



MTS Materials Science Academic Offer

An integrated solution for materials science and engineering education

Benefits:

- » Deeper understanding of materials testing
- » Improved learning outcomes
- » More efficient use of testing resources, including laboratory hours
- » Valuable experience combining virtual and physical testing
- » Curriculum materials for tensile, fatigue and fracture testing
- » Relevant preparation for work in the global engineering field

Universities, colleges, technical schools and other academic institutions strive to provide the best learning experiences for their students. In science and engineering disciplines, mastering the course material requires a combination of laboratory lessons and classroom lectures.

To further enhance the learning environment, MTS offers a comprehensive Academic Offer that supports multi-modal learning of materials science testing concepts. MTS enriches the classroom and lab experience by providing the tools for students to simulate mechanical testing outside of the lab environment.

The software simulation tools provided in the MTS Materials Science Academic Offer can augment classroom, laboratory and

student self-study to create a deeper understanding of the subject. This integrated virtual and physical approach makes lab time more efficient and emulates the real-world testing process.

With simulation mode, students are able to study effects of control modes and material behavior, receiving results in seconds instead of hours or days. In addition to providing information faster, this mode of teaching reduces the need for equipment, lab time or specimens. It can be used to reinforce the lessons learned in the classroom and lab, and demonstrates the uses and limitations of simulation. Best of all, because it parallels real-world iterative design processes of design, simulate, test and adjust, it prepares students for their endeavors beyond the classroom.

be certain.

Complete Offer, Including Curriculum

The MTS Materials Science Academic Offer includes all the elements needed to create a materials science course. In addition to an affordable test system, MTS also provides a pre-packaged materials science curriculum and individual student software licenses for offline test creation and simulation.

This materials science curriculum consists of 3 lesson plans (Tensile, High-Cycle Fatigue, and Fracture Toughness) and includes lecture notes, homework, and lab exercises. MTS TestSuite™ Software facilitates the transition between simulation and the physical lab with the use of the Python™ programming language, which makes it easier for students to move from an equation to the test program. Code is written in the same way as a manual calculation would be performed, and since Python is an open source language, many sample programs are available.

** Fatigue and fracture lesson plans may be used in simulation mode, or in conjunction with existing dynamic test systems.*

MTS MATERIALS SCIENCE ACADEMIC OFFER INCLUDES:

- » Materials Test System (or ReNew Upgrade)
- » Testing Accessories
- » PC with TestSuite Software license
- » 20 TestSuite Simulation Software Licenses
- » Curriculum Materials
 - Lecture Notes
 - Homework Assignments
 - Lab Exercises



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Create Your Own Simulation

MTS provides tools for you to design your own simulations to meet your course objectives. With the software included in the MTS Materials Science Academic Offer, you can create the test results that you want to simulate by using the open source programming language in the software to design the tests. Or if you draw and digitize the curve, the software can curve-fit and run tests accordingly. This capability gives you complete freedom to create complex simulation behavior.

Multi-Modal Instruction

There are several important advantages to integrating lectures, simulation and physical testing. Integration provides a direct illustration of material behavior, prompting discussion of more advanced concepts, such as why materials yield, what defines ductility and why some materials are stronger than others.

Students become familiar with the details of test methods, concepts, procedures and vocabulary as well as how to collect and interpret data, extract property values and identify where empirical results are used in analysis. In other words, an integrated curriculum effectively prepares students to create and perform real material tests.

Students increase their understanding of all aspects of running a physical test, from specimen selection, to alignment, to mounting, to running the test and analyzing data. None of these tasks is easy for a novice to master, but with an integrated curriculum, students can more efficiently practice all of these steps in a simulated environment.

Contact MTS today to learn more about how the MTS Materials Science Academic Offer can increase the effectiveness of materials science instruction at your institution.

Example of Curriculum Materials for Tensile Testing

LECTURE NOTES

- » Start with design example
- » Determine relevant characteristics to measure
- » Discuss sources of measurement uncertainty
- » Introduce principle of elastic versus plastic deformation

The coupler link is a two-force member loaded in tension, carrying a maximum load of 4.5 kN.

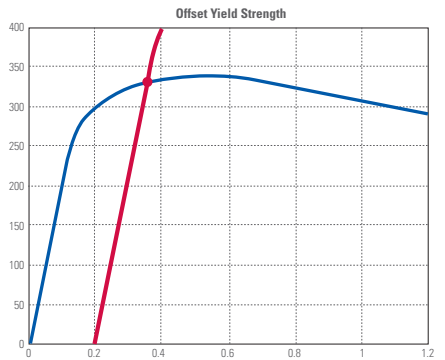
Q: How might it fail?

- failure
 - overload
 - static
 - fatigue

One obvious answer, if the 4.5 kN load is too much for the link to carry. An "overload" failure in this case could occur in (at least) two different ways – a *static* failure, or a *fatigue* failure.

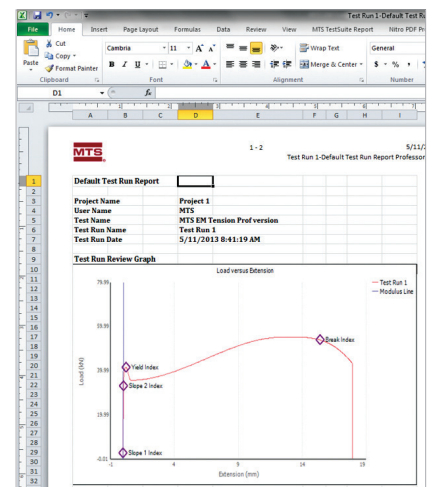
HOMEWORK

- » Run test in simulation mode to determine
 - Modulus
 - Yield Strength
 - Offset Yield Strength



LAB EXERCISE

- » Perform tests as planned during homework



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