MA35100 Spring 2024 COURSE SYLLABUS

Course Information:

1. **MA 35100 – Elementary Linear Algebra**

2. **Credit Hours:** 3.00. Systems of linear equations, finite dimensional vector spaces, matrices, determinants, eigenvalues and eigenvector applications to analytical geometry. Not open to students with credit in MA 26500.

3. **Prerequisites:** Any of Undergraduate level MA 17200, MA 17400, MA 18200, MA 26100, MATH 26100, MA 26300, MA 27100 with a Minimum Grade of C-. Not open to students with credit in MA 26500.

4. **All lectures and exams will be in person**. This is not an online course. All students are expected to attend all in-person lectures. While lectures will be available via BoilerCast, this is **NOT** a substitute for in-person instruction. This particular course requires active, real-time interactions.

5. **Course Brightspace page**. There are different Brightspace pages for each individual section of this course.

6. **Piazza Discussion Forum**. There will be a Piazza discussion forum set up specifically for this section. Students can ask and answer questions, discuss topics, ask for further explanations or examples. All may be done anonymously.

Instructor Contact Information:

- **Johnny Brown**

Learning Resources, Technology & Texts:

- Required text: **Linear Algebra: Ideas and Applications** by Richard C. Penney (**4th edition**)
- **Online Access to Text (click)**
- All homework is handwritten and submitted to **GRADESCOPE** via Brightspace link.
- Students can find **qualified tutors** through the Mathematics Department Home page.

Learning Outcomes:

- Learn standard methods to solve linear systems of equations.
- Learn properties of matrices, learn about column, row, and null spaces.
- Introduction to abstract vector spaces their properties and applications.
- Learn the Rank-Nullity Theorem.
- Learn the Fundamental Theorem of Linear Algebra.
- Learn the LU Factorization.
- Learn properties and applications of determinants.
- Learn diagonalization of matrices and applications.
- Learn the basic theory of eigenvalues and eigenvectors and applications to systems of linear differential equations.
- Learn how to construct matrix representations of linear transformations.
- Learn the Gram-Schmidt Orthogonalization Method
- Learn some basic applications of linear algebra, including least-squares

Assignments:

Category	Due	Weight
Handwritten Homework Assignments	Weekly	**25 %**
Quizzes (in class)	TBA	**5%**
Two Evening Midterm exams	TBA	**40 %**
FINAL EXAM	Set by University	**30 %**

Handwritten Homework:

- There will be weekly handwritten homework assignments with their due dates posted on our section webpage and on **Brightspace**.
- Assignments will be handwritten and submitted through **GRADESCOPE**. Instructions on homework submissions may be found here: **How to Submit HW to GRADESCOPE**
- Students may discuss homework with each other, but all work submitted must be their own. Copying others' work is considered cheating and could be reported to ODOS.
- No late homework will be accepted unless there is a good reason.

  Students who need to appeal a homework score due to possible computer error or other unforeseen circumstances should contact their grader.
- The lowest two homework scores will be dropped.

Quizzes:

- There will be 2 or 3 in class quizzes, dates and topics covered will be announced in advance.

Exams:

- There will be two evening midterm exams and one final exam, all in person.
- All exams will be a combination of short answer and multiple-choice questions. All exams will be hand-graded.
- **Exam 1**: TBA
- **Exam 2**: TBA
- Students who are entitled to special accommodations will get the appropriate time and conditions for exams from the DRC. See more details in section Accessibility below.
- **Final Exam** (date TBA). The comprehensive final exam will cover the entire course.
- No extra credit is available in this course.

Grading Scale:

Following the Department of Mathematics policy, students in this course whose course averages are:

at least **97%** are guaranteed a course grade of **A+**
at least **93%** are guaranteed a course grade of **A**
at least **90%** are guaranteed a course grade of **A-**
at least **87%** are guaranteed a course grade of **B+**
at least **83%** are guaranteed a course grade of **B**
at least **80%** are guaranteed a course grade of **B-**
at least **77%** are guaranteed a course grade of **C+**
at least **73%** are guaranteed a course grade of **C**
at least **70%** are guaranteed a course grade of **C-**
at least **67%** are guaranteed a course grade of **D+**
at least **63%** are guaranteed a course grade of **D**

It is possible that these percentages may be lowered at the end of the semester, but they will not be raised. Borderline cases will be considered on a case-by-case basis.

