

MIT MECH E

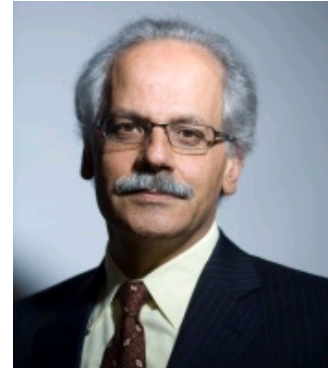
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Ahmed F. Ghoniem

Ronald C. Crane (1972) Professor of Mechanical Engineering

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Research Interests

High performance computing in turbulent reactive flow, computational mathematics, combustion dynamics and active control, modeling and simulation of transport-chemistry interactions in thermochemical and electrochemical systems including high temperature fuel cells, gasification processes and fuel production. Analysis of high-performance, zero-emission integrated energy systems with CO₂ capture.

Teaching Interests

Thermal-Fluid Science and Engineering, Fundamentals of Advanced Energy Conversion and Combustion, Advanced Fluid Mechanics, Turbulence

Educational Background

B.S. in Mechanical Engineering, July 1973, Cairo University, Egypt
M.S. in Mechanical Engineering, October 1975, Cairo University, Egypt
Ph.D. in Mechanical Engineering, June 1980, University of California, Berkeley

Academic Appointments at MIT

July 83 - Sept. 85, Assistant Professor
Sep. 85 - July 86, Edgerton Assistant Professor
July 86 - June 87, Edgerton Associate Professor
July 86 - June 88, Associate Professor, non-tenured
July 88 - June 92, Associate Professor, tenured
June 92 -Present, Professor

Other Related Experience

Oct. 73 - Sep. 75 Cairo University, Egypt Res. & Teaching Assistant
Sept. 75 - Sep. 76 Calgary University, Canada Res. & Teaching Assistant
Jan. 77 - Mar. 80 University of California, Berkeley Res. & Teaching Assistant
Mar. 80 - Nov. 80 University of California, Berkeley Postdoctoral Research



People

FACULTY
EMERITUS FACULTY
ADMIN STAFF
TEACHING STAFF
LECTURERS
RESEARCH STAFF
TECHNICAL STAFF
SUPPORT STAFF
POSTDOCS
VISITORS
FACULTY CLOUD

Consulting & Patents

Sep. 85 - Sep. 86 Cairo University, Egypt
Aug. 87 - Feb. 88 Flow Industries, Inc., Kent, WA
July 87 - Jan. 89 R & D Associates, Marina del Rey, CA
Sep. 87 – 1988 Bolt, Beranek and Newmann, Cambridge, MA
Sep. 87 – 1991 Altex Technologies, San Jose, CA
Sep. 88 – 1992 U.S. Army Atmospheric Sciences Laboratory
Sep. 89 - 1992 Allison Gas Turbine, G.M.
Nov. 89 - Dec. 89 Shell Oil Co.
Oct. 89 - Dec. 89 National Institute of Standards and Technology
Sep. 90 Current General Electric Co.
Sep. 90 - Jan. 91 Northwest Fuel Development, Inc.
Jan. 93 - June 93 Advanced Mechanical Technologies, Inc. (AMTI)
1991 – 1995 Altex Corporation, San Jose, CA
1990 – 1991 Northwest Fuel Development, Inc., Portland, OR
1991 - 1991 Chm Michelson Institute, Norway
1993 – 1994 AMTI, Newton, MA
1994 – 1995 Hinton and Alfert Law Offices, Walnut Creel, CA
1995 – 1997 United Technologies, East Hartford, CT
1995 – 1995 Sandia National Laboratories, Albuquerque, N.M.
1997 – 1997 Enppi, Egypt
1997 – 1997 Sandia National Laboratories, Livermore, CA
1998 United Technologies, East Hartford, CT
1998 United States Golf Association
1998 Radian Technologies
Professional Registration: The Egyptian Engineering Society

Principal Publications (last 5 years)

