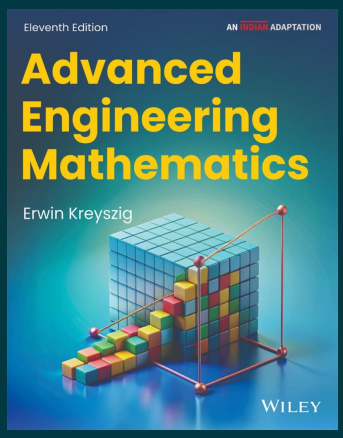
WILEY



Advanced Engineering Mathematics, 11ed An Indian Adaptation

By Erwin Kreyszig

Paperback 9789373329949 ₹1,099.00

Pages: 1152

Description

Advanced Engineering Mathematics, 11th Edition, is known for its comprehensive coverage, careful and correct mathematics, outstanding exercises, and self-contained subject matter parts for maximum flexibility. It opens with ordinary differential equations and ends with the topic of mathematical statistics. The analysis chapters address: Fourier analysis and partial differential equations, complex analysis, and numeric analysis. The book is written by a pioneer in the field of applied mathematics. This comprehensive volume is designed to equip students and professionals with the mathematical tools necessary to tackle complex engineering challenges and drive innovation.

This edition of the text maintains those aspects of the previous editions that have led to the book being so successful. In addition to introducing a new appendix on emerging topics in applied mathematics, each chapter now features a dedicated section on how mathematical modeling and engineering can address environmental and societal challenges, promoting sustainability and ethical practices. This edition includes a revision of the problem sets, making them even more effective, useful, and up-to-date by adding the problems on open-source mathematical software.

About the Author

Erwin Kreyszig

Erwin Kreyszig

Professor of Mathematics

Ohio State University, Columbus, Ohio

Herbert Kreyszig

New York, New York

Edward J. Norminton

Associate Professor of Mathematics

Carleton University, Ottawa, Ontario

Table of Contents

PART A Ordinary Differential Equations (ODEs)

CHAPTER 1 First-Order ODEs

- Basic Concepts. Modeling
- Geometric Meaning of y′ = ƒ(x, y). Direction Fields, Euler’s Method
- Separable ODEs. Modeling

- Exact ODEs. Integrating Factors
- Linear ODEs. Bernoulli Equation. Population Dynamics
- Orthogonal Trajectories. Optional
- Existence and Uniqueness of Solutions for Initial Value Problems
- Sustainability and Ethical Considerations
- Chapter 1 Review Questions and Problems
- Summary of Chapter 1

CHAPTER 2 Second-Order Linear ODEs

- Homogeneous Linear ODEs of Second Order
- Homogeneous Linear ODEs with Constant Coefficients
- Differential Operators. Optional
- Modeling of Free Oscillations of a Mass–Spring System
- Euler–Cauchy Equations
- Existence and Uniqueness of Solutions. Wronskian
- Nonhomogeneous ODEs
- Modeling: Forced Oscillations. Resonance
- Modeling: Electric Circuits
- Solution by Variation of Parameters
- Sustainability and Ethical Considerations
- Chapter 2 Review Questions and Problems
- Summary of Chapter 2

CHAPTER 3 Higher Order Linear ODEs

- Homogeneous Linear ODEs
- Homogeneous Linear ODEs with Constant Coefficients
- Nonhomogeneous Linear ODEs
- Sustainability and Ethical Considerations
- Chapter 3 Review Questions and Problems
- Summary of Chapter 3

CHAPTER 4 Systems of ODEs. Phase Plane. Qualitative Methods

- For Reference: Basics of Matrices and Vectors
- Systems of ODEs as Models in Engineering Applications
- Basic Theory of Systems of ODEs. Wronskian
- Constant-Coefficient Systems. Phase Plane Method
- Criteria for Critical Points. Stability
- Qualitative Methods for Nonlinear Systems
- Nonhomogeneous Linear Systems of ODEs
- Sustainability and Ethical Considerations
- Chapter 4 Review Questions and Problems
- Summary of Chapter 4

CHAPTER 5 Series Solutions of ODEs. Special Functions

- Power Series Method
- egendre’s Equation. Legendre Polynomials P_n(x)
- Extended Power Series Method: Frobenius Method

- Bessel’s Equation. Bessel Functions J_v(x)
- Bessel Functions of the Y_v (x). General Solution
- Sustainability and Ethical Considerations
- Chapter 5 Review Questions and Problems
- Summary of Chapter 5

CHAPTER 6 Laplace Transforms

- Laplace Transform. Linearity. First Shifting Theorem (s-Shifting)
- Transforms of Derivatives and Integrals. ODEs
- Unit Step Function (Heaviside Function). Second Shifting Theorem (t-Shifting)
- Short Impulses. Dirac’s Delta Function. Partial Fractions
- Convolution. Integral Equations
- Differentiation and Integration of Transforms. ODEs with Variable Coefficients
- Systems of ODEs
- Laplace Transform: General Formulas
- Table of Laplace Transforms
- Sustainability and Ethical Considerations
- Chapter 6 Review Questions and Problems
- Summary of Chapter 6

