Term Information

Effective Term	Summer 2018
Previous Value	*Summer 2012*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

Add DL designation to course.

What is the rationale for the proposed change(s)?

This course in in high-demand to be offered online. A well-developed online component is now available to be offered for this course.

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

None.

Is approval of the requrest contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Mathematics
Fiscal Unit/Academic Org	Mathematics - D0671
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	2568
Course Title	Linear Algebra
Transcript Abbreviation	Linear Algebra
Course Description	Matrix algebra, vector spaces and linear maps, bases and dimension, eigenvalues and eigenvectors, applications.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week, 8 Week, 7 Week, 6 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	Yes
Is any section of the course offered	100% at a distance
Previous Value	*No*
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark

Prerequisites and Exclusions

Prerequisites/Corequisites	Prereq: A grade of C- or above in 1172, 1544, 2153, 2162.xx, 2182H, or 4182H; or a grade of C- or above in both 1152 and CSE 2321; or credit for 154, 254.xx, 263.xx, 263.01H, or 264H.
Exclusions	Not open to students with credit for 4568 (568), 5520H (520H), or 572.
Electronically Enforced	No

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	27.0101
Subsidy Level	Baccalaureate Course
Intended Rank	Freshman, Sophomore

Requirement/Elective Designation

Required for this unit's degrees, majors, and/or minors
The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Understand linear systems and matrix algebra
- Understand vector spaces
- Understand linear transformations
- Understand eigenvalues and eigenvectors
- Understand scalar products

Previous Value

Content Topic List

- Systems of linear equations
- Matrix algebra
- Vector spaces; independence and dimension; linear operators and their matrices
- Eigenvalues and eigenvectors
- Inner products, orthogonal bases, least squares
- Applications

Sought Concurrence No

Attachments

- deadline appeal_012918.pdf: Deadline Appeal

  (Appeal. Owner: Husen,William J)

- sp18_2568_syllabus.pdf: Syllabus

  (Syllabus. Owner: Husen,William J)

- Math 2568 Ogle.pdf: ODHE Checklist for DL course

  (Other Supporting Documentation. Owner: Husen,William J)

- SU17_online_Math_2568_syllabus.pdf: Online syllabus

  (Syllabus. Owner: Husen,William J)

- SU17_online_modular_calendar.pdf: Online calendar

  (Syllabus. Owner: Husen,William J)

Comments

- DL syllabus now attached *(by Husen,William J on 02/06/2018 09:29 AM)*
- Two syllabi should be uploaded:one for the in-person (in-class) version and one for the distance learning version.

  The distance learning syllabus is not uploaded. *(by Vankeerbergen,Bernadette Chantal on 02/05/2018 08:55 AM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Husen,William J	01/29/2018 10:34 AM	Submitted for Approval
Approved	Husen,William J	01/29/2018 10:34 AM	Unit Approval
Approved	Haddad,Deborah Moore	02/05/2018 08:03 AM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	02/05/2018 08:55 AM	ASCCAO Approval
Submitted	Husen,William J	02/06/2018 09:29 AM	Submitted for Approval
Approved	Husen,William J	02/06/2018 09:29 AM	Unit Approval
Approved	Haddad,Deborah Moore	02/06/2018 09:38 AM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Oldroyd,Shelby Quinn Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler	02/06/2018 09:38 AM	ASCCAO Approval

Spring 2018 MATH 2568 Linear Algebra

Class Time: 12:40-1:35pm MWF (call number 32366) **Instructor: Yu TSUMURA**

➢ **Instructor's Information**

Office: Mathematics Tower (MW) 400

Email: tsumura.2@osu.edu

Office Hour: Monday & Tuesday 10:00-11:30AM

Grader: Chen, Junjie [chen.5810@osu.edu] MW200

Please contact your grader for any question regarding grades of your assignments.

Website: https://yutsumura.com/math-2568-linear-algebra-spring-2018/

➢ **Course Description**

Matrix algebra, vector spaces and linear maps, bases and dimension, eigenvalues and eigenvectors, applications.

➢ **Materials**

Required in Class:

Linear Algebra Workbook by Yu Tsumura (I will give handouts in class)

A binder is useful as I give many handouts.

Reference:

This is Linear Algebra by Crichton Ogle (available on my website)

➢ **Grading**

(1)	Midterm Exam 1	100 pts
(2)	Midterm Exam 2	100 pts
(3)	Final Exam	200 pts
(4)	Homework	130 pts
(5)	Attendance	30 pts
	Total	**560 pts**

Points	560-504	503-487	486-465	464-448	447-431	430-409	408-392	391-375	374-353	352-336	335-
%	100-90	89-87	86-83	82-80	79-77	76-73	72-70	69-67	66-63	62-60	59-
Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	E

Your grade will be determined only by total points you obtain.

