

Applied Linear Algebra: MATH 2002 - 41001

1 Contact Information

Professor: Dr. Blake Farman
Phone Number: (318) 342 - 1851
Email Address: farman@ulm.edu
Website: <https://ulm.edu/~farman>
Office: Walker 3-34
Office Hours: Monday/Wednesday: 9:00 AM - 12:00 PM
Tuesday/Thursday: 2:00 PM - 4:00 PM

1.1 Preferred Method of Communication

The best way to communicate with me during the semester is through email. I monitor my email Monday - Friday from 9:00 AM until 5:00 PM. I normally try to respond within one business day.

1.1.1 Official University Email Addresses

The University provides each student with an email address, username@warhawks.ulm.edu, and all official course correspondence will **only** be conducted using official university email addresses.

1.1.2 Email Etiquette

When you send an email, your message should contain the following information

- Subject:** A few words that describe the content of your email along with the course identifier (MATH 2002-41001).
- Salutation:** A professional greeting such as “Dear” or “Hello” followed by the appropriate honorific and the recipient’s last name.
- Body:** A concise message that clearly expresses the purpose of your email.
- Signature:** A simple closing (e.g. “Sincerely,” “Thank you,” “Best regards,” etc.) followed by your first and last name.

For your convenience, included below is an example email.

Subject: Homework Questions - Math 2002- 41001

Dear Professor Farman

I am having trouble with this week’s homework. I have tried working through the examples in the text, but I am struggling to understand the concepts involved. Could we schedule a time to meet before the next class to discuss some of the concepts in more detail?

Thank you,

Jane Doe

For more details, you can read this Medium post about [How to Email Your Professor](#).

2 Course Description

An introduction to the application of matrix algebra. Emphasis on the application of procedures and algorithms.

3 Course Prerequisites

You must have one of the following prerequisites to be eligible to be enrolled in Math 1011:

- A grade of C or better in MATH 1031 (or equivalent), or
- A grade of C or better in MATH 1014 (or equivalent).

4 Instructional Methods

This course is offered as a face-to-face course.

- Learning will be facilitated through face-to-face lectures and the online textbook.
- Homework assignments and written assessments are to be submitted in class.

4.1 Temporary Remote Instruction (TRI)

During the semester, class and/or campus operations might be disrupted by an occurrence such as a tornado, fire, or illness outbreak that temporarily prevents in-person instruction. Until in-person instruction is possible, the class will enter a phase of temporary remote instruction (TRI). During this phase, instruction will take place via virtual means, either synchronously or asynchronously. Your instructor will alert you when this happens via e-mail and will include a description of how the course will proceed.

4.2 Technical Requirements During TRI

During a period of temporary remote instruction, the need for the course to continue in a virtual manner means that you will be required to have appropriate equipment, software, and telecommunication access to allow you to participate. This course will require that you have the following, should we have to go into TRI:

- A stable internet connection that is capable of joining Zoom meetings and taking assessments.
- A web camera (internal or external) and a microphone that can be used for Zoom meetings.
- A device such as a scanner or a smartphone equipped with a scanning app such as Adobe Scan to upload assessments on Moodle.

5 Evaluation

This course will use **Mastery Based Grading**. The content is broken into *standards* that you are expected to master by the end of the course.

This grading system is *iterative* in the sense that you will have multiple opportunities to display mastery of each standard, and *forgetful* in the sense that your previous unsuccessful attempts are discarded once you demonstrate mastery of a standard.

Mastering a standard is a two-step process, consisting of mastering a Homework and a written Assessment. Each week we will cover around 1-2 standards and the homework that accompanies that standard. There will be a written Assessment that is due by the end of the following week.

Below, you can see a list of each standard and the homework that accompany them.

Systems of Equations

SE 1	I can identify whether or not a matrix is in Reduced Row Echelon Form. I can use Gaussian Elimination to put a matrix into Reduced Row Echelon Form. (§1.2)
Homework:	Section 1.2.5, Exercises 1 - 2
SE 2	I can use the Reduced Row Echelon Form of an augmented matrix to describe the solution space to a system of linear equations using appropriate notation. (§1.2)
Homework:	Section 1.2.5, Exercises 3 - 5
SE 3	I can use Pivot Positions to determine whether a linear system is consistent and, if so, whether the solution is unique. (§1.4)
Homework:	Section 1.4.4, Exercises 1 - 4

