



## ***Introduction to Matrices and Linear Algebra***

***MATH 0280***

***3 Credits***

**Description:** The principal topics of the course include vectors, matrices, determinants, linear transformations, eigenvalues and eigenvectors, and selected applications.

**Prerequisite:** The prerequisite is successful completion (a grade of C or higher) of MATH 0220: Analytic Geometry & Calculus 1 or an equivalent college course. An AP Calculus AB score of a 4 or 5 will also fulfill the prerequisite.

**Grading:** The student's final grade will not exceed the final exam grade by more than one letter grade.

**Textbook:** *Linear Algebra: A Modern Introduction*, 4<sup>th</sup> Edition by David Poole (ISBN-10: 1285463242). Faculty liaison will consider alternative textbooks on a case by case basis.

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**The following topics are covered in the University of Pittsburgh's MATH 0280 course:**

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| <p><b>1. The geometry and algebra of vectors</b></p> <ul style="list-style-type: none"> <li>– The Dot Product and its applications</li> <li>– Lengths, angles and projections</li> <li>– Lines and Planes.</li> </ul> | <p><b>7. Subspaces of vector spaces.</b></p> <ul style="list-style-type: none"> <li>– Basis for a subspace and Dimension</li> <li>– Coordinates</li> <li>– Subspaces associated with matrices</li> <li>– Rank, Nullity, and the Rank Theorem</li> </ul> |
| <p><b>2. Linear equations and systems of linear equations</b></p>   | <p><b>8. Introduction to Linear Transformations</b></p>   |
| <p><b>3. Solving systems of linear equations</b></p> <ul style="list-style-type: none"> <li>– Gaussian elimination method</li> <li>– Gauss-Jordan elimination method</li> </ul>                                       | <p><b>9. Determinants</b></p> <ul style="list-style-type: none"> <li>– The Laplace Expansion Theorem</li> <li>– Cramer's Rule</li> <li>– Formula for the inverse of a matrix</li> </ul>   |
| <p><b>4. Applications of solving systems of linear equations</b></p> <ul style="list-style-type: none"> <li>– Spanning sets</li> <li>– Linear independence</li> </ul>   | <p><b>10. Eigenvalues and Eigenvectors of square matrices</b></p> <ul style="list-style-type: none"> <li>– Eigenspaces</li> <li>– Invertibility and The Fundamental Theorem of Invertible Matrices revisited</li> </ul>                                 |
| <p><b>5. Matrices</b></p> <ul style="list-style-type: none"> <li>– Operations and algebra</li> </ul>  | <p><b>11. Similarity and Diagonalization</b></p> <ul style="list-style-type: none"> <li>– Applications of diagonalization</li> </ul>  |
| <p><b>6. The inverse of a square matrix</b></p> <ul style="list-style-type: none"> <li>– Elementary matrices</li> <li>– The Fundamental Theorem of Invertible Matrices</li> </ul>                                     | <p style="text-align: right;"><b>(continued)</b></p>  |



**12. Orthogonality**

- Orthogonal matrices
- Orthogonal Complements and Orthogonal Projections
- The Orthogonal Decomposition

**13. The Gram-Schmidt Process**

**14. Orthogonal Diagonalization of Symmetric Matrices**

**Additional course credit information for MATH 0280:**

At the University of Pittsburgh

- This course satisfies a requirement for most Engineering majors and the Physics major at Pitt. Mathematics majors at Pitt who have completed MATH 0280 are still required to take MATH 1180.

**Academic Integrity:** All College in High School teachers, students, and their parents/guardians are required to review and be familiar with the University of Pittsburgh's Academic Integrity Policy located online at [www.as.pitt.edu/fac/policies/academic-integrity](http://www.as.pitt.edu/fac/policies/academic-integrity).

**Grades:** Grade criteria in the high school course may differ slightly from University of Pittsburgh standards. A CHS student could receive two course grades: one for high school and one for the University transcript. In most cases the grades are the same. These grading standards are explained at the beginning of each course.

**Transfer Credit:** University of Pittsburgh grades earned in CHS courses appear on an official University of Pittsburgh transcript, and the course credits are likely to be eligible for transfer to other colleges and universities. Students are encouraged to contact potential colleges and universities in advance to ensure their CHS credits would be accepted. If students decide to attend any University of Pittsburgh campuses, the University of Pittsburgh grade earned in the course will count toward the student grade point average at the University. At the University of Pittsburgh, the CHS course supersedes any equivalent AP credit.

**Drops and Withdrawals:** Students should monitor progress in a course. CHS teacher can obtain a Course Drop/Withdrawal Request form from the CHS office or Aspire. The form must be completed by the student, teacher and parent/guardian and returned to teacher by deadlines listed. Dropping and withdrawing from the CHS course has no effect on enrollment in the high school credits for the course.