PART B Linear Algebra. Vector Calculus

CHAPTER 7 Linear Algebra: Matrices, Vectors, Determinants. Linear Systems

- Matrices, Vectors: Addition and Scalar Multiplication
- Matrix Multiplication
- Linear Systems of Equations. Gauss Elimination
- Linear Independence. Rank of a Matrix. Vector Space
- Solutions of Linear Systems: Existence, Uniqueness
- For Reference: Second- and Third-Order Determinants
- Determinants. Cramer’s Rule
- Inverse of a Matrix. Gauss–Jordan Elimination
- Vector Spaces, Inner Product Spaces. Linear Transformations. Optional
- Sustainability and Ethical Considerations
- Chapter 7 Review Questions and Problems
- Summary of Chapter 7

CHAPTER 8 Linear Algebra: Matrix Eigenvalue Problems

- The Matrix Eigenvalue Problem. Determining Eigenvalues and Eigenvectors
- Some Applications of Eigenvalue Problems
- Symmetric, Skew-Symmetric, and Orthogonal Matrices
- Eigenbases. Diagonalization. Quadratic Forms
- Complex Matrices and Forms. Optional
- Sustainability and Ethical Considerations
- Chapter 8 Review Questions and Problems
- Summary of Chapter 8

CHAPTER 9 Vector Differential Calculus. Grad, Div, Curl

- Vectors in 2-Space and 3-Space
- Inner Product (Dot Product)
- Vector Product (Cross Product)
- Vector and Scalar Functions and Their Fields. Vector Calculus: Derivatives
- Curves. Arc Length. Curvature. Torsion
- Calculus Review: Functions of Several Variables. Optional
- Gradient of a Scalar Field. Directional Derivative
- Divergence of a Vector Field
- Curl of a Vector Field
- Sustainability and Ethical Considerations
- Chapter 9 Review Questions and Problems
- Summary of Chapter 9

CHAPTER 10 Vector Integral Calculus. Integral Theorems

- Line Integrals
- Path Independence of Line Integrals
- Calculus Review: Double Integrals. Optional
- Green’s Theorem in the Plane
- Surfaces for Surface Integrals
- Surface Integrals
- Triple Integrals. Divergence Theorem of Gauss
- Further Applications of the Divergence Theorem
- Stokes’s Theorem
- Sustainability and Ethical Considerations
- Chapter 10 Review Questions and Problems
- Summary of Chapter 10

PART C Fourier Analysis. Partial Differential Equations (PDEs)

CHAPTER 11 Fourier Analysis

- Fourier Series
- Arbitrary Period. Even and Odd Functions. Half-Range Expansions
- Forced Oscillations
- Approximation by Trigonometric Polynomials
- Sturm–Liouville Problems. Orthogonal Functions
- Orthogonal Series. Generalized Fourier Series
- Fourier Integral
- Fourier Cosine and Sine Transforms
- Fourier Transform. Discrete and Fast Fourier Transforms
- Tables of Transforms
- Sustainability and Ethical Considerations
- Chapter 11 Review Questions and Problems
- Summary of Chapter 11

CHAPTER 12 Partial Differential Equations (PDEs)

- Basic Concepts of PDEs
- Modeling: Vibrating String, Wave Equation

- Solution by Separating Variables. Use of Fourier Series
- D’Alembert’s Solution of the Wave Equation. Characteristics
- Modeling: Heat Flow from a Body in Space. Heat Equation
- Heat Equation: Solution by Fourier Series. Steady Two-Dimensional Heat Problems. Dirichlet Problem
- Heat Equation: Modeling Very Long Bars. Solution by Fourier Integrals and Transforms
- Modeling: Membrane, Two-Dimensional Wave Equation
- Rectangular Membrane. Double Fourier Series
- Laplacian in Polar Coordinates. Circular Membrane. Fourier–Bessel Series
- Laplace’s Equation in Cylindrical and Spherical Coordinates. Potential
- Solution of PDEs by Laplace Transforms
- Sustainability and Ethical Considerations
- Chapter 12 Review Questions and Problems
- Summary of Chapter 12

PART D Complex Analysis

CHAPTER 13 Complex Numbers and Functions. Complex Differentiation

- Complex Numbers and Their Geometric Representation
- Polar Form of Complex Numbers. Powers and Roots
- Derivative. Analytic Function
- Cauchy–Riemann Equations. Laplace’s Equation
- Exponential Function
- Trigonometric and Hyperbolic Functions. Euler’s Formula
- Logarithm. General Power. Principal Value
- Sustainability and Ethical Considerations
- Chapter 13 Review Questions and Problems
- Summary of Chapter 13

CHAPTER 14 Complex Integration

- Line Integral in the Complex Plane
- Cauchy’s Integral Theorem
- Cauchy’s Integral Formula
- Derivatives of Analytic Functions
- Sustainability and Ethical Considerations
- Chapter 14 Review Questions and Problems
- Summary of Chapter 14

CHAPTER 15 Power Series, Taylor Series

- Sequences, Series, Convergence Tests
- Power Series
- Functions Given by Power Series
- Taylor and Maclaurin Series
- Uniform Convergence. Optional
- Sustainability and Ethical Considerations
- Chapter 15 Review Questions and Problems
- Summary of Chapter 15

