

**EGRM 512  
ENGINEERING MATHEMATICS  
SPRING 2008**

<u>Time:</u>	<u>Location:</u>	<u>Instructor:</u>	<u>Teaching Assistant:</u>
TR 5:30-6:45	ENGR1-106	Karla Mossi, Ph.D. Office: ENG WEST 3236 Office Phone: 827-5275 E-mail: <a href="mailto:kmmossi@vcu.edu">kmmossi@vcu.edu</a> Office Hours: by appointment through e-mail	Poorna Mane Office: ENG WEST 3237 E-mail: <a href="mailto:manepp@vcu.edu">manepp@vcu.edu</a> Office Hours: by appointment through e-mail

Course Description: This course introduces students of engineering, physics, mathematics and computer science to those advanced topics in applied mathematics most important for solving practical problems. Topics covered include: partial differential equations, boundary value problems, series solutions, complex variables and vector calculus. The course is appropriate for upper level undergraduate students or first year graduate students and is particularly suited as a preparatory course for graduate school.

Text: Erwin Kreyszig  
Advanced Engineering Mathematics, 9e  
Binder Ready w/ Binder & WileyPLUS  
ISBN: 978-0470-729380  
\$80 net to bookstore

OR

Erwin Kreyszig  
Advanced Engineering Mathematics, 9e w/ WileyPLUS  
ISBN: 978-0470-119167  
\$115 net to bookstore

OR

The *Wiley Desktop Editions*. [Kreyszig - Advanced Engineering Mathematics 9th Edition](http://www.wiley.com/go/desktopeditions) is available in downloadable ebook format for 40% off the price of the printed text.  
<http://www.wiley.com/go/desktopeditions>

OR

<http://he-cda.wiley.com/WileyCDA/Section/id-310807.html>

Online Course Info: Blackboard will be used for posting grades, announcements and other materials. Students can access Blackboard at <http://blackboard.vcu.edu/>. Announcements may be made via e-mail. Students must use a VCU e-mail address and should check their e-mail frequently.

Course Objectives: The key objectives of this course are:

1. Demonstrate the ability to solve a wide range of partial differential equations and boundary value problems.
2. Demonstrate effective problem solving methodology
3. Demonstrate an understanding of complex variables and their use in engineering problem solving.
4. Demonstrate the ability to solve ordinary differential equations with non-constant coefficients using the power series method.
5. Demonstrate the ability to solve problems in spherical and cylindrical coordinate systems.
6. Demonstrate the ability to use linear algebra and vector calculus to solve engineering problems

Grading Policy: The final grade for the course will be determined based on the following distribution:

Midterms (2, 15% each)	30%
Final Exam	30%
Project	20%
Homework	<u>20%</u>
	100%

Homework: Homework problems will be assigned each THURSDAY. Students will have one week to complete homework assignments. Assignments must be submitted in blackboard (digital dropbox) by 5pm on the day it is due. Late assignments will not be accepted. Cooperation in solving homework problems is allowed and encouraged; however, copying homework is not permitted and may result in a failing grade for the course. All homework problems will count equally, and partial credit may or may NOT be given.

**LATE ASSIGNMENTS WILL NOT BE ACCEPTED.**

Disabilities: Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 require Virginia Commonwealth University to provide academic adjustments or accommodations for students with documented disabilities. Students seeking academic adjustments or accommodations must self-identify with the Coordinator of Services for Students with Disabilities on the appropriate campus. After meeting with the Coordinator, students are

encouraged to meet with their instructors to discuss their needs and, if applicable, any laboratory safety concerns related to their disabilities. The instructor can ONLY provide accommodation upon presentation of an official memorandum from the Coordinator. Isolated areas, for those who require it, will be provided. Students who require exam modifications using auxiliary services or aids such as readers, proctors or scribes should make arrangements for those modifications through the Office of Services for Students with Disabilities. A minimum of 72 hours of advanced notice to this office is required.

*Access VCU: A handbook for Students with Disabilities at:*  
<http://www.vcu.edu/eeoaa/disability.html>

Academic Integrity: Virginia Commonwealth University recognizes that honesty, truth, and integrity are values central to its mission as an institution of higher education. As such, academic dishonesty will be dealt with seriously. Any student found to have cheated on a quiz, test, laboratory assignment or examination will be referred to the Honor System Coordinator and the Office of the Dean and Associate Vice Provost for Student Affairs for disciplinary action. Students are cautioned that the academic and disciplinary sanctions for academic dishonesty can be quite severe.

The Honor System document (Effective May 2002) is available in the Resource Guide and on the VCU Web at  
<http://www.students.vcu.edu/rg/policies/rg7honor.html>

Emergencies: What *to Know* and *Do* to be prepared for emergencies at VCU.

1. Sign up to receive VCU text messaging alerts <http://www.vcu.edu/alert/notify>). Keep your information up-to-date.
2. Know the safe evacuation route from each of your classrooms. Emergency evacuation routes are posted in on-campus classrooms
3. Listen for and follow instructions from VCU or other designated authorities.
4. Know where to go for additional emergency information <http://www.vcu.edu/alert>).
5. Know the emergency phone number for the VCU Police (828-1234). Report suspicious activities and objects.

Topics Covered:

- I. Review of Ordinary Differential Equations
- II. Series Solutions of Differential Equations: Special Functions
  - a. The power series
  - b. Singular points and the method of Frobenius
  - c. Bessel functions
  - d. Legendre functions
  - e. The hypergeometric function
- III. Boundary Value Problems and Characteristic-Function Representations
  - a. Orthogonality of characteristic functions
  - b. Sturm-Liouville theory
  - c. Expansion of arbitrary functions in series of orthogonal functions
  - d. Fourier series
  - e. Fourier-Bessel series
  - f. Legendre series
- IV. Partial Differential Equations
  - a. Separation of variables
  - b. The wave equation (D'Alembert's solution)
  - c. The heat equation
  - d. Laplace's equation
- V. Complex Analysis
  - a. Complex numbers and complex functions
  - b. Complex integration, Cauchy's integral theorem
  - c. Residue integration
  - d. Conformal mapping
  - e. Complex analysis applied to potential theory
- VI. Linear Algebra and Vector Calculus
  - a. Matrices
  - b. Eigenvalues and Eigenvectors
  - c. Vector differential calculus
  - d. Divergence and Curl of a vector field