

Finite Element and Variational Methods in Engineering

Instructor: Madhukar Vable

e-mail: mavable@mtu.edu

Office Hours:

Textbook: J.N. Reddy “An introduction to the Finite Element Method” 3rd Edition McGraw-Hill.

Grading: Assignments(20%); 2 Midterm exam(25%); Final (30%)

Office:

Phone:

Topic

Source

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|--------------------------------------|------------------------------------|
| 1. Variational Principles 1-D | Ref. 1&7; 2.1,2.2.4,2.3.2.4.3 |
| 2. Ritz’s Method 1-D | 2.5,2.5.2 |
| 3. Other Formulations | Ref 3 &4, 2.5.5 |
| 4. Weak Form 1-D | 2.4.2, |
| 5. FEM Overview | |
| 6. Lagrange polynomials 1-D | 3.1 |
| 7. FEM 1-D; 2nd order system | Chapters 3 & 4 |
| 8. FEM 1-D; 4th order system | Chapter 5 |
| 9. Variational Principles 2-D | Ref 2 &7. |
| 10. FEM 2-D; | Chapters 8,9 11,12, Refs. 2,5, & 6 |
| 11. Numerical Integration | 7.1, 9.3 |
| 12. Storage and Solution Techniques | Chapter 7 |
| 13. Variational Principles & FEM 3-D | Ref. 5 &6 &7. |
| 14. Time dependent problems | 2.3.6, 12.4,Chapter 6 |
| 15. Advanced Topics | Chapter 14 |

References

1. Cornelius Lanczos. “The Variational Principles Of Mechanics” 3rd.edition,Mathematical Expositions No.4, University of Toronto press. Toronto; 4th edition Dover Publications, Inc., New York.
2. Henry L. Langhaar. “Energy Methods in Applied Mechanics.” John Wiley and Sons, Inc. New York.
3. Bruce A. Finlayson. “The Method of Weighted Residuals and Variational Principles” Academic Press New York.
4. B.A Finlayson and L.E.Scriven. “The Method of Weighted Residuals a Review” Applied Mechanics Reviews. v19, n9 p 735-748.(Sept. 1966).
5. T.J. Chung “Finite element analysis in fluid dynamics” McGraw-Hill Book Company.New York
6. O.C. Zienkiewicz: “The finite element method” 3rd edition McGraw-Hill Company. New York.
7. M. Vable "Advanced Mechanics of Materials", madhuvable.org, Chapter 7; Expanding Educational Horizons, LLC.