

Ratneshwar (Ratan) Jha

Associate Professor

Mechanical and Aeronautical Engineering (www.clarkson.edu/mae)

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EDUCATION

Ph. D. Mechanical Engineering, Arizona State University, Tempe, Arizona, May 1999
“Development of Multidisciplinary Design Optimization Procedures for Smart Composite Wings and Turbomachinery Blades”

M. S. Aerospace Engineering, Georgia Institute of Technology, Atlanta, Georgia, December 1982

B. Tech. Aeronautical Engineering (Honors), Indian Institute of Technology, Kharagpur, India, May 1981

APPOINTMENTS

2007 **Summer Faculty Fellow**, AFRL/ML, NDE Branch, Dayton, OH

2006 **Summer Faculty Fellow**, AFRL/VS, Albuquerque, NM

2005-Present **Associate Professor**, Mech. and Aeronautical Engineering, Clarkson University

1999-2004 **Assistant Professor**, Mech. and Aeronautical Engineering, Clarkson University

1999 **Senior Engineer**, ZONA Technology, Inc., Scottsdale, Arizona

1995-1999 **Graduate Research Associate**, MAE, Arizona State University, Tempe, AZ

1990-1995 **Manager (Design)**, Aerodynamics Group, Aircraft Design Bureau, Hindustan Aeronautics Limited (HAL), Bangalore, India

1987-1990 **Deputy Manager (Design)**, Aerodynamics Group, HAL, Bangalore, India

1983-1987 **Aeronautical Engineer**, Aerodynamics Group, HAL, Bangalore, India

ACADEMIC EXPERIENCE

Clarkson University (1999- Present)

- *Research:* Structural health monitoring, modeling of composite and smart structures, intelligent control of smart structures and aerospace vehicles, and optimization
Published over 60 papers in archival journals and conference proceedings
Graham Faculty Research Award, Clarkson University, 2005
- *Teaching:* Aircraft Structures, Aircraft Stability and Control, Aircraft Performance and Flight Mechanics, Control System Analysis for Aerospace Vehicles, Aeronautical Engineering Seminar, Design Methodology
Graduated one PhD and nine Masters students (currently advising 5 grad students)
Supervised two Honors theses (currently advising one Honors thesis student)
- *Service:* Aeronautical engineering committee (chair), curriculum committee (member)
Associate Fellow - American Institute of Aeronautics and Astronautics (AIAA)
Member - AIAA Adaptive Structures Technical Committee (ASTC)
Member - Organizing Committee, Structural Health Monitoring/NDE Symposium

Arizona State University (1995-1999)

- Developed procedure for multidisciplinary, multiobjective optimization of smart composite wings with aerodynamic, aeroelastic and strength requirements.
- Developed procedure for aerodynamic-heat transfer optimization of turbomachinery blades using CFD code for viscous fluid flow and finite element method for thermal analysis.
- Performed composite structural analysis using higher order laminate theory. Extended composite structural model to include smart actuators based on PZT material. Studied effects of composite ply orientations on wing aeroelasticity.
- Performed aircraft aeroelastic computations using finite element structural analysis, panel method for unsteady aerodynamic loads and V-g/Laplace-domain method for dynamic aeroelasticity.

INDUSTRIAL EXPERIENCE

ZONA Technology (1999)

- Aeroelastic analysis and multidisciplinary optimization of F-18/VSS (Variable Stiffness Spar) aircraft using NASTRAN and ASTROS (MDO software)

Hindustan Aeronautics Limited (Large Aerospace Company) (1983-1995)

- Responsible for a team of five aeronautical engineers.
- Developed aerodynamic model of supersonic fighter aircraft in the entire flight envelope for simulation and control law design.
- Analyzed aircraft surface pressure data obtained from wind tunnel tests.
- **Authored 104 technical reports** relating to wind tunnel data analysis, configuration definition, and flight aerodynamic database.
- Completed advanced management development program (12 weeks).
- Analyzed results of over 7000 aerodynamic data polars obtained through low speed and high speed tests of 14 models in 9 wind tunnels. Test results included six-component forces & moments, control surface hinge moments and wing & fin loads.
- Defined optimum aerodynamic configuration, including wing and tail shape, size and location.
- Lecturer in Aircraft Stability & Control at HAL Training Institute.
- Performed aircraft conceptual design studies, including drag estimation, stability & control derivative prediction and performance calculation.

