Math 2B: Linear Algebra – Spring 2023
Mondays, Tuesdays, Wednesdays and Thursdays 10:30 – 11:20 am in S-45

Instructor: Dr. Cheryl Jaeger Balm

Email: `balmcheryl@fhda.edu`   **Office number:** S-76g

This is a HYBRID class which requires you to be on campus four days a week.

Each week you will have 4 hours of class **in-person** and 1 hour online asynchronous.

Tips for success (however YOU define it!):

- Expect to spend 6-10 hours a week outside of class studying and working on at-home assignments. *Schedule these hours just as you would work or class!*

- Form a study group, and make use of the tutoring center.

- Come to office hours, and start your assignments early so you can ask questions in office hours.

- Make an appointment to meet with me (virtually or in-person) if you are busy during regular office hours or want to talk one-on-one.

Office Hours
Tuesdays and Wednesdays, 11:30 am – 12:30 pm, in the tutoring center S-43

Attendance: Students enrolled in this class are expected to be present **in-person** for all class meetings. If you miss a class, you are responsible for covering the material before you return to class. You should get notes from a classmate, read the corresponding section(s) of the textbook, and check Canvas for additional materials. You are also responsible for knowing about any changes to the syllabus and/or schedule that may be discussed in class. **Please stay home if you are not feeling well or awaiting results from a COVID test**, but otherwise you should plan to attend all class meetings.

Student Learning Outcomes:

1. Construct and evaluate linear systems/models to solve application problems.

2. Solve problems by deciding upon and applying appropriate algorithms/concepts from linear algebra.

3. Apply theoretical principles of linear algebra to define properties of linear transformations, matrices and vector spaces.

Textbook: *Elementary Linear Algebra, by Anton et al* (12th edition)

Canvas: All class announcements will be on **Canvas**, which you can access through MyPortal. I recommend that you also download the **Canvas app** if you have a smart phone. Canvas messages are the best way to email me.

Once you have accessed **Canvas**, please go to Account → Notifications and adjust your **Notification Preferences** so that you have selected **"Notify me right away"** for Announcement and Submission Comment. Other notification settings are up to you.

Calculators: No calculators are required for this class, but you will be permitted to use a ***scientific calculator without graphing capabilities*** during exams.

Cell phones and other devices: You may bring a laptop or tablet to class to access your eBook or to take notes. However, cell phones, tablets, laptops and other electronic devices must not become a distraction to you or your classmates. If I see or hear you using a device during class to access unrelated content, I may confiscate the device until the end of that class meeting.

Homework: At the end of this syllabus there is a list of suggested homework problems for each section that we will cover in your textbook. This homework will not be collected or graded. However, solving these problems is essential to understanding the class material (and earning a good grade!). After each class, you are expected to work on the relevant assigned problems before the next class meeting. *Do not save all your homework for the weekends; you will fall behind!*

Podcast: You will create 4 podcast episodes for this class. Details are in the Podcast Project instructions. **Your podcast will account for 20% of your course grade (5% per episode).**

Quizzes: There will be 8 quizzes throughout the quarter. All quizzes will be take-home. They will be handed out at the end of class on Thursday and due at the *start of class* the following Monday. **Remember, there is a difference between collaborating and cheating!** Your lowest quiz score will be dropped. **Quizzes will account for 30% of your course grade (∼4% each).**

Midterm Exams: There will be 4 midterm exams. Each midterm will focus on the material covered since the previous exam. The midterm exam dates are on the calendar. **Each midterm exam will account for 10% of your course grade.**

Final Exam: Your final exam will be Thursday, June 29, 9:15-11:15 am. **Your final will account for 10% of your course grade.**

Course Grades:

Podcast	7 Quizzes	4 Midterms	Final
20%	30%	40%	10%
(5% each)	(∼4% each)	(10% each)	

Grade	A	B	C	D
Overall percent	≥ 90	≥ 80	≥ 70	≥ 60

Disability Statement: De Anza College makes reasonable accommodations for people with documented disabilities. Please notify Disability Support Programs and Services (DSPS) if you have any physical, psychological or other disabilities, vision or hearing impairments or ADD/ADHD. More details can be found here `https://www.deanza.edu/dsps/`

Academic Integrity: Learning involves the pursuit of truth, which cannot be pursued by presenting someone else's work as your own. Each student must pursue their academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Any suspected instance of academic dishonesty on any assignment will be reported to the college and may result in a 0 on the assignment and/or a failing grade in the class. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to `https://www.deanza.edu/policies/academic_integrity.html`.