Vectors and Matrices

VM 1	I can add vectors together and scale vectors by a real number. I can determine whether a vector can be expressed as a linear combination of a set of given vectors. (§2.1)
Homework:	Section 2.1.4, Exercises 1 - 6.
VM 2	I can add matrices together and scale matrices by a real number. I can perform matrix-vector multiplication. I can perform matrix-matrix multiplication. I can translate a system of equations into a matrix equation of the form $A\mathbf{x} = \mathbf{b}$. (2.2)
Homework:	Section 2.2.6, Exercises 1 - 6.
VM 3	I can determine whether a vector is in the span of a given set of vectors. I can describe the span of a set of vectors as a set. I can use this information to determine whether a linear system is consistent. (§2.3)
Homework:	Section 2.3.4, Exercises 1 - 5, 10.
VM 4	I can determine whether a given set of vectors is linearly independent. (§2.4)
Homework:	Section 2.4.5, Exercises 1 - 5, 9 - 10.
VM 5	I can define a matrix transformation, find its domain and range, and I can compose matrix transformations. I can also determine whether a given function is a matrix transformation. (§2.5)
Homework:	Section 2.5.4, Exercises 1 - 7

Invertibility and Bases

IB 1	I can use Gaussian Elimination to determine whether a matrix is invertible and, if so, find its inverse. (§3.1)
Homework:	Section 3.1.5, Exercises 1, 4 - 7.
IB 2	I can find a basis for a space and translate between the associated coordinate systems. (§3.2)
Homework:	Section 3.2.5, Exercises 1 - 4, 6 - 7.
IB 3	I can compute the determinant of a given matrix and I can use this invariant to determine whether the matrix is invertible. (§3.4)
Homework:	Section 3.4.5, Exercises 1, 3 - 9.
IB 4	I can determine the null and column spaces for a given matrix and compute a basis for each. I can determine whether a given set satisfies the definition of a vector space. (§3.5)
Homework:	Section 3.5.5, Exercises 1 - 5.

Eigentheory

ET 1 I can determine whether a vector is an eigenvector of a given matrix and, if so, find the associated eigenvalue. (§4.1)

Homework: Section 4.1.4, Exercises 1,3,6.

ET 2 I can use the characteristic polynomial to find the eigenvalues of a given matrix and their multiplicities. I can find a basis for the eigenspace associated to an eigenvalue. (§4.2)

Homework: Section 4.2.6, Exercises 1,2,5.

ET 3 I can determine whether a given matrix is diagonalizable and, if so, compute the diagonal matrix to which it is similar. (§4.3)

Homework: Section 4.3.5, Exercises 1, 3, 4, 6, 7.

Orthogonality

OR 1 I can compute the dot product of two vectors and use this to compute the angle between two vectors. In particular, I can determine whether two vectors are orthogonal. (§6.1)

Homework: Section 6.1.4, Exercises 1 - 4.

OR 2 I can compute the transpose of a matrix and use the transpose to describe the orthogonal complement of a given vector space, including its dimension and a basis. (§6.2)

Homework: Section 6.2.4, Exercises 1 - 5.

OR 3 I can perform Orthogonal Decomposition. (§6.3)

Homework: Section 6.3.4, Exercises 1 - 6.

OR 4 I can use Gram-Schmidt Orthogonalization to find an orthogonal and orthonormal basis for a given vector space. (§6.4)

Homework: Section 6.4.4, Exercises 1 - 5.

5.1 Grading Scale

Letter grades will be assigned based on the number of standards mastered in the course, as specified in the table below

Grade	Number of Standards Mastered
A	18 - 19
B	16 - 17
C	14 - 15
D	12 - 13
F	0 - 11

5.2 Assessments

The weekly Assessments contain problems corresponding to the standards covered that week. The standards are graded *independently* and, unlike quizzes or tests that you may have had in the past, there is no partial credit. You must master *each* of the problems that go with the standard.

5.2.1 Problem Scoring

Written assessments in this course will be scored on the following scale.

Mastery:	The given solution is correct with no content related errors. Appropriate justification is provided in a clear, easy to follow manner.
Progressing:	The given solution demonstrates an understanding of the material, but contains content related errors or lacks justification.
Needs Improvement:	The given solution was blank, illegible, or used inappropriate techniques.

5.3 Reassessment

Homework

You may resubmit one homework set that you have not mastered each week. When reassessing, you only need to correct and resubmit the exercises with mistakes.

Standards

There are four scheduled Reassessments days for this course where you have the opportunity to reassess all of the standards that you have not yet mastered. You will be given an assessment that contains problems for *every* standard that you have not yet mastered, and you may attempt as many of those standards as time allows.

6 Class Policies and Procedures

At a minimum, all policies stated in the current ULM student policy manual & organizational handbook should be followed (see <http://www.ulm.edu/studentpolicy/>). Additional class policies include:

6.1 Textbook

The required text for this course is *Understanding Linear Algebra* by David Austin, which is freely available: <https://davidAustinm.github.io/ula/frontmatter.html>.

