MATH*3160 Course Outline

Course Title: Linear Algebra II

Prerequisite: (MATH*1160 or MATH*2160) and 1.00 credits in MATH or STAT at 2000 level or above

Credit Weight: 0.5

Academic Department: Mathematics & Statistics

Campus: University of Guelph

Semester Offering: Fall 2022

Instructor Information

Instructor Name: Prof. David Kribs

Instructor Email: dkribs@uoguelph.ca

Office hours via Zoom: Thursdays 1:00pm to 2:00pm from September 16 to December 2. Recurring Zoom meeting link is listed under MATH*3160 CourseLink Zoom module. Extra office hours may be added during the semester and will be announced in class.

Teaching Assistant Information

TA Name: TBD

TA Email: TBD

Office hours via Zoom: TBD; starting the week of September 12 to 16, through to the week of November 30 to December 2. Zoom connection details will be announced during the semester.

Course Content and Delivery

Class Schedule: Tuesdays and Thursdays from 10:00am to 11:20am in ROZH 105, from September 8 to December 1, except for the Fall study break day on October 11.

Course Materials:
- **Course textbook (required)**: K. Hoffman, R. Kunze, *"Linear Algebra, second edition,"* Prentice-Hall, Inc., Toronto, 1971. This textbook is out of print, but some copies are available in the bookstore and online, and a PDF

of the book is posted on Courselink.

- **Supplementary course notes**: include supplemental exercises and examples with details worked out, written to complement the course textbook, and are posted as a single PDF on Courselink.
- **Lecture notes**: hand-written lecture notes will be posted on Courselink after each class.
- **Other course materials:** such as assignments, practice tests, and solutions will be announced in class or via group email and will be posted on Courselink.
- **MATLAB:** will not be used during course lectures and you will not be tested on it or allowed to use it on tests, but you are welcome to use it as a computational aide to check calculations, etc, on assignments and your homework.

Calendar Description: The topics covered will include a selection from complex vector spaces, algebra of linear operators, matrix representations of operators, polynomial theory, characteristic values, annihilating polynomials, invariant subspaces, direct sum decompositions, Cayley-Hamilton Theorem, diagonalizable operators, Primary Decomposition Theorem, Jordan canonical form of a matrix, unitary matrices, and the Spectral Theorem for normal operators.

Course Learning Outcomes and Subject History: Linear and matrix algebra are subjects that emerged in the early 1900's as a mathematical foundation for quantum mechanics and other scientific challenges of the time. Over the past century the topics have blossomed in all sorts of directions, so that linear algebra now touches on every area of modern science.

The intent of this course is to give a deeper and more theoretical introduction to linear algebra, built upon the tools and techniques developed in a first course in the subject. Primarily this is accomplished through an analysis of the theory of linear operators on complex vector spaces. The topics are presented with a view to develop and enhance the student's ability to appreciate and understand abstract mathematical concepts and proofs.

This course provides the necessary preparation and background for advanced courses such as functional analysis and linear statistical models, as well as the basic linear algebra found in many other scientific disciplines, and hence fulfills one of the fundamental learning objectives of higher-level mathematics courses.

Lecture Content: The specific lecture content will be announced in class and adjusted as needed through the semester. The course will cover a selection of topics from chapters 3 to 9 of the course textbook.

Attendance: This course is being offered in standard face-to-face format and lectures will generally NOT be recorded or streamed online. Following each class, hand-written lecture notes will be posted on Courselink, but these notes will not capture the surrounding discussions on the material during class, and so you are strongly

encouraged to attend class. Beyond this, if you are unable to attend class, it is your responsibility to find out what you missed from your classmates.

Email Etiquette: Although I try to respond to all email messages, please don't ask me math questions by email (instead come and see me or our TA during our online office hours listed above). Please keep your messages to the point, polite, and clearly state your question.

Course Homework and Grading Policies

Homework: Homework problems will be suggested during classes, mainly from the textbook. You are encouraged to work through these problems, review examples covered in class, and review the supplemental course notes which has many additional worked out examples and problems. All of this content will be the basis for the questions on the tests and written assignments.

Tests and Written Assignments: Tests and assignment questions are based primarily on material from examples and theory covered in class and in the homework problems.

- 25% Midterm Test 1: Thursday, September 29. Held in-class 10:00am to 11:20am.
- 35% Written Assignment 1: Announced in class and via email, and due Wednesday, November 2 at 11:00pm in the Dropbox Assignment 1 folder on Courselink.
- 25% Midterm Test 2: Thursday, November 24. Held in-class 10:00am to 11:20am.
- 15% Written Assignment 2: Announced in class and via email, and due Wednesday, December 7 at 11:00pm in the Dropbox Assignment 2 folder on Courselink.