REFEREED JOURNAL PAPERS (* or ** indicates graduate or undergraduate student)

14. Whelan, M.J.* , Gangone, M.V.* , Janoyan, K.D., and Jha, R., “Operational Modal Analysis of a Multi-Span Skew Bridge Using Real-Time Wireless Sensor Networks,” *Journal of Vibration and Control* (under review)
13. Whelan, M.J.* , Gangone, M.V.* , Janoyan, K.D., and Jha, R., “In-Service Modal Analysis of a Highway Bridge Using a Real-Time Wireless Sensor Network,” *Engineering Structures* (under review).

12. Alavinasab, A. *, Jha, R., Ahmadi, G., Cetinkaya, C., and Sokolov, I., "Computational Modeling of Nano-Structured Glass Fibers," *Computational Materials Science* (at press).
11. Jha, R., and He, C. *, "Adaptive Neurocontrollers for Vibration Suppression of Nonlinear and Time Varying Structures," *Journal of Intelligent Material Systems and Structures*, Vol. 15, No. 9-10, Sept.- Oct. 2004, pp. 771-781.
10. Jha, R., and He, C. *, "A Comparative Study of Neural and Conventional Adaptive Predictive Controllers for Vibration Suppression," *Smart Materials and Structures*, Vol. 13, No. 4, 2004, pp. 811-818.
9. He, C. *, and Jha, R., "Experimental Evaluation of Augmented UD Identification Based Vibration Control of Smart Structures," *Journal of Sound and Vibration*, Vol. 274, No. 3-5, July 2004, pp. 1065-1078.
8. Marzbanrad, J., Ahmadi, G., and Jha, R., "Optimal Preview Active Control of Structures During Earthquakes," *Engineering Structures*, Vol. 26, August 2004, pp. 1463-1471.
7. Jha, R., Pausley, M. *, and Ahmadi, G., "Optimal Active Control of Launch Vibrations of Space Structures," *Journal of Spacecraft and Rockets*, Vol. 40, No. 6, November 2003, pp. 868-874.
6. Jha, R., and He, C. *, "Design and Experimental Validation of an Adaptive Neurocontroller for Vibration Suppression," *Journal of Intelligent Material Systems and Structures*, Vol. 14, No. 8, August 2003, pp. 497-506.
5. Jha, R., and He, C. *, "Neural-Network-Based Adaptive Predictive Control for Vibration Suppression of Smart Structures," *Smart Materials and Structures*, Vol. 11, No. 6, December 2002, pp. 909-916.
4. Jha, R., and Rower, J. *, "Experimental Investigation of Active Vibration Control Using Neural Networks and Piezoelectric Actuators," *Smart Materials and Structures*, Vol. 11, No. 1, February 2002, pp. 115-121.
3. Chen, P. C., Sarhaddi, D., Jha, R., Liu, D. D., Griffin, K. and Yurkovich R., "Variable Stiffness Spar Approach for Aircraft Maneuver Enhancement Using ASTROS," *Journal of Aircraft*, Vol. 37, No. 5, September 2000, pp. 865-871.
2. Jha, R. and Chattopadhyay, A., "Multidisciplinary Optimization of Composite Wings Using Refined Structural and Aeroelastic Analysis Methodologies," *Engineering Optimization*, Vol. 32, No. 1, 1999, pp. 59-78.
1. Chattopadhyay, A., Seeley, C. E. and Jha, R., "Aeroelastic Tailoring Using Piezoelectric Actuation and Hybrid Optimization," *Smart Materials and Structures*, Vol. 8, No. 1, February 1999, pp. 83-91.

THESES AND DISSERTATIONS

Graduate Students

1. **Steven M. DeLessio**, "Design of a Compliant Mechanism to Amplify Displacements," **ME Project**, Clarkson University, May 2000.
2. **Jacob H. Rower**, "Active Vibration Control Using Neural Networks and Piezoelectric

Actuators,” **MS Thesis**, Clarkson University, May 2001.

