Graduate Program in Acoustics

Special Overview Information for CAV Workshop Participants

prepared by

Victor W. Sparrow
Professor of Acoustics and Interim Head
Penn State Graduate Program in Acoustics
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Acknowledgements

Students
(this is what its all about)
What is the Graduate Program in Acoustics?

• The Graduate Program in Acoustics is:
  - Intercollege graduate degree program (IGDP), based in the College of Engineering
  - Administratively aligned with Dept. of Aerospace Engineering
  - Associated with the Applied Research Laboratory (ARL)

• History
  1965 Graduate Program established to provide the US Navy with an academic program in acoustics and its applications.
  1987 Distance Education established in partnership with ARL to further extend educational opportunities to students unable to pursue graduate school at University Park.
Philosophy

• Provide a broad education in acoustics fundamentals that will last a lifetime

• Provide this education for
  – residence students
  – working professionals
    ○ courses a la carte
    ○ pursue M. Eng. degree

• Blend residence and distance students when possible
Penn State Graduate Program in Acoustics

www.acs.psu.edu

- Over 65 in-residence graduate students in Acoustics
- Over 80 distance education students taking courses each semester
- Over 40 faculty members from across Penn State ARL, College of Engineering, etc.
- Degrees offered in Acoustics:
  - Master of Engineering
  - Master of Science (in-residence only)
  - Doctor of Philosophy (in-residence only)
Acoustics Program Uniqueness

• Only U.S. institution awarding degrees in Acoustics
• Blending/Simulcasting almost all classes to both local and distance students
• Our distance education classes began (1987) before Penn State World Campus was established (1998). [We also enjoy a healthy relationship with World Campus.]
Employment for Acoustics Students

Apple
APL Johns Hopkins
ARL Penn State
BBN
Boeing
Bose Corporation
Army Corps of Engineer’s Research Lab
Eminance Loudspeakers
ENSCO, Inc.
FDA
IBM
Ingersol Rand
Jet Propulsion Lab
Motorola
NASA Langley Research Center
Naval Surface Warfare Center
Northrup Grumman
Panasonic
Raytheon
US DOT Volpe Center
Verizon
Wyle

Brigham Young University
Central Washington University
Cheju National University (Korea)
Harvard Medical School
Illinois Institute of Technology
James Madison University
Kettering University
Lehigh University
McGill University
Silpakorn University (Thailand)
University of Arizona
University of Cincinnati
University of Hartford
University of Michigan
University of Nebraska
University of Rhode Island
University of Texas at Austin
Virginia Tech

Students also go to architectural acoustics/consulting firms . . .

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Acoustics Courses

- Fundamentals of Acoustics (ACS)
- Transducers
- Digital Signal Processing (DSP)
- Structural Acoustics
- Ocean Acoustics
- Data Measurement and Analysis
- Architectural Acoustics
- Outdoor Sound Propagation
- Noise Control Engineering
- Aerodynamically Induced Noise
- Thermoacoustics (refrigeration using sound)
- Nonlinear Acoustics (high amplitude sounds)
What a distance education student sees

6.11 Sound Power For Realistic Noise Sources

**Fan Noise**

- Centrifugal Fans*

- Airfoil blades — used in large HVAC systems (relatively clean air)
- Backward curved blades (BCB) — general ventilation and _____, higher efficiency, fan speed must be higher for given flow rate, usually 8 to 16 blades
- Radial blades (FCB) — ______ handling systems, industrial applications where sand, wood chips, small particles present in air, usually 6 to 12 blades
- Forward curved blades (FCB) — lower fan efficiency, used for low pressure rise, low speed (domestic furnaces, packaged home A/C units), usually 36 to 64 blades

**Axial Fans**

- Stationary vanes

(Students asking questions in chat area. Also can use microphone.)
Some Recent/Future DE Offerings

Fall 2013 / Spring 2014:

- Fundamentals of ACS
- Transducers
- ACS of Fluids II
- Math Review
- Marine Bioacoustics
- Flow-induced Noise
- Spatial Sound and 3-D Audio
- Architectural ACS and Noise Control
- Sound Structure Interaction
- Data Measurement and Analysis

Fall 2014 / Spring 2015:

- DSP
- Advanced Transducers and Acoustic System Modeling
- Research and Writing for Acousticians
- Outdoor Sound Propagation (+ all the blue courses above)

+ one more . . .
A choice for Spring 2015

• We would like your input
• Spring 2015
  – Nonlinear acoustics:
    • high amplitude, shocks, wave steepening, spectral broadening, etc.
  – Computational acoustics:
    • acoustic FDTD, acoustic FEM, acoustic BEM, infinite elements, etc.

• Both need to be offered. But which one 1st?

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Another proposed idea

- We would like your input
- **1 year-resident Master of Science Program (no thesis)**
  - New, additional program to Penn State
  - *Under consideration* in Acoustics Program
  - If approved, would begin Fall 2015
  - 30 credits of courses (12 in Fall, 12 in Spring, 6 in Summer)
  - Many schools are going to non-thesis M.S. degrees

- Pros: 1-year, some tuition $$ for dept.
- Cons: ?, students might write a research paper for a class instead of a thesis

What are your thoughts about this?
Acoustics Information Contacts

• Victor Sparrow – Interim Head
  vws1@psu.edu

• Dan Russell – Director of Distance Education
  drussell@engr.psu.edu

• Karen Thal – Graduate Records Manager + CAV
  kjt3@psu.edu

• Christine Popovich – Operations Manager for Distance Education
  cxp23@psu.edu

(814) 865-6364

acoustics@psu.edu  www.acs.psu.edu