NORQUEST COLLEGE

Course Start Date: January 6, 2025

Course End Date: April 11, 2025

Academic Term and Year: Winter, 2025-2026

Official Course Outline Information

Course Name: Linear Algebra I

Course Code: Math 1205 **Version #:** V1

Instructor: [redacted]

Email: [redacted]

Office Hours: TBD

How to Contact Your Instructor: By e-mail, at _____

E-mails subject headings should include your student ID number, course name, and section.

Official College Calendar Description:

This course introduces the basic principles and fundamentals of linear algebra and helps students develop logical, creative, and critical-thinking and problem-solving skills for various mathematical problems in computer science and machine learning, computer graphic design, physics, mechanics, engineering, economics, ecology, and other natural sciences. Students will learn about systems of linear equations, matrices and matrix operations, linear and matrix transformations, determinants, vector spaces and subspaces, coordinates, dimensions, and eigenvalues and eigenvectors.

Course Overview:

This course introduces the learner to systems of linear equations, augmented matrices, and elementary row operations on them; formal procedure for solving linear systems; matrices as rectangular arrays of numbers, algebraic properties of matrices and operations on them, matrix addition, multiplication, and matrix-vector products, identity matrices, transposes, inverses and invertible matrices, elementary matrices; transforming (i.e., mapping) one vector to another by linear transformations and their matrices; determinants of matrices of any size and their evaluation, basic properties of and methods for solving determinants, Cramer's rule for solving linear systems of any size; basic properties of vectors in Euclidean three-dimensional space, vector lengths, distances between points and lines and planes, vector projections, vector dot products and crossproducts; vectors in n-dimensional space, their properties and operations with them, dot products, orthogonality, norms (lengths) and distances; ranks and diagonalization of matrices, matrix similarity; vector sets and subsets, spaces and

subspaces, spans, linearly independent and dependent vectors, bases and standard bases, dimensions, orthogonality; complex numbers, and their application in matrix diagonalization algorithm, complex eigenvalues and eigenvectors. <<copy text from previous outlines or update to reflect your approach to the course>>

Credits: 3

Prerequisites: Math 30-1, Math 30-2, or approved equivalent.

Total Course Hours: 61 hrs

Structure of Hours: Lecture: 48 hrs Lab: 13 hrs Other: 0 hrs

Note: *Course hours are based on the number of credits. Students may need to budget two to three times this number of hours to complete the course successfully.*

Total Number of Weeks: 16

Course Meeting: Tuesday 12:30 PM – 3:30 PM in Singhmar Centre 3-101 for lecture;

Thursday 3:30 PM – 5:00 PM in Singhmar Centre 4-013 for labs, beginning week of January 13th, 2025.

Delivery Mode: HyFlex

Faculty: Faculty of Arts and Sciences

Program: Arts & Sciences Diploma Program

Course Goals/General Learning Outcomes:

Upon successful completion of this course, students will be able to

1. Define linear equations, scalars, vectors, matrices, and determinants.
2. Solve systems of linear equations by row operations and methods of elimination.
3. Apply elementary matrices, identity matrices, transposes, inverses, and invertible matrices.
4. Evaluate determinants by methods of cofactor expansion and row reduction.
5. Explain vector spaces, subspaces, dot and cross products and their properties, coordinates, basis, dimensions, and eigenvalues and eigenvectors.
6. Integrate basic linear algebra principles in a variety of mathematical, computer science, and science problems.

Course Units/Topics:

This course consists of the following units/topics:

1. Systems of Linear Equations and Methods of Elimination

2. Matrices and Matrix Operations
3. More on Matrix Operations, Matrix Multiplication
4. Inverses and Elementary Matrices
5. Linear Transformations, Determinants
6. More on Determinants, Inverses and Diagonalization
7. Vector Geometry in Three-Dimensional Space
8. More on Vector Geometry in Three-Dimensional Space, Cross Product
9. Vector Operations in n-Dimensional Space, Subspaces and Spans
10. Dimensions and Orthogonality in n-Dimensional Space
11. Rank of Matrix in n-Dimensional Space, Similarity and Diagonalization
12. Diagonalization Revisited, Complex Eigenvalues

Required Textbooks, References, Materials:

Nicholson, W. K. (2021). Linear algebra with applications (Open Edition, Version 2021-A).

Nicholson, W. K. (2019). Linear algebra with applications: Partial student solution manual (Open Edition, Version 2019-A).

