

**MIAMI UNIVERSITY
SCHOOL OF ENGINEERING AND APPLIED SCIENCE
DEPARTMENT OF ENGINEERING TECHNOLOGY**

ENT 333

Computational Methods for Engineering Technology

3

Course Number	Title	Credit hours
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DESCRIPTION:

An in-depth study of engineering analysis techniques with emphasis on mathematical analysis of mechanical and electrical subsystems. Detailed study of a variety of situations using techniques based on state-variable analysis and state-transition matrix; convolution and circuit response in the time domain; system function and response in the frequency domain; and time shift and periodic functions.

PREREQUISITES:

MTH 251: Calculus-II

TEXT MATERIAL:

[Advanced Engineering Mathematics, Textbook 9th Edition](#)

[Erwin Kreyszig](#)

[ISBN: 978-0-470-08484-7](#)

[Hardcover](#)

[May 2006](#)

[US \\$162.95](#)

[Publisher: WILEY](#)

COURSE OBJECTIVES:

Upon completion of this course, the student should be able to:

- Have strong knowledge about linear algebra, Taylor series, Laplace Transforms and differential equations.

COURSE OUTCOMES:

1. Perform Matrix operations.
2. Solve a variety of differential equations.
3. Appreciate the need for eigenvalues and eigenvectors.
4. Conduct Fast Fourier Transform.
5. Utilize techniques of Laplace Transforms.

TOPICAL OUTLINE:

Week # 1 : Complex Numbers, Partial Fractions, Determinants, Taylor series.

Week # 2 : Vectors, Scalar Products and Vector Products. Gram-Schmidt Orthogonalization.

Week # 3 : Chapter # 3 : Linear Equations. Inverse and Derivative of Matrices. Exam. # 1
 Week # 4 : Eigenvalues and Eigenvectors. Diagonalization of Matrices. The Matrix Exponential.
 Week # 5 : Separable, Exact and Homogeneous Equations. Bernoulli and Riccati Equations.
 Week # 6 : Second and Higher Order Differential Equations. Oscillatory Solutions. Cauchy-Euler.
 Week # 7 : Laplace Transform. Initial & Final Value Theorems. Transfer Function. Control Systems.
 Week # 8 : Series Solution of Differential Equations. Singular Points. Bessel & Gamma Functions.
 Week # 9 : Convergence. Frequency and Amplitude Spectra. Double Fourier Series. Exam. # 2
 Week # 10 : Fourier Integral. Fourier Transform. Fourier Sine and Cosine Transforms.
 Week # 11 : Vector Differential Calculus. Directional Derivatives, Divergence & Curl of a Vector.
 Week # 12 : Vector Integral Calculus. Transport Theorems. Exam. # 3
 Week # 13 : Analytic Functions. Cauchy-Goursat Theorem.
 Week # 14 : Conformal Mapping, Boundary Value Problems.
 Week # 15 : Final Exam. Comprehensive.

METHOD OF EVALUATION:

The student will be evaluated on homework, class participation, performance on quizzes, a final examination, and written laboratory reports.

Tests	45%
Homework and class participation	15%
Labs	20%
Final exam	20%

Ethics and Academic Conduct

It is expected that all members of the Department of Engineering Technology (faculty, staff and students) will adhere to the highest ethical standards in all matters. The Department endorses the Code of Ethics for Engineers proposed by the National Society of Professional Engineers and strongly defends the rights and responsibilities that accompany academic freedom which are at the heart of the intellectual integrity of Miami University.

It is expected that students will actively conduct themselves in an ethical fashion, for example, by only possessing and using materials authorized by the instructor during examinations, submitting assignments which are the student's original work (carefully referencing sources of information), protecting the integrity of assignments by adhering to prescribed procedures, and carefully utilizing the University's educational resources of materials and equipment.

Any activity that tends to compromise the academic integrity of the institution or subvert the educational process is defined as academic misconduct. Cheating and other forms of academic misconduct undermine the value of a Miami education for everyone, especially for the person who cheats.

The ENT department regards the adhering to academic ethical standards as a very serious issue and will follow the procedures and penalties for academic misconduct (dishonesty) as prescribed in Part V of The Student Handbook, pp. 10-12.

Miami University Learning Community

Miami University is committed to fostering a supportive learning environment for all students irrespective of individual differences in gender, race, national origin, religion, handicapping condition, sexual preference, or age. Students should expect, and help create, a learning environment free from all forms of prejudice. Disparaging comments, sexist or racist humor, or questioning the academic commitment of students based upon these individual differences are behaviors that undermine our learning community. If such behaviors occur in class, please seek the assistance of your instructor or department chair.

University Statement Asserting Respect for Human Diversity

Miami University is a multicultural community of diverse racial, ethnic, and class backgrounds, national origins, religious and political beliefs, physical abilities, ages, genders, and sexual orientations. Our educational activities and everyday interactions are enriched by our acceptance of one another; and, as members of the

University community, we strive to learn from each other in an atmosphere of positive engagement and mutual respect.

Because of the necessity to maintain this atmosphere, bigotry will not go unchallenged within this community. We will strive to educate each other on the existence and effects of racism, sexism, ageism, homophobia, religious intolerance, and other forms of invidious prejudice. When such prejudice results in physical or psychological abuse, harassment, intimidation, or violence against persons or property, we will not tolerate such behavior nor will we accept jest, ignorance, or substance abuse as an excuse, reason, or rationale for it.

All who work, live, study, and teach in the Miami community should be committed to these principles which are an integral part of Miami's focus, goals, and mission.