MSE 705 001/601 Mechanical Properties of Materials

Section 001  T - H 10:15– 11:30 am EB1 3003
Section 601  Engineering On Line

1.1 Instructor and course information

Professor Ronald O. Scattergood
Office: 3078D EB1
Email: scatterg@ncsu.edu
Office phone: 919-515-7843
Office hours – please contact by e-mail for questions/consultation

Course lecture notes/materials will be available in Moodle

1.2 Prerequisites: MSE 500 or equivalent

1.3 GER satisfied by this course: Not applicable.

1.4 Learning outcomes
Students completing this course should be able to:

• Apply elasticity and plasticity methods to engineering problems
• Analyze defect interactions and strengthening mechanisms
• Explain creep, fracture and fatigue mechanisms
• Estimate creep and fatigue lifetimes using engineering data
• Describe hardness and nanoindentation testing methods
• Calculate elastic and viscoelastic deformation response in polymers
• Explain mechanical properties in selected biomaterials

1.5 Textbook
Course notes/references will be provided; no textbook is required.

1.6 Scope
Continuum elasticity and plasticity theory will be covered first. Slip geometry and dislocation theory will be used to establish the fundamentals of plastic deformation in crystalline solids. Strengthening mechanisms in metals and alloys will be treated. Thermal effects, creep, fracture and fatigue will be covered. This will include basic mechanisms and engineering analysis. Selected topics in test methods, organic materials and biomaterials will complete the course.

1.7 Assignments
The course will be based on in-class lectures, course notes and homework sets provided as PDF files in Moodle. In-class lectures emphasize concepts and key points while homework sets provide practice on conceptual and mathematical applications. Students are expected to handle engineering-math calculations at the graduate level. Some capability with math packages (Maple, Matlab, etc.) is desirable. Selected numerical calculations will be illustrated using Maple.

1.8 Course schedule and submission deadlines
The course schedule for lectures, homework and quizzes is provided separately. EOL students can schedule quizzes at dates/times convenient for the student and proctor (take home quizzes
do not require a proctor). Homework sets for on-campus and EOL students must be submitted on the due date given in the course schedule – EOL students submit directly to the EOL coordinator and on-campus students submit by 3 pm (EB1 3078).

1.9 Exams, Homework and Grading
EOL students should submit homework and quizzes directly to the EOL coordinator. Homework problems will not be graded on a percentage correct scale. Full credit will be given for a reasonable attempt. Quizzes will be graded on a percentage correct scale. The overall grade will be determined by homework grades (approximately 10%) and quiz grades (approximately 90%). There will be 2 closed-book in-class quizzes and a take-home final quiz. The suggested grading scale to determine a grade is as follows (this is subject to modification).

<table>
<thead>
<tr>
<th>Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>97 - 100</td>
<td>A+</td>
</tr>
<tr>
<td>92 - 96</td>
<td>A</td>
</tr>
<tr>
<td>90 - 91</td>
<td>A-</td>
</tr>
<tr>
<td>88 - 89</td>
<td>B+</td>
</tr>
<tr>
<td>82 - 87</td>
<td>B</td>
</tr>
<tr>
<td>80 - 81</td>
<td>B-</td>
</tr>
<tr>
<td>78 - 79</td>
<td>C+</td>
</tr>
<tr>
<td>72 - 77</td>
<td>C</td>
</tr>
<tr>
<td>70 - 71</td>
<td>C-</td>
</tr>
<tr>
<td>68 - 69</td>
<td>D+</td>
</tr>
<tr>
<td>62 - 67</td>
<td>D</td>
</tr>
<tr>
<td>60 - 61</td>
<td>D-</td>
</tr>
<tr>
<td>&lt; 60</td>
<td>F</td>
</tr>
</tbody>
</table>

1.10 Incomplete grades (IN) and late assignments
Incomplete grades will be given only under extenuating circumstances agreed to in advance by the instructor. The burden of fulfilling an incomplete grade is the responsibility of the student. On-campus students must turn in exams or other assignments on the scheduled dates unless an excused absence is approved. Deadlines can be extended for Engineering On Line students with travel or related conflicts approved by the instructor.

1.11 Attendance
On campus students are expected to attend lecture classes, but attendance will not be taken. Engineering On Line videos will be available for cases where conflicts occur.

1.12 Academic integrity
As a student enrolled in this class, you are expected to honor the NCSU policies regarding academic integrity found in the Code of Student Conduct (POL11.35.01). It is the understanding and expectation of the instructor that the student’s signature on any in-class or take-home test means that the student neither gave nor received unauthorized aid.
1.13 Students with disabilities
Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services Office (http://www.ncsu.edu/dso/) located at 1900 Student Health Center, Campus Box 7509, 515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01).

1.14 Laboratory safety: Not applicable.

1.15 Extra expenses
No charges beyond that for textbooks or course notes (if applicable) will be incurred.

1.16 Transportation accommodations: Not applicable.