Recommended Resources:

1) Linear Algebra and its Applications, by David Lay, et al.
2) Linear Algebra and its Applications, by Gilbert Strang, et al.

Course Evaluation:

Mark distribution for the course will be as follows:

Midterm Exam 1	30%
Midterm Exam 2	30%
Final Exam	40%
Total	**100%**

Passing Level/Grading Scale:

The passing grade for this course is 50% (D).

Marking and Grade Conversion

Letter Grade (post-secondary programs)	Grade Point Value (post-secondary programs)	Percentage Scale (Alberta Education)	Description
A+	4.0	95–100	
A	4.0	90–94	Excellent
A–	3.7	85–89	
B+	3.3	80–84	
B	3.0	75–79	Good
B–	2.7	70–74	
C+	2.3	67–69	
C	2.0	64–66	Satisfactory
C–	1.7	60–63	
D+	1.3	55–59	
D	1.0	50–54	Poor
F	0.0	0–49	Failure

Inclusive Culture:

At NorQuest College, we are committed to fostering a space where both learners and staff can engage in honest conversations in a respectful, responsible, and thoughtful manner without fear of repercussions. A NorQuest education is inclusive, and our learners are supported and preparing to meet the needs of a diverse society with hands-on training with people from a variety of cultures, religions, and genders. For some learners, this may challenge your values and beliefs. We understand and have supported many learners to stretch their comfort zones to find a balance between job success and cultural or religious beliefs.

As part of the NorQuest community, in your programs, classrooms, labs, clinical work, work-integrated learning (WIL), and practicums, you will encounter and work with individuals from other cultures and religious backgrounds and of all genders and gender identities, including those who are part of the 2SLGBTQIA+ community. You will also meet and work with people with sensory sensitivities, who are neurodivergent, or who have different abilities, as well as individuals who may differ significantly in age or may have special considerations or restrictions around clothing and jewellery. Our community also includes people from a variety of socio-economic classes, castes, and income levels.

We celebrate our differences, and we value continuous growth and learning from each other. We create a sense of belonging where we do not judge anyone based on gender

identity or expression, biological sex, sexual orientation, race/ethnicity, religion, linguistic and/or cultural background, age, physical or mental ability, or any other aspect of one's person. NorQuest does not tolerate bullying, racism, or harassment. If you or another learner or staff member are subjected to any of these actions, your voice will be heard and taken seriously. It is everyone's responsibility to nurture a space where each person can feel safe and respected.

NorQuest College is committed to providing an environment that expects and promotes ethical behaviour in all aspects of college activities. This includes ensuring that employees, learners, and volunteers can confidentially and without fear of retaliation seek advice and/or disclose alleged wrongdoing or improper activity. The Office of Safe Disclosure provides a safe space to hear NorQuest community members' equity, human rights, and discrimination concerns, and other reports of wrongdoing or improper activity. All learners, employees, and other members of the NorQuest community are welcome to access these services.

To contact the Safe Disclosure Office, individuals are encouraged to make an appointment to meet with an advisor by emailing disclosure@norquest.ca.

Anti-Racism Statement

NorQuest College is working towards becoming an anti-racist institution. As such, we are making efforts to develop anti-racist curriculum and classroom learning experiences. This means using resources from multiple perspectives and equity deserving groups, learning from each other's lived experiences, and discussing anti-racism in our classrooms.

Integrating an anti-racist approach in the way we frame and implement courses and programs is central to achieving our desired state as an institution. It aligns with our college vision and *Deans' Joint Commitment to Anti-Racism for Equity*. Embedding anti-racism in teaching and learning practice will contribute to anti-oppressive and equitable learning experiences and outcomes for all learners. Everyone is invited to support our learners to succeed in a diverse and multicultural learning space, workplace, and society.

Skills of Distinction:

At NorQuest College, learners develop Skills of Distinction as a part of belonging to the NorQuest community. Through the Circle of Courage, learners build competence in Resilience, Inclusion, and New Ways of Thinking. These human skills prepare all learners for the changing workforce and the changing world.

Course Policies and Expectations:

Statement of Conduct and Expectations

NorQuest College is committed to maintaining high standards of non-academic and academic performance and integrity in order to foster a learning environment conducive to the personal, educational, and social development of its students. This commitment is founded upon the principles of fairness, trustworthiness, honesty, respect, and responsibility. The college expects that its students will be guided at all times by these principles in the work that they submit and the behaviour in which they engage.

It is the student's responsibility to be familiar with and follow NorQuest College policies and procedures, including the Student Code of Conduct. Student policies can be viewed on the college website. Policies specific to a program will be in the student program manual. If you have questions, please ask your instructor.

