Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional

Submit original form and 25 copies. Attach a course syllabus to each.*

1. This request is submitted by the Department of Mechanical Engineering

2. Course prefix, number and complete title MEEN 608 Continuum Mechanics

3. Course description (not more than 50 words) Development of field equations for analysis of continua (solids as well as fluids); conservation laws; kinematics, constitutive behavior of solids and fluids; applications to aerospace engineering problems involving solids and fluids.

4. Prerequisite(s) Graduate Classification

5. Is this a variable credit course? □ Yes □ No If yes, from ______ to _______

6. Is this a repeatable course? □ Yes □ No If yes, this course may be taken ______ times. Will the course be repeated within the same semester/term? □ Yes □ No

7. Has this course been taught as a 489/689? □ Yes □ No If yes, how many times? ______ Indicate the number of students enrolled for each academic period it was taught. 4

8. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

10. Prefix Course # Title (exclude punctuation)
    MEEN 608 CONTINUUM MECHANICS

    Lect. Lab SCH Subject Matter Content Code Admin. Unit Acad. Year FICE Code
    0 3 0 0 0 3 1 4 9 0 1 0 0 6 1 9 2 0 8 - 0 9 0 1 0 3 6 6

    Do not complete shaded area.

    Approval recommended by:
    Head of Department 11/7/2007
    Chair, College Review Committee 11-26-07

    Head of Department (if cross-listed course) Date
    Dean of College 11/26-07

    Submitted to Coordinating Board by:
    Dean of College Date

    Director of Academic Support Services Date Effective Date

* Attach a syllabus according to the guidelines on the Internet site www.tamu.edu/admissions/oaras. To have this form reviewed, please send to Linda F. Lacey, Mail Stop 1265 or fax to 847-8737.
MEEN 608
Continuum Mechanics

COURSE DESCRIPTION
MEEN 608  Continuum Mechanics. (3-0). Credit 3: Development of field equations for analysis of continua (solids as well as fluids); conservation laws; kinematics, constitutive behavior of solids and fluids; applications to aerospace engineering problems involving solids and fluids. Prerequisite: Graduate classification.

INSTRUCTOR: Ray Bowen
252C Evans Library Annex
(979) 862-2955
rbowen@tamu.edu

TEXTBOOK
INTRODUCTION TO CONTINuum MECHANICS FOR ENGINEERS, By Ray M. Bowen, Plenum Press, 1-261, 1989

Note: This book is currently out of print. A revised electronic version is available at no charge at http://www1.mengr.tamu.edu/rbowen/.

TEXTBOOK TABLE OF CONTENTS
Chapter

1. One-Dimensional Continuum Mechanics
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   1.2. Balance of Mass
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   1.5. General Balance
   1.6. The Entropy Inequality
   1.7. Example Constitutive Equations
   1.8. Thermodynamic Restrictions
   1.9. Small Departures from Thermodynamic Equilibrium
   1.10. Small Departures from Static Equilibrium
   1.11. Some Features of the Linear Model
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   2.2. Velocity, Acceleration and Deformation Gradients
   2.3. Transformation of Linear, Surface and Volume Elements
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   3.3. Balance of Angular Momentum
   3.4. Balance of Energy
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   3.6. Jump Equations of Balance - Material Versions
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4. **Models of Material Behavior**
   4.1. Examples
   4.2. Isothermal Elasticity - Thermodynamic Restrictions
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   4.4. Isothermal Elasticity - Material Symmetry
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   4.6. Thermoelastic Material with Heat Conduction and Viscous Dissipation-
       Constitutive Assumptions
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   5.2. Maxwell-Cattaneo Heat Conductor
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   5.4. Closing Remarks-Alternate Forms of the Entropy Inequality
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Appendix A. **Mathematical Preliminaries**

A.1. Vector Spaces
A.2. Linear Transformations
A.3. Inner Product Spaces
A.4. Components of Vectors and Linear Transformations
A.5. Cross Products, Determinants and the Polar Decomposition Theorem
A.6. Multilinear Functionals and Tensor Algebra
A.7. Euclidean Point Spaces, Coordinate Systems
A.8. Vector Analysis

Bibliography

Appendix B. Representation Theorems

Bibliography

COURSE COVERAGE:
The course will cover most of Chapters 1 through 4. In addition, the material in Appendices A and B will be covered

Weekly Summary of Lectures:
1. Week 1
   a. Organizational Meeting
   b. Chapter 1, Section 1.1
2. Week 2
   a. Chapter 1, Sections 1.2 and 1.3
   b. Chapter 1, Sections 1.4, 1.5, 1.6
3. Week 3
   a. Chapter 1, Sections 1.6 and 1.7
   b. Chapter 1, Section 1.8
4. Week 4
   a. Chapter 1, Sections 1.8 and 1.9
   b. Chapter 1, Section 1.10
5. Week 5
   a. Chapter 1, Section 1.11
   b. Exam
6. Week 6
   a. Appendix A, Sections A.1 to A.3
   b. Appendix A, Sections A.3 to A.5
7. Week 7
   a. Appendix A, Section A.5
   b. Appendix A, Sections A.5 to A.8
8. Week 8
   a. Chapter 2, Sections 2.1 to 2.2
   b. Chapter 2, Section 2.3 to 2.4
9. Week 9
   a. Chapter 2, Section 2.5. Chapter 3, Sections 3.1 to 3.2
   b. Chapter 3, Sections 3.2 to 3.3
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11. Week 11
   a. Chapter 3, Sections 3.3 to 3.4
   b. Chapter 4, Sections 4.1-4.7 (Skip Sections 4.2-4.5)

12. Week 12
   a. Chapter 4, Sections 4.7-4.9
   b. Chapter 4, Sections 4.10-4.11

13. Week 13
   a. Exam
   b. Chapter 4, Section 4.11-4.12

14. Week 14
   a. Review
Americans with Disabilities Act (ADA) Policy Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room B118 of Cain Hall or call 845-1637.

Academic Integrity Statement

"An Aggie does not lie, cheat, or steal or tolerate those who do."

"The Aggie Code of Honor is an effort to unify the aims of all Texas A&M men and women toward a high code of ethics and personal dignity. For most, living under this code will be no problem, as it asks nothing of a person that is beyond reason. It only calls for honesty and integrity, characteristics that Aggies have always exemplified. The Aggie Code of Honor functions as a symbol to all Aggies, promoting understanding and loyalty to truth and confidence in each other."

http://student-rules.tamu.edu/aggiecode.htm