

Dr. David J. Purdy
Chair - Mechanical Engineering Department
Rose-Hulman Institute of Technology
Terre Haute, IN 47803

November 4, 1999

Dear Dr. Purdy:

I would like first to congratulate you again for being selected as Department Head. I look forward to the departmental improvements that will occur under your direction. I truly enjoyed visiting with you during Homecoming and participating in the ME Focus Group (the ME survey was received yesterday).

I am writing to apply for the ME faculty position that Dr. Roper and Mary Anne Pierce recently delineated to me. This position requires an academically strong Mechanical Engineer with devotion to undergraduate education. I believe these requirements accurately mirror my academic background, teaching experience, and, most importantly, my career goals.

I received my BS ME degree in 1994 and my MS ME degree in 1996, both from Rose-Hulman Institute of Technology. I plan to complete my Engineering Science PhD in May of 2000 at the University of Tennessee, Knoxville. My MS work focused on the finite element determination of pressure distributions over airfoils for comparison with experimental data. I also evaluated and documented Algor for flow visualization in undergraduate aerodynamics. My PhD research emphasizes Computational Fluid Dynamics in the area of minimally diffusive finite element approximations to hyperbolic conservation law systems. This research has culminated in stable, highly accurate, characteristics-biased methods which I am using to investigate open channel flow.

My teaching experience includes two years as a Graduate Teaching Fellow in the Engineering Fundamentals Division (EFD), UTK's analog to the RHIT IFYCSEM, where I have taught Autocad 14 / Mechanical Desktop, Matlab programming, Statics, and Dynamics. I have also had full responsibility for four sections of Engineering Graphics and served for three years as a Instructor with the Tennessee Governor's School for Manufacturing. I have been actively involved in UTK's streaming video distance education activities, synthesizing the first Internet Governor's School for Manufacturing in the nation and deploying the first fully on-line graduate courses in the College of Engineering.

My background, experience, and interests well-complement your job expectations. I believe that I would serve as an enthusiastic, effective teacher and scholar at Rose-Hulman. I would be grateful if you would consider my request for an interview to elaborate further on my qualifications and to learn more details on this job opportunity.

Thank you for your consideration and I look forward to hearing from you.

Sincerely,

Zachariah Chambers

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DESIRED POSITION

I seek a tenure-track faculty position at an engineering college dedicated to undergraduate education where I can teach Engineering Mechanics in an Integrated Freshman/Sophomore Curriculum environment, deliver traditional upper-level Mechanical Engineering courses, including Finite Elements, Fluid Dynamics, Aerodynamics, and Heat Transfer, and contribute to the enhancement of the undergraduate educational experience through state-of-the-art teaching pedagogy.

EDUCATION

Present **PhD Candidate in Engineering Science and Mechanics**

The University of Tennessee, Knoxville, TN

Graduation Date: May 2000

Dissertation: A Characteristics Finite Element Algorithm for Computational Open Channel Flow Analysis

Advisor: Dr. J. Iannelli, *Assistant Professor*

GPA: 3.8 / 3.9 (major)

1996 **Master of Science in Mechanical Engineering**

Rose-Hulman Institute of Technology, Terre Haute, IN

Thesis: A Verification of the Finite Element Method for Use in Computational Fluid Dynamics

Advisor: Dr. A.T. Roper, *VP Planning and Data Systems*

GPA: 3.9 / 4.0 (major)

1994 **Bachelor of Science in Mechanical Engineering**

Rose-Hulman Institute of Technology, Terre Haute, IN

GPA: 3.2

TEACHING PHILOSOPHY

I enjoy engaging students in an interactive learning environment. Students take an active role in the lecture through numerous introspective questions and group learning exercises. Material application and relevance is stressed and connections are drawn to situations extending beyond the classroom. Most important to me is the personal connection with the students and the opportunity to provide guidance, support, and encouragement throughout their undergraduate career.

