

ranging from Winston Cup race cars to high performance rocket engines.

### **NSF Fellowships**

NSF fellowships are available to professors, postdocs and Ph. D candidates from US universities. The fellowship consists of full tuition plus a travel allowance if applicable; see web site for an application form. In addition to the application form, please submit a two page vita in NSF format and a 200 word statement indicating why the short course will help your career **by July 15, 2003.**

### **Course Organization**

#### **Registration**

Mail in the completed registration form with check or money order.

#### **Registration Dates**

Now – July 15, 2003

#### **Course notes**

The course notes will consist of all presentation materials, lecture notes and appropriate review papers.

#### **Fees**

The registration fee for the short course is as follows:

Monday and Tuesday: \$1,200

Wednesday to Friday: \$1,500

Monday to Friday: \$2,000

**An additional \$200 fee will be added to late registrations received after July 11th, 2003. Register by June 1<sup>st</sup> and receive a 20% discount.**

The fee includes continental breakfast, coffee breaks, and lunch, each day plus a reception dinner on Monday and a banquet

dinner on Thursday as well as course lecture notes.

#### **Location**

The course will be held at Northwestern University.

#### **Accommodations**

A block of rooms has been reserved at special rates for short course attendees at the Omni Hotel. To qualify for special rates, you must mention that you are attending the “NSF Summer Institute on Nano Mechanics and Materials” short course. Attendees should contact the hotel directly to make reservations **(847) 866-8700**. The rooms at the **special rate of \$79** will only be held until July 11, 2003.

Dorm housing is also available; please check

<http://www.northwestern.edu/housing/> for more information.

#### **Daily Schedule**

The lectures start at 8 a.m. and end at 6 p.m.

#### **For additional information, contact:**

Ms. Charlotte Gill Letscher (847) 467-7909

[summerinstitute@mail.mech.northwestern.edu](mailto:summerinstitute@mail.mech.northwestern.edu) or Prof. Wing Kam Liu

<http://tam.northwestern.edu/summerinstitute/Home.htm>



### **NSF Summer Institute on Nano Mechanics and Materials \***

**Co-sponsored by: ASME, the Northwestern University NASA URETI BIMat Center, the Northwestern University Materials Research Center, the NU Nanoscale Science and Engineering Center and Northwestern University**

Professor Wing Kam Liu (Director)

Professor Ted Belytschko (Co-Director)

Professor Yip-Wah Chung (Co-Director)

Northwestern University, Robert R.

McCormick School of Engineering and

Applied Science, 2145 Sheridan Rd.

Evanston, IL 60208

\* Funded by the Civil and Mechanical Systems Division, monitored and guided by Dr. Ken P. Chong.

**A Short Course on: Nanoscale Design of Materials**

Instructors:

**Charles Kuehmann, QuesTek**

**Innovations**

**Hern-Jeng Jou, QuesTek Innovations**

**August 25 to 29, 2003**

## Registration Form

U.S. professors, postdocs and graduate students see other side for NSF Fellowships.

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_

Zip Code: \_\_\_\_\_ Country: \_\_\_\_\_

E-mail: \_\_\_\_\_

Affiliation (will be printed on your name tag) \_\_\_\_\_

Phone: (\_\_\_\_) \_\_\_\_\_

Make check or money order payable to:

Northwestern University

Send to: Attn: Wing Kam Liu

Northwestern University, Dept. of Mechanical Engineering, 2145 Sheridan Rd. Evanston, IL 60208

## Institute Mission

- To identify and promote important areas of nanotechnology, and to create new areas of focus which will augment current nanotechnology research and development by universities, industries and government.
- To train future and practicing engineers, scientists and educators in the emerging areas of nanotechnology, nanoengineering, nano-mechanics, and nano-materials.

- To exchange new ideas, disseminate knowledge and provide valuable networking opportunities for researchers and leaders in the field.

The short courses will provide fundamentals and recent new developments in selected areas of nanotechnology. The material will be presented at a level accessible to BS graduates of science and engineering programs. Emphasis will be on techniques and theory only recently developed that are not available in texts or standard university courses. The instructors are well known for their research and teaching.

**Course description:** Traditional materials and process development is a highly empirical, time consuming and expensive process. Often the results of such activities are poorly understood and suffer failure during scale-up or in the field because they aren't robust. Simply replacing experiment with computational modeling in this process may be beneficial, but is not ideal. To achieve the optimal results a design-centered approach is necessary.

This course will demonstrate how to treat materials as systems, realizing the necessary complexity of real materials yet building a framework that breaks it into manageable pieces for design. Computational modeling capabilities will be reviewed from a design perspective to illustrate how to build and select appropriate tools

## Program Outline

### Monday Aug. 25

**AM:** Materials as Systems, Systems Approach to Design – Lectures

**PM:** Property/Performance Relations – Materials Selection – Lecture and Lab

### Tuesday Aug. 26

**AM:** Tuesday AM: Design Tools – Modeling approaches and examples – Lecture

**PM:** Design Tools – ThermoCalc/DICTRA & CMD Codes – Lab

### Wednesday Aug. 27

**AM:** Applications of Design Principles in Advanced Alloys – Lecture

**PM:** Design Examples – Lab

### Thursday Aug. 28

**AM:** Examples in nonmetals – Lecture

**PM:** Extensions beyond design to development

### Friday Aug. 29

**AM:** Robust design and Quality Engineering Principles – Lecture and Lab

## Course Credit and Pre-requisites

The total number of contact hours for the five-day program is 27, and 2.7 CEUs. There are certain pre-requisites for each topic. In order to maximize the learning experience, we will provide complete course materials to students prior to the class. Pre-requisite material will be reviewed briefly at the beginning of each course.

## Instructors

### Charles Kuehmann, QuesTek

#### Innovations

Dr. Charles Kuehmann is a leader in the field of computer-aided systems design of materials. As a founding member of QuesTek Innovations, he has directed the development of advanced gear and bearing steels, ultra high-strength steels, and ferritic superalloys using Thermo-Calc, DICTRA and other custom thermochemical and kinetic models. He directed the applications of these tools to achieve improvements in strength, toughness, corrosion resistance, fatigue, hydrogen resistance, and magnetic properties by the Materials by Design<sup>®</sup> method. Dr. Kuehmann holds a Ph.D. in Materials Science and Engineering from Northwestern University.

### Hern-Jeng Jou, QuesTek

**Innovations**  
Dr. Hern-Jeng Jou is Director of Technology at QuesTek Innovations. His work has centered on mechanistic materials modeling of hierarchical microstructure and its software implementation. Since joining QuesTek, Dr. Jou has been leading the development of the *CMD* (Computational Materials Dynamics) platform. His recent work includes leading the successful development of *PrecipiCalc*, a general purpose, multicomponent and 3D precipitation model and software tool. Dr. Jou has led the application of these tools in the design of advanced alloys for applications