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 603 Theory of Elasticity

3. Course description (not more than 50 words): Analysis of stress and strain in two and three dimensions, equilibrium and compatibility equations, strain energy methods; torsion of noncircular sections; flexure; axially symmetric problems

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:

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 | 603 | THEORY OF ELASTICITY

    Lect. | Lab | SCH | Subject Matter Content Code | Admin. Unit | Acad. Year | FICE Code | Level
    --- | --- | --- | --- | --- | --- | --- | ---
    03 | 00031419010006 | 192008-09 | 010366

Do not complete shaded area.

Approval recommended by:

Head of Department: ____________________________ Date: 11/7/2007

Chair, College Review Committee: ____________________________ Date: 11-26-07

Dean of College: ____________________________ Date: 11-26-07

Submitted to Coordinating Board by:

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 603
Theory of Elasticity

Instructor: Dr. Anastasia Muliana
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http://www.mengr.tamu.edu

Prerequisites: Mechanics of Materials, Advanced Calculus, Differential Equations

Textbook:

Reference Books:

Grading:
Homework: 40%
Exams: 2 (30%) 60%

Course Objectives:
• To learn the concepts of stress, strain and energy and the stress and displacement formulation methods
• To derive equilibrium, constitutive, kinematic and compatibility equations using different approaches
• To study the generalized Hooke’s law for anisotropic solids
• To find approximate solutions of two- and three-dimensional engineering mechanics problems by using suitable assumptions
• To understand the nature of the approximations and their effects on the accuracy of the resulting elasticity solutions
• To apply the elasticity theory to analyze deformation problems common in engineering design
Course Outline

1. **Tensor Analysis**: index notation, tensor algebra, tensor calculus (*2 weeks*)
   *(Chapter 1)*

2. **Kinematics**: deformation, displacements, strain tensors, strain-displacement relations, compatibility equations (*1 week*) *(Chapter 2)*

3. **Kinetics**: traction vector, stress tensors, principle stresses, equations of motion, equilibrium (*1 week*) *(Chapter 3)*

4. **Constitutive Equations**: anisotropic/orthotropic/transversely isotropic/isotropic materials, generalized Hooke’s law, linearized elasticity (*1 week*) *(Chapters 4 & 11)*

5. **Basic Principles**: stress and displacement formulations, superposition, St. Venant’s principle, boundary conditions (*1 week*) *(Chapter 5)*

6. **Variational Methods**: strain energy, uniqueness, complementary energy, potential energy, virtual work principle, minimum total potential/complementary energy principle, approximate solutions (*1.5 weeks*) *(Chapter 6)*

7. **Two-Dimensional (2-D) Theory**: plane stress and plane strain, anti-plane shear, Airy’s stress function, inverse method, complex variable method, displacement solution (*1 week*) *(Chapters 7 & 10)*

8. **2-D Problems**: beam bending, plate with a hole, curved beams, pressurized cylinders, wedges, Flamant problem, rotating disks (*1.5 weeks*) *(Chapters 8 & 10)*

9. **Torsion**: St. Venant torsion theory, Prandtl stress function, membrane analogy (*1 week*) *(Chapter 9)*

10. **3-D Theory and Problems**: Helmholtz theorem, Galerkin vector, elastic potentials, Kevin solution, Boussinesq problem, thick-walled spheres (*2 weeks*) *(Chapter 13)*

11. **Other Topics**: dislocation problems, higher-order elasticity theories, thermoelasticity (*1 week*) *(Chapters 12 & 14)*

**Other Relevant Information:**
- Solving problem is essential in learning the course materials. Several sets of homework problems will be assigned and graded.
- Some assigned homework problems will be required to be completed or checked using either Maple or Matlab.
- The instructor is available for additional help with appointments.
- The class notes are intended to be self-consistent, but more examples can be found in the textbook and references suggested.
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