Information sheet for Math 304 Spring 2023

Class meets: MTRF noon - 12:50 pm in BH 419

Credits: four credits

Teacher: Branko Ćurgus, Proofesor of Mathematics

Office: BH 184A

Office Hour: MTRF 1 pm or by appointment (see the class **Canvas page** for a Zoom link)

Email: curgus@wwu.edu

Course website: http://faculty.wwu.edu/curgus/Courses/304_202320/304.html

Text: *Linear algebra and its applications, Fifth edition*
by David C. Lay, Steven R. Lay, Judy J. McDonald

Material covered: We will review parts of Chapter 4 and study Chapters 5, 6 and 7.

Course Objectives: The successful student will demonstrate: (1) understanding of the concept of reduced row echelon form of a matrix and the full power of its utility; (2) understanding of the concept of change of coordinates matrix and ability to calculate such matrices in simple examples; (3) the ability to compute eigenvalues and eigenvectors (of small matrices), establish whether or not a matrix is diagonalizable, and diagonalize a matrix when possible; (4) geometric understanding of the eigenvalues and eigenvectors of a real matrix, including the case of complex eigenvalues; (5) the ability to construct a matrix representation of a linear transformation, relative to given bases, and to choose a convenient basis for a representation of a linear transformation; (5) the ability to use eigenvalues and eigenvectors in the analysis of linear discrete dynamical systems; (6) understanding of the role of an inner product in the geometry of vector spaces; (7) geometric and analytic understanding of orthogonality and orthogonal projection, both in real n-dimensional space and in more abstract vector spaces, including vector spaces of functions; (8) the ability to construct an orthogonal basis for a subspace by using the Gram-Schmidt process; (9) understanding of least-squares problems, the ability to solve them, and knowledge of their applications to linear models and to approximation; (10) knowledge of the properties of symmetric matrices and their associated quadratic forms; (11) the ability to compute the singular value decomposition of a matrix and the understanding of its relationship to other concepts of linear algebra.

On Your Written Work: Students must submit their work electronically through Canvas Assignments. The only allowable file type is pdf. I cannot grade work submitted by email. Please make sure that you produce a high-quality, readable pdf file of your work. LaTeX is a free software designed for typesetting high-quality mathematical documents. I encourage you to learn LaTeX and use it for your writing. If you submit your handwritten work, write neatly on paper with a light-colored background using a dark pencil or ink. Please use a good scanning app to produce a high-quality, readable pdf file.

Since you will have enough time to work on the homework and assignments, your papers should be well-written. Presenting calculations alone without the context in which they occur and explanations of your reasoning is not sufficient for the full credit. I believe

that writing mathematics in complete sentences organized in meaningful paragraphs enhances the learning process. As a guide for writing, you can use examples in the textbook or my writing on the class website.

Assignments: There will be no traditional exams. Instead of the exams there will be four assignments for which you will have one week to finish. The work that you submit in your assignments must be your own. You can ask clarifying questions about the assignment problems in Discussions on Canvas. If your question involves a part of your solution, you can ask me during office hours. You can discuss problems on the assignments with other students in general terms only. You should not share your solutions with others.

The due dates for the first three assignments will be given on the class Canvas page. The final assignment will be posted on Canvas on the last Tuesday of classes and it will be due on Friday, June 9 at 11:59 pm.

Homework: A list of suggested homework problems will be posted daily on the class website. Homework will not be collected. To succeed in class you should do each problem on your own. While working on problems you should recognize which theoretical tools are being used to solve a particular problem. As a result you will acquire general problem solving strategies, which is one of the goals of higher education.

Grading: Each assignment will be graded by an integer between 0 and 100. Your final grade will be determined using the following formula

$$\texttt{FG} = \lceil (\texttt{A1} + \texttt{A2} + \texttt{A3} + \texttt{A4})/4 \rceil,$$

where `A1`, `A2`, `A3`, `A4` are the grades for the assignments. In the above formula the symbol $\lceil x \rceil$ denotes the ceiling of a real number x. Your letter grade will be assigned according to the following table:

F : 0 - 49	D : 50 - 54	C−: 55 - 59	C : 60 - 64	C+: 65 - 69
B−: 70 - 74	B : 75 - 79	B+: 80 - 84	A−: 85 - 89	A : 90 - 100

This course is a continuation of Math 204. It relies heavily on concepts and methods learned in Math 204. Therefore it is essential that you keep up with the material presented every day; do the homework problems; review Math 204 material as needed; look for help if you encounter difficulties.

How to succeed: Doing well in mathematics builds on understanding rather than memorizing. To understand, practice critical thinking in all mathematical activities, and question everything until clarity has been achieved. Put your questions in writing, share them with me or with the class in Discussions on Canvas, ask in the Math Center. Please refrain from discussing the assignment problems with the Math Fellows at the Math Center. I will gladly talk to you during office hours, or you can make an appointment.

Diversity, Equity, Inclusion: Welcome to my class. I promise to keep my mind open to all the diverse mathematical experiences you bring to this class. I want to help you use those personal experiences creatively to build your understanding of the content studied in this class. I will bring diverse approaches to most concepts. For example, to make this class more diverse, I looked into the history of linear algebra. Amazingly,

the first known system of linear equations appears on the old Babylonian tablet VAT 8389, which is between 3600 and 4000 years old (2000-1600 BC). The second oldest one is from ancient Egypt in the Rhind papyrus, dating back to around 1550 BC. This system involves five unknowns, but the solution in the papyrus is cryptic. The oldest treatment of systems of linear equations from antiquity, which uses a method that resembles matrices, is in Chapter 8 of the Chinese textbook *Nine Chapters of the Mathematical Art*, which is at least 1800 years old.

I understand that each of you comes to this class with a diverse mathematical background. Mathematics is so universally diverse that it offers a path to understanding to everybody. The only prerequisite is to be open to the human worth of rigorous thinking. Mathematics, in general, and Linear algebra, in particular, are the best environments to experience and practice rigorous thinking. Let me help you build your own understanding of Linear Algebra. The goal is to create an environment where you can succeed in Mathematics and be proud of your achievement.

Academic Honesty Policy: Academic dishonesty is not tolerated at Western Washington University. Representing the work of another as one's own is an act of academic dishonesty. For a full description of the academic honesty policy and procedures at Western, see Appendix D in the University Catalog.

Flexibility Statement: This syllabus is subject to change. Changes, if any, will be announced in class or online. Students will be held responsible for all changes.

Syllabi@WWU Please also check https://syllabi.wwu.edu/