



Science, Technology, Engineering, and Mathematics (STEM) Division
3322 College Drive, Vineland, NJ 08360
856-691-8600

MA 207 Linear Algebra Lab for Engineers

Syllabus

Lecture Hours/Credits: 1/1

Catalog Description

Prerequisites: MA140: Calculus II

This is a linear algebra lab designed to prepare engineering students for their Differential Equations course. Topics include vector operations, matrix row operations, matrix operations, determinants, vector spaces and subspaces, eigenvalues and eigenvectors, diagonalization and spectral decomposition, various applications, and numerical methods. Students will be introduced to new concepts in a lecture format and will then experiment with those concepts in a lab setting using mathematical software.

Textbook and Course Materials

It is the responsibility of the student to confirm with the bookstore and/or their instructor the textbook, handbook, and any other materials required for their specific course and section.

Click here to see current textbook prices at cccnj.bncollege.com.

Evaluation Assessment

Online Proctoring

All courses offered at RCSJ, whether they are web-enhanced, hybrid, or fully online, may include assessments that make use of Online Proctoring. To find out more about Online Proctoring, and to learn about the minimum technical requirements, visit rcsj.edu/elearning/online-proctoring.

Grading Distribution

Grading to be determined by individual instructors.

Individual instructors may include the following assessment(s):

- Class participation/Attendance
- Quizzes and lecture exams
- Final Exam
- Lab reports (incl. field trips)
- Project

Grading

The grading scale for each course and section will be determined by the instructor and distributed the first day of class.

Rowan College of South Jersey Core Competencies

(Based on the NJCCC General Education Foundation - August 15, 2007; Revised 2011; Adopted 2014)

This comprehensive list reflects the core competencies that are essential for all RCSJ graduates; however, each program varies regarding competencies required for a specific degree. Critical thinking is embedded in all courses, while teamwork and personal skills are embedded in many courses.

1. **Written and Oral Communication:** Students will communicate effectively in both speech and writing.
2. **Quantitative Knowledge and Skills:** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems
3. **Scientific Knowledge and Reasoning:** Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
4. **Technological Competency:** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals
5. **Society and Human Behavior:** Students will use social science theories and concepts to analyze human behavior and social and political institutions and to act as responsible citizens.
6. **Humanistic Perspective:** Students will analyze works in the fields of art, history, music, or theater; literature; philosophy and/or religious studies; and/or will gain competence in the use of a foreign language
7. **Historical Perspective:** Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.
8. **Global and Cultural Awareness:** Students will understand the importance of a global perspective and culturally diverse peoples.
9. **Ethical Reasoning and Action:** Students will understand ethical issues and situations.
10. **Information Literacy:** Students will address an information need by locating, evaluating, and effectively using information.

MA 207 Core Competencies

This course focuses on three of RCSJ's Core Competencies:

- [Add Core Competencies here](#)

Student Learning Outcomes: MA 207 Linear Algebra Lab for Engineers

Successful completion of MA 207 will help students:	RCSJ Core Competencies	Evaluation / Assessment (Additional means of evaluation may be included by individual instructors)
Perform various operations using matrix and vector algebra.		<ul style="list-style-type: none"> • Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project
Solve systems of equations (and their applications) using Gaussian Elimination, as well as multiplication of the coefficient matrix inverse (if possible).		<ul style="list-style-type: none"> • Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project
Use vector space properties to confirm a set of vectors is a vector space, and determine the basis and span of a given vector set. Continue to apply the vector space principles throughout coursework.		<ul style="list-style-type: none"> • Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project
Discuss the four Fundamental Subspaces of a matrix, and state the Rank Theorem		<ul style="list-style-type: none"> • Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project
Compute the eigenvalues and eigenvectors for square matrices, and use their results in various application, including raising matrices to high powers and spectral decomposition.		<ul style="list-style-type: none"> • Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project
Obtain the LU and QR forms of a matrix		<ul style="list-style-type: none"> • Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips)

Successful completion of MA 207 will help students:	RCSJ Core Competencies	Evaluation / Assessment (Additional means of evaluation may be included by individual instructors)
		<ul style="list-style-type: none"> • Project
Compute Eigenvalues and Eigenvectors numerically using a variety of methods.		<ul style="list-style-type: none"> • Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project

Topical Outline

Basic Concepts and Notations of Vectors/Matrices (3 weeks)

- Vector Operations, Angle between vectors, and Projection
- Linear Systems of Equations:
 - Gauss-Jordan Elimination
 - Reduced Row-Echelon Form
 - Properties of Systems
 - Parameterization of Dependent solutions
- Matrix Algebra
 - Matrix Addition, Scalar Multiplication
 - Matrix Multiplication
 - Matrix Transposition

Matrix and Vector Space Theory (4 weeks)