Tentative in-class schedule (subject to change):

Q = quiz, P = podcast, E = exam

Week	Monday	Tuesday	Wednesday	Thursday
Wk 1: Apr 10-13	1.1	1.2	1.2	1.3
Wk 2: Apr 17-20	Q1 due 1.4	1.4	1.5	1.6
Wk 3: Apr 24-27	Q2 due 1.7	1.8	E1 (1.1-1.7)	1.8 P1 due Sunday
Wk 4: May 1-4	Q3 due 1.9	2.1	2.2	2.3, 3.2
Wk 5: May 8-11	Q4 due 3.3	3.3, 3.5	4.1	4.2 P2 due Sunday
Wk 6: May 15-18	Q5 due E2 (1.8-3.5)	4.3, 4.4	4.4, 4.5	4.6
Wk 7: May 22-25	Q6 due 4.7	4.7, 4.8	4.8, 4.9	5.1
Wk 8: May 29 - June 1	**Holiday - No class**	5.1, 5.2	E3 (4.1-4.9)	5.2 P3 due Sunday
Wk 9: June 5-8	Q7 due 6.1, 6.2	6.3	7.1	7.2
Wk 10: June 12-15	Q8 due 9.1	8.1	E4 (5.1-7.2, 9.1)	8.2 P4 due Sunday
Wk 11: June 19-22	**Holiday - No class**	8.2, 8.3	8.4	Wrap up
Finals: June 26-29				Final 9:15-11:15

Detailed plan and suggested homework:

		Week 1	
Mon 4/10	1.1	Linear Systems Matrices and Elementary Row Operations **HW 1.1: 1, 5, 7, 19, 25, 26, 27, T/F: b, d-h**	
Tues 4/11	1.2	(Reduced) Row Echelon Form Gaussian and Gauss-Jordan Elimination	
Wed 4/12	1.2	Homogeneous Systems **HW 1.2: 1, 3, 9-19 odd, 23, 25, 31, 32, 40, T/F: a-h**	
Thur 4/13	1.3	Row, Column and Square Matrices Matrix Operations Submatrices and Partitions Transpose and Trace **HW 1.3: 1, 3, 5, 11, 13, 15, 23, 26, 29, 33, 34ab, 35, T/F: a-i, m**	Quiz 1 due Monday (1.1, 1.2)

		Week 2	
Mon 4/17	1.4	Properties of Matrix Operations Identity Matrices Inverse Matrices	**Quiz 1** **due**
Tues 4/18	1.4	Matrix Exponents Proof by Induction Matrix Polynomials Properties of Transpose Matrices **HW 1.4: 15, 17, 21-27 odd, 35, 37, 39, 43, 44, 45a, 46, 49**	
Wed 4/19	1.5	Computing Inverse Matrices **HW 1.5: 9-19 odd, T/F: d-f**	
Thur 4/20	1.6	Linear Systems and Augmented Matrices Properties of Inverse Matrices **HW 1.6: 1-7 odd, 10, 12, 13, 15, 16, 18, T/F: a-c, f, g**	Quiz 2 due Monday (1.3-1.5)
		Week 3	
Mon 4/24	1.7	Diagonal and Triangular Matrices Symmetric Matrices **HW 1.7: 1-9 odd, 13, 17, 19, 21, 26, 27, 32, 35, 41,** **T/F: all**	**Quiz 2** **due**
Tues 4/25	1.8	n-dimensional Euclidean Space $\mathbb{R}^n$ Transformations and Operators Matrix Transformations	
Wed 4/26		**Exam 1** (1.1-1.7)	
Thur 4/27	1.8	Linear Transformations Special Types of Operators **HW 1.8: 1-9 odd, 13, 15, 19, 23, 25, 31, 37, 45, 48,** **T/F: a-d, f, g**	**Podcast #1** **due Sunday** Quiz 3 due Monday (1.6, 1.7)
		Week 4	
Mon 5/1	1.9	Composition of Transformations Inverse Transformations **HW 1.9: 5, 7, 9, 13, 15, 17, 21, 24, T/F: a-c, e**	**Quiz 3** **due**
Tues 5/2	2.1	Determinant **HW 2.1: 11, 13, 15, 16, 21, 23, 25, 26, 29, 31, 33, 39,** **T/F b, c, e-j**	
Wed 5/3	2.2	Determinants and Row Operations **HW 2.2: 5-21 odd, 29, 31, T/F a-c, e, f**	
Thur 5/4	2.3 3.2	Determinant Properties **HW 2.3: 7-17 odd, 35, T/F: a, c, d, g, h, j** Vectors and Inner Products Cauchy-Schwartz and Triangle Inequalities **HW 3.2: 1, 3, 5, 9, 12, 15, 16, 17b, T/F a, c, d, f-j**	Quiz 4 due Monday (1.8-2.2)