Academic Integrity

NorQuest College is committed to maintaining high standards of academic performance and integrity, and it is the responsibility of all members of the college community to uphold these standards. Academic misconduct may be defined broadly as the giving, taking, or presenting of information that dishonestly aids an individual or group in the determination of academic merit or standing. Common examples include, but are not limited to, plagiarism and cheating, which includes the unethical use of generative artificial intelligence (AI) tools (such as ChatGPT, Grammarly, etc). Allegations of academic misconduct are serious and may lead to sanctions such as mark reduction, course failure, or withdrawal from the course or program.

Plagiarism

Plagiarism is a form of academic misconduct that occurs when someone presents, as one's own, work that has been created by another. It is a serious offence and can result in suspension or expulsion from the college.

There is no tolerance for academic misconduct in this course. Any student caught plagiarizing will be penalized, and the incident will be recorded in the student's file. Multiple offences may result in the student's withdrawal from the course and/or program. Students are encouraged to familiarize themselves with the NorQuest College Student Judicial Affairs Policy and avoid any behaviour that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts, and/or participation in an offence.

Student Misconduct

Academic misconduct may be defined broadly as the giving, taking, or presenting of information that dishonestly aids an individual or group in the determination of academic merit or standing. Examples include, but are not limited to, plagiarism and cheating.

Non-academic misconduct may be defined broadly as any behaviour that adversely affects the learning of others or the college's educational mission, violates civil or criminal statutes, threatens the safety or well-being of members of the NorQuest community, or violates the ethical standards set by professional associations or the workplace standards set by practicum, clinical, or volunteer placement agencies.

Allegations of academic or non-academic misconduct will be adjudicated according to Student Judicial Affairs Policy and procedures, and may result in sanctions ranging from mark reduction, remediation, course failure, or withdrawal from the course or program. For more information, please talk to your instructor or contact the Office of Student Judicial Affairs at osja@norquest.ca

Use of Generative AI

In general we will not use Generative Artificial Intelligence or other AI tools in this course. If any exceptions will be made, they will be communicated to you on a case-by-case basis by your instructor. By default, you should assume that the appropriate way to complete assignments is the method taught in class or learned through course learning materials. If the use of technological tools is not mentioned in assignment instructions, you should not use them to complete assignments. Inappropriate or unethical use of Artificial Intelligence will be reported as Academic Misconduct.

Attendance Policy

Students are expected to arrive on time, and to remain for the duration of the class. Please come to class having completed any assigned homework/tasks and prepared with the appropriate materials. If you are absent from class, it is your responsibility to complete the assigned homework/tasks listed in the course schedule and to check for any new information, documents, or materials.

Learning Technologies

This course uses misiwe pehtâkwan (formerly called Moodle), NorQuest's online Learning Management System, as a repository for course materials (http://myclass.norquest.ca). Upon registration, you will receive login information via your NorQuest email account. Course materials may include review materials, handouts, course outline, PowerPoints, notices from your instructor, reading schedule, assignments, and exams. It is important

that you log in and review the course materials and information regularly. For technical support, please contact the Student Service Desk.

Student Support

Students who have a disability affecting mobility, vision, hearing, learning, or mental or physical health and who require accommodations in this course are advised to discuss their needs with a Student Support Specialist at NorQuest College Student Services.

Technology and Electronics Policy

Please note that the use of laptops, mobile phones, and other electronic devices during class and exams for private/personal information or communications is not permitted, as it is disruptive to the learning environment. Misuse of electronics during class time will result in the deduction of participation marks. Students who persist in disruptive behaviours during class will be asked to leave.

How to Submit Assignments

Your instructor will provide specific submission instructions for each assignment.

Late Assignment Submissions

Assignments are due on the scheduled date, per the course schedule and assignment instructions. Late assignments will be deducted 5% per day, including weekends. Exceptions will only be made in cases of illness or personal emergency. Please contact the instructor via email as soon as possible so accommodations can be made. Note: extensions cannot be granted retroactively (ie: after the assignment deadline has passed), and assignments will not be accepted after the class set has been marked and returned. Please see the misiwe Course Calendar and Course Schedule for assignment due dates.

Communications Policy

Email: Email is the official method of communication between students and instructors, and for most interactions at the College. Instructors check their NorQuest email accounts routinely during regular business hours, and will respond within 24-48 hours when possible. Please ensure you use appropriate etiquette and include your full name, course section, and student ID when corresponding with instructors and other College personnel.

