Linear Algebra

Class code
MATH-UA 9140 - 001

Instructor Details
Prof. David Larman
806, Mathematics Department, University College London

Class Details
Linear Algebra Fall 2013
Wednesdays, 10.30-1.30
Location to be confirmed.

Prerequisites
Pre-calculus and High School Geometry

Class Description
This is an introductory course in the theory of linear transformations and abstract vector spaces. It is designed to familiarize students with the basic concept of a vector space and its algebraic properties and the manipulative techniques necessary to use matrices and determinants in solving applied problems. This course supports many applications in engineering, science, statistics and operations research.

The course is delivered through lectures and discussions. The amount of material covered may not allow for complete proofs to be given in class of all the results that are important. However, all proofs will be, at least, outlined. Students are expected to read carefully the recommended textbook.

Desired Outcomes
At the end of the course, students will be able to:
1. Understand the dimension of a vector space, rank of a matrix and basis for a vector space.
2. Use Gaussian elimination and LU decomposition to solve systems of linear equations.
3. Apply the knowledge of Linear Algebra to solve real life problems.
4. Understand the concept of spanning sets, linear independence, linear transformation and determinants.
5. Find eigenvalues and eigenvectors, and diagonalize matrices.

Assessment Components
There will be weekly assignments; a mid-term exam and a final exam. The breakdown of the marks for the overall assessment are: Weekly assignments 40%, Mid-Term 20%, Final Exam 40%
Failure to submit or fulfil any required course component results in failure of the class.
### Assessment Expectations

**Grade A:** A thorough understanding of both theory and methods.

**Grade B:** A good understanding of the theory and complete confidence in applying the methods.

**Grade C:** A good understanding of the theory and reasonable competence in the methods.

**Grade D:** A reasonable understanding of both theory and methods.

**Grade F:** An inability to master the theory and methods to an acceptable level.

### Grade conversion

NYU in London uses the following scale of numerical equivalents to letter grades:

- **A**=94-100
- **A-**=90-93
- **B+=**87-89
- **B=**84-86
- **B-**=80-83
- **C+=**77-79
- **C=**74-76
- **C-**=70-73
- **D+=**67-69
- **D=**65-66
- **F=**below 65

Where no specific numerical equivalent is assigned to a letter grade by the class teacher, the mid point of the range will be used in calculating the final class grade (except in the A range, where 95.5 will be used).

### Grading Policy

NYU in London aims to have grading standards and results in all its courses similar to those that prevail at Washington Square.

### Attendance Policy

NYUL has a strict policy about course attendance. **No unexcused absences are permitted.** While students should contact their class teachers to catch up on missed work, you should **NOT** approach them for excused absences.

Excused absences will usually only be considered for serious, unavoidable reasons such as personal ill-health or illness in the immediate family. Trivial or non-essential reasons for absence will not be considered.

Excused absences can only be considered if they are reported in accordance with guidelines which follow, and can only be obtained from the appropriate member of NYUL's staff.

**Please note that you will need to ensure that no make-up classes – or required excursions - have been organised before making any travel plans for the semester.** See also section 11.1 - Make up days.
Absence reporting for an absence due to illness

1. On the first day of absence due to illness you should report the details of your symptoms by e-mailing absences@nyu.ac.uk including details of: class(es) missed; professor; class time; and whether any work was due including exams. Or call free (from landline) 0800 316 0469 (option 2) to report your absences on the phone.

2. Generally a doctor’s note will be required to ensure you have sought treatment for the illness. Contact the Gower Street Health Centre on 0207 636 7628 to make an appointment, or use HTH general practitioners if you cannot get an appointment expediently at Gower Street.

3. At the end of your period of absence, you will need to complete an absence form online at http://bit.ly/NuCl5K. You will need to log in to NYU Home to access the form.

4. Finally you must arrange an appointment to speak to Nigel Freeman or Donna Drummond-Smart on your first day back at class. You must have completed the absence form before making your appointment.

Supporting documentation relating to absences must be submitted within one week of your return to class.

Absence requests for non-illness reasons

Absence requests for non-illness reasons must be discussed with the Academic Office prior to the date(s) in question – no excused absences for reasons other than illness can be applied retrospectively. Please come in and see us in Room 308, 6 Bedford Square, or e-mail us at academics@nyu.ac.uk.

Further information regarding absences

Each unexcused absence will be penalized by deducting 3% from the student’s final course mark. Students are responsible for making up any work missed due to absence.

Unexcused absences from exams are not permitted and will result in failure of the exam. If you are granted an excused absence from an examination (with authorisation, as above), your lecturer will decide how you will make-up the assessment component, if at all (by make-up examination, extra coursework, viva voce (oral examination), or an increased weighting on an alternate assessment component, etc.).

NYUL also expects students to arrive to class promptly (both at the beginning and after any breaks) and to remain for the duration of the class. If timely attendance becomes a problem it is the prerogative of each instructor to deduct a mark or marks from the final grade of each late arrival and each early departure.

Please note that for classes involving a field trip or other external visit, transportation difficulties are never grounds for an excused absence. It is the student’s responsibility to arrive at an agreed meeting point in a punctual and timely fashion.

Please refer to the Student Handbook for full details of the policies relating to attendance. A copy is in your apartment and has been shared with you on Google Docs.
of Work during office hours (Mon – Fri, 10:30 – 17:30). Please also send an electronic copy to academics@nyu.ac.uk for submission to Turnitin.

