

**Hazim A. El-Mounayri**  
**Associate Professor of Mechanical Engineering**

**Education**

- B.S., Mechanical Engineering, The American University in Cairo, Cairo, Egypt, 1989.
- M.S., Materials Engineering, The American University in Cairo, Cairo, Egypt, 1992.
- Ph.D., Mechanical Engineering, McMaster University, Hamilton, ON, Canada 1997.

**Positions and Ranks at IUPUI**

- 2003 – Present, Associate Professor of Mechanical Engineering.
- 1997 –2003, Assistant Professor of Mechanical Engineering.

**Other Related Experience**

- 1996-1997, Research Assistant, McMaster University, ON Canada.
- 1993-1996, Teaching Assistant, McMaster University, ON Canada.
- Summer 1992, Research Engineer, IMMRC, McMaster University, ON, Canada.
- 1990-1991, Technical Packaging Engineer, Procter and Gamble, Egypt.
- 1989-1991, Teaching Assistant, The American University in Cairo, Cairo, Egypt.
- Summer 1989, Trainee Engineer, Bechtel Overseas, Cairo, Egypt.
- Summer 1988, Trainee, Chemical Research Institute, Vespem, Hungary.

**Consulting, Patents, Etc.**

- Consulting, Advanced Science and Automation Corp., Indianapolis, Indiana, 2004-present.
- Consulting, Subaru-Isuzu Automotive Inc., Indianapolis, Indiana, 2002.
- Consulting, Overton & Sons Co., Indianapolis, Indiana, 1999-2000.
- Consulting, Excalibur, Ontario, Canada, 1997.

**Teaching Interests**

Design, Manufacturing processes, and CAD/CAM.

**Courses Taught at IUPUI**

*ME 196 Introduction to Computer Applications in Engineering; ME 197 Introduction to Computer Programming; ME 262 Mechanical Design I; ME 372 Mechanical Design II; ME 446/ME 546 CAD/CAM Theory and Applications.*

**Research Interests**

Advanced manufacturing, intelligent machining, manufacturing process modeling, simulation and control, Virtual manufacturing, CAD/CAM enhancement, and Solid modeling techniques and applications.

### **General Summary**

Dr. El-Mounayri has been conducting research in manufacturing process control, including modeling, simulating and optimizing the machining process. He developed empirical, semi-empirical and AI-based models for accurate prediction and optimization of milling. The developed models and optimization techniques are integrated into the current state-of-the-art CAD/CAM technology to produce enhanced systems that are readily available for industry. The developments include both physical models and geometric models. The geometric simulators are implemented using standard open architecture solid modeling kernels. CAD/CAM is also used to conduct applied R&D projects as well as training to the local industry. Dr. El-Mounayri has worked as consultant for a number of companies on the utilization and customization of CAD/CAM technology for process/product modeling and simulation, especially for manufacturing applications. He has published over 40 technical papers and gave presentations at various national and international conferences. Dr. El-Mounayri is currently conducting research in virtual manufacturing and intelligent machining which aims at developing the Advanced Virtual Manufacturing Laboratory for Training, Education and Research (AVML). The new initiative is supported by federal and state funds.

### **Principal Publications**

#### ***Journal Papers***

1. H. El-Mounayri, H. Kishawy, and J. Briceno, "Optimization of CNC Ball End Milling: A Neural Network-based Model", accepted for publication in the Journal of Materials Processing Technology, May 2004
2. H. El-Mounayri, J. Briceno, and M. Gadallah, "A New Artificial Neural Network Approach to Modeling Ball-End Milling", *International Journal of Advanced Manufacturing Technology*, 2003.
3. V. Tandon, H. El-Mounayri, and H. Kishawy, "NC End Milling Optimization Using Evolutionary Computation", *International Journal of Machine Tools and Manufacture*, v. 42, pp. 595-605, 2002.
4. H. El-Mounayri, H. Kishawy, and V. Tandon, "Optimized CNC End Milling: A Practical Approach", *International Journal of Computer Integrated Manufacturing*, v. 15, pp.453-470, 2002.
5. H. El-Mounayri, M. Gadallah, and J. Briceno, "Enhanced Modeling and Optimization of Milling Using Hybrid Techniques", *Transactions of the CSME (Canadian Society for Mechanical Engineering)*, v. 26, No. 2, pp. 179-199, 2002.
6. J. Briceno, H. El-Mounayri, and S. Mukhopadhyay, "Selecting an Artificial Neural Network for Efficient Modeling and Accurate Simulation of the Milling Process", *International Journal of Machine Tools and Manufacture*, v. 42, pp. 663-674, 2002.