3. **Matthew E. Pausley**, “Active Vibration Control of Space Structures During Space Shuttle Lift-Off,” **MS Thesis**, Clarkson University, December 2001 (Co-Advisor: Prof. Ahmadi).
4. **Allison F. Bailey**, “Combined Active and Passive Vibration Control During Space Shuttle Liftoff,” **MS Thesis**, Clarkson University, January 2003 (Co-Advisor: Professor Ahmadi).
5. **Chengli He**, “Identification and Control for Vibration Suppression of a Nonlinear and Time Varying Smart Structure,” **PhD Dissertation**, Clarkson University, January 2004.
6. **Feng Yan**, “Structural Health Monitoring Based on the Hilbert-Huang Transform,” **MS Thesis**, Clarkson University, January 2005 (Co-Advisor: Professor Ahmadi).
7. **Brian D. LeFevre**, “Attitude Dynamics and Stability of Solar Sails During Spin Deployment,” **MS Thesis**, Clarkson University, October 2006.
8. **Josef Ulrich**, “Design and Construction of a Bridge Model for Structural Health Monitoring Experiments,” **ME Project**, Clarkson University, May 2007.
9. **Kevin R. Cross**, “Numerical and Experimental Investigations of Bridge Health Monitoring Using Modal Curvature and Instantaneous Phase Methods,” **MS Thesis**, Clarkson University, November 2007.
10. **Conner B. Shane**, “Development of a Proper Orthogonal Decomposition Based Algorithm for Structural Health Monitoring of Composite Plates,” **MS Thesis**, Clarkson University, May 2008.

Undergraduate Honors Theses

1. **Joel Thomson**, “The Evolutionary Neuro Controller,” Clarkson University, April 2005
2. **Conner Shane**, “Structural Health Monitoring of a Wing using Linear Time Series Analysis Methods,” Clarkson University, April 2006

SPONSORED RESEARCH

Grants and Contracts

1. Vento Tek – “Fabrication and Marketing of Smart Wind Turbine Blade,” **\$50,000**, Jan 2008-Dec 2008, Marzocca (PI), Jha, Ahmadi, and Bollt.
2. Pratt & Whitney – “Development of a Blade Outer Air Seal Parametric Geometry Tool,” **\$120,000**, Aug 2006-Dec 2008, Willmert (PI), Jha, Helenbrook, Marzocca, Visser, and Moosbrugger.
3. US Army - “Smart Responsive Nanocomposite for Soldier Protection,” **\$102,396**, Sep 2006-Sep 2009, Jha (PI), Cetinkaya and Ahmadi.
4. NASA - “Microgravity Vibration Suppression Using Adaptive Predictive Controllers,” **\$133,400**, July 2004- June 2009, Jha (PI) (GSRP Student: Brian LeFevre).
5. National Science Foundation - “US-India Planning Visit: International Collaboration for Research in Smart Structures,” **\$4,730**, June 2007 – May 2008, Jha (PI).
6. NYSERDA - “Wireless Intelligent Sensor Network for Transportation Infrastructure,” **\$453,273**, Dec 2003 – Oct 2008, Jha (PI: Phase3), Janoyan, Sazonov (PI: Phases 1-2).

7. National Science Foundation - "MRI: Acquisition of a Scanning Laser Vibrometer for Smart Structures Research," **\$199,000**, Sep 2005-Aug 2006, Jha (PI), Ahmadi, Kim, Marzocca and Sazonov.
8. Spectra Quest, Inc - "Machinery Health Monitoring," **\$7,000**, May 2003-Aug 2004, Jha (PI).