MS Teams (and other direct messaging tools): Direct messaging through MS Teams or any other platform is not an official or appropriate method of communicating with your instructor. Please note that any direct messages sent through Teams or other applications will not receive a response

Meetings: If course questions/concerns cannot be resolved through email, the instructor is available to meet with students on a limited basis. To request a meeting with an

instructor, please email them to arrange a date, time, and platform/location in advance. Note that the instructor may not be available for in-person meetings outside of class.

Course Schedule:

Please note that this schedule is subject to change. Any changes or cancellations will be communicated by your instructor. It is your responsibility to check your NorQuest email account for relevant messages.

Date	Unit/Topic/Reading	Assessment

Final Exam Date and Location: Click here to enter text.

Bring to Final Exam: Student ID, pens, pencils, and relevant writing materials.

Additional Information:

-No bathroom breaks during exams unless an appropriate medical exemption or other relevant accessibility accommodation has been obtained prior to the examination indicating that the individual would have cause to make frequent bathroom breaks.

-If an incident of academic misconduct is suspected, the student will receive a grade of 0 on the applicable examination or assignment until such time as an OSJA investigation determines that grade of 0 should be altered in any way.

-All students regardless of whether they are registered to attend remotely or in person must write exams in person on the exam dates given by the instructor. The only exceptions are in cases where those registered in courses live more than an hour's drive away from Edmonton. In this case, those remote who live more than an hour's drive from Edmonton and who wish to have permission to write their exam remotely must notify the instructor prior to January 17th, 2025, and be prepared to provide evidence of their distant residence.

Homework: At the end of each lab class, students may be assigned homework. The homework is not for credit and will not be marked, however, it is highly recommended that the students do it timely, on their own time, for the purposes of better preparation and mastering the material. For the same reason, students are also encouraged to solve as many as possible problems at the end of each covered in lectures unit/chapter/topic of the required/recommended resources above.

Exams: For this course, all examinations (midterm and final exams) must be written in person. As e-proctoring services are not able to adequately capture the complexity of these exams, in order to maintain our high standards of academic integrity and to preserve transfer credit agreements with other post-secondary institutions, in-person examination is required for all students, including HyFlex. If you have any concerns about this exam requirement (for example, if you do not live in Edmonton and cannot write your exams on campus), please contact the Arts & Sciences Program Chair, Dr. Dana Wight (Dana.Wight@norquest.ca), directly to inquire about exam accommodation. Please note that proof of address or other supporting documentation may be required. Student ID is required during all the midterm and final exams. Students must arrive punctually. If a student is late for an exam, the instructor has the discretion to decide whether or not the student will be allowed to write the exam. Once the exam has commenced, students must remain in the room for at least 30 minutes before they can leave. No calculators will be permitted during examinations. The exams are not open book. Any devices capable of

external communication, e.g. cellphones, iPods, or Bluetooth-enabled devices, cannot be used for exams of any type. Laptops, other computer devices, and Internet are not allowed during the exams of any type. Students should bring their own pens/pencils. Exam booklets will be provided. Permission to use the washroom during exams is at the discretion of the instructor and may require accompaniment.

Missed Midterm Exams: A student who misses a midterm exam must contact the instructor either directly or via email at the earliest possible time, and in all cases within 24 hours of the missed exam, with a valid explanation, supported with appropriate documentation if needed. If a student's absence is excused, the student may be given a chance to write a deferred exam with the Testing Services within the next five (5) days, or the weight of the midterm exam may be transferred to the final exam. A mark of zero will be given in situations where unsatisfactory explanation and/or no supporting documentation is available.

Deferred Final Exam: Final exams may not be deferred except in cases where students with valid reasons, e.g. documented, serious, and/or immediate family, personal, or health crises, where they may request an exam deferral via email or official form from the instructor, who may escalate the request to the Department Chair for consideration.

Originated By: NorQuest College

Last Revised By: Leif Eliasson

Revision Date: January 6, 2025

Approved By (Program Chair or Dean): Dana Wight, PhD

Minimum Instructor Requirements: Master's degree in Mathematics

Prior Learning Assessment Recognition (PLAR): Yes
Credit can be awarded for this course through PLAR

Methods of Obtaining PLAR: Transfer Credit

Transferability to Other Institutions: See ACAT for course transferability details

NOTE: Students are advised to keep course outlines in personal files for future use. These may be used to apply for transfer of credit to other educational institutions. A fee may be charged for additional or replacement copies.

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