TEACHING EXPERIENCE

- 1999 - Present **Senior Graduate Teaching Fellow**, Engineering Fundamentals Division
Teach Autocad 14 / Mechanical Desktop, MatLab programming, Statics, and Dynamics in the UTK college-wide Integrated Freshman Curriculum (EFD). Responsible for two 75 minute lectures per week / 30 students per semester. Actively develop curriculum material, homework, and exams. Provide leadership for first year GTF's.
- 1998-99 **Graduate Teaching Fellow**, Engineering Fundamentals Division
Taught above material in second pilot year of EFD. Developed entire MatLab programming curriculum which was followed by the other eight GTF's. Delivered two 75 minute lectures per week / 30 students per semester. Provided evening tutoring.
- 1997-98 **Graduate Teaching Assistant**, Engineering Graphics
Taught hand-drafting and Autocad 14 / Mechanical Desktop for four 75 minute lectures per week / 60 students per semester. Responsible for creation of syllabus, homework, exams, and assignment of final grades.
- Summer
1997-99 **Instructor**, Tennessee Governor's School for Manufacturing
Created, taught, and refined the eight two-hour modules featuring Office97 applications and web page design for the Internet Governor's School for Manufacturing (IGSM).
- 1996-97 **Graduate Teaching Assistant**, Statics and Dynamics
Tutored five 30 student sections of statics and dynamics. Graded three 30 student sections of dynamics homework.

DISTANCE EDUCATION EXPERIENCE

- 1998 - Present **Streaming Video Specialist / Webmaster**, MAES 551w-552w
Created and refined the graduate-level 551w and 552w distance education web sites featuring live streaming video, integrated support material, and interactive chat. Currently provide web maintenance and live/static streaming video support.
<http://cfdlab.engr.utk.edu/551w99> <http://cfdlab.engr.utk.edu/552w>
- Summer
1998, 99 **Streaming Video Specialist / Webmaster**, IGSM
Synthesized the entire IGSM web site. Prepared/converted all supporting material, developed the composite Interface window containing embedded video, interactive chat, and automated slides, and Internet-broadcast the entire thirty day program to six high schools in Tennessee.
<http://www.engr.utk.edu/~gschool>
- 1998-99 **Streaming Video Specialist / Webmaster**, AE422w
Developed the pilot undergraduate Theoretical Aerodynamics website with archived streaming video lectures
<http://cfdlab.engr.utk.edu/AE422w>

RESEARCH EXPERIENCE

1998 - Present **Numeric Stability and Accuracy of Hyperbolic Conservation Laws**

University of Tennessee, Knoxville

Currently investigating the stabilization of finite element approximations to hyperbolic conservation laws via a non-linear, characteristics-biased dissipation operator. Accurate and stable solutions have been achieved for the open channel flow equations. This research has resulted in a full understanding of finite element methodology and associated error mechanisms coupled with insight into the underlying physics of the problem statement and an appreciation of the pure mathematical issues involved in solving these equation systems.

1997 - Present **Optimization of Internet Education Potential**

University of Tennessee, Knoxville

Develop pioneering web sites for distance education employing streaming audio/video, integrated support material, and interactive chat. Research has included a comparison of modern distance education media and streaming video technologies yielding an optimized environment for education at a distance. Results of this research are the creation of first Internet Governor's School in the United States and the deployment of the first fully Internet-based courses in the UTK College of Engineering.

1996 **Evaluation of CFD Software for Undergraduate Use**

Rose-Hulman Institute of Technology

Evaluated Algor and ANSYS for feasibility of implementation in undergraduate Aerodynamics course for low Reynolds number airfoil simulation. A user manual detailing Algor model calibration was prepared in conjunction with a Perl script to impose user-specified initial conditions and auxilliary FORTRAN coding which solved for pressure, lift, and drag coefficients from the Algor output file.

1996 **FEA Stress Analysis of AMS Laptop Hinge**

Rose-Hulman Institute of Technology

Performed three-dimensional stress analysis of AMS laptop computer to verify stress concentrations exceeding material limits under normal usage. Results used to assist Waters Computing Center in enforcing repair contract with AMS.

GRANTS AND PROPOSALS

- **Tennessee Space Consortium Grant Recipient (PI) - \$12,000 to date**
Awarded semesterly to two UTK PhD students performing research in aerodynamics related fields. Recipient every semester since fall 1998.
- **Preliminary Distance Education Hardware Investment (PI) - \$25,000**
Proposal presented to the Tennessee Governor's School for Manufacturing and the College of Engineering. Detailed necessary hardware, software, and facilities renovation to initiate a streaming video distance education program. Accepted.
- **Creation of a COE Distance Education Facility (PI) - \$118,000**
Proposal presented to the College of Engineering delineating the necessary modifications to fully convert an existing computer lab into a distance education facility. Under review.
- **Development of an Internet-Based Terminal Master's Degree Program in Computational Methods (Consultant) - \$500,000 / over 3 years**
Consulted on feasibility of project goals for NSF proposal. Under review.