AWARDS AND HONORS

1. Coulter School of Engineering Teaching Excellence Recognition, Spring 2006
2. Faculty Research Award 2005, Clarkson University
3. Associate Fellow, American Institute of Aeronautics and Astronautics (AIAA)
4. Who's Who in Science and Engineering
5. Who's Who in Engineering Academia
6. Regents Graduate Academic Scholarship, ASU, Fall 1995-Fall 1998
7. Indian Institute of Technology Merit Scholarship, 1976-1981
8. National Merit Scholarship (India), 1974-1976

INVITED SEMINARS

1. "Vibration-based Health Monitoring of Composite Structures: Issues and Approaches," GE Global Research Center, Niskayuna, NY, February 16, 2004.
2. "Design of a Neural Adaptive Predictive Controller for Nonlinear Control of UAV Takeoff," West Virginia University Institute of Technology, Montgomery, WV, April 26, 2004.
3. "Vibration Suppression of Nonlinear and Time Varying Structures Using Adaptive Predictive Control," NASA Marshall Space Flight Center, Huntsville, AL, Dec. 9, 2004.
4. "Diagnostics of Composite Structures," CAMP Symposium, Albany, NY, April 2008.
5. "Diagnostics of Latent Damage in Composite Structures," GE Global Research Center, Niskayuna, NY, June 2008.

CONFERENCE PROCEEDINGS PAPERS (* or ** indicates graduate or undergraduate student)

48. Shane, C. and Jha, R., "Singular Value Decomposition Based Algorithm for Damage Detection in Composite Structures," SMASIS2008-597, ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems, October 28-30, 2008, Ellicott City, Maryland.
47. Alavinasab, A. *, Ahmadi, G., and Jha, R., "Nonlocal Continuum Theory Based Modeling of Carbon Nanotube Composites," SMASIS2008-595, ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems, October 28-30, 2008, Ellicott City, Maryland.
46. Azizi, Y. *, McNamara, D. *, Ziarani, A., and Jha, R., "Damage Detection Based on Adaptive Estimation of Amplitude and Phase," ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems, October 28-30, 2008, Ellicott City, Maryland, USA.

45. LeFevre, B. * and Jha, R., “Launch Vehicle Ascent Flight Control Augmentation via a Hybrid Adaptive Controller,” AIAA Guidance, Navigation and Control Conference and Exhibit, 18 - 21 Aug 2008, Honolulu, Hawaii.
44. Shane, C. * and Jha, R., “Integrated Structural Health Monitoring for Composites using Proper Orthogonal Decomposition-based Model Filter,” SPIE Paper 6935-61, Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring, 9-13 March 2008, San Diego, California.
43. Whelan, M. * , Gangone, M. * , Janoyan, K., and Jha, R., “Wireless Vibration Monitoring for Damage Detection of Highway Bridges,” *Invited Paper*, SPIE Paper 6933-19, Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring, 9-13 March 2008, San Diego, California.
42. Gangone, M. * , Whelan, M. * , Janoyan, K., and Jha, R., “Field Deployment of a Dense Wireless Sensor Network for Condition Assessment of a Multispan Bridge,” SPIE Paper 6933-21, Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring, 9-13 March 2008, San Diego, California.
41. Shane, C. * and Jha, R., “Proper Orthogonal Decomposition Based Model Filter for Health Monitoring of Composite Structures,” The 18th International Conference of Adaptive Structures and Technologies, 3-5 October 2007, Ottawa, Canada.
40. Cross, K. * , Jha, R., Whelan, M. * , Janoyan, K., and Gangone, M. * , “Bridge Health Monitoring Using Linear and Nonlinear Approaches: Experimental Validation,” The Sixth International Workshop on Structural Health Monitoring, 11–13 Sep 2007, Stanford University, CA.
39. Cross, K. * , Jha, R., Whelan, M. * , and Janoyan, K., “Bridge Health Monitoring Using Linear and Nonlinear Approaches: Numerical Simulations,” The Sixth International Workshop on Structural Health Monitoring, 11–13 Sep 2007, Stanford University, CA.
38. Gangone, M. * , Whelan, M. * , Janoyan, K., Cross, K. * , and Jha, R., “Performance Monitoring of a Bridge Superstructure using a Dense Wireless Sensor Network,” The Sixth International Workshop on Structural Health Monitoring, 11–13 Sep 2007, Stanford University, CA.
37. Whelan, M. * , Gangone, M. * , Janoyan, K., Cross, K. * , and Jha, R., “Reliable High Rate Bridge Monitoring Using Dense Wireless Sensor Arrays,” The Sixth International Workshop on Structural Health Monitoring, 11–13 Sep 2007, Stanford University, CA.
36. Cross, K. * , Jha, R., Whelan, M. * , and Janoyan, K., “Numerical Evaluation of Hilbert-Huang Transform and Fourier Spectrum for Benchmark Bridge Health Monitoring,” 18th Engineering Mechanics Division Conference, ASCE, 3-6 June 2007, Blacksburg, VA.
35. Shane, C.B. * and Jha, R., “Structural Health Monitoring of a Composite Wing Model using Proper Orthogonal Decomposition,” AIAA-2007-1726, 15th AIAA/ASME/ AHS Adaptive Structures Conference, Honolulu, Hawaii, 23-26 April 2007.
34. O’Donnell, K.S. * , McNall, C. * , Marzocca, P., Jha, R., and Bollt, E.M., “Development of a Wind Tunnel Apparatus to Assist Flow and Aeroelastic Control via Zero Net Mass Flow Actuators,” AIAA-2007-1771, 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Honolulu, Hawaii, 23-26 April 2007.