CHAPTER 16 Laurent Series. Residue Integration

- Laurent Series
- Singularities and Zeros. Infinity
- Residue Integration Method
- Residue Integration of Real Integrals
- Sustainability and Ethical Considerations
- Chapter 16 Review Questions and Problems
- Summary of Chapter 16

CHAPTER 17 Conformal Mapping

- Geometry of Analytic Functions: Conformal Mapping
- Linear Fractional Transformations (Möbius Transformations)
- Special Linear Fractional Transformations
- Conformal Mapping by Other Functions
- Riemann Surfaces. Optional
- Sustainability and Ethical Considerations
- Chapter 17 Review Questions and Problems
- Summary of Chapter 17

CHAPTER 18 Complex Analysis and Potential Theory

- Electrostatic Fields
- Use of Conformal Mapping. Modeling
- Heat Problems
- Fluid Flow
- Poisson’s Integral Formula for Potentials
- General Properties of Harmonic Functions. Uniqueness Theorem for the Dirichlet Problem
- Sustainability and Ethical Considerations
- Chapter 18 Review Questions and Problems
- Summary of Chapter 18

PART E Numeric Analysis Software

CHAPTER 19 Numerics in General

- Introduction
- Solution of Equations by Iteration
- Interpolation
- Spline Interpolation
- Numeric Integration and Differentiation
- Sustainability and Ethical Considerations
- Chapter 19 Review Questions and Problems
- Summary of Chapter 19

CHAPTER 20 Numeric Linear Algebra

- Linear Systems: Gauss Elimination
- Linear Systems: LU-Factorization, Matrix Inversion
- Linear Systems: Solution by Iteration
- Linear Systems: Ill-Conditioning, Norms
- Least Squares Method

- Matrix Eigenvalue Problems: Introduction
- Inclusion of Matrix Eigenvalues
- Power Method for Eigenvalues
- Tridiagonalization and QR-Factorization
- Sustainability and Ethical Considerations
- Chapter 20 Review Questions and Problems
- Summary of Chapter 20

CHAPTER 21 Numerics for ODEs and PDEs

- Methods for First-Order ODEs
- Multistep Methods
- Methods for Systems and Higher Order ODEs
- Methods for Elliptic PDEs
- Neumann and Mixed Problems. Irregular Boundary
- Methods for Parabolic PDEs
- Method for Hyperbolic PDEs
- Sustainability and Ethical Considerations
- Chapter 21 Review Questions and Problems
- Summary of Chapter 21

PART F Optimization, Graphs

CHAPTER 22 Unconstrained Optimization. Linear Programming

- Basic Concepts. Unconstrained Optimization: Method of Steepest Descent
- Linear Programming
- Simplex Method
- Simplex Method: Difficulties
- Sustainability and Ethical Considerations
- Chapter 22 Review Questions and Problems
- Summary of Chapter 22

CHAPTER 23 Graphs. Combinatorial Optimization

- Graphs and Digraphs
- Shortest Path Problems. Complexity
- Bellman’s Principle. Dijkstra’s Algorithm
- Shortest Spanning Trees: Greedy Algorithm
- Shortest Spanning Trees: Prim’s Algorithm
- Flows in Networks
- Maximum Flow: Ford–Fulkerson Algorithm
- Bipartite Graphs. Assignment Problems
- Sustainability and Ethical Considerations
- Chapter 23 Review Questions and Problems
- Summary of Chapter 23

PART G Probability, Statistics (available online)

CHAPTER 24 Data Analysis. Probability Theory

- Data Representation. Average. Spread

- Experiments, Outcomes, Events
- Probability
- Permutations and Combinations
- Random Variables. Probability Distributions
- Mean and Variance of a Distribution
- Binomial, Poisson, and Hypergeometric Distributions
- Normal Distribution
- Distributions of Several Random Variables
- Sustainability and Ethical Considerations
- Chapter 24 Review Questions and Problems
- Summary of Chapter 24

CHAPTER 25 Mathematical Statistics

- Introduction. Random Sampling
- Point Estimation of Parameters
- Confidence Intervals
- Testing Hypotheses. Decisions
- Quality Control
- Acceptance Sampling
- Goodness of Fit. χ2-Test
- Nonparametric Tests
- Regression. Fitting Straight Lines. Correlation
- Sustainability and Ethical Considerations
- Chapter 25 Review Questions and Problems
- Summary of Chapter 25

PROJECTs

APPENDIX 1 References

APPENDIX 2 Answers to Odd-Numbered Problems (available online)

APPENDIX 3 Auxiliary Material

A3.1 Formulas for Special Functions

A3.2 Partial Derivatives

A3.3 Sequences and Series

A3.4 Grad, Div, Curl, ∇^2 in Curvilinear Coordinates

APPENDIX 4 Additional Proofs

APPENDIX 5 Tables

APPENDIX 6 Emerging Topics in Applied Mathematics

To purchase this product, please visit:
https://www.wileyindia.com/advanced-engineering-mathematics-11ed-an-indian-adaptation.html

Scan to buy