

***DISTINGUISHED
LECTURER SERIES***

***VCU
MECHANICAL ENGINEERING***

***Computational
Issues in Control
and Design: From
Ultra-Small
Nanodevices to
Ultra -Large Space
Structures***



***cProfessor John A. Burns
Virginia Tech
24 September 2007
Social Hour: 11:30-12:00 noon
Seminar: 12:00-1:00 pm
Room 105
Engineering Building***

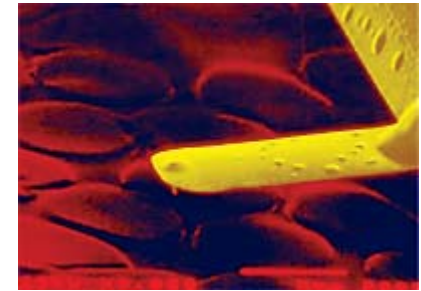
ABSTRACT

Computational science has already become one of the key tools in modern engineering. However, engineering design in the 21st century will require new and advanced computational tools for simulation, optimization, design and control of complex systems of partial differential equations (PDEs). The construction of practical approximation schemes for optimal design is much more complex than one might first imagine. The issue of approximation is of paramount importance in the practical design, optimization and implementation of control laws for PDE systems.

In this presentation we discuss several theoretical and computational issues that arise in the development and analysis computational algorithms for optimal design. We motivate the talk by discussing examples from nanotechnology, inflatable space structures, aerodynamic design and fluid flow control. Several of these problems involve shape as one of the design variables and fall into a class of design problems known as shape optimization. We provide a general methodology based on infinite dimensional optimization theory and close with numerical examples to illustrate the ideas. The examples also demonstrate the efficiencies that can be obtained with algorithms based on the delaying the introduction of approximations.

BIO

John Burns is the Hatcher Professor of Mathematics at Virginia Tech and the Director of the Center for Optimal Design and Control. He has published over 125 research papers on computational methods for identification, optimization and control of systems governed by partial and functional differential equations. He has directed over twenty Ph.D. students and 10 MS thesis. He has served on more than 12 editorial boards and he was the founding Editor of the SIAM Book Series on Advances in Design and Control. He has directed twenty graduate students. He has served as Vice President of SIAM, is the past Chair of the SIAM Activity Group on Systems and Control and is a Fellow of the IEEE. Dr. Burns' primary interests concern the development of rigorous and practical computational algorithms for design and optimization of engineering and biological systems. He has applied his research to a wide variety of areas including fluid dynamics, smart materials, large space structures, nano-devices and aerodynamic design. Dr. Burns has been a consultant and advisor to Booz Allen & Hamilton, NASA Langley Research Center, The Air Force Research Labs, DARPA, The Babcock and Wilcox Company, Solers Inc. and held several academic visiting positions in the USA and Europe.



***Contact:
Mechanical Engineering
School of Engineering
Virginia Commonwealth
University
601 West Main St
Richmond, VA 23284-3015
Office: 804-828-9117
Fax: 804-827-7030***