33. LeFevre*, B. and Jha, R., "Attitude Dynamics and Stability of Solar Sails during Deployment," AIAA-2006-1704, 7th AIAA Gossamer Spacecraft Forum, 1-4 May 2006, Newport, Rhode Island.
32. Rendall, T., Cormier, P.** , Marzocca, P., and Jha, R., "Static, Buckling and Dynamic Behavior of Inflatable Beams," AIAA-2006-1701, 7th AIAA Gossamer Spacecraft Forum, 1-4 May 2006, Newport, Rhode Island.
31. Shane, C. ** , and Jha, R., "Structural Health Monitoring of a Wing Using Linear Time Series Analysis Methods," AIAA Region I-NE Student Conference, March 30 – April 1, 2006, Syracuse University, Syracuse, NY (won third place in individual paper competition).
30. Jha, R., Cross, K.*, Janoyan, K., Sazonov, E., Fuch*, M., Krishnamurthy*, V., "Experimental Evaluation of Instantaneous Phase Based Index for Structural Health Monitoring," SPIE Paper Number 6173-51, *Smart Structures and Materials and NDE for Health Monitoring and Diagnostics*, 26 Feb.-2 March 2006, San Diego, CA.
29. Janoyan, K., Sazonov, E., Jha, R., Fuch*, M., Cross, K. *, Krishnamurthy*, V., "Environmental Testing of Wireless Sensor System for Structural Health Monitoring of Civil Infrastructure," *Smart Structures and Materials and NDE for Health Monitoring and Diagnostics*, 26 Feb.-2 March 2006, San Diego, CA.
28. Sazonov, E., Jha, R., Janoyan, K., Krishnamurthy*, V., Fuch*, M., and Cross, K. *, "Wireless Intelligent Sensor and Actuator Network (WISAN): a scalable ultra-low-power platform for structural health monitoring," *Smart Structures and Materials and NDE for Health Monitoring and Diagnostics*, 26 Feb.-2 March 2006, San Diego, CA.
27. Jha, R., Xu, S.*, and Ahmadi, G., "Health Monitoring of a Multi-Level Structure Based on Empirical Mode Decomposition and Hilbert Spectral Analysis," *Fifth International Workshop on Structural Health Monitoring* (Editor: Fu-Kuo Chang), September 12–14, 2005, Stanford University, CA.
26. Sazonov, E., Janoyan, K., Jha, R., Nelson, R., Krishnamurthy, V., Gao, Z., and Fuch, M., "Signal processing and power issues in acquisition of vibration data by MEMS accelerometers," *Fifth International Workshop on Structural Health Monitoring* (Editor: Fu-Kuo Chang), September 12–14, 2005, Stanford University, CA.
25. Thomson, J.** and Jha, R., "Development of an Evolutionary Neuro Controller for Autonomous Control Under Various Flight Conditions," AIAA Region I-North East Student Paper Conference, April 2005, Princeton University, NJ.
24. Jha, R., Xu, S.*, and Ahmadi, G., "Damage Detection in a Multi-Level Structure Using Hilbert-Huang Transforms," 13th AIAA/ASME/AHS Adaptive Structures Conference, 18-21 April 2005, Austin, TX. (*indicates graduate student at Clarkson)
23. Thomson, J.** , Jha, R., and Doorly, D., "Evolutionary Neuro-Controller Design for Autonomous Unmanned Aerial Vehicles," AIAA-2005-0913, 43rd AIAA Aerospace Sciences Meeting, 10-13 January 2005, Reno, NV. (**indicates undergrad student at Clarkson)
22. Sazonov, E., Janoyan, K., and Jha, R., "Sensor Network Application Framework for Autonomous Structural Health Monitoring of Bridges," *Structural Materials Technology (SMT): NDE/NDT for Highways and Bridges 2004*, 14-17 September 2004, Buffalo, NY.