SERVICE TO THE UTK COLLEGE OF ENGINEERING

- 1998 - Present **Internet Consultant to MAES Department**
Provide Internet, web site, and streaming audio/video advice to the Mechanical, Aerospace, and Engineering Science (MAES) department. Contributed to advancement of distance education via streaming video.
- 1998 **Student Recruiting**
Returned to Rose-Hulman to recruit graduate students for all departments within the College of Engineering.
- Summer
1998 **Minority Engineering Review Instructor**
Taught hand-drafting and Autocad 14 / Mechanical Desktop to special needs minority freshman during a two-week prep course.
- 1996 **MAES Departmental Website**
Created a web presence for the MAES department.

SERVICE TO ROSE-HULMAN INSTITUTE OF TECHNOLOGY

- 1995-96 **Student Manager, Waters Computing Center**
Assisted in the implementation of Rose-Hulman's first and second year freshman laptop programs. Performed software installation, quality assurance, and regular maintenance. Certified AMS laptop technician.
- 1992-94 **Resident Assistant, BSB Hall**
Provided supervision, guidance, and counseling to approximately 40 freshman students.
- 1991-92 **Sophomore Advisor, BSB Hall**
Assisted resident assistant and acted as role-model for approximately 40 freshman students.
- 1991-94 **Learning Center Tutor**
Proofread and peer-reviewed papers. Also provided assistance with statics and calculus.

PROFESSIONAL ASSOCIATION

- American Society for Engineering Education (ASEE)
- American Society of Mechanical Engineers (ASME)
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

COMPUTER SKILLS

Operating Systems	Window 95/98/NT, Sun, Linux, Mac
FEA Applications	Algor, ANSYS, Cosmos, Patran
Programming Languages	Fortran, MatLab, C, Java
Streaming Video	RealServer 5.0, G2; RealPublisher 5.0; RealProducer G2
Graphic Applications	Adobe Premiere, Photoshop, Acrobat; Radius MotoDV

PUBLICATIONS

- 1 Chambers Z., Iannelli J. “**A Characteristics Biased Finite Element Algorithm for the One-Dimensional Open Channel Flow Equations,**” *Finite Elements in Flow Problems 2000*, 2000 (under review).
- 2 Chambers Z., Taylor M.B., Iannelli J. and Baker A.J. “**Production of Digital Internet Video for Streaming Applications,**” *Proc. ASEE National Conference*, Session 3220, 1999.
http://cfdlab.engr.utk.edu/~chambers/UnderTheHood/PDFs/ASEE99_zc.pdf
- 3 Baker A.J., Chambers Z. and Taylor M.B., “**Finite Element Analysis for the Engineering Sciences: A Web-Based, Video-Streamed Education Environment at a Distance,**” *ASEE National Conference*, Session 3220, 1999.
http://cfdlab.engr.utk.edu/~chambers/UnderTheHood/PDFs/ASEE99_ajb.pdf
- 4 Walker T.W., Chambers Z. and Baker A.J., “**A Web-Based Streaming Video Graduate Course in Agricultural Sciences,**” *ASEE National Conference*, Session 3220, 1999.

PRESENTATIONS

- 1 Chambers Z., “**COE Distance Education - Executive Summary**”, *UTK President W. Gilley*, Oct. 1999.
- 2 Chambers Z., “**Status of Distance Education in the COE**”, *College of Engineering Board of Advisors*, Oct. 1999.
- 3 Chambers Z., “**Production of Digital Internet Video for Streaming Applications**”, *ASEE National Conference*, June 1999.
<http://cfdlab.engr.utk.edu/ASEE99>
- 4 Chambers Z., “**Streaming Video - Your Continuing Education Solution**”, *Maintenance and Reliability Center Yearly Conference*, May 1999.
- 5 Chambers Z., “**How to Create Streaming Video**”, *Innovative Technology Center Faculty Short Courses*, Feb. 1999.
- 6 Baker A.J. and Chambers Z., “**Finite Element Analysis for the Engineering Sciences: A Web-Based, Video-Streamed Education Environment at a Distance**”, *ASEE National Conference*, June 1999.
- 7 Baker A.J. and Chambers Z., “**Video Streamed Graduate Courses**, *Nuclear Engineering Department*, Feb. 1999.
- 8 Iannelli J. and Chambers Z., “**Tennessee Internet Governor’s School for Manufacturing**”, *Tennessee State Board of Education*, Oct. 1998.
- 9 Iannelli J. and Chambers Z., “**Tennessee Internet Governor’s School for Manufacturing**”, *University of Tennessee Statewide System*, Sep. 1998.
- 10 Iannelli J. and Chambers Z., “**Tennessee Internet Governor’s School for Manufacturing**”, *College of Engineering Board of Advisors*, Aug. 1998.

REFERENCES

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