

# HYSITRON<sup>®</sup>

## An Introduction to Hysitron's NanoGuru<sup>™</sup>

*A Nanomechanical Education System*

*For **Every** Discipline of Undergraduate Engineering Students*

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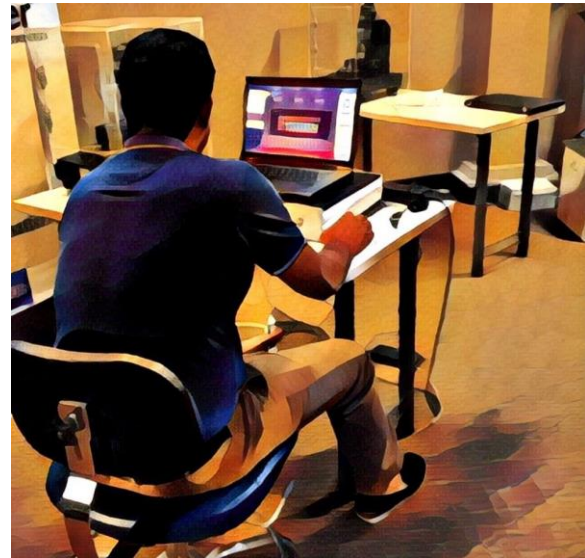
### Introduction

The implementation of nanotechnology is expanding within the world of science; in research, in engineering, and much more. Educators from around the world recognize this trend and increasing demand for college undergraduates – well trained in the area of nanotechnology. With the demand for nanoscale-educated graduates comes an increased burden on educators to understand and instruct extensively on this subject. Hysitron Inc., a world leader in Nanomechanical Testing, has designed and developed the NanoGuru<sup>™</sup> Nanomechanical Education System. The NanoGuru<sup>™</sup> provides educators with a cutting-edge, comprehensive solution to meet curriculum demands.

The NanoGuru<sup>™</sup> Nanomechanical Education System is a modern, turnkey system consisting of Instrumentation and Practicum<sup>®</sup> based curriculum. The curriculum, samples, and experiments are designed to extensively involve undergraduate engineering students in the study of nanoscale science and materials.

Conceived and guided by Dr. Syed Asif, director of R&D at Hysitron, the NanoGuru<sup>™</sup> suite was developed to provide educators in all disciplines of undergraduate study with the tools necessary to efficiently instruct students on the basic

building blocks for nanotechnology. Understanding the nanoscale is essential for comprehending where material properties originate. The NanoGuru<sup>™</sup> provides a complete education system based on proven SBIR Award winning technology that bridges the gap between nano and macroscales.



### NanoGuru<sup>™</sup> Project Goals

The priority of the NanoGuru<sup>™</sup> is to provide educators all around the globe with the means to methodically educate the growing student population on the essentials of nanoscale science and nanotechnology. The entire NanoGuru<sup>™</sup> suite was designed with the

undergraduate student and instructor in mind. Intuitive software and detailed modules help students learn nanoscale science effectively while saving educators valuable planning and laboratory time.

Not only does the NanoGuru™ aim to save educators' time and introduce students to the nanoscale world, the suite intends to deliver a solid foundation for further education. Whether a student is moving from their undergraduate studies to a position in industry or academia, the NanoGuru™ is built to provide a strong base of nanoscale knowledge and an understanding of the interplay between nano and macroscale properties.

## NanoGuru™ Instrumentation

The NanoGuru™ nanomechanical indentation instrument is a new product developed at Hysitron. Hysitron is the world leader in the development and commercialization of nanomechanical test instruments who has designed, manufactured, and serviced cutting edge technology for the scientific community for over twenty years. The commitment to engineering design that gave the company world leader status in nanomechanical test instrumentation continues. Hysitron scientists and engineers acutely dedicate themselves to the continuous quality and design of the NanoGuru™ instrumentation and curriculum.

## Exclusive NanoGuru™ Instrumentation Highlights

The NanoGuru™ nanomechanical indentation instrument most notably features Hysitron's patented capacitive transducer technology. This transducer provides a portal with systematic access to reliable mechanical property measurements at the nanoscale.

Alongside the patented capacitive transducer, the NanoGuru™ contains proprietary in-situ

SPM imaging. SPM Imaging enables precise test positioning and observation of post-test deformation behavior to  $\pm 10$  nanometers. The patented in-situ imaging technology provides 3D topographical mapping at the nanoscale, allowing students to observe the nanoscale world in real time.

In order to operate the nanoindentation instrument, the NanoGuru™ Nanomechanical Education System provides an intuitive software designed specifically for undergraduate students. The software is intentionally built for a user with little to no familiarity with nanoindentation and nanoscale property measurements. The NanoGuru™ is an undergraduate laboratory instrument and curriculum that introduces nanotechnology concepts.

## NanoGuru™ Curriculum

The NanoGuru™ Education System encompasses an in-depth curriculum which acquaints the instrument user with the world of nanotechnology. The curriculum was developed under the guidance of Deborah Newberry, a world renowned specialist in the instruction of nanotechnology to the undergraduate education community. The curriculum includes five practicums, background information, and laboratory exercises.

The practicums covered in the curriculum consist of

- Instrumentation and Measurement Science at Nanoscale
- Basics of Instrumented Indentation
- Elasticity and Plasticity
- Structure Property Correlation at Nanoscale
- Thin Film Mechanical Properties

This curriculum will provide students with a strong foundation in nanomechanical science. This foundation will prepare users for a world

becoming more familiar and thus reliant on nanotechnology.



## Practical Skills

The NanoGuru™ illustrates the undeniable connection between nanoscale structures and macroscale applications by providing students with the information necessary to investigate nanoscale structures through nanoindentation. Students will gain hands on experience with real life materials by exploring nanomechanical indentation using a nanoscale diamond tip. Students will also be taught how to analyze their collected data.

The NanoGuru™ guides students through the background of nanoindentation and material properties, the physical nanoindentation process, and the analysis of collected nanoindentation data. The experimental thought process and testing skills learned by nanomechanical indentation are likewise applicable in other laboratories. Also taught in the NanoGuru™ curriculum is the ability to extrapolate useful and viable information from measured data which is a necessary skill for any college graduate in science and technology.

Understanding nanoscale properties will help drive innovation, application, products, and the market for nanotechnology.

## Impact

All of the physical, electrical, and biological properties of a material are defined by the material's nanoscale structure. With the intention of engineering better materials in the future, nanoscale structures must be understood. This knowledge allows the desired macroscale properties to be designed. In order to plan with current materials properly, material properties must be understood thoroughly so as to prevent product failure.

Nanostructure modified steel has already been created to display superior mechanical properties. Additionally, coatings that are antibacterial, self-cleaning, or provide thermal management are all based on nanoparticles or nanolayers incorporated into the coatings.

Nanotechnology is a growing field that needs nanoscience educated graduates to lead the way. The NanoGuru™ Nanomechanical Education System is one solution to providing industry and academia with the educated leaders they need. The NanoGuru™ helps both undergraduate students and educators make a difference in the nanotechnology world.

## Commitment to Success

Hysitron, Inc. is committed to the customers' success with the NanoGuru™ Nanomechanical Education System. The service and support of the NanoGuru™ is handled through Hysitron, Inc.'s world renown customer service department with over 40 years combined experience servicing nanomechanical testing equipment. We pride ourselves in our immediate tech support assistance and ability to quickly separate user error, instrument idiosyncrasies, and nanoscale phenomenon,

providing solutions quickly. Every NanoGuru™ comes with a standard one-year warranty and different levels of extended support agreements are available to help ensure long term customer success.

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