NO CURVES by the Math Department policy.

➢ **Requirements**

1. Midterm Exams

Two in-class midterm exams will be given. No calculators, no electric devices, no notes, no books are allowed.

1st Midterm Exam: Feb. 9th (F)

2nd Midterm Exam: Mar. 28th (W)

2. Final Exam

Final exam will be given during the exam week. (**May. 1st (T) 12:00-1:45pm**)

It is cumulative.

3. Homework

13 homework assignments will be given throughout the semester (10 pts each). Some problems may not be graded. Each homework is due in class. Late homework will not be accepted.

You may handwrite your solutions or you may use a word processor but you may be asked to submit the source file as well. Your handwriting must be neat so that the grader can read it with no effort. Think your homework is a report for your future employer. Do not submit your first draft computation. You need to revise it so that your idea is well-presented to the grader.

When you solve homework problems, you are encouraged to work in groups, but you should be honest with yourself: being able to nod along when the solution is told to you is not the same as being able to solve the problem yourself.

You may discuss homework scores (with the grader) or exam scores (with the instructor) only within a week after the date the instructor return them in class. After a week, all scores will be finalized.

4. Attendance

The first **three absences** will not be penalized. From the fourth absence on, **each will lower your attendance grade by 5 points from the maximum 30 pts.** If your attendance point is zero, then your final grade is automatically E. If you have a legitimate reason (influenza, extended illness, job interview, school trip, family emergency) you may be excused. In such case, you must notify your instructor in advance with **the official document** issued by an authority. In any case, you have to initiate the communication with the instructor to avoid grade reduction. Every tardiness of 20 minutes or more will count as an absence. If you leave before the class ends without the instructor's permission, you will not receive the attendance point.

➢ **How to Succeed/Expectation**

Before each lecture, you are required to read the Linear Algebra Workbook and do some practice problems. These practice problems will not be collected but they help you understand the materials. and activities in class. The instructor will assume that you have read the workbook and did practice problems. Refer to "Preparation" in the workbook for required practice problems.

➢ **Cheating Policy**

Cheating on your in-class quizzes and exams will result in **an automatic "F"** for the entire course. Those who let someone see his/her paper will receive a score of zero on that quiz/exam.

➢ **Make-up Policies**

No make-up tests will be given except under unusual circumstances which are beyond your control. The need for a make-up must be expressed to the instructor **IMMEDIATELY** with supporting documents. Make-up exams must be taken within one week of the original date.

➢ **Academic Misconduct**

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-48.7). For additional information, see the Code of Student Conduct at http://studentlife.osu.edu/csc/.

➢ **Students with Disabilities**

Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614- 292-3307, slds@osu.edu; http://slds.osu.edu

➢ **Important Dates**

Feb. 2nd (F) Last Day to drop without a "W"
Mar. 23rd (F) Last day to drop without petitioning
For more information regarding important dates of the registration, go to
https://registrar.osu.edu/registration/Important_dates/SP18_important_dates.pdf

Schedule (tentative)

				Homework Due	Topics (the order is subject to change)
1		1/8	M		
2	Week 1	1/10	W		
3		1/12	F		
		~~1/15~~	~~M~~	**MLK Day (No Class)**	
4	Week 2	1/17	W	HW1	Intro to Matrices and Systems of Linear Algebra
5		1/19	F		Echelon Form and Gaussian-Jordan Elimination
6		1/22	M		Consistent Systems of linear Equations
7	Week 3	1/24	W	HW2	Matrix Operations
8		1/26	F		Algebraic Properties of Matrix operations
9		1/29	M		Linear Independence and Nonsingular Matrices
10	Week 4	1/31	W	HW3	Matrix Inverses and Their Properties
11		2/2	F		
12		2/5	M		
13	Week 5	2/7	W	HW4	
14		2/9	F		**Midterm Exam 1**
15		2/12	M		
16	Week 6	2/14	W	HW5	
17		2/16	F		
18		2/19	M		
19	Week 7	2/21	W	HW6	Vector Space Properties of R^n
20		2/23	F		Examples of Subspaces
21		2/26	M		Bases for Subspaces
22	Week 8	2/28	W	HW7	Dimension
23		3/2	F		Vector Spaces
24		3/5	M		Subspaces
25	Week 9	3/7	W	HW8	Linear Independence, Bases, and Coordinates
26		3/9	F		Orthogonal Bases for Subspaces
		3/12-3/16	M-F	**Spring Break (No Class)**	Linear Transformation from R^n to R^m
27		3/19	M		
28	Week 10	3/21	W	HW9	
29		3/23	F		
30		3/26	M		
31	Week 11	3/28	W	~~HW10~~	**Midterm Exam 2**
32		3/30	F	HW10	
33		4/2	M		
34	Week 12	4/4	W	HW11	
35		4/6	F		The Eigenvalue Problem for 2x2 Matrices
36		4/9	M		Determinants and the Eigenvalue Problem
37	Week 13	4/11	W	HW12	Eigenvalues and Characteristic Polynomial
38		4/13	F		Eigenvectors and Eigenspaces
39		4/16	M		Complex Eigenvalues and Eigenvectors
40	Week 14	4/18	W	HW13	Similarity Transformations and Diagonalization
41		4/20	F		
42	Week 15	4/23	M		