- Nonsingular Matrices, Inverse Matrices, Determinants, Cramer's Rule
- Vector Space:
 - Subspaces
 - Linear Combinations
 - Linear Span
 - Linear independence
 - Basis
- The Fundamental Subspaces of a Matrix
- Rank and Nullity

Eigenvalues and Eigenvectors (5 weeks)

- Properties of Eigenvectors
- Diagonalization
- Applications of Eigenvectors and Eigenvalues
- Symmetric Matrices
- The Graham-Schmidt Process
- Diagonalization using Orthogonal Matrices
- Positive Definite Matrices and Quadratic Applications
- Complex Generalizations

Numerical Methods (3 weeks)

- LU Factorizations
- Doolittle's Method
- Cholesky's Method
- Solving for Eigenvalues Numerically – Power Method, Shifted Power Method

Affirmative Action Statement

The Board of Trustees is committed to providing a work and academic environment that maintains and promotes affirmative action and equal opportunity for all employees and students without discrimination on the basis of certain enumerated and protected categories. These categories are race, creed (religion), color, national origin, nationality, ancestry, age, sex (including pregnancy and sexual harassment), marital status, domestic partnership or civil union status, affectional or sexual orientation, gender identity or expression, atypical hereditary cellular or blood trait, genetic information, liability for military service, or mental or physical disability, including AIDS and HIV related illnesses.

For questions concerning discrimination, contact Almarie J. Jones, Special Assistant to the President, Diversity and Equity/Title IX and Compliance, 856-415-2154 or ajones@rcsj.edu or (Cumberland) Nathaniel Alridge, Jr., JD, Director, Diversity and Equity/Title IX and Judicial Affairs, 856-691-8600, ext. 1414 or nalridge@rcsj.edu. For disability issues or any barriers in the learning or physical environment related to a document condition/disability please contact: Gloucester campus – Dennis M. Cook, Director, Department of Special Services, ADA/504 Officer at 856-415-2265 or dcook@rcsj.edu; or Cumberland Campus – Meredith Vicente, Senior Director, Physical & Learning Disabilities, Center for Academic & Student Success (CASS) at 856-691-6900 ext. 1282 or mvicent1@rcsj.edu

Department of Special Services

The Department of Special Services, located in the Enrollment and Student Services building, within the Testing Center, welcomes students of all abilities. The staff members in Special Services are committed to providing support services and ensuring equal access to eligible students with documented conditions/disabilities as outlined by the Americans with Disabilities Act (ADA) and the Americans with Disabilities Act with Amendments Act (ADAAA). For more information, please visit our website-[Department of Special Services](#) or call 856-691-8600 x1445 or x1487.

Reporting Allegations of Sexual Assault Resource Referrals (8/2020)
Cumberland Campus

There are multiple safe places for students to report allegations of sexual assault, both on and off campus. Reports of sexual assault can be made to any of the following offices listed in the chart below.

All students are encouraged to report alleged crimes on campus. Employees must report crimes that pose an immediate threat to the campus to the Security Office, the local Police Department or the Sheriff's Office.

Service	Resource	Phone Number/Location/Website
Non-Confidential Reporting Law Enforcement	Vineland Police Dept.	856-691-4111
	Millville Police Department	856-825-7010
	Cumberland Co. Sheriff's Office	856-451-4449
	Cumberland County Emergency Services	9-1-1
	Cumberland Campus Security 856-200-4706 (Direct)	Andres Lopez, Director Safety and Security 856-691-8600, ext. 1777
Non-Confidential On-Campus Reporting Support Services	Almarie J. Jones Special Assistant to the President Diversity and Equity, Title IX and Compliance	856-415-2154 College Center, room116 ajones@rcsj.edu
	Nathaniel Alridge, Jr., JD, Director Diversity and Equity, Title IX and Judicial Affairs	856-200-4712 nalridge@rcsj.edu Academic Building, 2nd floor
	Kellie W. Slade Executive Director Student Services, Student Life	856-200-4615 kslade@rcsj.edu Student Life Building (near gym)
Confidential On-Campus Counseling and Support Services	Heather Bense, LCSW, ACS Director	856-200-4759 hbense@rcsj.edu Academic Building downstairs
	John Wojtowicz, LSW, VACW Mental Health Counselor	856-200-4760 jwojtowicz@rcsj.edu
	Student Counseling and Wellness Center	Academic Building – 1st floor
Confidential Off-Campus Full-Service Support	Center for Family Services – Services Empowering Rights of Victims (SERV)	24/7 Hotlines Cumberland Co. – 1-800-225-0196 Camden & Glo. Co. 1-866-295-7378 centerffs.org/serv
Sexual Assault Nurse Examiner on Site	Inspira Medical Center Vineland	1505 W. Sherman Ave., Vineland, NJ 856-641-8000