7. M. Gadallah and H. El-Mounayri, "Exhaustive Search Approximation in Design Optimization – An Algorithmic Implementation", *Transactions of the CSME (Canadian Society for Mechanical Engineering)*, v. 26, No. 2, pp. 201-218, 2002.
8. V. Tandon and H. El-Mounayri, "A Novel Artificial Neural Networks Force Model for End Milling", *International Journal of Advanced Manufacturing Technology*, v. 18, pp. 693-700, 2001.
9. J. Henkle, S. Jayanti, R. Pidaparti and H. El-Mounayri, "Design Simulation of Cord-Rubber Structures Using ProE/ANSYS", *Composite Structures*, v. 52, pp. 287-294, 2001.
10. H. El-Mounayri, A. Spence and M. Elbestawi, "Milling Process Simulator – A Generic Solid Modeller Based Paradigm," *Journal of Manufacturing Science and Engineering*, ASME, v. 120, no. 2, pp. 213-221, 1998.
11. H. El-Mounayri, M. Elbestawi, A. Spence, and S. Bedi, "General Geometric Modelling Approach for Machining Process Simulation," *International Journal of Advanced Manufacturing Technology*, v. 13, pp. 237-247, 1997.

#### **Conference Proceedings**

1. El-Mounayri, D. Aw, T. Wasy, and A. Wasfy "Virtual CNC Machining: A Comprehensive Approach", Accepted for presentation at the ICC&IE 2005.
2. T. Wasfy, A. Wasfy, H. El-Mounayri, and D. Aw; "Virtual Training Environment for 3-axis CNC milling Machine"; Submitted to 25<sup>th</sup> Computers and Information in Engineering (CIE) Conference (DETC2005).
3. A. Wasfy, T. Wasfy, H. El-Mounayri, and D. Aw; "Web-based Multi-Media Lecture Delivery System with Text-to-Speech and Virtual Instructors", Submitted to 25<sup>th</sup> Computers and Information in Engineering (CIE) Conference (DETC2005).
4. Hazim El-Mounayri, Daniel Aw, Tamer Wasfy and Ayman Wasfy, "Virtual Advanced Manufacturing Laboratory for Training and Education" accepted for publication at the 2005 ASEE Annual Conference.
5. Haiyan Deng, Hazim El-Mounayri, and Daniel K. Aw, "A Generic Approach for Optimization of End Milling using Solid Modeling and Neural Network", 2<sup>nd</sup> International Industrial Engineering Conference, IIEC, 2004.
6. H. A. Kishawy, H. El-Mounayri, A. I. El-Wahab and Y. Zhang, "Characteristics of High Speed Machining of Difficult-to-Cut Materials with Self-Propelled Rotary Tools", accepted for publication at the MDP-8 International conference for Design and Production, January 4-6, 2004.
7. Deng H. and El-Mounayri H., "An Integrated Process Simulation System for End Milling", accepted for publication at the MDP-8 International conference for Design and Production, January 4-6, 2004.
8. Deng H. and El-Mounayri H., "An Integrated Process Simulation System for End Milling", accepted for publication at the MDP-8 International conference for Design and Production, January 4-6, 2004.
9. H. A. Kishawy, H. El-Mounayri, A. I. El-Wahab and Y. Zhang, "Characteristics of High Speed Machining of Difficult-to-Cut Materials with Self-Propelled