1. Annaswamy A.M. and Ghoniem, A.F., "Active Control of Combustion Instability: Theory and Practice," IEEE Control Systems Magazine Vol. 22, No. 6, pp. 37-54, Dec 2002.
2. Hathout, J.P., Fleifil, M., Annaswamy, A.M., and Ghoniem, A.F., "Combustion Instability and Active Control Using Periodic Fuel Injection," AIAA Journal of Propulsion and Power, vol. 18, no. 2, pp.390 -399, March-April 2002.
3. Ghoniem, A.F., Annaswamy, A., Wee, D., Yi, T., and Park, S., "Shear Flow Driven Combustion Instability; Evidence, Simulation and Modeling." The Proceedings of the Combustion Institute, Vol 29, 2002, pp. 53-60.
4. Lakkis, I. and Ghoniem, A.F., "Axisymmetric vortex method for low-Mach number, diffusion-controlled combustion," J. Comput. Phys., Vol 184 (2003) 435-475
5. Murugappan, S., Park, S., Annaswamy, A.M., Ghoniem, A.F., Acharya, S., and Allgood, D.C., "Optimal Control of a Swirl Stabilized Spray Combustor Using System Identification Approach," Combust. Sci. Tech., 175:55-81, 2003.
6. Wachsman, A., Park, S.B., Annaswamy, A.M., Ghoniem, A.F., "Simultaneous Combustion Instability and Emissions Control Using Air and Fuel Modulation," the 42nd AIAA Aerospace Science Meeting, Reno NV, January 2004.
7. Marzouk, Y.M., and Ghoniem, A.F., "Vorticity Formulation for an Actuated Jet in Cross Flow," the 42nd AIAA Aerospace Science Meeting, Reno NV, January 2004.
8. Ghoniem, A.F., Park, S., Wachsman, A., Annaswamy, A. Wee, D. and Altay, M., "Mechanism of Combustion Dynamics in a Backward-facing Step stabilized Premixed Flame", The Proceedings of the Combustion Institute, Vol 30, 2004, 1783-1790.
9. Ghoniem, A.F., Annaswamy, A., Park, S., and Sobhani, Z., "Stability and Emissions Control Using Air Injection and H2 Addition in Premixed Combustion,"

- The Proceedings of the Combustion Institute, Vol 30, 2004, p. 1765-1774.
10. Wee, D.H., Yi, Y., Annaswamy, A. and Ghoniem, A.F., "Self Sustained Oscillations and Vortex Shedding in Backward-Facing Step Flows: Simulation and Linear Instability Analysis", Phys. Fluids, 16, pp. 3361-3373, 2004.
 11. Marzouk, Y.M., and Ghoniem, A.F., "K-means Clustering for Optimal Partitioning and Dynamic Load Balancing of Parallel Hierarchical N-Body Simulations" J. Comput. Phys., Vol. 207, pp. 493-528, 2005.
 12. Ghoniem, A.F. and Marzouk, Y.M., "Simulations of high Reynolds number transverse jets and analysis of the underlying vortical structure," the 43rd AIAA Aerospace Science Meeting, Reno NV, January 2005, AIAA-2005-0308.
 13. Wee, Dh., and Ghoniem, A.F., "Modified interpolation kernels and treating diffusion and remeshing in vortex methods," J. Comput. Phys., Vol. 213, pp. 239-263, 2006.
 14. Marzouk, Y.M. and Ghoniem, A.F., "Vorticity structure and evolution in a transverse jet," J. Fluid Mech., in press, 2006.

Department & Institute Committees

- Sep. 83 - Current Department Undergraduate Faculty Advisor
- Sep. 84 - Sep. 87 Department Graduate Committee
Department Graduate Advisor
- Sep. 85 - Sep. 90 Mathematics Minor Advisor
- Sep. 85 - June 86 Department Seminar Chairman
- Sep. 87 - Sept. 88 Department Admission Committee
- Sep. 90 - Current Computers in Education
- Nov. 91 - Jan. 92 Ad hoc Committee on Promotion
- 1991 – 1992 Committee to establish PEEER
- Jan. 92 Current Department Admissions Committee
- Jan. 90 - May 94 SAL Seminar Series
- Jan. 94 - June 94 Search Committee Chair
- Jan. 94 - 1995 Ad hoc Committee on the Core Development
- Jan. 94 - Current Space Committee
- Sep. 95 - June 98 Committee on Undergraduate Programs
- June 96 - Current Head of Thermo Fluids Sciences Division
- Sep 99 - Sep 00 Committee on Curricula, member
- Sep 00 Committee on Curricula, Chair

Professional Service

- Sep. 90 - Feb. 91 National Research Council Committee on Research Directions in Computational Mechanics
- 1993 – 1994 DOE Review Panel on Energy Related Research
- 1993 – 1996 NSF Review Board on Supercomputer Allocation
- 1997 NCSA Users Advisory Board

Scientific and Professional Societies

- American Society of Mechanical Engineers (Fellow)
- American Institute of Aeronautics and Astronautics (Associate Fellow)
- The Combustion Institute
- American Mathematical Society (Member)
- Society of Automotive Engineering (Member)

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