21. Jha, R., Yan, F.*, and Ahmadi, G., "Energy-Frequency-Time Analysis of Structural Vibrations Using Hilbert-Huang Transform," AIAA 2004-1975, 12th AIAA/ASME/AHS Adaptive Structures Conference, 19-22 April 2004, Palm Springs, CA.
20. Sazonov, E., Janoyan, K., and Jha, R., "Wireless Intelligent Sensor Network for Autonomous Structural Health Monitoring," Proceedings of SPIE's Annual International Symposium on Smart Structures and Materials, March 2004, San Diego, CA.
19. Thomson, J.***, Jha, R., and Pradeep, S., "Neurocontroller Design for Nonlinear Control of Takeoff of Unmanned Aerospace Vehicles," AIAA 2004-777, 42nd AIAA Aerospace Sciences Meeting, 5-8 January 2004, Reno, NV.
18. Marzbanrad, J., Ahmadi, G., and Jha, R., "Vibration Control of Structures During Earthquakes with an Optimal Preview Active Control Strategy," Sixth International Conference on Civil Engineering, 5-6 May 2003, Isfahan, Iran.
17. Jha, R., and He, C.*, "Neural and Conventional Adaptive Predictive Controllers for Smart Structures," AIAA-2003-1808, 11th AIAA/ASME/AHS Adaptive Structures Conference, 7-10 April 2003, Norfolk, VA.
16. Jha, R., Bailey, A.*, and Ahmadi, G., "Combined Active and Passive Control of Space Structure Vibrations During Launch," AIAA-2003-1724, 11th AIAA/ASME/AHS Adaptive Structures Conference, 7-10 April 2003, Norfolk, VA.
15. Jha, R., and He, C.*, "Adaptive Neurocontrollers for Vibration Suppression of Nonlinear and Time Varying Structures," 13th International Conference on Adaptive Structures and Technologies (ICAST '02), October 7-9, 2002, Potsdam/Berlin, Germany.
14. Jha, R., and He, C.*, "Neural Network Based Adaptive Predictive Control for Vibration Suppression," AIAA 2002-1540, 43rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, April 22-25, 2002, Denver, CO.
13. Pausley, M.*, Jha, R., and Ahmadi, G., "Optimal Vibration Control of Onboard Equipment During Space Vehicle Lift-Off," AIAA 2002-1628, 43rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, April 22-25, 2002, Denver, CO.
12. Jha, R., and He, C.*, "Design and Experimental Validation of Adaptive Neurocontroller for Beam Vibration Suppression Using Piezoelectric Actuators," IMECE2001/AD-23731, 2001 ASME International Mechanical Engineering Congress and Exposition, November 11-16, 2001, New York, NY.
11. Jha, R., and Rower, J.*, "Experimental Investigation of Active Vibration Control Using Neural Networks," AIAA 2001-1436, 42nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, April 16-19, 2001, Seattle, WA.
10. Jha, R. and Chattopadhyay, A., "Smart Composite Wing Design for Optimal Aeroelastic Control," AIAA 99-1514, 40th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, St. Louis, Missouri, April 12-15, 1999 (CD-ROM: A99-24934).
9. Chen, P. C., Jha, R., Sarhaddi, D., Liu, D. D., Griffin, K. and Yurkovich, R., "A Variable Stiffness Spar (VSS) Approach for Aircraft Maneuver Enhancement Using ASTROS,"

AIAA 99-1471, 40th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, St. Louis, Missouri, April 12-15, 1999 (CD-ROM: A99-24812).