6.2 Health and Safety Requirements

In order to safeguard the health and safety of students, faculty, and staff during the COVID-19 pandemic, the University has instituted a variety of different protocols in response to State of Louisiana and University of Louisiana System mandates during the different phases of reopening. All students are expected to be in compliance with these required policies and procedures. This means that students will need to wear face masks, practice social distancing, and follow other requirements inside all campus buildings and while attending classes until such time as State and University authorities no longer mandate them. Students who fail to follow these guidelines could be subject to the Classroom Behavior Policy which can be found in the Student Handbook. As we continue to pursue learning during this unprecedented health crisis, please remember that you are being required to do these things to protect others and to show concern for their welfare; you should expect the same consideration in return.

Face masks have been shown to greatly reduce the risk of the transmission of the virus when they are appropriately constructed and worn. All face coverings, whether disposable or reusable, must

- be made with at least two layers of breathable material;
- fully cover the nose and mouth and secure under the chin;
- fit snugly but comfortably against the side of the face; and
- be secured on the face, allowing one to remain hands-free.

For more information about University policies and procedures regarding the COVID-19 pandemic, please visit <https://www.ulm.edu/coronavirus/>.

6.3 Attendance Policy

Students are expected to adhere to the Class Attendance Policy outlined in the ULM Student Policy Manual.

- Class attendance is regarded as an obligation and a privilege, and all students are expected to attend all required classes in which they are enrolled regularly and punctually. Failure to do so may jeopardize a student's scholastic standing and may lead to suspension from the University. **Students are responsible for the effect absences have on all forms of evaluating course performance.**
- In accordance with University policy, the instructor will take roll regularly. It is the student's responsibility to ensure that his/her attendance is recorded. To be marked present for a given class period, students must stay until the class is completed.
- Each student is responsible for all class material and assignments whether or not the student is present. If a student misses class, then he/she is expected to check Moodle and ULM email for announcements and to work on the assignments listed on Moodle.
- A student accumulating absences of 25% of the class meetings regardless of the reasons (excused or unexcused) will be reported to the Dean of Arts, Education, & Sciences which could result in academic withdrawal from the course or a course grade of F. This may be avoided if the course is dropped; however, it is the responsibility of the student to drop the course. Class removal carries with it the penalties of being assigned a grade of W or F, whichever is appropriate, and no credit for the course. Academic withdrawal may negatively impact a student's full-time status.
- If a student comes to class late, it is his/her responsibility to let the instructor know after class to be counted present and to receive the appropriate attendance credit.
- University Excuses: Any University-related activity requiring an absence from class will count as an absence when determining if a student has met the minimum attendance requirement.

6.4 Make-up Policy

In the event of a missed assessment due to absence, the student will be provided an opportunity to reassess on the next Reassessment day.

6.5 Academic Integrity

Faculty and students must observe the ULM published policy on Academic Dishonesty (see the ULM Student Policy Manual – <http://www.ulm.edu/studentpolicy/>).

Any student caught turning in work that is not his/her own will be reported to the School of Sciences. If the student is found to be responsible for such a violation, then a formal report will be made to the Office of Student Services and the student will receive **a grade of F for the course.**

6.6 Course Evaluation Policy

At a minimum, students are expected to complete the online course evaluation.

7 Academic Services

8 Student Services

You can find information about the following available ULM student services at the websites listed below.

- Student Success Center (<http://www.ulm.edu/cass/>).
- Counseling Center (<http://www.ulm.edu/counselingcenter/>).

- Special Needs (<http://www.ulm.edu/counselingcenter/special.htm>).
- Library (<http://www.ulm.edu/library/referencedesk.html>)
- Computing Center Help Desk (<http://www.ulm.edu/computingcenter/helpdesk>)

Additional information can be found on The Student Services web site (<http://www.ulm.edu/studentaffairs/>).

8.1 Disability Accommodations

The University of Louisiana at Monroe strives to serve students with special needs through compliance with Sections 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act. These laws mandate that postsecondary institutions provide equal access to programs and services for students with disabilities without creating changes to the essential elements of the curriculum. While students with special needs are expected to meet our institution's academic standards, they are given the opportunity to fulfill learner outcomes in alternative ways. Examples of accommodations may include, but are not limited to, testing accommodations (oral testing, extended time for exams), interpreters, relocation of inaccessible classrooms, permission to audiotape lectures, note-taking assistance, and course substitutions.