Week 5			
Mon 5/8	3.3	$(n{-}1)$-dimensional Subspaces (Lines and Planes) Orthogonal Projection	**Quiz 4 due**
Tues 5/9	3.3	Distances and the General Pythagorean Theorem **HW 3.3: 1, 9, 11, 17, 19, 23, 25, 27, 33, T/F: b-g**	
	3.5	Cross Product **HW 3.5: 1, 3, 7, 19, 29, 30, T/F: b-f**	
Wed 5/10	4.1	General Vector Spaces Vector Space Axioms **HW 4.1: 3-10, 13, 14, 21, 22, T/F: a-e**	
Thur 5/11	4.2	Subspaces **HW 4.2: 23, 29, T/F: a-e, h**	**Podcast #2 due Sunday** Quiz 5 due Monday (2.3-3.5)
Week 6			
Mon 5/15		**Exam 2** (1.8, 1.9, 2.1-2.3, 3.2, 3.3, 3.5)	**Quiz 5 due**
Tues 5/16	4.3	Spanning Sets **HW 4.3: 1, 3, 7, 13, 17, 23, T/F: a, c, e, f**	
	4.4	Linear Independence	
Wed 5/17	4.4	Wronskian **HW 4.4: 1ab, 3, 7-21 odd**	
	4.5	Bases **HW 4.5: 1, 2, 7, 21, 30, T/F: a-c**	
Thur 5/18	4.6	Dimension Span of a Set **HW 4.6: 1-7 odd, 13, 17, T/F: a-e**	Quiz 6 due Monday (4.1-4.5)
Week 7			
Mon 5/22	4.7	Coordinates and Coordinate Maps Change of Basis and Transition Matrices	**Quiz 6 due**
Tues 5/23	4.7	Computing Transition Matrices **HW 4.7: 1-9 odd, 13-19 odd, T/F: a-c, f**	
	4.8	Row, Column and Null Spaces	
Wed 5/24	4.8	Rank **HW 4.8: 3-11 odd, 13a, 15, 17, 18, 21, 25, 30, 33, T/F: a-e, i**	
	4.9	Nullity Fundamental Spaces	
Thur 5/25	5.1	Eigenvalues and Eigenvectors **HW 4.9: 1, 7, 11, 13, 19, 22, 23, 28-31, T/F: a-e, g, h**	Exam 3 Tuesday

		Week 8	
Tues 5/30	5.1	Eigenspaces **HW 5.1: 1-15 odd, 25, T/F: b, c**	
	5.2	Similarity	
Wed 5/31		**Exam 3** (4.1-4.9)	
Thur 6/1	5.2	Diagonalization **HW 5.2: 1-7 odd, 11, 13, 15, 25, 26, 27, 31, 33, 34a, T/F: a-h**	**Podcast #3 due Sunday** Quiz 7 due Monday (4.6-5.1)
		Week 9	
Mon 6/5	6.1	Inner Product Spaces **HW 6.1: 17, 18, 27, 28, T/F: b-f**	**Quiz 7 due**
	6.2	Angles Properties of Inner Product Spaces **HW 6.2: 3, 4, 9, 10, 13, 14, 16, 21, 23, T/F: e, f**	
Tues 6/6	6.3	Orthogonal and Orthonormal Bases **HW 6.3: 2, 5, 7, 8, 27-31 all, 37, 38, 44, T/F: a, d**	
Wed 6/7	7.1	Orthogonal Matrices **HW 7.1: 1-11 odd, T/F: a, d, e**	
Thur 6/8	7.2	Orthogonal Diagonalization **HW 7.2: 7, 9-13 all**	Quiz 8 due Monday (5.2-7.1)
		Week 10	
Mon 6/12	9.1	*LU* Decomposition Elementary Matrices **HW 9.1: 1-6, T/F: a-c**	**Quiz 8 due**
Tues 6/13	8.1	General Linear Transformations Kernel and Range **HW 8.1: 1, 3, 4, 7, 10, 13a, 14a, 15, 17, 23, 25, 27, 33, 35, T/F: b-h**	
Wed 6/14		**Exam 4** (4.1-4.9, 5.1, 5.2, 6.1-6.3, 7.1, 7.2, 9.1)	
Thur 6/15	8.2	One-to-one and Onto (Injectivity and Surjectivity) Bijectivity and Isomorphisms Composition	**Podcast #4 due Sunday** Quiz 9 due Tuesday (7.2, 9.1, 8.1)

		Week 11	
Tues 6/20	8.2	Inverse Linear Transformations **HW 8.2: 3, 7, 11, 13, 19-27 odd, 31, 45, T/F: a-d, f-i**	**Quiz 9 due**
	8.3	Isomorphisms and Euclidean Spaces $\mathbb{R}^n$ **HW 8.3: 1, 3, 9, 11, 17, 19, 22-24, T/F: all**	
Wed 6/21	8.4	General Linear Transformations and Matrices **HW 8.4: 1a, 3a, 7, 14, 15**	
Thur 6/22		Wrap up and Review	
		Week 12	
Thur 6/29		**Final Exam 9:15-11:15 am** (8.1-8.4)	

Student Learning Outcome(s):

*Construct and evaluate linear systems/models to solve application problems.
*Solve problems by deciding upon and applying appropriate algorithms/concepts from linear algebra.
*Apply theoretical principles of linear algebra to define properties of linear transformations, matrices and vector spaces.

Office Hours:

In-Person   S-43   T,W   11:30 AM   12:20 PM