Come to UC for Graduate School!

Prof. Paul D. Orkwis
Director of Graduate Studies
AsE&EM

February 1, 2006
Agenda

- Introduction
- Why UC for graduate school?
- Research Images
- AsE&EM Organization
- Faculty Members Research Interests
- Graduate Degrees Offered/Requirements
- Typical Student Load
- Contact Points
- What to do now…
- Questions
- Additional Faculty Presentations/Discussion
Introduction

Graduate school might be for you if:
- You want to control more of what you do in the future…
- You want to learn more about your field and specialize in an area…
- You want to become an expert in a specific area…
- You’d like to earn a little more but can wait a few years…

Best future prospects come about if:
- You went to the best institution in your field
- You worked with the world expert in your area
- You did the most outstanding original research

The hierarchy
- B.S. – Institution
- M.S. – Advisor
- Ph.D. – Research

Suggestion: Choose the best advisor for you!!!!
- Respected in the field
- Well funded… at least enough to support you
- Good facilities
- Wants to work with you
- You want to (and can) work with him/her
Why UC for Graduate School?

- Outstanding research opportunities in experimental and computational sciences – gas turbines, flow control, aeroacoustics, aerodynamics, nondestructive evaluation, composites, orbits, autonomous systems, robotics…..
- Graduate stipends for teaching and research from $18-30k per year
- Over $3.66M in research funding in 2005 and growing…
- Part of the Ohio Aerospace Triangle
  - GE Infrastructure – Aircraft Engines
  - U.S. Air Force Research Laboratory
  - NASA Glenn Research Center
- Free Tuition
- Easy application process, no GRE requirement for UC senior applicants
- Begin taking classes and start research as a Senior
- You already know the faculty!
- Deadline is March 31, 2006 – First offer letters sent March 15, 2006
Gas Turbine Simulation Laboratory
Professors Orkwis and Turner

Compressor and Turbine Simulations

Full engine simulation

Film cooling effectiveness studies

1000+-Node UC-GTSL OCAPP Cluster
80 Node GE Cluster
64 Node Prop21 Cluster

Stereo Projection System
Passive Polarized Glasses
Aeroacoustics and Unsteady Flow Simulations
Professor Hamed

Schematic of Cavity Flow Characteristics

Iso-surfaces of $\omega_x$

Sound Pressure Level Spectra: Comparison with Experiment
Gas Dynamics and Propulsion Laboratory
Professor Gutmark

Afterburner and Turbine Cooling Simulator

Intelligent Combustion 20 bar Rig

Transonic Cascade Facility

Aeroacoustic Experimental Research Facility

UC Pulse Detonation Engine
NDE for Turbine Engine Life Extension

Professor Nagy

**Goal:** To recover the conservatism inherent in the current turbine-engine life-management system for fracture-critical components, without increasing risk of failure.

**Technical Objective:** To develop Nondestructive Evaluation (NDE) methods for near-surface residual stress assessment in surface-treated (shot-peened, laser shocked, and low-plasticity burnished) engine components.

**Retirement for Age versus Cause:** Discarding turbine disks prior to their full useful life represents a significant cost. Technologies are required to more fully use the service lives inherent in turbine engine disks.

**NDE Approach:** Eddy current spectroscopy with analytical inversion.
Processing, Thermomechanical Characterization, Modeling and Development of Polymeric Composite Materials and Structures
Professor Abot

(a) Wet laboratory facilities for processing of polymers and composite materials; (a1) nano-reinforced epoxy samples; (b) press machine and RTM processing of polymeric composite materials; (c) aircraft composite half-fuselage being cured (senior class aircraft project); (d) graduate student performing characterization of polymeric composite sample in DMA; (e) mechanical characterization of polymeric composite sample with loading stage and strain-gage data acquisition system.
The Mission of the UC Autonomous Systems Lab (695 Rhodes) is to Develop Flight Traceable Hardware and Algorithms to Further the State of the Art in Space Automation and Robotics

Current Research and Development Projects Include

- Spacecraft Servicing Testbed
- Pose Estimation Algorithms
- Path Planning Algorithms
- Target Track Filters
- Modeling & Simulation
- Visualization
- Textured Illumination
- Compliance Control
- Redundant Manipulators

Spacecraft Servicing Testbed
Initial Operational Capability Expected June 2006
AsE&EM Organization

Disciplinary Structure

- 16 Full-time Faculty
- 4 Research Professors
- 2 Active Emeritus Professors

- Dynamics and Controls (4-0-1)
- Fluid Dynamics and Propulsion Systems (8-4-1)
- Solid Mechanics and Structures (4)
Dynamics & Controls Faculty

Albert Bosse, Ph.D. Autonomous systems, robotics, spacecraft control systems, structural dynamics, vibration control, system identification, and modal testing

David L. Richardson, Ph.D. Astrodynamics, long-term orbital evolution and chaos theory.