Current policies on serving students with disabilities can be obtained from the ULM website: <http://ulm.edu/counselingcenter/>. If you need accommodation because of a known or suspected disability, you should contact the director for disabled student services at:

- Voice phone: (318) 342 - 5220
- Fax: (318) 342 - 5228
- Walk In: ULM Counseling Center, 1140 University Avenue (this building and room are handicapped accessible).

If you have special needs of which I need to be made aware, you should contact me within the first two days of class.

8.2 Mental Wellness

If you are having any emotional, behavioral, or social problems, and would like to talk with a caring, concerned professional please call one of the following numbers:

- The ULM Counseling Center (318) 342 - 5220
- The Marriage and Family Therapy Clinic (318) 342 - 9797
- The Community Counseling Center (318) 342 - 1263.

8.3 Title IX

Title IX of the Education Amendments of 1972 prohibits sex discrimination against any participant in an educational program or activity that receives federal funds, including federal loans and grants. Furthermore, Title IX prohibits sex discrimination to include sexual misconduct, sexual violence, sexual harassment and retaliation. If you encounter unlawful sexual harassment or gender-based discrimination, please contact Student Services at (318) 342 - 5230 or to file a complaint, visit www.ulm.edu/titleix.

Remember that all services are offered free to students, and all are strictly confidential.

8.4 Emergency Procedures

The emergency number for the ULM Police Department is (318) 342 - 5350 and should be used for emergency calls. If the campus police are contacted about an emergency for a student, they will go to the student's class to inform the student.

8.5 Discipline / Course Specific Policies

Any policies given here may be altered by the professor if deemed necessary. If this occurs, ample notice will be given.

8.6 FERPA

Do not email or call your professor regarding your course grades. The Family Education Rights and Privacy Act (FERPA) prohibits your professor from discussing your grade in any manner except in person. Please do not have family members, friends, or anyone else contact your professor about your grade as FERPA prohibits your professor from sharing that information with them.

9 Tentative Course Schedule

9.1 Contact Information

Professor: Dr. Blake Farman
Phone Number: (318) 342 - 1851
Email Address: farman@ulm.edu
Website: <https://ulm.edu/~farman>
Office: Walker 3-34
Office Hours: Monday/Wednesday: 9:00 AM - 12:00 PM
 Tuesday/Thursday: 2:00 PM - 4:00 PM

Week 1

Day	Date	Homework Due	Assessment
Tue	8/17		
Thu	8/19	SE 1	

Week 2

Day	Date	Homework Due	Assessment
Tue	8/24		
Thu	8/26	SE 2, SE 3	SE 1

Week 3

Day	Date	Homework Due	Assessment
Tue	8/31		
Thu	9/2	VM 1, VM 2	SE 2-3

Week 4

Day	Date	Homework Due	Assessment
Tue	9/7		
Thu	9/9	VM 3, VM 4	VM 1-2

Week 5

Day	Date	Homework Due	Assessment
Tue	9/14		
Thu	9/16	VM 5	VM 3-4

Week 6

Day	Date	Homework Due	Assessment
Tue	9/21		
Thu	9/23	IB 1	SE 1-3, VM 1-5

Week 7

Day	Date	Homework Due	Assessment
Tue	9/28		
Thu	9/30	IB 2	IB 1

Week 8

Day	Date	Homework Due	Assessment
Tue	10/5		
Thu	10/7	IB 3	IB 2

Week 9

Day	Date	Homework Due	Assessment
Tue	10/12		
Thu	10/14	IB 4	IB 3

Week 10

Day	Date	Homework Due	Assessment
Tue	10/19		
Thu	10/21	ET 1	SE 1-3, VM 1-5, IB 1-4

Week 11

Day	Date	Homework Due	Assessment
Tue	10/26		
Thu	10/28	ET 2	ET 1

Week 12

Day	Date	Homework Due	Assessment
Tue	11/2		
Thu	11/4	ET 3	ET 2

Week 13

Day	Date	Homework Due	Assessment
Tue	11/9		
Thu	11/11	OR 1	ET 3

Week 14

Day	Date	Homework Due	Assessment
Tue	11/16		
Thu	11/18	OR 2	SE 1-3, VM 1-5, ET 1-3, OR 1

Week 15

Day	Date	Homework Due	Assessment
Tue	11/23	OR 3	
Thu	11/25	<i>Thanksgiving Break</i>	

Week 16

Day	Date	Homework Due	Assessment
Tue	11/30	OR 4	OR 3

Finals Week

Date	Assessment	Standards Covered
12/6 10:00 AM - 11:50 AM	Final Reassessment	SE 1-3, VM 1-5, ET 1-3, OR 1-4