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

MA 220 Differential Equations

Syllabus

Lecture Hours/Credits: 4/4

Catalog Description

Prerequisites: MA 210

Topics include first order linear equations with constant and variable coefficients, solutions by infinite series, Laplace transforms and numerical methods. Other topics include existence and uniqueness theorems, phase plane and equilibrium points as well as modeling real world problems by using differential equations.

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 220 Core Competencies

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

- *Add Core Competencies here*

Student Learning Outcomes: MA 220 Differential Equations

Successful completion of MA 220 will help students:	**RCSJ Core Competencies**	**Evaluation / Assessment** **(Additional means of evaluation may be included by individual instructors)**
Classify differential equations in terms of ordinary or partial, order and linearity		• Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project
Verify a solution by substitution into the differential equation		• Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project
Determine whether a first order linear initial value problem has a unique solution over a given interval		• Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project
Apply initial conditions to a general solution to find a unique solution		• Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project
Determine a differential equation for a variety of application problems by applying modeling methods: Modeling with First Order and Higher Order differential equations, Series solutions of linear equations, and Laplace Transforms		• Class participation/Attendance • Quizzes and lecture exams • Final Exam • Lab reports (incl. field trips) • Project

Topical Outline

- Differential Equations and their Solutions
    - Classification of Differential Equations
    - Solutions of Differential Equations
    - Initial-value problems and existence uniqueness for first order initial value problems
    - Modeling applications as Differential Equations
- Solving First-Order differential equations.
    - Separable equations. Exact differential equations
    - First order linear equations by variation of parameters an and by integration factors
    - Solutions by substitution and Homogeneous equations
    - Bernoulli differential equations
- Numerical Methods of approximating the solution of first order differential equations
    - Direction Fields
    - Euler's Method
    - Improved Euler's Method
    - Runge-Kutta Method
- Modeling with First-Order Differential Equations
    - Newton’s law of cooling, mixture and dynamics
    - Logistic, flow rates and velocity
- Systems of linear and nonlinear differential equations
    - Combined mixture problems
    - Predator-Prey models
    - Numerical estimation of solution curves
- Higher-Order Differential Equations
    - Terminology and preliminary theory
    - Linear independence and a general solution
    - Reduction of order
    - Solving homogeneous linear equations with constant coefficients
    - Undetermined coefficients
    - Variation of Parameters
    - Cauchy-Euler equation
    - Solving systems of linear equations
- Modeling with higher-order Differential Equations
    - Undamped vibration system
    - Damped vibration system
    - Driven motion
    - Nonlinear equations
    - Diabetes and a Glucose Tolerance Test
- Infinite series solutions

- Review of Power series
- Power series solutions
- Method of Frobenius

• The Laplace Transform

- Definition and general properties
- Inverse transform and the transform of a derivative
- Using to solve initial value problems
- Solving systems of linear equations

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, ADAAA/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. Millville Police Department Cumberland Co. Sheriff's Office Cumberland County Emergency Services Cumberland Campus Security 856-200-4706 (Direct)	856-691-4111 856-825-7010 856-451-4449 9-1-1 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 Nathaniel Alridge, Jr., JD, Director Diversity and Equity, Title IX and Judicial Affairs Kellie W. Slade Executive Director Student Services, Student Life	856-415-2154 College Center, room116 ajones@rcsj.edu 856-200-4712 nalridge@rcsj.edu Academic Building, 2nd floor 856-200-4615 kslade@rcsj.edu Student Life Building (near gym)
Confidential On-Campus Counseling and Support Services	Heather Bense, LCSW, ACS Director _____ John Wojtowicz, LSW, VACW Mental Health Counselor **Student Counseling and Wellness Center**	856-200-4759 hbense@rcsj.edu Academic Building downstairs _____ 856-200-4760 jwojtowicz@rcsj.edu **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**