## A. Faculty Resumes

- Rotary Tools”, accepted for publication at the MDP-8 International conference for Design and Production, January 4-6, 2004. Paper published in proceedings.
10. H. El-Mounayri, H. Gadallah, and J. Briceno, “Optimized CNC End Milling Using Computational Intelligence”, International Conference on Industrial Engineering and Product Management (IEPM’2003)
  11. Hazim El-Mounayri, Zakir Dugla, and Haiyan Deng, "Prediction of Surface Roughness in End Milling using Swarm Intelligence, IEEE, Indianapolis, IN, 2003.
  12. H. El-Mounayri, H. Deng, and S. Mukhopadhyay, “A Neural network Model for Integrated Modeling and Optimization of CNC End Milling”, submitted to NAMRCXXXI, McMaster University, Hamilton, ON, Canada, May 20-23, 2003. Paper was published in proceedings.
  13. Z. Dugla, H. El-Mounayri, and M. Gadallah, “Accuracy Prediction in Flat End Milling Using Neural Network Approach”, submitted to NAMRCXXXI, McMaster University, Hamilton, ON, Canada, May 20-23, 2003.
  14. H. El-Mounayri, H. Deng, and S. Mukhopadhyay, “A Neural network Model for Integrated Modeling and Optimization of CNC End Milling”, submitted to NAMRCXXXI, McMaster University, Hamilton, ON, Canada, May 20-23, 2003.
  15. Z. Dugla and H. El-Mounayri, “Accuracy Prediction in Flat End Milling Using Neural Network Approach”, submitted to NAMRCXXXI, McMaster University, Hamilton, ON, Canada, May 20-23, 2003.
  16. H. El-Mounayri and N. Lamm, “Introducing Problem-based Learning in a Modular Freshman Course”, IL/IN ASEE Sectional Conference, pp. 61-66, 2002.
  17. H. El-Mounayri, Z. Dugla and H. Deng, “Predicting Surface Roughness in End Milling Using an Innovative Technique from Evolutionary Computation”, accepted for presentation in Symposium on Advances to Further the Automation of Metal Removal Processes at the International Mechanical Engineering Congress and Exposition (IMECE 2002), ASME, Nov. 2002.
  18. H. El-Mounayri, J. Briceno, and M. Gadallah, “Prediction of Forces in Ball-end milling Using RBF Neural Networks”, Transactions of NAMRI/SME, Volume XXX, pp. 313-320, 2002.
  19. H. El-Mounayri and V. Tandon, “An AI-based Model for Predicting Instantaneous Cutting Force in End Milling”, accepted for presentation in Symposium on Process planning and Process Optimization at the International Mechanical Engineering Congress and Exposition (IMECE 2002), Nov. 2002.
  20. H. El-Mounayri, H. Kishawy, H. Deng, “An Integrated Approach for Optimized CNC End Milling”, submitted to the 3<sup>rd</sup> Assiut University International Conference on Mechanical Engineering Advanced Technology for Industrial Production (MEATIP3), December 24-26 2002.
  21. M. Gadallah and H. El-Mounayri, “Modeling for Optimization (MO-OP): Tools for Manufacturing and Design Engineering Problems”, Proceedings of DETC’01 ASME 2001 Design Engineering Technical Conference and Computers and Information in Engineering Conference, Pittsburgh, PA, September 9-12, 2001.