Work submitted within 5 weekdays after the submission time without an agreed extension receives a penalty of 10 points on the 100 point scale.

Written work submitted more than 5 weekdays after the submission date without an agreed extension fails and is given a zero.

Please note end of semester essays must be submitted on time.

Plagiarism Policy

Plagiarism: the presentation of another piece of work or words, ideas, judgements, images or data, in whole or in part, as though they were originally created by you for the assignment, whether intentionally or unintentionally, constitutes an act of plagiarism.

Please refer to the Student Handbook for full details of the plagiarism policy.

All students must submit an electronic copy of each piece of their written work to www.turnitin.com and hand in a printed copy with the digital receipt to their professor. Late submission of work rules apply to both the paper and electronic submission and failure to submit either copy of your work will result in automatic failure in the assignment and possible failure in the class.

Electronic Submission

The Turnitin database will be searched for the purpose of comparison with other students’ work or with other pre-existing writing or publications, and other academic institutions may also search it.

In order for you to be able to submit your work onto the Turnitin website, you will need to set up an account:

1) Go onto the Turnitin website http://www.turnitin.com
2) Click ‘Create Account’ in the top right hand corner
3) Select user type of ‘student’
4) Enter your class ID & Turnitin class enrolment password (these will be e-mailed to you after the drop/add period, or contact academics@nyu.ac.uk if you have misplaced these).
5) Follow the online instructions to create your profile.

To submit your work for class, you will then need to:

1) Log in to the Turnitin website
2) Enter your class by clicking on the class name
3) Next to the piece of work you are submitting (please confirm the due date), click on the ‘submit’ icon
4) Enter the title of your piece of work
5) Browse for the file to upload from wherever you have saved it (USB drive, etc.), please ensure your work is in Word or PDF format, and click ‘submit’
6) Click ‘yes, submit’ to confirm you have selected the correct paper (or ‘no, go back’ to retry)
7) You will then have submitted your essay onto the Turnitin website.
8) Please print your digital receipt and attach this to the hard copy of your paper before you submit it to your professor (this digital receipt appears on the web site, immediately after you submit your paper and is also sent to your e-mail address). Please also note that when a paper is submitted to Turnitin all formatting, images, graphics, graphs, charts, and drawings are removed from the paper so that the program can read it accurately. Please do not print the paper in this form to submit to your
lecturers, as it is obviously pretty difficult to read! You can still access the exact file you uploaded by clicking on the ‘file’ icon in the ‘content’ column.

Please also see the Late Submission of Work policy, above.

Students must retain an electronic copy of their work for one month after their grades are posted online on Albert and must supply an electronic copy of their work if requested to do so by NYU in London. **Not submitting a copy of a piece of work upon request will result in automatic failure in the assignment and possible failure in the class.** NYU in London may submit in an electronic form the work of any student to a database for use in the detection of plagiarism, without further prior notification to the student.

Penalties for confirmed cases of plagiarism are set out in the Student Handbook.

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**Required Text(s)**

**Supplemental Text(s) (not required to purchase as copies are in NYU-L Library)**


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**Internet Research Guidelines**
Not Applicable.

**Additional Required Equipment**
Pen and paper.

**Session 1**
4th Sept.2013
Introduction to Vectors and Mathematical Proofs: The Geometry and Algebra of Vectors (1.1). Length and Angle. The Dot Product (1.2).
First assignment set

**Session 2**
11th Sept 2013
Introduction to Systems of Linear Equations (2.1).
Second assignment set, first assignment due.

**Session 3**
Direct Methods for Solving Linear Systems (2.2).
18th Sept. 2013 Second assignment due, third assignment set.

**Session 4**

Spanning sets and linear independence (2.3)


**Session 5**

Applications of linear equations (2.4).

2nd Oct. 2013 5th assignment set, fourth assignment due

**Session 6**

Matrices, matrix operations (3.1) and matrix algebra (3.2).

9th Oct. 2013 Sixth assignment set, fifth assignment due.

**Session 7**

The inverse of a matrix (3.3) and the LU factorization (3.4).

16th Oct. 2013 Seventh assignment set, sixth assignment due.

**Session 8**

Revision and two hour mid-term exam

23rd Oct. 2013 No assignment

**Session 9**

Matrices: subspaces, basis, dimensions and rank (3.5)


**Session 10**

Introduction to Linear Transformations (3.6)

Session 11
13th Nov.2013
Eigenvalues and eigenvectors, determinants (4.2).
Tenth assignment set, ninth assignment due.

Session 12
20th Nov.2013
Eigenvectors and eigenvalues of nxn matrices
Tenth assignment due, 11th assignment set

Session 13
27th Nov.2013
Similarity and diagonalization (4.4)
12th assignment set, 11th assignment due.

Session 14
4th Dec.2013
General vector spaces: linear independence, basis and dimension (6.2)
No assignment

Session 15
11th Dec.2013
Final exam. Two hours 30 minutes.

Classroom Etiquette
Mobile phones and other electronic devices switched off.

Required Co-curricular Activities
None

Suggested Co-curricular Activities
Visit Grantham and Woolsthorpe in Lincolnshire, birth place of Isaac Newton (and Margaret Thatcher).
See the apple tree which inspired Newton’s theory of gravity.

Your Instructor