Course Outline:

- **TEXTBOOK**: **Linear Algebra: Ideas and Applications** by Richard C. Penney (**4th edition**)
- **HOMEWORK:** Handwritten homework submitted via **GRADESCOPE**

Course Topics

CHAPTER 1 : Systems of Linear Equations

1.1 – Vector Space mxn matrices
1.2 – Linear Systems
1.3 – Gaussian Elimination
1.4 – Column Space and Null Space

CHAPTER 2 : Linear Independence and Dimension

2.1 – Linear Independence
2.2 – Dimension
2.3 – Row Space and Rank-Nullity Theorem

CHAPTER 3 : Linear Transformations

3.1 – Linearity Properties
3.2 – Matrix Multiplication
3.3 – Inverses
3.4 – LU Factorization
3.5 – Matrix of Linear Transformation

CHAPTER 4 : Determinants

4.1 – Definition of Determinant
4.2 – Reduction and Determinant
4.3 – Inverses

CHAPTER 5 : Eigenvectors and Eigenvalues

5.1 – Eigenvectors
5.2 – Diagonalization
5.3 – Complex eigenvectors

CHAPTER 6 : Orthogonality

6.1 – Scalar Product in R^N
6.2 – Projections
6.3 – Gram-Schmidt Process

APPLICATIONS (if time permits):

- *Least Squares Method*
- *Data Compression (Wavelets)*
- *Cayley-Hamilton Theorem*

Grade check during the semester:

All scores are posted on Brightspace. Students can use those scores to approximate the percentage they have obtained at any given time during of the semester to see where they would be at the end of the semester given the above criteria and provided they keep performing at the same level.

Attendance:

1. Attendance is **strongly** expected, though not required, to gain the full experience of this course.
2. Anticipated absences: When conflicts or absences can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible.
3. For other absences such as Grief/Bereavement, Military Service, Jury Duty and Parenting Leave, please consult Purdue's attendance policy
4. **Medically Excused Absence Policy for Students (MEAPS).** Students will be excused, and no penalty will be applied to a student's absence for situations involving hospitalization, emergency department or urgent care visit and be given the opportunity to make up coursework as defined in the course syllabus. Students experiencing hospitalization, emergency department or urgent care visits can provide documentation to ODOS who will then assess the student's request for a Medical Excused Absence, and issue notification of the start and end of the absence to the student's instructors. The student should then follow up with the instructor to seek arrangements as per the policy. Consult Purdue's attendance policy for more details.

Important Dates:

Students should consult the **Academic Calendar** to find information about important dates, such as the last day to withdraw from the course, etc. Important dates include:

1. Classes begin Monday, January 8.
2. No classes MLK Holiday, Monday, January 15.
3. Last date to drop a course with **W**, Wednesday, April 24 (5pm).
4. **Midterm Exam 1:** TBA
5. **Midterm Exam 2:** TBA
6. **Spring Break**: Monday - Saturday, March 11-16.
7. **Quiet Period**: Monday-Saturday, April 22 - 27.
8. Classes end Saturday, April 27.
9. **Final Exam Week**: Monday - Saturday, April 29 – May 4.
10. Grades due by 5 p.m. Tuesday, May 7.

Academic Guidance in the Event Students are Quarantined/Isolated:

If you become quarantined or isolated at any point in time during the semester, in addition to support from the Protect Purdue Health Center, you will also have access to an Academic Case Manager who can provide you academic support during this time. Your Academic Case Manager can be reached at acmq@purdue.edu and will provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify your professor and TA via email or Brightspace. They will make arrangements based on your particular situation. The Office of the Dean of Students odos@purdue.edu is also available to support you should this situation occur.