Assignment and Test Grading and Corrections: Collaboration is allowed on the written assignments, up to a maximum of groups of 3 students, but you must write up your assignment in your own words. The TA will grade most of the assignments and tests and can be contacted via email or during office hours for corrections and answering questions about grading. If you have corrections please contact the TA to have your score adjusted. If you find errors in grading and you miss the office hours offered by the TA then email the TA to schedule an appointment. However, as our TA is only paid for a limited number of hours, IF YOU MISS THE TA OFFICE HOURS THERE IS NO GUARANTEE THAT THE TA WILL BE ABLE TO SEE YOU TO MAKE ASSIGNMENT OR TEST CORRECTIONS. CORRECTIONS CANNOT BE MADE AFTER THE END OF CLASSES. It is in your best interests to check through your assignments and tests in a timely manner with the solutions provided.

Submission and Picking up of midterm tests and assignments: Midterm tests will be handed back in class, and written assignments will be submitted and returned electronically through the Dropbox tool on Courselink – ASSIGNMENTS MUST BE SUBMITTED AS PDF'S.

Academic Consideration:
- There will be NO MAKE-UP MIDTERM EXAMS. If you miss a Midterm exam due to serious illness of yourself or a death in your immediate family, or due to personal grounds, please contact me by email ASAP explaining the reason for missing the test. You do not need to get a doctor's note. If consideration is granted I will readjust the weight of assessed material, as described in the next section. However, once you have taken an exam no accommodations can be granted (it is general University of Guelph procedure to not grant accommodations retroactively). For further details concerning Academic Consideration see
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml
- UNDER NO CIRCUMSTANCES WILL ANY EXAM BE RE-SCHEDULED AT A DIFFERENT TIME AND/OR DATE, with the possible exception of exams taken in SAS.

Procedure used to re-adjust the weight of assessed material: If consideration is given to miss a test (at most one can be missed for legitimate reasons), the percentage of missed material (25%) is divided evenly amongst the other test (12.5%) and the written assignment component of the course (12.5%). Please DO NOT ASK FOR ALTERNATE ARRANGEMENTS AS FOR REASONS OF FAIRNESS TO OTHER STUDENTS IT WILL NOT BE GRANTED.

Regulations regarding a grade-reassessment: If you believe that an error has been made in the determination of your final grade then you must write to the chair of the department (by the 10th class day of the new semester) requesting a grade re-assessment. This can lead to the grade staying the same, a grade increase, or a grade decrease. Please note that this should not be used as a means of 'trying to get a few extra marks', but for situations where you have grounds for believing that mistakes have been made in the determination of your final grade. For further information see:
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Disclaimer For This Semester

While we expect the course format described above not to change, please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via class email. This includes on-campus scheduling during the semester, term tests and final

examination schedules. All University-wide decisions will be posted on the COVID-19 website https://news.uoguelph.ca/2019-novel-coronavirus-information/ and circulated by email.

Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g., term test or assignment).

Mental Health Services

One in five students in Canada experiences some sort of mental health issue at some point in their academic career. If you find yourself facing a mental health crisis, or just need to talk to someone, please consider taking advantage of one of the following resources available to University of Guelph students:

- **Counselling Services (x53244)** is located at Health Services (J.T. Powell Building) and offers individual and group counselling sessions by appointment or walk-in.
- **Student Support Network** offers confidential, peer-based, drop-in support; see SNN details here: https://wellness.uoguelph.ca/ssn
- **Good2Talk (1-866-925-5454)** is a free, 24/7 student hotline that provides professional counselling and referrals for mental health, addictions and well-being.
- **Here 24/7 (1-844-437-3247)** specializes in assessment, referral and appointment booking and is available 24/7 for crisis support.

You are not alone and you will not be judged for asking for help.

Standard Statements

The following are standard statements for inclusion on all course outlines at the university.

E-mail Communication
As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement
When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See

[the undergraduate calendar for information on regulations and procedures for Academic Consideration.](#)

Drop Date
Courses that are one semester long must be dropped by the end of the last day of classes; two-semester courses must be dropped by the last day of classes in the second semester. The regulations and procedures for dropping courses are available in the Undergraduate Calendar.

Copies of out-of-class assignments
Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility
The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1. Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

More information: www.uoguelph.ca/sas

Academic Misconduct
The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is

not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

[The Academic Misconduct Policy is detailed in the Undergraduate Calendar](#).

Recording of Materials
Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources
The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.