MEC 455/530 - APPLIED STRESS ANALYSIS
Spring Semester 2018

Credit: 3 credits
Prerequisite: MEC 363 or equivalent course
Lectures: Mon/Wed 4:00 – 5:20PM at Heavy Engineering 201
Instructor: Toshio Nakamura, (toshio.nakamura@stonybrook.edu)
Include MEC455 or 530 in the subject line when emails are sent
Office Hour: Mon, Thu 1:30 – 3:00PM at Light Engineering 137
TA: Jing Xue (Jing.Xue@stonybrook.edu), TBD.

Text/Primary Reference Book:

Other Related Books:
- Textbook for MEC363 (textbook for MEC410 is also useful).

Homework: Homework and/or computer assignments are given about every week.
Exams: Two mid-term tests will be given (in March & April/May). No final exam.
Project: Final computer project using FEM and written report will be required (due 5/8/2018)
Grading: Homework (including computer assignments) 34%
          Two Mid-Term Tests 44%
          Finite Element Course Project 22%

Course Learning Objectives:
The course is designed to learn the fundamentals and various solution procedures for structural problems including analytical methods and finite element method. Through understanding tensor algebra, solution formulations and various materials behaviors, students will be effectively utilized these solution techniques to determine stress and deformation fields of engineering structures and components. The course also prepares students to become professional engineers through writing detailed analysis/project reports.

Finite Element Program:
The course will use ABAQUS finite element software. A student edition of the program can be downloaded. First create “DS Passport” by accessing to http://academy.3ds.com/software/simulia/abaqus-student-edition/ and follow the necessary procedure. Do this immediately to download the software.
Manuals for some homework assignments can be downloaded from Blackboard.
A student may also use another Finite Element software for the assignments (e.g., NX I-DEAS in CADLAB?) but no assistances will be given on how to use the software.
Topics:

- Review of Stresses and Strains, Vectors and Tensors with Indicial Notation (chap 2, appendix C).
- **Energy Formulation** – fundamentals of FEM, minimum potential energy (chap 7).
- **Finite Element Formulations** – interpolation functions (chap 8).
- Stress, Deformation and Strain – equilibrium and compatibility (chap 2).
- Material Behavior – constitutive equations, strain energy (chap 3).
- Simple Elastic Problems – axial loading, thin-walled cylinder (chap 4).
- 2-D Elasticity – plane stress and plane strain, Airy stress function (chap 5).
- **FE Modeling and Mesh Design** – symmetry, discretization, B.C.s. (chap 7, 8).
- Strength and Failure – fracture and plasticity (chap 6, 9).

**DISABILITY SUPPORT SERVICES (DSS) STATEMENT**
If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

**ACADEMIC INTEGRITY STATEMENT**
Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

**CRITICAL INCIDENT MANAGEMENT**
Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.

**CALCULATOR POLICY**
Only the following calculators will be permitted to be used on all midterm and final exams in the Department of Mechanical Engineering. There will be no exceptions! This list of calculators is identical to that allowed for the National Council for Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) exam that many of you will take in your senior year, as well as Professional Engineering (PE) exam that you may take.

- **Casio:** All fx-115 models. Any Casio calculator must contain fx-115 in its model name.
- **Hewlett Packard:** The HP 33s and HP 35s models, but no others.
- **Texas Instruments:** All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.

For detail information, follow [https://ncees.org/exams/calculator-policy/](https://ncees.org/exams/calculator-policy/)