

## GOSHEN COLLEGE MATHEMATICS DEPARTMENT MATH 301 LINEAR ALGEBRA – FALL 2021-22

Catalog Description	Linear systems of equations, vector spaces, linear transformations, matrices, determinants, characteristic vectors and values, inner products, computational aspects, and applications. Prerequisite: Math 211 and either Math 205 or 212. (3 credit hours)		
Motivation	The simplest functions are linear. Yet, real-world phenomena as diverse as error-detecting codes, population change, digital image compression, and crystallography can be described with linear functions. This course is a study of linear functions and their applications.		
Learning Objectives	Students will		
	<ol> <li>Demonstrate knowledge of vectors, systems of linear equations, matrices, determinants, eigenvalues and eigenvectors, orthogonality, vector spaces, linear transformations, and inner products;</li> </ol>		
	2. Solve pure and applied problems and explore ideas by adeptly using mathematical concepts and techniques, problem solving heuristics, pattern recognition, deduction, and software tools;		
	3. Learn mathematics by reading, listening, exploring, and conversing in an effective manner;		
	4. Explain and critique mathematical reasoning through speaking and writing in a precise and articulate manner in both informal and formal settings;		
	5. Exhibit curiosity, playfulness, creativity, confidence, perseverance, interest in multiple perspectives, and a collaborative spirit; and		
	6. Describe applications of linear algebra and connections with other areas of mathematics.		
Prerequisites	Math 211 Calculus I and either Math 212 Calculus II or Math 205 Discrete Mathematics. Some examples will use functions and calculus, and you will critique and write proofs.		
Instructor	David Housman, SC 117, dhousman@goshen.edu, 535-7405 Office hours posted on office door and on Moodle		
Class Time	MWF 1:00-1:50 p.m. in SC 107.		
Text	David Poole, Linear Algebra: A Modern Introduction, 4th edition, Brooks/Cole, Cengage Learning, 2015, ISBN-13: 978-1-285-46324-7. The Student Solution Manual is on Good Library reserve.		
<b>On-line</b>	Moodle (moodle.goshen.edu) contains all course information. Announcements posted to the forum will be emailed to all students.		
Software	GNU Octave is an open source application that is similar to MATLAB. Octave is available for free download (gnu.org/software/octave) and an online version (octave-online.net) is also available. We will also use Sage (sagemath.org) and its collaborative notebook interface CoCalc (cocalc.com), which can also run Octave code.		
Notebook	A one-inch three-ring binder with loose-leaf lined and graph paper is recommended so that you can keep printed copies of course resources and a written record of problem-solving attempts, questions, math concept and technique discoveries, and skill assessments.		
Activities	Reading and investigating are important skills to develop. Reflective practice is the best way to develop these skills. You will be expected to read about and investigate a topic <u>before</u> participating in class. Read with paper and pencil in hand, and take an anticipatory approach: try to obtain solutions, explanations, and proofs before reading what the author provides. If you do not understand something, write a question that is as specific as possible.		
	Class will complement your preparatory reading and investigating through mini-lectures, student presentations, discussion of course readings, and group activities.		
	An average student can obtain an average grade with an average of nine hours each week devoted to this course—adjust if you are not average or desire a grade that is not average.		

Grading	Course grades will be based on performance on the	Activity	Weight	
	activities listed in the table and further described	Assignments	25%	
	below. The score for each activity is capped at 100.	Project Presentation	10%	
	The course grade will be translated into letter grades	Project Report	15%	
	in the following manner: 93 to A, 90 to A-, 87 to B+,	Exam 1 (Wed Sep 25)	15%	
	83 to B, 80 to B-, $//$ to C+, $/3$ to C, $/0$ to C-, $6/$ to	Exam 2 (Fri Nov 1)	15%	
	D+, 00 to $D$ , and 0 to $F$ .	(Wed Dec 8, 3:30-5:30nm)	20%	
	l	(Wed Dec 0, 5.50 5.50pm)		
Assignments	Achieve and exhibit understanding by solving problems, proving propositions, and writing explanations. Typically, written solutions will due on a Tuesday and graded by Wednesday.			
Exams	Exhibit your ability to solve problems and describe mathematical concepts without assistance or collaboration. There may be both in-class and take-home portions.			
Project	Study a topic without instructor guidance and explain your findings to the class, listen actively and learn from your peers' presentations, and discuss your findings carefully and compellingly in a written paper. Topics will be chosen from the text explorations, applications, and vignettes. Projects will be completed independently or with a partner. Sign up for your topic on Moodle as soon as possible.			
Extra Credit	Receive extra credit toward your assignments grade by doing one or more of the following: (1) find errors in the text or posted course materials and describe the error in writing; (2) attend a quantitative presentation (e.g., <u>Science Speakers</u> ) or participate in a quantitatively based activity and describe in writing some interesting mathematical aspect of the presentation or activity; or (3) participate in a <u>Career Services</u> event and describe your most important discovery. The description should be a substantive paragraph or two and be submitted to the instructor on paper.			
Tutoring	The Academic Success Center provides individual tutoring by appointment at tutorcal.goshen.edu.			
Disability Services	Goshen College is committed to providing all students equal access to programs and facilities. Students who need accommodations based on disability should contact the Director of the Academic Success Center (ASC). Students must register with ASC before faculty are required to provide reasonable accommodations. For more information or to register, please contact the Director of the ASC, Judy Weaver, Good Library 112, jweaver@goshen.edu or 574-535-7560. To ensure that learning needs are met, contact the director of the ASC the first week of classes.			
Other Assistance	Any student who has difficulty accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Students Gilberto Pérez Jr. (gperez@goshen.edu) for support. Furthermore, please notify the instructor if you are comfortable in doing so. He may be able to provide additional assistance or flexibility in meeting the requirements of the course.			
Collaboration and Academic Integrity	n You are encouraged to use all available resources in order to learn the concepts and techniques discussed in this course. In particular, conversations with other students and the instructor can be an effective learning method. Reading other books and web pages can be another effective learning method. However, copying someone else's work subverts the learning process.		es n be an ning	
	For assignments and projects, you may look at and discu work developed during collaboration with another studer own solutions. You should give written acknowledgeme discussions and to any written materials (other than the to <i>not</i> use any resources unless a specific exception is stated	ss another student's work, but any we not should be destroyed before writin ent to people with whom you have h ext) that were helpful. For exams, ye d by the instructor.	ritten g your ad rou may	
	Failure to observe the above rules will result in a zero on Any violation of academic integrity will be reported to the rules will help you learn the material well and give you the earned your grade.	a the homework assignment, project, ne Associate Dean. Observation of the he satisfaction of knowing that you	or exam. he above have	
Due Date Policy	Class participation, assignments, projects, and exams car (1) there is a serious medical problem, a death in the imm with another official Goshen College activity; (2) there is authorities; and (3) the instructor is notified prior to the c	n only be excused, rescheduled, or n nediate family, or an irreconcilable of s written documentation signed by p due date or as soon as possible afterv	nade up if conflict roper vards.	