedures. DR is located on the main floor of the Student Services Building,
Room 1076; their phone is 515-294-6624. Any student who requires an accommodation under such
provisions should contact Leslie Hogben privately as soon as possible and no later than the end of the
second week of class or as soon as documentation of the need for accommodation is obtained. Contact
may be made by e-mail (L.Hogben@iastate.edu) or in person (office 488 Carver). No retroactive
accommodations will be provided in this class.

All audible ringers of cell phones, pagers, etc. must be turned off and such electronic devices should not
be used, during class. All such electronic devices must be turned off and not visible during
examinations.

Any change to these policies will be announced in class, by e-mail and on the web-site.