22. B. June, R. Pidaparti, and H. El-Mounayri, "Bending Failure Behavior Recycled Aluminum Reinforced Composites", 2001 ASME International Mechanical Engineering Congress and Exposition, New York, Nov. 11-16, 2001.
23. H. Kishawy, A. El-Wahab, and H. El-Mounayri, "On the Effect of Rake Angle and Edge Preparation during Machining – A Finite Element Modeling and Analysis", 7<sup>th</sup> International Conference on Production Engineering, Design and Control, February 13-15, 2001.
24. J. Zhang, J. Chen and H. El-Mounayri, "PDM-based Virtual Product Template for Optimum Design and Manufacturing," Proceedings of the Current Advances in Mechanical Design & Production, Proceedings of the 7<sup>th</sup> Cairo University International MDP Conference, Cairo, Egypt, v. 7, pp. 373-380, 2000.
25. V. Tandon and H. El-Mounayri, "Closing the Gap between Pro/E and CNC Manufacturing," 2000 Pro/USER International Conference, Orlando, Florida, USA, June 18-21, 2000.
26. V. Tandon and H. El-Mounayri, "Aspects of Integrated CAD/CAM for Advanced Manufacturing," Proceedings: Electrical Insulation Conference and Electrical Manufacturing & Coil Winding '99 Conference, Cincinnati, Ohio, pp. 539-546, 1999.
27. J. Zhang, J. Chen and H. El-Mounayri, "A Generic Template for Collaborative Product Development," Presented at the ASME Symposium on Virtual Environment for Manufacturing at the International Mechanical Engineering Congress and Exposition (IMECE), Nashville, Tennessee, Nov. 14-19, 1999.
28. H. El-Mounayri, J. Zhang, and J. Chen, "PDM-based System for Manufacturing Process Analysis and Optimization," Proceedings: Electrical Insulation Conference & Electrical Manufacturing & Coil Winding '99 Conference, Cincinnati, Ohio, pp. 15-21, Oct. 26-28, 1999.
29. L. Kwok and H. El-Mounayri, "CAD/CAM-based Geometric Modeling Simulation for Virtual Manufacturing," Proceedings: Electrical Insulation Conference and Electrical Manufacturing & Coil Winding '99 Conference, Cincinnati, Ohio, pp. 547-551, 1999.
30. H. El-Mounayri, M. A. Imani, M. Elbestawi, and A. Spence, "Closing the Gap between CAD/CAM and Machining Process Simulation: A Generic Solution," 1997 ASME International Mechanical Engineering Congress and Exposition, Symposium on Predictive Modeling in Metal Cutting as Means of Bridging the Gap between Theory and Practice, Dallas, Texas, November 17-21, 1997.
31. H. El-Mounayri; A. Spence and M. Elbestawi, "Enhanced CAD/CAM for Simulation and Optimization of 3-5 axis Milling of Dies and Molds," Proceedings of the 13<sup>th</sup> Symposium on Engineering Application of Mechanics, 1996 CSME Forum, McMaster University, ON, Canada, pp. 394-401, 1996.

### **Professional Presentations/Seminars**

1. Technical paper presentation. "Virtual CNC machining: A comprehensive approach", ICC&IE 2005, Istanbul, Turkey, June 19-22, 2005.

### *A. Faculty Resumes*

2. Technical paper presentation. "Virtual Advanced Manufacturing Laboratory for Training and Education", 2005 ASEE Annual Conference, Portland, Oregon, June 12-15, 2005.
3. Poster presentation at Solutions Conference 2005, IUPUI, 2005.
4. Poster presentation at the Advanced Manufacturing Summit I, II, and IV, Purdue University, 2002, 2003, and 2005.
5. Technical paper presentation. "A Generic Approach for Optimization of End Milling using Solid Modeling and Neural Network", 2<sup>nd</sup> International Industrial Engineering Conference, IIEC, Riyadh, Saudi Arabia, 2004.
6. Technical paper at the NAMRCXXX, Purdue University, May 21-24, 2002.
7. Seminar to ME Industrial Advisory Committee, IUPUI, 2002.
8. Seminar to School of Engineering & Technology, IUPUI, summer 2001.
9. Student presentations of technical papers at Graduate Showcase, IUPUI, 2001.
10. Poster presentation at ConnectTech 2001 and ConnectTech 2003, IUPUI, 2001 and 2003.
11. Technical paper at the PEDAC'2001: 7<sup>th</sup> International Conference on Production, Design and Control, Egypt, February 2001.
12. Technical paper at the 7<sup>th</sup> Cairo University International Conference on Mechanical Design & Production, Egypt, February 2000.
13. Poster presentation at the 2000 Pro/USER International Conference, June, US, 2000.
14. Poster presentation at Graduate Showcase, IUPUI, 2000.
15. Seminar to ME Department, IUPUI, April 2000.
16. Technical paper at the IMECE, Symposium on Virtual Environment for Manufacturing, ASME, November 1999.
17. Poster presentation at Graduate Showcase, IUPUI, 1999.
18. Technical paper at the 1997 ASME International Mechanical Engineering Congress and Exposition, Symposium on Predictive Modeling in Metal Cutting as Means of Bridging the Gap between Theory and Practice, November 1997.