Trevor Williams, Ph.D. Dynamics of Extra-Vehicular Activity (EVA) maneuvering systems, dynamics and control of flexible structures and numerical methods for control.
Fluids & Propulsion Faculty

Shaaban Abdallah, Ph.D. Computational methods for turbomachinery and propulsion system analysis.

Peter J. Disimile, Ph.D. Experimental fluid mechanics/heat transfer, flow field diagnostics - liquid crystals, full field passive optical techniques, laser absorption, LIF image processing - for subsonic and supersonic flows.

Kirti N. Ghia, Ph.D. Flow separation, bluff-body wakes, high incidence aerodynamics, vortex dynamics, unsteady flows, transition, turbulence, flow control, jet mixing.

Ephraim Gutmark, Ph.D. Gas turbines, experimental fluid mechanics, combustion control, heat transfer, rocket and air breathing propulsion, aeroacoustics.

Awatef Hamed, Ph.D. Engine erosion and ice accretion, Aeroacoustics & multiscale unsteady flow simulations, high-speed propulsion integration, Supersonic intake & exhaust systems.
Fluids & Propulsion Faculty

San Mou Jeng, Ph.D., Combustion, two-phase chemical reacting flows, diagnostic tool developments and applications.

Prem Khosla, Ph.D., Computational aerodynamics - supersonic inlets and nozzles, numerical methods.

Paul D. Orkwis, Ph.D., Computational Fluid Dynamics of steady & unsteady vortex dominated flow. Advanced algorithm development for serial and parallel computer architectures. Turbulence modeling and flow field stability analysis.

Widen Tabakoff, Ph.D., Propulsion systems, multi-phase flows in turbomachinery, heat transfer, space vehicle and engine performance and deterioration.

Mark Turner, Sc.D., Computational fluid dynamics analysis of steady and unsteady vortex-dominated flow fields.
Solids & Structures Faculty

Jandro Abot, Ph.D., Materials characterization, nano-structures.

Peter B. Nagy, Ph.D., Experimental ultrasonics, materials characterization and nondestructive evaluation (NDE).

Ala Tabiei, Ph.D., Structural stability, finite element (FE) simulation of strength and deformation of composite materials; implementation of material models into FE codes; crashworthiness simulation.

James E. Wade, Ph.D., Wave propagation, finite element methods and structural analysis.
Graduate Degrees Offered

- MS Aerospace Engineering – Thesis Option
- MS Aerospace Engineering – Nonthesis Option
- MS Engineering Mechanics – Thesis Option
- MS Engineering Mechanics – Nonthesis Option
- Ph.D. Aerospace Engineering
- Ph.D. Engineering Mechanics
## MS Specific Requirements

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PhD Specific Requirements

- 135 credits beyond BS or 90 past MS
- 3 credits seminar
- Residence requirement – 12 graduate credits for 3 out of 5 consecutive quarters

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‡ - Previous MS counts as 30cr coursework, 15cr research
§ - At least 18 credits at 700 level or above
## Typical M.S. Student Load

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### Summer/Fall – Year 2

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<tr>
<td>Total</td>
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Talk with your advisor to define a program that is right for you!
Contact Points

Prof. Paul D. Orkwis  
Director of Graduate Studies  
745B Baldwin Hall  
556-3366  
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Ms. Julie Muenchen  
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AsE&EM DoGs

Ms. Brenda Smith  
AsE&EM Secretary  
745 Baldwin Hall  
556-3548  
Brenda.Smith@UC.Edu
What to do now…

- Go on-line to https://www.grad.uc.edu/admissions/app/
- Get two letters of recommendation
  - Drop them off in 701ERC
- Choose an area
- Find an advisor
- Develop a research topic

Deadline is March 31, 2006 – First offer letters sent March 15, 2006
Questions?