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.)  

Net access, word processing, spreadsheet and graphing capability required

5. Specific Learner and Expressive Outcomes and Assessment Strategies:

<table>
<thead>
<tr>
<th>ABET Outcome Criteria #</th>
<th>Learner Outcomes</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a,b,h 9a,d</td>
<td>specify Codes and perform ‘compliant’ tests like tensile, hardness and impact</td>
<td>Homework, and lab exercises</td>
</tr>
<tr>
<td>3a,b,g 9f</td>
<td>use computers for research, data collection, analysis and presentation</td>
<td>reports and exams</td>
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<tr>
<td>3a 9a,b,e,n</td>
<td>instrument these tests using strain energy and photoelastic methods</td>
<td>lab exercises and projects</td>
</tr>
<tr>
<td>3a,f,g 9a,b,d,e</td>
<td>perform common non-destructive inspections and evaluations</td>
<td>lab exercises</td>
</tr>
<tr>
<td>3g</td>
<td>write and evaluate reports by using assessment to improve them, and by using decision matrices.</td>
<td>Homework assignments, examinations, and lab reports</td>
</tr>
</tbody>
</table>
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