### **Graduate Students Supervised**

1. Dennis Walsh, MSME, in progress.
2. Daniel Aw, MSME, in progress.
3. Gustavo Rengifo, MSME, in progress.
4. Lee Aun Siow, MSME, Non-Thesis, 2005.
5. Haiyan Deng, MSME, Thesis: "A Generic Approach for Integrated Modeling and Optimization of 2 ½ - Axis End Milling Using Solid Modeling and Artificial Intelligence", 2003.
6. Zakir Dugla, MSME, Thesis: "Prediction of Dimensional Accuracy in CNC Milling using Computational Intelligence Techniques and Experimental Data", 2003.
7. Jorge Briceno, MSME, "CAD/CAM based system for modeling and simulating ball-end milling using Artificial Neural Network, 2002.
8. Lim Kwok, MSME, Non-Thesis, 2002.

9. Vipul Tandon, MSME, "Closing the Gap between CAD/CAM and Optimized CNC End Milling", 2000.

### **Principal Research Projects**

1. "SBIR/STTR Phase II: Advanced Virtual Manufacturing Lab for Research, Training, and Education," NSF, \$500,000, Academic Investigator (IUPUI share: 30%), 06/05-06/07.
2. "SBIR/STTR Phase I: Advanced Virtual Manufacturing Lab for Research, Training, and Education," Indiana 21<sup>st</sup> Century Fund, \$100,000, Academic Investigator (IUPUI share: 48%), 12/04-06/05.
3. "SBIR/STTR Phase I: Advanced Virtual Manufacturing Lab for Research, Training, and Education," NSF, \$100,000, Academic Investigator (IUPUI share: 30%), 12/03-12/04.
4. "Basic assessment of the Rotary Tool Performance During Dry Hard Machining," SME (Society of Manufacturing Engineers), \$15,000, PI, 06/03-06/04.
5. "Development of 4<sup>th</sup> axis Capabilities for an Accurate Machining of the Helical Pinion at BST," El-Mounayri (PI) and Chen (Co-PI), \$12,636.
6. CATIA-based Casting Die Development at KIPT, KIPT (Keihin Indiana Precision Technology), Indianapolis, IN, \$7,475, PI, 09/02-08/03.
7. "Extending the Machining Database of Allison Transmission for Force Modeling Prediction of New Machining Scenarios - Phase I," Allison Transmission Company, Indianapolis, IN, \$4,000, PI, Fall 2002.
8. "An Investigation of the Machinability of Steel 35MNV7 for Use in the Manufacturing of Bishop Steering Rack," Bishop Steering Technology, Indianapolis, IN, \$7,500, PI, 06/02-12/02.
9. "Introducing Geometric Dimensioning and Tolerancing and Total Quality at Bishop," Bishop Steering Technology, Indianapolis, IN, \$9,998, PI, 02/01-04/01.
10. "Introduction of Pro/ENGINEER and Implementation of Computer-Aided Manufacturing Post-processors for Raytheon," Raytheon Systems Company, Indianapolis, IN, \$30,000, PI, 07/00-07/01.
11. "Implementation of Computer Aided Manufacturing (CAM) Post-processors for Raytheon CNC Machines – Phase I," Raytheon Systems Company, Indianapolis, IN, \$15,823, PI, 06/99-10/99.
12. "Implementation of Computer Aided Manufacturing Post-processors for Raytheon CNC (Computer Numerical Controlled) Machines – Phase II," Raytheon Systems Company, Indianapolis, \$21,405, PI, 10/99-06/00.