8. Talya, S. S., Jha, R., Chattopadhyay, A. and Rajadas, J. N., "Development of Multidisciplinary Optimization Procedure for Gas Turbine Blade Design," AIAA 99-0364, 37th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 11-14, 1999.
7. Jha, R., Chattopadhyay, A. and Rajadas, J. N., "Optimization of Turbomachinery Airfoil Shape for Improved Performance," AIAA 98-1917, 39th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conf., Long Beach, CA, April 20-23, 1998.
6. Chattopadhyay, A., Seeley, C. E. and Jha, R., "Aeroelastic Tailoring Using Piezoelectric Actuation and Hybrid Optimization," SPIE 3329-04, SPIE's 5th Annual International Symposium on Smart Structures and Materials, San Diego, CA, March 1-5, 1998.
5. Chattopadhyay, A. and Jha, R., "Multidisciplinary Optimization of Composite Wings Using Refined Structural and Aeroelastic Analysis Methodologies," AD-Volume 53-3, Fourth International Symposium on Fluid-Structure Interactions, Aeroelasticity, Flow-Induced Vibration & Noise, ASME International Mechanical Engineering Congress, Dallas, TX, Nov. 16-21, 1997.
4. Jha, R., and Chattopadhyay, A., "Development of a Comprehensive Aeroelastic Analysis Procedure for Composite Wings Using Laplace Domain Methodology," AIAA 97-1026, 38th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, Kissimmee, FL, April 7-10, 1997.
3. Chattopadhyay, A., Jha, R., and Seeley, C. E. "Application of Hybrid Optimization Technique for Improved Aeroelastic Performance of Composite Wings," AIAA 96-4015, Sixth AIAA/NASA/USAF Symposium on Multidisciplinary Analysis and Optimization, Bellevue, WA, September 4-6, 1996.
2. Chattopadhyay, A., Zhang, S., and Jha, R., "Structural and Aeroelastic Analysis of Composite Wing Box Sections Using Higher-Order Laminate Theory," AIAA 96-1567, 37th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, Salt Lake City, UT, April 15-19, 1996.
1. Sreenivasan, M. N., and Jha, R., "Evolution of Aerodynamic Configuration for a Modern Combat Aircraft," 42nd Annual General Body Meeting, Aeronautical Society of India, Calcutta, India, December 1990.

UNIVERSITY AND PROFESSIONAL SERVICES

Clarkson Committees and Duties

Curriculum and Academic Policies Committee (University level; 2005-2008)

Coulter School of Engineering Dean Search Committee

Aeronautical Engineering Committee (Chair)

Recruitment and Teaching Committee

Strategic Planning Committee

Curriculum Committee

AIAA Faculty Co-Advisor

Sigma Gamma Tau Faculty Co-Advisor

Professional Memberships

Member - AIAA Adaptive Structures Technical Committee (ASTC)

Vice Chair – Education Subcommittee of ASTC (2004-2005)

Associate Fellow – American Institute of Aeronautics and Astronautics (AIAA)

Member – American Society of Mechanical Engineers

Member – American Society for Engineering Education

Session Chair/Co-Chair

Adaptive Structures Modeling, AIAA Adaptive Structures Conference, April 2002

Adaptive Structures Modeling, AIAA Adaptive Structures Conference, April 2003

Morphing Aircraft Structures, AIAA Adaptive Structures Conference, April 2005

Active Noise and Vibration Control, AIAA Adaptive Structures Conference, May 2006

Design and Analysis of Smart Structures, AIAA Adaptive Structures Conference, May 2008

Vibration-Based Techniques, Structural Health Monitoring/NDE, SMASIS, October 2008

