

ADVANCED ENGINEERING MATHEMATICS

- **Instructor:** Dr. Hossein Ashrafi
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 - **Coarse Codes:** ME205301
 - **Time/Place:** Sundays and Thursdays 14-16 in Sater Complex
 - **Required Text:** “ADVANCED ENGINEERING MATHEMATICS Textbook”, and “Instructor’s Notes”
 - **Prerequisites:** Engineering Mathematics
 - **Syllabus:**
- **Office Hours:** Open Door
 - **Phone:** +98 31 5591 3439
 - **Class Level:** Graduate

Introduction, Linear Algebra, Vector Spaces, Vector Calculus, Inner And Outer Products And Orthogonality, Matrix Calculus, Determinants And Diagonalization, Cramer’s Rule, Derivative Of A Matrix, The Cayley–Hamilton Theorem, Matrix Eigenvalues And Eigenfunctions, Solutions Of Linear Systems, Systems Of Differential Equations, Linear Differential Equations and Systems, Green’s Functions and Green Theorems, The Laplace Transform, Partial Differential Equations (PDES), Orthogonal Functions, Separable Partial Differential Equations, Boundary Value Problems And Sturm-Liouville Theory, Wave Equation, Heat Equation, Fourier Integrals And Transforms, Use Of Laplace And Fourier Transform Methods For PDES, Numerical Solutions Of Partial Differential

Equations, Variational Calculus, Concepts Of Work And Energy, Virtual Work Principles, Hamilton's Principle For Particles And Rigid Bodies, The Ritz Method, Weighted-Residual Methods.

• **Grading:**

Class Participations and Homework	10 %
Mid-Term Exam	45 %
Final Exam	45 %

• **References**

1. Boyce, W.E. DiPrima, R.C. Meade, D.B. *Elementary Differential Equations and Boundary Value Problems*, 11th edition, John Wiley & Sons, 2017.
2. Brown, J.W. Churchill, R.V. *Fourier Series and Boundary Value Problems*, McGraw-Hill, 2012.
3. Chihara, T.S. *An Introduction to Orthogonal Polynomials*, Courier Corporation, 2014.
4. Duffy, D.G. *Advanced Engineering Mathematics with MATLAB®*, 4th edition CRC Press, 2017.
5. Hoffman, K. Kunze, R. *Linear Algebra*, 2nd edition, Prentice Hall, 1972.
6. Jeffrey, A. *Advanced Engineering Mathematics*, Elsevier Academic Press, 2002.
7. Kreyszig, E. *Advanced Engineering Mathematics*, 10th edition, John Wiley & Sons, 2012.
8. Lipschutz, S. Lipson, M. *Schaum's Outline of Linear Algebra*, 6th edition, McGraw-Hill, 2018.
9. Powers, D.L. *Boundary Value Problems: And Partial Differential Equations*, 5th edition, Elsevier Academic Press, 2006.
10. Reddy, J.N. *Energy Principles and Variational Methods in Applied Mechanics*, John Wiley & Sons, 2017.
11. Wylie, C.R. Barrett, L.C. *Advanced Engineering Mathematics*, 6th edition, McGraw-Hill, 1995.
12. Zill, D.G. *Advanced Engineering Mathematics*, 6th edition, Jones & Bartlett Learning, 2018.