### **Membership in Scientific and Professional Societies**

1. American Society of Mechanical Engineers (ASME).
2. American Society for Engineering Education (ASEE).
3. Society of Manufacturing Engineers (SME).
4. American Association of University Professors (AAUP).

### **Honors and Awards**

1. Winner of the 2001-02 Trustees Teaching Award.
2. ASME Award for Valued Services, 2001 and 2002.
3. Winner of TERA Teaching Excellence Award, 2000.
4. Nominated for the Outstanding Teacher Award, 2000.
5. ARTI Partners for Invention & Entrepreneurship Honor, 2000.
6. Nominated for the Wisner-Stoelk Award for Teaching Excellence, 1999.
7. ASME Award for Outstanding Services, 1998.
8. C.W. Sherman Graduate Scholarship, McMaster University, 1995-96.
9. McMaster-CIDA Scholarship, McMaster University, 1992-94.

### **Significant Institutional Service**

#### ***Campus***

Tragedy/National Crisis Outreach Committee, Member, 2001-2003.

#### ***School***

1. Member, Undergraduate Policy Committee, 2002-2004.
2. Member, Nomination Committee, 2000-present.
3. Member/Alternate, Faculty Senate, 2002/2004-present.
4. Member, Freshmen Curriculum Committee, 2000.
5. Instructor, MEAP (Minority in Engineering Advancement Program), IUPUI, summer 2002.

#### ***Department***

1. Chair, Student Awards Committee, 2004-present.
2. Chair, Design Curriculum Committee, 1999-present.
3. Graduate Student Research Committee (7 students), Chair, 1998-present.
4. Graduate Student Research Committee (6 students), Member, 1998-present.
5. Member, Undergraduate Educational Committee, 1998-present.
6. Chair, Equipment Committee, 2003-present.
7. Academic Advisor to Mechanical Engineering Students, IUPUI, 2000-present.

### **Significant Professional Service**

1. Faculty Advisor of IUPUI ASME Student Chapter, 1997-present.
2. Co-Chair of Conference Session at the NAMRCXXVIII, Lexington, KY, May 23-26, 2000.
3. Reviewer, Transactions of ASME, Journal of Manufacturing Science and Engineering.
4. Reviewer, International Mechanical Engineering Congress and Exposition, ASME
5. Journal of Composite Structures.

### *A. Faculty Resumes*

6. Reviewer, Journal of Manufacturing Systems.
7. Reviewer, Journal of Manufacturing Processes.
8. Reviewer, International Journal of Intelligent Automation and Soft Computing.
9. Reviewer, Book review (Mastering CAD/CAM by I. Zeid, 2004).
10. Reviewer, Journal of Machining Science and Technology

### **Significant Professional Development Activities**

1. Training session on the development of virtual courses, IUPUI, 2005
2. NSF/ASEE Faculty Development Workshop: “Promoting Higher Level Thinking, Part II), IUPUI, March 2001.
3. Speaker in the Leadership Workshop: “Nuts and Bolts of Successful Student Organizations”, IUPUI, January 2001.
4. Workshop on OnCourse, IUPUI, January 2001.
5. NSF/ASEE Faculty Development Workshop: “Promoting Higher Level Thinking, Part I), IUPUI, October 2000.
6. Training Course on Surface modeling, PTC, Indianapolis, IN, June 1999.
7. Training Course on Pro/Manufacturing, PTC, Minneapolis, MN, August 08-14, 98.
8. One-week IU Development/Grant Writing Workshop, IUPUI, Summer 1998.
9. NSF-sponsored Workshop on Parametric Solid Modeling and its Applications, MCATE, Elgin, Illinois, June 22-25, 1998.
10. NSF-sponsored Workshop on CNC Machine Tool Setup and Operation, MCATE, River Grove, Illinois, June 13-16, 1998.