

1. Course Title:

Applications in Strength of Materials

MET 426 – 4 Credits

Three Hours Lecture and Two Hours Laboratory per week

MET Core Program Requirement

Prerequisite: IET 312 and MET 351

This is a Technical content course under ABET Criterion 5

2. Faculty Member Information:

Instructor: Dr. Craig Johnson
Office: Hogue 304
Phone: 509- 963-1118
E-mail: cjohnson@cwu.edu

3. Course Description:

Topics support stress analysis and design. Laboratory activities include material strength, hardness, impact testing, strain gage technology, photoelasticity, ultrasonics and eddy current.

4. Textbook and other required materials for the course:

Mark's Standard Handbook for Mechanical Engineers, Avallone and Baumeister, (latest ed.)

Mechanics of Materials, 7th ed., by Hibbeler; Prentice Hall Publ., 2008. ISBN: 0132209918

Engineering Materials Technology, current ed., by Jacobs & Kilduff; Prentice Hall Publ.

Net access, word processing, spreadsheet and graphing capability required

5. Specific Learner and Expressive Outcomes and Assessment Strategies:

ABET Outcome Criteria #	Learner Outcomes The student will demonstrate their ability to:	Assessment Students will be assessed through
3a,b,h 9a,d	specify Codes and perform 'compliant' tests like tensile, hardness and impact	Homework, and lab exercises
3a,b,g 9f	use computers for research, data collection, analysis and presentation	reports and exams
3a 9a,b,e,n	instrument these tests using strain energy and photoelastic methods	lab exercises and projects
3a,f,g 9a,b,d,e	perform common non-destructive inspections and evaluations	lab exercises
3g	write and evaluate reports by using assessment to improve them, and by using decision matrices.	Homework assignments, examinations, and lab reports

6. Course Topics and Schedule:

- Week 1 Lab Rpt Guide, Safety, Resources Sections 3, 5, 6: Force/Stress/Strain/Displ
Lab. #1 – Analysis SS: Due next class!
- Week 2 Combined Loads, Stress/Strain 3D, Failure (Mohr's, Principal stress & strain)
Saint Venant's, stress concentrations (5-5), ASTM E8, ISO9000
Lab #1 - Tensile Testing #1, test specimen for Poisson's Ratio and E parameters
- Week 3 Marks Sec 5: Loading Types, Rates, Temps & Silly Putty and Hardness Demos
Lab #1 - Tensile Testing #2 (ASTM E8 with statistics!, 6 sigma)
- Week 4 Hardness: Marks 1-25 and 5-12
Lab #2, I - Hardness (Hardness Tests, ASTM E18; macro/micro/superficial)
Lab #2, II - Intro to SPC; X bar and Range Plots, Hardness; Data Presentation
- Week 5 **Exam #1:** mechanical behavior, tensile, hardness, stress conc., SPC
Review Exam / Decision Analysis Matrix & Activity (which computer to buy?)
- Week 6 Marks 5.2.74 Energy Methods, and Strain Rosettes
Strain Gaging Demo/Lab
Lab #3, Impact (Ductility, Fracture, and intro to ASTM E23) Memo Format
- Week 7 Experimental Data vs. predictions: Analytical and Energy Methods
Lab #4, I - Strain Gaged Beam Analysis & Applications (to individual projects?)
- Week 8 Comparing experimental results with predictions
Lab #4, II - Photoelastic Analysis
Exam #2: Energy Methods, Impact and Strain
- Week 9 Intro to Non-destructive testing: ASTM, ASNT, ASM;
Sensors: ΔR , piezo, thermistor/TC
Lab #5, I - NDT techniques (visual, magnaflux, fluorescence)
- Week 10 Lab #5 Memo format report), II – (cont.) and Project Work
Project Presentations at Final

7. Grading:	Lab Assignments	(5)	40%
	Exams	(2)	30%
	Projects (Individual)	(1)	20%
	Professionalism/Ethics	(20)	10%

A(92-100), A-(90-92), B+(88-90), B(82-88), B-(80-82), C+(78-80), C(72-78), C-(70-72), D+(68-70), D(62-68), D-(60-62), F(<60)

8. ADA Statement:

Students who have special needs or disabilities that may affect their ability to access information and or material presented in this course are encouraged to contact me or Robert Harden, ADA Compliance Officer, Director, ADA Affairs and Students Assistance on campus at 963-2171 for additional disability related educational accommodations.

Prepared by Roger Beardsley June 24, 2009