Final Exam: May. 1st (T) 12:00-1:45pm

Arts and Sciences Distance Learning Course Component Technical Review Checklist

Course: Linear Algebra (Mathematics 2568)
Instructor: Crichton Ogle
Summary: Online course offering (Hyflex Model)

Standard - Course Technology	Yes	Yes with Revisions	No	Feedback/ Recomm.
6.1 The tools used in the course support the learning objectives and competencies.	✓			The learning objectives and competencies are supported by the course tools used in this course in the following ways. • Topic based synchronous/asynchronous video lectures • Interactive textbook Q&A sessions • Lecture prompted online activities • Assigned readings with homework problems • Weekly short quizzes • Discussion forum for peer discussions of course content • Real time chat during synchronous lectures
6.2 Course tools promote learner engagement and active learning.	✓			Students will engage with the course materials and instructor on a weekly basis in the following ways to promote active learning. • Ximera • Carmen LMS • Twitch.tv • YouTube
6.3 Technologies required in the course are readily obtainable.	✓			All technologies listed in the course syllabus are readily obtainable and can be accessed or downloaded with an internet connection and web browser.
6.4 The course technologies are current.	✓			All technologies listed in the course syllabus are current and can easily be accessed with an internet connection and web browser.
6.5 Links are provided to privacy policies for all external tools required in the course.	✓			Links have beeen provided in the “Course technology” section of the syllabus to the privacy policy statements for the following external tools being used for this course. • YouTube

				• Twitch.tv
Standard - Learner Support				
7.1 The course instructions articulate or link to a clear description of the technical support offered and how to access it.	✓			Links to the technical support offered for YouTube, Twitch.tv Carmen and Ximera have been included in the syllabus.
7.2 Course instructions articulate or link to the institution's accessibility policies and services.	✓			a
7.3 Course instructions articulate or link to an explanation of how the institution's academic support services and resources can help learners succeed in the course and how learners can obtain them.	✓			b
7.4 Course instructions articulate or link to an explanation of how the institution's student services and resources can help learners succeed and how learners can obtain them.	✓			c
Standard – Accessibility and Usability				
8.1 Course navigation facilitates ease of use.	✓			Recommend using the Carmen Distance Learning "Master Course" template developed by ODEE and available in the Canvas Commons to provide student-users with a consistent user experience in terms of navigation and access to course content.
8.2 Information is provided about the accessibility of all technologies required in the course.	✓			Links have been provided in the "Accessibility" section of the syllabus to the accessibility statements for all tools listed below. • Carmen • Ximera • YouTube • Twitch.tv
8.3 The course provides alternative means of access to course materials in formats that meet the needs of diverse learners.	✓			Recommend that resources be developed to address any requests for alternative means of access to course materials. These resources should be in formats that meet the needs of diverse learners.
8.4 The course design facilitates readability	✓			Recommend using the Carmen Distance Learning "Master Course" template developed by ODEE and available in the Canvas Commons to provide student-users with a consistent user experience in terms of navigation and access to course content.
8.5 Course multimedia facilitate ease of use.	✓			All assignments and activities with embedded multimedia facilitate ease of use through a web browser.

Reviewer Information

- Date reviewed: 4/26/2017
- Reviewed by: Mike Kaylor

Notes:
[a]The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know via email immediately so that we can privately discuss options. You are also welcome to register with Student Life Disability Services to establish reasonable accommodations. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information:slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue. **Consider putting text for the accessibility statement in BOLD 16 pt font.**

[b]Add to the syllabus this link with an overview and contact information for the student academic services offered on the OSU main campus.
http://advising.osu.edu/welcome.shtml

[c]Add to the syllabus this link with an overview and contact information for student services offered on the OSU main campus. http://ssc.osu.edu. Also, consider including this link in the “Other Course Policies” section of the syllabus.