Reviewer

AIAA Journal, Journal of Aircraft, AIAA/ASME Adaptive Structures Conferences

Journal of Aerospace Engineering (ASCE), Journal of Mechanical Design (ASME)

Smart Materials and Structures, Journal of Intelligent Material Systems and Structures

Journal of Offshore Mechanics and Arctic Engineering (ASME)

Shock and Vibration, Kuwait Journal of Science and Engineering

Control and Cybernetics, Soft Computing, International Journal on Mechatronics

Structural and Multidisciplinary Optimization

Introduction to Flight, 5th edition, John D. Anderson, McGraw Hill Publications (Book)

Proposal (Air Force Office of Scientific Research)

Proposal (National Science Foundation - Civil and Mechanical Systems)

Proposal (NASA Post-Doctoral Program)

TEACHING AND MENTORING

Curriculum and Laboratory Development

1. Initiated major enhancements to the Aeronautical Engineering (AE) curriculum, introduced and coordinated new AE Seminar course, and developed the course material for new courses.
2. Developed **Smart Structures Laboratory** at Clarkson for undergraduate and graduate education and research. Current work focuses on control of structures using smart actuators, optimal, adaptive, and intelligent control systems, and structural health monitoring. The laboratory equipments include a Scanning Laser Vibrometer (acquired through NSF grant of \$199,000), electro-dynamic shakers, and data acquisition system.

Undergraduate Instruction

1. **AE200 Aeronautical Engineering Seminar:** This course provides an introduction to

aeronautical engineering and the nature of related jobs and industry. It includes seminars by various MAE faculties to familiarize the students with relevant concepts and terminology. Experimental demonstrations in the Wind Tunnel and the **Smart Structures Laboratory** are included. A 'glider competition' at the semester's end serves as a motivator and 'reality check' for students.

2. **AE350 Aircraft Structural Analysis:** This course provides fundamental knowledge in topics of aircraft structural analysis and design concepts. I employ a consistent elasticity approach, instead of the traditional problem-solving drill, to better prepare the students for current structural design practices based on the finite element methods. The course coverage is tailored for a seamless integration with the next course in aircraft structures (AE 458).
3. **AE429 Aircraft Performance and Flight Mechanics:** This course introduces the students to the fundamental concepts of airplane aerodynamics, propulsion, and the equations of motion. It enables the students to analytically estimate airplane performance for all phases of flight. I have introduced a semester long project in this course wherein student teams select an airplane and carry out a complete performance analysis. The teams make oral presentations of their work and submit final project reports that enhance the students' written, oral, and graphical communication skills.
4. **AE430 Stability and Control of Aerospace Vehicles:** This course provides fundamental concepts of atmospheric flight dynamics and enables students to analytically estimate static and dynamic stability derivatives. It includes the stability of longitudinal and lateral motions using the linearized equations and responses to actuation of open-loop and closed-loop controls. I have introduced project work in this course similar to that discussed above (AE 429). Since AE 429 and AE 430 were given as a single course earlier, I have developed the course material for the two separate courses based on my aircraft design experience.
5. **AE458 Design of Aircraft Structures:** This course provides knowledge in advanced topics of aircraft structural analysis and design. It introduces the students to finite element analysis and mechanics of composite structures, which are very important for current design of aircraft structures. I relate the material presented in the classroom to real world applications using my industry experience, such as the F-18 structural analysis and optimization. A semester long project using finite element analysis of wing-like structures gives the students an idea about real aircraft structural design.

Graduate Instruction

1. **ME504 Design Methodology:** This graduate level course covers fundamentals of engineering design process including design requirements, concept generation and evaluation, product development, modeling and simulation, and robust & quality design. The course is aimed at helping students learn how to be more creative in solving design problems and how to design as part of a group activity.
2. **ME657 Selected Topics in Solid Mechanics:** This is an advanced independent study course in 'Smart Structures' for graduate and undergraduate students. The course material is based mostly on journal papers and my research. This course included introduction to smart materials (piezoelectric and shape memory alloys), modeling of smart composite structures (beams and plates), and control systems for vibration suppression.