Academic Integrity:

- The handwritten homework will be submitted individually using **GRADESCOPE.**
- Students may discuss homework problems with other students, but submit their own work. They may consult their textbook and use calculators while they do their homework. **ChatGPT is definitely NOT allowed**, nor are any other such websites.

The two evening midterms and the final exam will all be in person:

- The exams are a combination of handwritten and multiple-choice questions and will all be hand graded.
- Students are not allowed to discuss exam problems with other students, or anyone else, during exams. If they have a question, they can only ask their professor or the proctor.
- Students are not allowed to use calculators during exams.
- Students are not allowed to use any electronic devices during exams.

Students caught cheating on homework or on computer labs will get **0** on that assignment. Students caught cheating on an exam will get a zero on the exam and may get F in the course. **All cases of cheating will be reported to the Office of the Dean of Students**. Students can report anonymously any issues of academic integrity that they observe through the OSRR by calling 765-494-8778 or emailing integrity@purdue.edu.

Accessibility:

Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone at 765-494-1247.

If you have been certified by the Disability Resource Center (DRC) as eligible for accommodations, you should contact your TA to discuss your testing accommodations as soon as possible. For all in-class accommodations please contact your professor as soon as possible. You should make sure you send your Course Accessibility Letter to your TA and to the professor. Instructions for how to do this can be found at: https://www.purdue.edu/drc/students/course-accessibility-letter.php

Course and Instructor Evaluations:

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s) through online course evaluations. On Monday of the 14th week of classes, you will receive an official email from evaluation administrators with a link to the online site. You will have two weeks to complete this evaluation. Your participation in this evaluation is an integral part of this course. Your feedback is vital to improving education at Purdue University. We strongly urge you to participate in the evaluation system.

Classroom Guidance Regarding Protect Purdue:

The Protect Purdue Plan, which includes the Protect Purdue Pledge, is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, wearing a mask in classrooms and campus building, at all times (e.g., no eating/drinking in the classroom), disinfecting desk/workspace prior to and after use, maintaining proper social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

Students who are not engaging in these behaviors (e.g., wearing a mask) will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class. Students who do not comply with the required health behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office with sanctions ranging from educational requirements to dismissal from the university.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also Purdue University Bill of Student Rights.

Nondiscrimination Statement:

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. More details are available on our course Brightspace table of contents, under University Policies.

Mental Health Statement:

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try WellTrack. Sign in and find information and tools at your fingertips, available to you at any time.

If you need support and information about options and resources, please contact or see the Office of the Dean of Students. Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc. sign up for free one-on-one virtual or in-person sessions with a Purdue Wellness Coach at RecWell. Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at evans240@purdue.edu.

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

Emergency Preparation:

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted on the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your **@purdue.edu** email account on a frequent basis.

Related Considerations and Guidelines

1. If you experience any symptoms of COVID-19 or suspect you may have been exposed to someone with COVID-19 stay home and call the Protect Purdue Health Center at 765-496-INFO.
2. Keep your cell phone on to receive a Purdue ALERT text message.
3. Emergency preparedness is your personal responsibility. Purdue University is actively preparing for natural disasters or human-caused incidents with the ultimate goal of maintaining a safe and secure campus. Let's review the following procedure
    - For any emergency text or call 911.
    - There are more than 300 Emergency Telephones (aka blue lights) throughout campus that connect directly to the Purdue Police Department (PUPD). If you feel threatened or need help, push the button and you will be connected right away.
    - If we hear a fire alarm, we will immediately evacuate the building. Do not use the elevator. Go over the evacuation route (see specific Building Emergency Plan).
    - If we are notified of a Shelter in Place requirement for a tornado warning we will stop classroom or research activities and shelter in the lowest level of this building away from windows and doors.
    - If we are notified of a Shelter in Place requirement for a hazardous materials release, we will shelter in our classroom shutting any open doors and windows.
    - If we are notified of a Shelter in Place requirement for an active threat such as a shooting, we will shelter in a room that is securable preferably without windows.
    - **(NOTE: Each building will have different evacuation & shelter locations. The specific Building Emergency Plan will provide specific locations and procedures)**