Math 2568/4568 Summer 2017
Course Information

This is a Canvas-based course. The complete textbook is online, and the subject matter for the course itself is contained in four modules which appear under "Modules" on your Canvas course page. The online text contains both embedded examples and exercises. Specific information for the course follows.

Instructor information

Instructor: Prof. Crichton Ogle

Office: MW410

email: Please use the Canvas email system to contact me.

Office hours: MWF $3-4$ or by appointment (online hours to be determined).

Numerical grade breakdown of 500-point total

Homework: 100 points (based on four homework assignments worth 25 points each).

Online homework: 100 points.

Midterm: 100 points.

Final Exam: 200 points

Online computational engine for linear algebra

Octave online: https://octave-online.net/

Disability Statement: Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614-292-3307, slds@osu.edu; (http://slds.osu.edu).

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Modules

Module I - Linear systems and row reduction

Topics include: Systems of linear equations, augmented coefficient matrix representation, computing the set of solutions via row operations, reduced row echelon form, matrix representation of a system, matrix algebra.

Module II - Vector spaces and coordinates

Topics include: Axiomatic definition of a vector space, subspace, direct sum, linear combination of a set of vectors, linear independence and spanning sets, bases, coordinate systems, linear transformations and their matrix representations, row and column space, null space, rank-nullity theorem.

Module III - Eigenvalues and determinants

Topics include: Definition and properties of the determinant, eigenvalues and eigenvectors, characteristic polynomial, eigenspaces, algebric vs geometric multiplicity, diagonalizable matrices, Schur's Theorem.

Module IV - Inner products and applications

Topics include: Symmetric bilinear pairings and their matrix representation, inner products, orthogonality, orthogonal decomposition, projection formulas, fundamental subspaces theorem, least squares approximation, least-squares solution to a linear system, polynomial fitting of data sets, and additional applications.

Modular Guide to the DL Lineaar Algebra course

Crichton Ogle

Dept. of Mathematics OSU

Module 1 - Linear Systems

Topics covered:

- Overview of linear systems and basic terminology
- The augmented coefficient matrix of a system
- Plan for row reduction and the three types of row operations
- Algorithms for row reduction
- Decoding the reduced row echelon form
- Matrix equations and matrix algebra
- General solutions and the superposition princople
- Elementary matrices
- Column operations

Module 2 - Vector Spaces

Topics covered:

- Basic examples - Euclidean n-space
- Axiomatic definition of an abstract vector space
- Linear combinations and linear independence
- Spanning sets and bases
- Subspaces and basic examples (Span of a set of vectors, null-space of a matrix)
- Dimension of a vector space
- Coordinate systems and coordinate vectors
- Linear transformations between vector spaces
- Matrix representation of a linear transformation, and the change of basis formula

Module 3 - Eigenvectors and Eigenspaces

- Definition of an eigenvector of a square matrix A, and its corresponding eigenvalue
- The determinant of a matrix, and methods for computing it
- The characteristic polynomial of a square matrix and eigenvalues
- The eigenspace associated to an eigenvalue
- Algebraic vs geometric multiplicity of an eigenvalue
- Direct sum decompositions
- Similarity and diagonalization; defective matrices
- Complex eigenvalues and eigenspaces
- Schur's Theorem
- Normal matrices

Module 4 - Inner Product Spaces

- The dot product in $\mathbb{R}^n$
- Symmetric bilinear pairings on $\mathbb{R}^n$ and their representation
- Symmetric bilinear pairings on a vector space V and their representation
- Inner products on $\mathbb{R}^n$ and their representation
- Inner products on a vector space V and their representation
- Examples of inner products
- Orthogonal vectors and subspaces
- Projection onto subspaces and Gram-Schmidt orthogonalization
- Orthogonal and orthonormal bases
- Least-squares approximations and the Fundamental Subspaces Theorem
- Least-squares solutions
- Application of least-squares to computing projections
- Application of least-squares to polynomial data-fitting

THE OHIO STATE UNIVERSITY

College of Arts and Sciences
Department of Mathematics

100 Math Tower
231 W 18th Avenue
Columbus, OH 43210-1174

614-292-4975 Phone
614-292-1479 Fax

Math.osu.edu

January 29, 2018

Re: Deadline Appeal

To Whom It May Concern,

I am writing to request an exception to the standard deadlines for course change requests. In this case, the course change request is to add a distance learning certification to an existing course, Math 2568. I am asking for this deadline appeal so that this course change would be approved for a Summer 2018 (second session) offering of this course as a distance learning course.

Sincerely,

William J. Husen, Ph.D.
Director of Undergraduate Instruction